Repoliticizing Development: Tracing Spatial Technology in the Rural Development Landscape of South India

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Abstract

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This dissertation is an ethnography that develops a situated understanding of the trend of privileging remote sensing and Geographic Information Systems (GIS) as planning tools in rural development in India. While these tools are actively propagated by the State, I argue that the proclaimed power of these tools is difficult to realize in practice. In order to understand the ambiguities of practice in spatial technology based rural development this dissertation provides insights from a semi-arid location in south India where an NGO employed these tools to create watershed development plans. Working at the boundaries of Critical Development Geography and Science and Technology Studies (STS), this research is informed by theories that pay attention to robust spatiality. The two main features of my approach are attention to processes as they take shape, and relationships between actors. I follow the translations and articulations amongst a range of actors such NGO staff, farmers, state officials, local traders, and soil and moisture. I identify, in this historical-geography of articulations, crucial moments that I call 'movement'. It is these moments of 'movement' that demonstrate how actors use many objects to understand their world, and represent it.

The central argument of this dissertation is that these moments of ‘movement’ allow us to understand the complexities in, and most importantly allow us to repoliticize technological and development practice, rather than assume they are inherently reductive and apolitical.

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Glossary

Term	Definition
Adivasi	term that denotes tribal communities
bajra	pearl millet
birsu	hard soil
dalal	money lender cum grain trader
doab	fertile strip of land between two rivers
gobra	manure
gowda	erstwhile landlord, now also refers to a caste group, and loosely refers to large landholders
Gram Panchayat	village government council, the body that administers decentralized local governance
Gram Sabha	public village meeting conducted by the gram panchayat
halla	river
hingaru	second agricultural season, during northeast monsoon from October to January
hobli	an administrative unit that falls under district and taluk level, a cluster of gram panchayats
jameen	cultivable private property
jhola	sorghum
jowar	sorghum
kadlee	bengal gram
kere	tank, and also depression in which farmers collect and harvest alluvium
khata	title of property
kharif	first agricultural season, during southwest monsoon from June to September
Lambani	a tribal community
Lingayat	a traditional agricultural caste, occupying a high status in the caste hierarchy
maidan	flat, open space, refers to a part of the Deccan plateau
mikke jhola	corn
mungaru	first agricultural season, during southwest monsoon from June to September
naala	stream
ooru gobra	organic manure
Panchayati Raj	system of decentralized local governance
rabi	second agricultural season, during northeast monsoon from October to January
raiyats	farmers
rajki	politics (noun) and politicking (verb)
raki	alluvial soil
sajjee	pearl millet
sarkar gobra	chemical fertilizers
sowcar	landlord
taakat	capacity
tahsildar	chief officer in the taluk level governance office
taluk	administrative unit below district level
tanda	tribal hamlet

thingal hesaru	green gram
thotaa	wet garden / vegetable garden
tippe gobra	livestock manure
urulai	horse gram
Zilla Panchayat	district level governing body

Abbreviations

ANT	Actor-Network Theory
AO	Agricultural Officer
APMC	Agricultural Produce and Marketing Co-operative
CAG	Comptroller and Auditor General
CCT	Continuous Contour Trenches
CD	check dam
CDG	Critical Development Geography
CMP	Community Monitoring Program
CPR	Common Property Resource
CRIDA	Central Research Institute for Dry land Agriculture
cum	cubic meter
DAP	diammonium phosphate, a fertilizer
DDP	Desert Development Program
DLH	Dry land Horticulture
DPAP	Drought Prone Areas Program
DST	Department of Science and Technology
DOS	Department of Space
FYP	Five Year Plan
GIS	Geographic Information Systems
GOI	Government of India
GP	Gram Panchayat
ha	hectare
HADP	Hill Area Development Program
HAR	Households at Risk
HDI	Human Development Index
HPCRRI	High Power Committee for Redressal of Regional Imbalances
HYV	High Yielding Variety
IAS	Indian Administrative Service
ICT4D	Information Communication Technologies for Development
IMSD	Integrated Mission for Sustainable Development
ISRO	Indian Space Research Organization
KSRSAC	Karnataka State Remote Sensing Applications Centre
LAR	Lands at Risk
LCC	Land Capability Classification
m	meter
MLA	Member of Legislative Assembly
MP	Member of Parliament
MSP	Minimum Support Price
NABARD	National Bank for Agriculture and Rural Development
NNRMS	National Natural Resources Management System
NRDMS	Natural Resources Data Management System
NRSA	National Remote Sensing Agency
NRSC	National Remote Sensing Centre
OBC	Other Backward Caste
OC	Other Caste

PDS	Public Distribution System
PRA	Participatory Rural Appraisal
PTRG	People's Technical Resource Group
P.U.C	Pre-University Course
RRSSC	Regional Remote Sensing Service Centre
RS	Remote Sensing
RSK	Raita Sampark Kendra / agricultural extension office
RFC	rubble field checks
SAC	Space Applications Centre
SC	Scheduled Caste
SHG	Self Help Group
ST	Scheduled Tribe
STS	Science and Technology Studies
T & V	Training & Visit System
TcB	Trench-cum-Bund
UAS	University of Agricultural Sciences
VDS	Village Development Society

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I hope I have not forgotten others, but if I have it is only because I am numb with the excitement of being done.

Chapter 1

Ambiguities Under the Sky

It's never a straightforward process – looking into one's mind and narrating a history of how one got here. I loved to sketch and particularly with charcoal, and pen and ink. This love for handwork and the form included a love for map aesthetics. But I do remember that when I wanted to learn how to make maps in graduate school in the mid nineties I had to confront the digital environment and Geographic Information Systems (GIS). I went with the flow but the double-click[1] never clicked inside my head. I did not have a mathematical or programming background. I was constantly trying to understand what digital technologies did by looking at the results of every operation on the computer monitor.

Besides learning GIS, I also immersed myself in the new field of political ecology. I was more comfortable understanding people and their actions. I studied Joint Forest Management in India for my M.S. Thesis, and I wanted a job in India which would put me in touch with the field and with ground realities. Here too the discomfiting word (in my mind) - GIS - came to my rescue. It was not uncommon in the corridors of Science Hall, which housed the Geography Department in University of Wisconsin, to hear fellow students talking about GIS skills and how it often helped to get your foot in the door. That's exactly what happened to me! I landed a job in India in a multi-disciplinary research project that was studying the causes and impacts of deforestation in the Western Ghats of India. I got my foot in the door because I knew how to work with ArcView. I thought this project would allow me to understand the complexity of property rights arrangements in the Western Ghats and how this related to forest use. Instead I was told that the project would like me to make land use land cover maps for the project, and in the process I could also work with other staff in order to get some social science experience.

I took the job. There was one other GIS/Remote Sensing (RS) person in the project with a few years of experience, with whom I was to work. Imagine my discomfort when in the first week of work, my boss called me to trouble shoot something to do with projection display in ArcView. The team wanted to test what this U.S. returned Geography graduate could do. I couldn't solve the problem. I brought nothing special to the team but an extra pair of hands, and an extra brain – both of which were struggling like the others to make sense of the digital environment. Now when I look back at those days it is very clear to me that the ambiguity of this digital environment – its power to make and obfuscate – was what permeated the air in that office.

Let me lay out the details of this ambiguity.

In a research project that was investigating land use change over two decades, satellite images presented significant power to see - power to see change in a landscape and to pinpoint change at the level of a pixel. There was also power to

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1 Latour uses the term 'double-click' to symbolize the instantaneous supply of information in the digital

overlay property boundaries onto land use maps, pinpoint what type of changes have occurred where, and power to tell people of a particular region what changes they have wrought on their landscape. These were some of the objectives of the study I was involved in. The change data that came out of the mapping process was to play an important role in the project because it contained the evidence for where, what type of change had occurred. However, in the political economy of the Indian spatial technology sector of the late nineties, I personally found that this power was not easy to create.

Satellite images were expensive. Hence environmental research projects operating in a project funding environment had to be picky about the number of time frames for which they wanted satellite images, the extent of area they wanted to map, and the kinds of satellite images they wanted for change detection. Secondly, software licenses were expensive and this limited the computing capacity of the project team. But most importantly for me, at the level of a project staff, the biggest scarcity was in terms of expertise. Who could we go to if we wanted to know how to import a raw image? How to geo-rectify a raw image? How to get accurate geodetic information about datums, spheroids, etc., to aid us in the geo-rectification process? The spatial technology sector was far from organized in the late nineties, despite Indian Space Research Organization (ISRO) and National Remote Sensing Agency's (NRSA) pronouncements about the utility of satellite images for the natural resource management needs of the country.

We ended up doing a lot of bootstrapping for each process in satellite image processing. Since there was no authority in this field, and no standards, everybody was more or less reinventing the wheel. The topic of conversation during tea breaks in conferences and workshops was about geo-rectification, and root mean square (RMS) error, and accurately overlaying cadastral maps. Access to experts was scarce. And to a certain extent the policies of the Indian state institutions were deterrents. While the country at large was never allowed to ignore the launch of a new satellite, and the scientific advancements each new launch enabled, very few state sponsored initiatives were put out to support the use of these powerful images. The initiatives that existed – be it the user interaction workshop organized by NRSA or the local State run remote sensing centers - provided a rather dull environment where users could not push questions in order to get solid answers. The feeling was one of separation. While they had their labs and technicians who were churning out databases, and interpreting maps, every time I visited one of these centers I was made to feel like a lesser citizen who did not need to know the details. I would sometimes leave wondering if it was all an effort to create a mirage – did some of those technicians really know what vector data structures looked like behind the computer monitor? Or were they only digitizing?

My boss on the other hand, an engineer turned environmental economist, was a stickler for detail and accuracy. There were times when he would quiz me on my high school trigonometry while I was trying to geo-rectify an image. He would tell me, part jokingly, that as the sole geographer on the team I had to be the gatekeeper of these issues. I was often left frustrated and wondered why my B.Sc. professors taught me only the graphical method and not the geometric method of map projections. Despite this, I survived. I was sent to Survey of India to enquire about the spheroid and datum used for the Indian topographic sheets. I met a retired Survey of India

official to cross verify the datum and spheroid information. I was asked to find out the physical location of a geodetic point so that I could verify the accuracy of our handheld Global Positioning System (GPS). At the end of my three years in this research project I felt that I was brimming with a specific set of skills – the skills to ferret out information in an environment of scarcity and to cross verify if that information was accurate and correct. None of the other information we needed was as easily available as the satellite images! There was a disconnect between the technical side and technical people in the sector and the applications people.

Looking back today I don't see the problem being the practice of bootstrapping. Instead the point I want to highlight through this recounting, is that bootstrapping occurred in a specific environment of scarcity at the level of practice, and this scarcity was being negotiated against the backdrop of a heavy symbolism of the Indian satellites in the sky.

In the midst of this bootstrapping, we had to deal with another kind of scarcity – high turnover of GIS project staff. Reasons for this high turnover extend beyond the ambit of the environmental research sector that used GIS. An externally funded environmental research project could not provide the required incentives for GIS staff. Post-graduate courses in GIS and RS were just beginning to spring up and the people who graduated from them typically looked for jobs in multinational companies that focused on infrastructure services. On the other hand, jobs in the 'island' state sponsored institutions were not always easy to come by and one could only apply when there was an official call for applications. Hence research project jobs were fallback options for those who didn't have luck with the MNCs or State institutions. However no one stopped looking for those higher paying jobs despite the fact that the MNC jobs were mostly to do with data conversion. Following the Information Technology (IT) boom, MNCs began contracting Indian companies for this job and this has led to a big source of employment.

I found that magazines that wrote about the GIS industry in the country placed undue emphasis on political and organizational issues of the industry. Ravi Gupta, a leading observer of the GIS sector in India, in his paper titled, 'Prospects and Problems in GIS in India', says “As in many other developing nations, the major impediments to the widespread and successful use of geographic information in India are not technical, but political and organizational” (Gupta R 1999, 6). The organizational issues that he points out are the lack of a national spatial data infrastructure, the absence of a pro-active stance of the Indian state, and the secrecy that shrouds access to spatial data in India which is predominantly owned, produced and consumed by the State. 83 per cent of National Remote Sensing Agency's (NRSA) revenue is from Government departments themselves (Gupta R 1999, 2). Moreover NRSA and Space Applications Centre (SAC) have been credited for creating an industry of GIS vendors doing the sort of work described above. Also contribution of GIS data in India's software exports began to rise. All this substantiates one set of changes in the GIS services industry. What this does not address is the environment-development field and its use of geographic data.

This brings me to another aspect of obfuscation that I perceived in the Indian spatial technology sector - limited engagement with content or in other words data and the measurement of data. As a student of political ecology I was puzzled by the

set of variables typically extracted from satellite images and incorporated in a GIS – the set was often limited to rainfall, slope, land use / land cover, drainage and soil. I wondered if these layers were adequate to address the natural resource management issues of the country. Each of the variables were also defined in very broad terms and accordingly measured. For example, rainfall was represented by annual figures for several regions that depended on the vagaries of the seasonal monsoon. Land use and land cover were represented through broad classes such as fallow, first season crop, second season crop, double crop, forest, grasslands and wastelands. There was little attempt to capture the people-environment interactions in landscape, and there was little explanation for what was left out of the classifications. Also, most thematic layers were represented at small scales of 1:50,000 or 1:250,000. These issues of data become even more relevant to think about when data produced by the State becomes the most visible source in the absence of any institutional frameworks for data sharing, and data access.

While there are many examples of a preoccupation for particular scales and models in the works of State institutions I will pick one predominant example that was showcased in the Integrated Mission for Sustainable Development (IMSD). IMSD was initiated in 1987 by the Department of Space at the behest of the then Prime Minister Rajiv Gandhi 'to find a scientific and lasting solution to mitigate drought following the unprecedented drought in many parts of the country during 1985-87' (ISRO 2001, 3). A pilot project was conducted in one southern Indian district in 1987 and results were presented to the Planning Commission in 1991. The Planning Commission approved the IMSD methodology and recommended extension to 153 districts that have been classified as 'marginal' through other State programs such as Drought Prone Areas Program (DPAP), Desert Development Program (DPP), or Hill Area Development Program (HADP). In 1994, the Secretary of the Department of Rural Development requested ISRO to generate IMSD 'action plans' for 80 selected blocks in 80 priority districts. While the IMSD methodology was standardized, a cursory survey of some of the action plans revealed differences in rigor and quality depending on the range of actors involved in plan preparation.

The core feature of IMSD is generation of a new sustainable land use plan for the district. Using remotely sensed satellite data, conventional secondary data, and field visits, ISRO collates general district level information on climate, geology, basic amenities, literacy levels, % urban and rural populations, and livestock in order to develop a land use problem hypothesis specific to the area such as overgrazing and incorrect cultivation methods. The specific data layers that are integrated in the GIS are land use/land cover, soil, hydrogeomorphology, rainfall, slope, aspect, altitude, drainage, watershed, transportation, and settlement (ISRO 2001, 22). Socio-economic details are not integrated. The next step - decision-making - involves overlaying all the layers and using an algorithm (that assigns a specific weight to each layer/determinant based on discussions with district planning officials) to come up with a land use suitability ranking method for each 1000 - 2000 ha watershed unit within the district. For example, in a hilly and 'ecologically fragile' region, slope is assigned the strongest weightage. Depending on the slope of the land a suitable sustainable land use is recommended. These models / plans are created at the scale of 1:50,000. It is only for implementation purposes that they are enlarged to 1:8000 scale, transposed on a cadastral map with survey number boundaries and handed to the implementing agencies.

While the overlay model is one of the most common spatial analysis methods, particularly post GIS, the point I would like to raise is that the variables were defined and measured rather coarsely in the IMSD program[2]. Moreover, the results of these analyses were seldom used by district planning officials. In 2004 when I was about to begin field research for my Ph.d, staff at ISRO told me that IMSD was not functioning anymore. Later in 2009, during my field work, when I met a senior planning official to discuss the use of GIS in the State Planning Department, she told me that while there was always talk of GIS based planning, bureaucrats in the Planning Department still carried on with conventional methods of planning that were based on financial outlays and budget allocations. In the same year, the GIS coordinator of a district level planning department told me that most of what he and his staff did in their well equipped lab was digitization. He also added that staff at Space Applications Centre (SAC) at the Federal level were busy developing algorithms for spatial analysis but would never communicate the techniques in manner that his team could learn to apply them.

At the Federal level, programs to show case the potential of remote sensing and GIS were floated – there was the Natural Resources Data Management System (NRDMS), the National Natural Resources Management System (NNRMS), and an assortment of smaller programs which were documented in bound volumes that I would find later in the Indian Space Research Organization (ISRO) and Planning Commission libraries. Why so many different programs with overlapping objectives – databases and decision support systems for managing natural resources of the country? Why parallel initiatives? A senior expert in the field clarified for me that NRDMS was a Department of Science and Technology (DST) initiative, while NNRMS was a Department of Space (DOS) Initiative. He added that the Planning Commission recommended merging both institutions in the 9th Five Year Plan (1997-2002), but that has not happened because it has been difficult for two strongholds to merge their activities.

I also found that there were different views of what these technologies could provide. For example, during an interview with me a senior technocrat who had retired from ISRO expressed his frustration with some agricultural scientists who persisted in using the traditional method of crop cutting surveys and not satellite images and GIS to calculate crop estimates. Here he took pains to specifically explain to me that mapping change, rather than mapping the universe every season and every year was a lot more 'scientific'. He went to add that 'scientific' method meant thinking about the most sophisticated way to measure something, and using the latest computing capabilities offered by the digital medium. According to him this would be smarter than going to the field and conducting 'unscientific' crop cutting experiments. He felt that there was little innovative thinking in applied research institutions that could harness the potential of remote sensing technologies. In a similar vein, an IMSD prototype report prepared by an NGO in collaboration with ISRO emphasizes the importance of accurate and reliable information for natural resources management. In

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2 For an intellectual history of the spatial overlay model in Geography and GIS refer to Harvey, F., 1997. Harvey engages with the debates between holistic and systems approaches of spatial analysis. While he highlights the reductiveness of the systems approach he also points out that this approach is typically associated with problems in the measurement and representation of each individual layer. He proposes an engagement with both approaches in order to develop a deeper understanding of space.

commercial GIS journals in circulation in the country there is also an unproblematic celebration of the importance of *geographic* information. But as a geography student, at the user level I never saw any real engagement with the content and history of geographic information. The meaning of 'where' was rather superficial. A common end objective was literally to see 'where' things are on maps that were churned out of a GIS.

Meanwhile in the research project, we became engrossed in rethinking our classification system for land use land cover mapping in the Western Ghats. Since it is a landscape that has been historically modified by human use, there existed many subtle variations in forest cover. We began to experiment with different image interpretation techniques that would be suited for the heterogeneous landscape we were working in, and a classification scheme to map parameters of interest (not merely vegetation classes) such that they can be linked to the larger socio-economic study of determinants and impacts of forest use change. We found that many of our concerns were being addressed in publications such as 'People and Pixels' that is a collection of papers exploring how the analytical capabilities of spatial technologies can be linked effectively with the concerns of social scientists (Rindfuss et al. 1998).

It is with all these ideas that I wrote my statement of purpose when applying to doctoral programs in United States. During the initial years of my doctoral program I had the time to read more critical literature on the applications of GIS and remote sensing, and my courses in Science and Technology Studies in particular gave me a theoretical framework with which I could begin to make sense of all the ambiguities I had noticed in my job in India. Working as a teaching assistant with my then Ph.d supervisor Nick Chrisman, and using his GIS textbook finally gave me a comprehensive representation framework with which to understand the content, i.e. data measurements and transformations that happened in a GIS. The text is written with the objective of making transformations of data transparent and traceable. I felt a great sense of relief that I could now view GIS for the meaning of, and exclusions behind the pretty maps. My discomfort with GIS slowly began to dissipate, and for my dissertation research I proposed to develop a critical understanding of these technologies as planning tools, through an ethnography of their everyday use. When it was time to do field work I returned to India with the idea of doing an ethnography of GIS-based planning in a State institution.

Last year, one of India's leading news journals – Frontline – published an article on the recent review conducted by the Comptroller and Auditor General (CAG) of India about the effectiveness of ISRO's seven satellites that were operational between 2003 – 2008, and the performance audit of National Remote Sensing Centre (NRSC), earlier known as National Remote Sensing Agency (NRSA). NRSC is the authority that collates and disseminates remote sensing data acquired from the Indian remote sensing satellites. The main findings of the study substantiated for me the discomfort I felt as a project staff between 1998 and 2001.

One of the main findings was that three out of the seven satellites were operating at less than 50% of their full capacity. Full capacity was taken to the maximum number of scenes they were designed to beam down to the control center. Of the three, two were designed for land based natural resource applications, and the third was designed for oceanographic studies. In terms of returns on investment,

where revenues generated from satellite image sales were compared with original investment costs, all satellites showed negative values. They showed negative values even when sale revenues were compared with operating costs of each of the satellites. NRSC's response is very telling – that the pricing structure was never intended to make up for the initial investment costs, and that other intangible benefits that result from the use of satellite images need to be added to the sales revenues. While this throws up questions that demand a thorough analysis I will add that this points towards the symbolism that is assumed by technocrats in ISRO, just as the evidence of obfuscation that I perceived does.

The CAG report also states NRSC has not done enough to widen its customer base, and that about 80% of its sales is to other Government agencies. It has not followed up on the recommendations of the Parliamentary Standing Committee of 1996-97 to increase sales to private sector. The CAG also points out that NRSC could do more to customize data to suit customer needs. The audit also pointed out that assessment of user needs in different thematic areas such as drought monitoring and land use / land cover mapping was not satisfactory, and questioned how given this lack of pulse on users, ISRO could continue to develop new satellites. It was also pointed out that NRSA did not adequately discharge its duties in assisting NNRMS in implementing various thematic projects (such as the National Wastelands Mapping) by supply of data and analysis. In some cases, they have provided analyses that could not be implemented on the ground due to time lapse (Ramachandran 2011).

I insert here a quote from a speech delivered by Madhavan Nair, former chairman of ISRO from 2003 to 2009, to illustrate the claims about these technologies and their potential for rural development -

> "We need to substantiate the government's efforts to start a revolution, which can take its 6 lakh villages 'fast forward' in time - converting them into economically viable units and growth engines. Realizing the advantage of space as a vantage point, the visionary in Dr. Vikram Sarabhai, the father of the Indian space programme, saw an opportunity to exploit the space technology as a resource for community outreach, capable of serving the remote villages transcending geographical boundaries. And today, India's space programme distinctly exemplifies how space technology could be the harbinger of rural development" (Nair 2009, 3).

The trend of spatial technology based rural development has also spurred in some ways, and overlaps in many ways with the claims of the Information Technology (IT) industry in India which is ratcheting up the utility of Information and Communication Technologies (ICT) to solve the problems of rural development. Underdeveloped people and areas are becoming convenient legitimation for these technology industries in the country.

In my work in the spatial technology sector I found that in reality the proclaimed power of the technology is difficult to create. There are several ambiguities in the process of practice, and this is why I argue that many of these claims such as the quotes presented above, qualify as 'mixed questions' highlighted by Latour – "borderline questions that pertain simultaneously to the domain of the social and to the domain of natural sciences" (Latour 1991, 4). These are questions that

demand further investigation in order to repoliticize the construction and practice of technology and development. These questions and claims are often put forth and legitimized though a separation of the technical and the social, but following Latour I view them as 'imbroglios of political and scientific affairs, these tangles of ozone layer, frozen embryos, dying whales, printed chips, electronic money, and rain forests.....They have grown, and grown, and developed for three centuries.' (Latour 1991, 15)

Some strands of GIS-Society, specifically the work of Paul Robbins interrogates the Indian State's employment of remote sensing technologies. In his study on a State Forest Department's use of these technologies, Robbins argues that selective aspects of the technology are used by the Forest Department to define forest categories and represent the landscape in a manner that allows them to continue to wield power vis a vis local communities. This parallels arguments of large development projects in the work of Ferguson in *Anti-politics Machine* and Tania Li in *The Will to Improve* (Ferguson 1994; Li 2007). Their work also shows how the state represents society in a depoliticized manner (as backward) to maintain their sovereignty. Li extends the argument by following development processes through a more complex set of actors. Li is able to excavate the political spaces of development processes on the ground, yet she retains a separation between the 'technical' aspects and other 'political' spaces. Based on my insights from the ground I argue that there is a messy middle ground of practice and materialities that these theorists are missing, and that the middle ground is invisibilized through a manner of framing or conceptualization. For this reason, I am most compelled to frame my research concerns through a question of representation.

I intended to conduct an ethnography of spatial technology based planning in state sponsored rural development project in order to develop a critical understanding of the ambiguities of practice. However, my passage was not smooth. Firstly, a grant I had received for fieldwork was not given clearance by the Indian government because my proposal had the key words – 'remote sensing' and hence my research was considered a threat to national security. Secondly, I had no luck gaining entry to any state sponsored institutions that used remote sensing and GIS. When I would visit various government offices and explain my field research objectives I was met with the response, “We will call you after the maps are made. Then you can come and analyze the maps.” So much for an ethnography of practice!

I gave up my idea of an ethnography of a state institution with some reluctance and widened my search for cases. One day when I was directed to an NGO that had used remote sensing and GIS in a watershed development project I decided to follow the lead. In my first meeting with the NGO director when I was led through a rich presentation on the makings and content of their GIS plan prototype, and welcomed to conduct my ethnographic research and possibly also contribute to their spatial planning team, I did little to resist the offer. What followed is the subject of this dissertation.

The pseudonym I use for the NGO in which I conducted my ethnographic fieldwork is Jalaa. Jalaa was established in a semi-arid district of interior northern Karnataka over two decades ago. The Director of the NGO, Ashok (also a pseudonym) whose background is in journalism, and disaster relief set up Jalaa in this

region because it was defined by the Indian State as one of the country's most backward districts. In Chapter 3 I demonstrate that official definitions of backwardness are implicated in state sponsored development for the country as a whole post Independence. Regions of the country with a natural resource base conducive for 'productive agriculture' were delineated for programs such as the Green Revolution. Consequently semi-arid areas with highly variable rainfall, and away from major river deltas were defined as backward and by-passed by development projects such as the Green Revolution. Ashok's aim in setting up Jalaa was to help make sustainable, dry land farmers' income generation practices which had to deal with the vagaries of the monsoon.

My ethnographic research demonstrates that Ashok, while borrowing the official definitions of this region as backward in setting up his NGO, worked actively with the practices of people in the course of his development projects. He and the staff of Jalaa remained attentive to the dynamic manner in which farmers of the region worked with the landscape. Early on in his explorations of dry land agricultural practices Ashok realized the complexities in farmers' spaces of daily decisionmaking. This led him to move away from 'telling farmers what to do', and instead on focus on strengthening their land as an asset. While on the surface this could be read as an act of depoliticization by a development professional – stepping away from the complexities of agricultural practice, I argue that this represents a political act – as it is a decision that comes from an engagement with the work of actors on the ground. This decision marked his entry into soil and moisture conservation programs, particularly Watershed Development programs. Many state-sponsored projects of Watershed Development too are premised on assumptions of backwardness of the country's dry land areas. The chain of explanation in these development projects is a story of low productivity of land being the cause for livelihood insecurity and hence seasonal migration, which in turn leads to lack of interest in land based activities.

Jalaa began to experiment with the use of spatial technologies of remote sensing and GIS to make and implement watershed development plans for watersheds of sizes from 500 to 1000 ha. While established theories of the use of spatial technologies in natural resources based rural development, and in development studies might lead one to think that Jalaa used the technologies in a manner that did not revolutionize the practice of development, but instead used them in a manner to maintain their position of power in the landscape, my ethnographic research reveals a more complex picture. Ashok, because of the position of alterity in Jalaa – a small NGO in the development landscape has to strike a balance between procuring funding and implementing development programs on the ground. Ashok does prepare reports for his funders, but not only reports that depoliticize – he does not discount the agency of the people in this landscape. I also noticed the recurrence of the backwardness yardstick in many NGO meetings, when Ashok would often roughly measure the impact of their interventions with the changing statistics of the district.

I argue that to a certain extent while Li, Ferguson, Robbins are curtailed by their subjects (State, big development agencies), and also curtailed by their methods, I differ from them on both counts – my theoretical framework, and my phenomenon of enquiry. The solution that Robbins suggests is alternate classification systems such as local knowledge classifications. In excavating the instrumental effects of development projects, Ferguson, shows how the development project itself was acted on. His 'Anti-

politics Machine' is a sci-fi metaphor, where the machine has its own intelligibility. Power is theorized in a disembodied manner.

I, on the other hand, have worked at the intersection of Critical Development Geography (CDG) and Science and Technology Studies (STS) and conceptualized my phenomenon of study as both the practice of development and spatial technologies. I align myself with approaches in CDG that work at the intersection of Marxist political economy and post structural theory, which argue for conceptualizations of development processes through a robust working of space. These theories have many consonances with the spatiality inherent in Latour's framework of translation in STS. For example, Gillian Hart's concept of articulation and relational ethnography presents a much more compelling way of bringing Foucault and Gramsci together, than Li's project in 'The Will to Improve'. I argue that these spatial approaches move beyond the divisions and allow for intellectual projects that do not presuppose distinctions but allow understandings through following the messiness of how processes take shape. She urges us to move away from 'institutionalist definitions of culture as 'embedded' within structured social relations' and stylized representations to more processual understandings (Hart 2002, 818).

The two touchstones that I identify in deep conceptions of spatiality of theories in CDG and in Bruno Latour's theory of translation are attention to processes taking shape – which I call movement - and relationships between actors. Inspired by these approaches I asked a broad research question: How is knowledge produced and rural development practiced using these spatial technologies? The chapters that follow are my rendering of the ethnography I conducted in a semi-arid landscape of the south Indian state of Karnataka, where I followed how a spatial technology based development plan circulated in a landscape layered with the articulations of a range of actors such as NGO staff, farmers, state officials, local money lenders, seed traders, and soil and moisture. I identify crucial moments in this historico-geography of articulations that I call movements. It is these moments of movement that demonstrate how actors move through, and use many objects to understand their world, and represent it. They can change their minds, and also be acutely aware of their political projects. They speak about their movements, without erasure. It is these moments of movement that eventually allow me to make sense of the ambiguities that I laid out at the beginning of this chapter - the said claims of the State regarding these technologies, the shallow spatial models, some practitioners' obsession with accuracy, the assumption that scientific information will solve natural resource management and rural development problems, to recount a few. My central argument is that these moments of movement allow us to understand the complexities in, and most importantly allow repoliticization of, the practices of development and spatial technology based development.

Working at the margins of the two fields of CDG and STS my theoretical contributions are 1) a critique of post-structural theories of development as embodied in the works of Li and Ferguson, and 2) a response to claims in STS that translation approach is apolitical. My ethnographic research demonstrates how Latour's theory of translation can be productively used for political reasons if it is given its due place and extended, through a robust reading. In tracing relationships in representation I use the concept of deep spatiality, which I interpret in both Hart's theory of articulations

(following Gramsci) and Latour's theory of translation, in order to politicize my understanding of processes on the ground.

Chapter 2 lays out the details of my engagement with theoretical literature. I begin this chapter with a review of GIS-Society literature in the field of natural resource management (NRM) based development. I then engage with debates in CDG and STS to extend certain aspects of GIS-Society that seem most relevant to my situation on the ground.

Probably the most important reason I decided to situate my research in this particular NGO was the detailed manner in which they had engaged with remote sensing applications and GIS. This detailed engagement was intriguing to both the practitioner in me who had been frustrated with ambiguities while working in India, and to the Geographer in me who had begun an immersion in STS. I thought this detailed engagement with the technology and the fact that the NGO was situated not in the state capital but in a semi-arid rural location in which they were intervening, would allow me to understand the complexities that are part of development and technological practice. The Director of the NGO emphasized that I should visit the semi-arid rural location before I finalized my decision[3]. When I began my fieldwork I soon realized that one of the most important characterizations of this region is its 'backwardness'.

In Chapter 3 I provide a background description of this region. In paying attention to Ferguson's call for situating the discourse of underdevelopment, I extend Ferguson's approach of discourse analysis by using Akhil Gupta's framework in 'Postcolonial Development.' I deem this extension necessary in order to pay attention to the discursive history of development in postcolonial India. In this chapter I show how my study area is anomalous in terms of many factors such as rainfall, soil, and irrigation – factors that are considered productive from the perspective of a development State. This anomaly explains why this region was 'by-passed' by development projects, and also touches on why this region was labeled as 'backward'. Also following Gupta I take the view that “discourse” is not separated from “reality” on the ground, and thereby demonstrate through ethnographic material how the identifiers of development are not external to the people of this landscape, and that modernity is a relevant category for them. I also show how, at the same time, people are very actively working their landscape despite low, erratic rainfall, and negotiating the structural constraints of a dry land political economy.

In Chapter 4, I begin my ethnography of how knowledge is produced and rural development practiced using spatial technologies, through a historical analysis of a development NGO's planning models. Through this historical analysis I tease out the ways planning practice, on a daily, local basis, rework and reproduce models of spatial technology based development. Using Latour's framework of translation I follow the movement of ideas in each of the NGO's planning models. Insights from this chapter serve to extend findings of studies that have critiqued the use of GIS in a broadly defined natural resources management sector (details in Chapter 2). I extend the works of Robbins 2000, Hoeschele 2000 and Turner 2003 who all move beyond the dichotomies of technology / society, yet conclude by assigning a fairly rigid

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3 This was his test for eager urban people who wanted to make a change in rural areas.

instrumentality to technology and the experts who use it. Secondly, this chapter also serves as a critique to 'Anti-politics Machine' of Ferguson, and 'rendering technical' of Tania Li (Ferguson 1994; Li 2007).

In Chapter 5, I continue my ethnography in my attempts to search for the traces of the GIS in the NGO. Where is this GIS that they are talking about? In this I am specifically influenced by the work of Harvey & Chrisman who argue in response to the dichotomies of the GIS debates and the idea of a 'universal toolkit' GIS, that 'locally contingent and complex social forces make a different GIS every time (Harvey & Chrisman 1988, 1683). Here I find that Latour's framework of translation, when he urges us to trace the networks that create the order, provides the required empiricism that allows us to understand Foucault's powerful analysis of governmentality. In the networks that create the order, I find that the 'labor gang' in implementing the GIS plan and the watershed on the ground is a key element. I use insights of this chapter, along with those of the previous chapter, to point attention to the 'glimmer' of the assemblage of the 'deep database' in the GIS and the relationships around it. This 'glimmer' provides some of what farmers want in terms of development programs.

In Chapter 6, I look more closely at the positions of the watershed engineer and his team of field workers in order to understand what it means for them to be doing the work they do, in the interest of exploring invisibilized spaces in development practice (Dove 1994; Nagar et. al. 2002; O'Reilley 2004; Robbins 2003). In excavating their position of alterity I engage with debates in development studies, about the position of development workers, their identity and knowledge. I analyze their practices of knowledge production through the trope of knowledge 'conversion', inspired by STS approaches. I argue that their work demands that they understand the 'partitions' that come with development programs, and translate between the 'modern' and 'amodern' (Latour 1991). While it is liberating for them to learn through practice in the NGO it is also a burden for them to be negotiators. There is limited mobility for them in these jobs, and modernity is a valid, desired category for them, as has been argued in two recent influential works on development in India (Mosse 2005; Sivaramakrishnan & Agrawal 2003).

In Chapter 7, I reconnect with Chapter 3 to move beyond the 'margins' of the NGO into the undulations of the semi-arid landscape. In this chapter I analyze my ethnographic data of farmers' practices of soil and moisture conservation in order to contextualize the NGO's construction of a GIS-based plan for watershed development. I analyze farmers' narratives that I gathered through traversing the micro-topography of this landscape in order to understand differences in practices amongst farmers and the NGO. My ethnographic analysis shows how farmers have historically worked the landscape within their means, and contrary to definitions of 'backwardness' have created structures for inter-generational equity. I analyze points of consonance and dissonance between farmers' practices and the NGO's watershed management practices, and I end with the point of confluence – an idea/ a practice / a structure called the 'Trench-cum-Bund' – which stands the test of movement of soil, water, and social relationships of development.

In Chapter 8, an extension of Chapter 3 and 8, I analyze ethnographic data on farmers' practices of knowledge seeking, sharing and decisionmaking. Why this shift?

While all the previous ethnographic chapters allow me to make sense of the content and context of spatial technology based planning in a broadly defined natural resources management based rural development sector through an idiographic study, this chapter allows me to examine a more recent shift in the spatial technology sector in India. This more recent trend is Information Communication Technologies for Development (ICT4D). This trend appears in one of the models that the NGO puts together. When the NGO realizes they do not necessarily need a GIS for Trench-cum-Bund, they decide to use GIS to create an information infrastructure in order to solve the perceived information asymmetry that farmers face in this 'backward' region of the country. Through my analysis of farmers' practices of knowledge seeking, sharing and decision making I complicate the assumptions of the ICT4D trend, specifically its preoccupation to provide decontextualized information that pales in comparison to the negotiations of farmers in their daily lives. The daily work that farmers do serves as strong critique to the definition of 'backwardness'.

In Chapter 9, I synthesize my findings and also speak to the combined theoretical framework of STS and Critical Development Studies. While the contextual assemblage of a deep database and relationships amongst the many actors is able to provide a structural change to farmers in their landscape of uncertainty, the decontextual information infrastructures represent a rupture in the development landscape.

Chapter 2

Literature Review and Theoretical Framework

In this chapter, I walk through broadly three streams of literature that have provided me the analytical tools to frame and explore my research question – How is knowledge produced and rural development practiced using the spatial technologies of remote sensing and Geographic Information Systems (GIS)? In the first section I undertake a literature review of GIS-Society literature in a natural resource management (NRM) context. I selected this subset of literature because it helped me think through my most immediate concerns as stated in Chapter 1. At the end of this section I articulate issues that seem most relevant and ripe for further investigation, foremost among which is my move to frame the phenomenon of inquiry both as technology and development. Given this framing, in the second and third sections I sift through specific strands of literature in the fields of Science and Technology Studies (STS) and Critical Development Geography (CDG). Working at the boundaries of these two fields that have been disciplined over the past several decades, I include my engagement with selected theoretical debates about development and the philosophy of representation. In the fourth and fifth sections I articulate my research question and methodology respectively.

Section I - Review of GIS-Society Literature in a NRM Context

Critical interpretations of GIS in the field of geography can be traced to debates between social theorists and GIS specialists. The studies that I have chosen to review are attempts to move beyond polarized debates between social theorists who, without engaging with the details of the technology, have advanced instrumentalist critiques of the use of these technologies and argued that they are inherently reductionist; and GIS specialists who have argued that these technologies are inherently objective and capable of providing effective solutions. Details of these debates can be found in reviews such as Chrisman, 2002 and Schuurman, 2000. I find studies that moves beyond these entrenched positions through analyses of actual instances of use of the technologies is more useful to sharpen the framing of my study. Based on the theoretical approaches employed these studies cluster into the following broad groups - 1) those that primarily focus on the institutional culture of the state / expert scientific institutions and its use of technology; 2) those that focus more on implementational issues; and 3) those that focus on the construction of technological products through an alternative conceptualization of representation.

1 - Collusion of institutional culture of State and nature of technology results in use of technology to further State interests

Wolfgang Hoeschele examines the use of remote sensing and GIS technologies by the Kerala State Land Use Board and the National Remote Sensing Agency to develop sustainable land use plans for an administrative block in Kerala state, India. He highlights the State's practice of classifying permanent fallow and scrub areas that locals use for grazing and fuelwood collection as 'wastelands' that then require state-led and state-controlled land use interventions such as agro-forestry

plantations.

His explanation for such practices lies in the collusion of the following two processes in the space that he defines as Geographic Information Engineering (GIE): 1) Following Scott 1998, the institutional context of the state wherein control over resources and populations are prime reasons for existence and thus dictate a focus on 'synoptic visions of society and nature that make localities simplified' and marginalization of local knowledge (Hoeschele 2000, 294); 2) Following Winner, and Veregin's concept of reverse adaptation, the technology is used for those types of data and applications that are 'easily' accomplished. The example that Hoeschele provides is that state officials do not really want to traverse the ground for mapping and planning and engage with the details on the ground (in this case, also for the relevant reason of difficult terrain). In such cases remote sensing technology allows them to bypass even detailed engagement with social realities on the ground.

In his conceptualization of GIE, in order to move away from arguments of technological determinism or purely instrumentalist arguments pertaining to State power and control, he argues that 'it is difficult to establish whether the technology is pre-adapted to the organizational and social context, or the practices of the organization are being adapted to the technology.' (Hoeschele 2000, 294)

Hoeschele also undertakes, following Porteous, what he calls an 'intimate sensing' of the land use of the area to show how a representation that engages in conversation with locals can provide a more ground up perspective than the state's representation of the landscape using the tools. His methods for intimate sensing comprised interviews with stratified random sampling of households, field checks on the farm plots, traverses across all villages, and panoramic photographs of the areas from key vantage points. He was unable to obtain satellite images, aerial photos or topographic maps of the area. His resultant classification comprised of more detailed classes that had more relevance to local meaning and practice.

Hoeschele concludes that the institutional context is however more important than the technology. He recommends that adequate participatory and democratic institutional settings need to be created to undertake land use planning and management. Once this is created the need, or lack thereof, for the technology can be assessed.

Paul Robbins has done considerable work on the forestry department's use of remote sensing technologies in the state of Rajasthan, India to settle disputes regarding the nature of forests and afforestation. Through participatory mapping of satellite images and interviews with forest officials and locals he illustrates the differing definitions of forests. Forest officials categorize as forests the fast reproducing stands of *Prosopis juliflora*, an exotic species they introduced, which the locals have little use for.

Through a historical analysis of the institutional culture and conversations with forestry officials he reveals the complexity in forest department practices which on the surface may seem to be just an instrumental use of remote sensing technology. Forest department officials choice of this fast reproducing species is linked to practices of promotion on the basis of percent increase in forest cover in the areas

they manage. The practice of defining and mapping forest cover is linked to the colonial legacy of the forest department where mapping is an act of control. Hence the department's request for funding from national and international sources is premised on the need to use remote sensing technology to map, and monitor their afforestation efforts. Prevailing ideas of ecological modernization - increasingly looking to science to understand *and* solve problems - further legitimates the granting of funds and adoption of remote sensing technology. Robbins also argues that the technology is not a passive player in this nexus. Through interviews he establishes that somewhere along the way forest officials realized that the monospecific stands of *Prosopis juliflora* are easily captured in satellite images as 'horizontality and reflectivity' are inherent properties of remote sensing.

His main arguments thus are 1) following Latour, the satellite mapping is used by the forest department to bolster (act as 'natural arbiter') their already established claim of what are forests rather than actually helping settle a dispute between competing claims of foresters and locals; 2) using the concept of reverse adaptation, from Verrigen and Winner, above mentioned collusion of technology and the interests of the forest department legitimate and exert a strong influence on the nature and direction of environmental change in the area.

Moving beyond normalizing the technology in the above-mentioned article (horizontality and reflectivity are its inherent properties), Robbins along with Maddock in a second article refer to the many developments in image processing techniques that harness more from satellite technology, and land use land cover classificatory systems that engage with complexity on the ground and not just broad generalizations. Hence they illustrate that the choice of the forest department to selectively choose aspects of the technology that allow them to represent a story of their choice, is one among many options. They argue that the Department's process of mapping is deductive. There is no space for the natural landscape in their mapping practices - "There is no true forest per se, only multiple discrete things brought together as if they were the same..." (Robbins & Maddock 2000, 297) As an alternative to such practices, the authors provide a different classification of a satellite images based on classifications elicited from the local community. They conclude that such an exercise to map multiple meaning is a starting point for processes of dispute settlement.

The convergence in Hoeschele's and Robbins' arguments reinforces dominant explanations of the institutional culture of the state and indicates that much remains unchanged in the face of new planning tools inspite of the fact that the tools are sought after for precise, scientific, objective representations of land cover. Both authors move beyond the extreme positions in GIS debates that either argue that these technologies are inherently objective and capable of effectively providing solutions (Openshaw 1991), or that the technologies are inherently reductionist (Pickles 1995) These two authors instead, through engagements with real cases, point to a collusion of forces that explain how the technology is used, and the resulting knowledge products. I argue that Robbins, through a wider set of methods including interviews with forest officials, is able to flesh out this space of collusion and establish a sequence of events that result in a specific use of the technology and outcome in the landscape. In Hoeschele's analysis, where evidence of State practices is limited to secondary data such as reports and other articles the space of collusion seems to

amount to a correlation of existing processes.

A useful extension to their work could engage in the details of government officials' assumptions of the technology to provide a richer explanation than evidence that reveals choice of aspects of technology that go hand in hand with a particular ideology. How do various government officials come to develop understandings of these technologies? Are these assumptions fixed? Who are the actors who are actually involved in the technological practice of image classification and mapping? What are their assumptions of the tasks at hand and what can and cannot the technology do? What is the nature of interaction between the forestry officials and the technical staff? A deeper and richer exploration of meaning, assumption and daily interactions and their linkages to the actual content of knowledge products could help develop a more nuanced understanding of the process of representation and knowledge construction that goes on within the State machinery. This, if situated along with a symmetrical analysis of other knowledge communities such as that of the local community could inform a politically enabling process of planning for rural development.

2 - Understanding the phenomenon through a focus on implementation of technology.

Barrett, Sahay and Walsham's research, heavily influenced by Giddens and theoretical frameworks used in Information Systems, focuses on the introduction of these technologies in government institutions such as the forest departments and district planning offices. In one strand of research, borrowing from Giddens' theories of structuration and its applications in Information Systems, they frame the phenomenon of interest as an organizational issue. GIS use can be studied by paying attention to the interactions between the processes of implementation and the social context, both comprising the organizational setup (Sahay & Walsham 1996, 389).

Based on data from structured and unstructured interviews key features of the organizational complex they highlight are a developing country context which is characterized by traditional organizational structures within the bureaucracy, a feature of which is frequent transfers of government officials; and technocratic culture amongst government officials features of which are a strong belief in science and technology and the separation of technology and society. They conclude, following Taylor, that due to such organizational issues characteristic of developing country context, 'visible benefits of GIS ....(are) marginal.'(Sahay & Walsham 1996, 399) and hence recommend training and educating the officials, change in the organizational setup of the institutions, and more research at the user end of the process to better understand user requirements.

In a second strand of research, borrowing from Gidden's theories on social transformations in a globalizing world they conceptualize the introduction of these technologies as a global force of change vis a vis the stable traditional organizational setup of Indian bureaucracy. They pay attention to 'social transformations' at the level of the institution and the individual, to look at change embodied in the introduction of these technologies. Specifically they focus on the concepts of 'separation of time and space', 'disembedding mechanisms', and 'processes of institutional reflexivity' which Giddens says are characteristic of globalizing forces (Barrett, Sahay & Walsham 2001, 11).

The traditional bureaucratic culture in the country thrives on face-to-face interactions and this is a barrier for the technology-related trust that they argue is required for such a 'globalizing force'. Feelings of trust and fear arise in the minds of staff due to the introduction of a new technology that they assume will replace their roles, and change some of their practices. Their conclusion is that if developing countries want to realize the benefit of GIS they need to focus on organizational issues. Developing country contexts are often too messy and hence there is a misfit between these contexts and the organizational setup that GIS requires.

Their work reinforces certain characteristics of the State that Robbins and Hoeschele highlight. But above and beyond this, since they interviewed officials who have actually been involved with the technology they are also able to provide some insights on the 'beliefs, motivations, fears and expectations' of the groups of people who influence the implementation of GIS. They also stress that much research is needed at the user end. The biggest limitation is that their research framework normalizes technology and society (see above paragraph). By emphasizing the organizational setup they do not pay much attention to political economy, and the content of the technology and knowledge generated. Inspite of their claim that they remedy the limitations of the factors approach of Information Systems theory by using structuration theory wherein 'context' and 'process of implementation' are inextricably linked and 'each is created, limited, and shaped by the other.' (Sahay & Walsham 1996, 404), their empirical work does not really bring out this interaction. Rather it seems to be more descriptive and an attempt to look for theoretical concepts in their cases.

Eugene Martin on the other hand argues that studies of GIS implementation that focus on organizational issues and those informed by Information Systems theory that focus on social-technical interaction are limited because they do not fully explore the 'multifaceted relationships that exist between internal and extended elements of the organization in social, technical and political arenas.' In order to widen the focus of above mentioned approaches he uses Actor-Network Theory (ANT) following Callon and Latour, to understand the use of GIS in natural resource conservation initiatives of three NGOs and one government organization in Quito, Ecuador.

ANT 'shifts the analytic focus from the organization to the characteristics and behavior of actor interactions between elements of society and techno-science.' These interactions are mediated by objects and thus power is distributed in a network among a wide range of actors (which includes inanimate objects) as the emphasis is on 'technology research without the limiting artificial divisions other disciplines erect between human, non-human, science, nature and society.' (Martin 2000, 717)

Instead of tightly bounding components of the organizational setup and limiting oneself to theoretically concepts as is the case in Barrett et. al.'s work, ANT recommends paying attention to any aspect that proves to be important on the ground. In this regard, an ANT case study might often amount to be descriptive, but therein lies its thrust and politics - 'To apply ANT is to assert that knowledge is locally and socially constructed and society is created by science and vice versa.' (Martin 2000, 717)

Similiar to Barrett, Sahay, and Walsham, Martin's research endeavors to

understand issues specific to GIS implementation in a country where it is a new technology. Methods employed are interviews with a range of interlinked actors such as technical staff, data providers, funders, users, and texts (textual analysis) such as contracts, office memos, and GIS outputs. He then conceptualizes the interactions between the various actors using an 'association diagram' for each institutional case study.

His aim is to identify certain key features of actor interactions that are most relevant to understanding the social-technical interactions in a GIS implementation system, more specifically, the durability and sustainability of a GIS initiative. His analysis of the cases reveals that 'alignment' or lack thereof between various actors such as funders, researchers, technical team, users, etc., in the network, 'convergence' or disagreement on issues, the ability to substitute actors and move on, weak or strong 'obligatory points of passage' all have a bearing on the durability of a GIS network depending on the context of each specific case. 'Circulation' of 'artefacts' (i.e. sharing of information products) also has a bearing on the credibility of the network. He recommends that the examination of the GIS implementation in other contexts would reveal other useful 'patterns of actor interaction'.

Martin's application of ANT does reveal that each of the four cases is different and depend on the context-specific set of network configurations that come to be. Unlike Barrett et al, he does not normalize and separate 'technology' and 'society' in his study of interactions. Interactions are instead captured in a more distributed manner among a range of actors. A certain fluidity and dynamism is revealed in all his cases as actors try to juggle and cope with what is available. At the same time he tries to systematize his findings into a set of concepts that may help us to better understand how GIS initiatives could be sustained, as mentioned in the above paragraph. But he inserts the caveat that 'the use of ANT for predictive or diagnostic purposes is quite unfaithful to ANT's founding precepts (Law 1997). For the moment, the best use of ANT for investigating GIS may be to continue exposing the social interactions behind GIS operations so practitioners, managers, theorists and researchers will be more sensitive to building stable GIS actor-networks.' (Martin 2000, 735) A study of actor interactions specific to GIS implementation could have been enriched with attention to objects / actors directly related to the technology and the content of knowledge / information produced in this network. This is absent in Martin's work.

I find that in terms of findings, the two strands of research in the above two sections do provide complementary insights - different pieces of the puzzle, so to speak. Despite certain limitations Barrett et. al.'s and Martin's research through a focus on implementation do provide some insights on the spaces in which the production of knowledge actually takes place. These spaces are more or less absent in the works of Robbins and Hoeschele, who on the other hand throw light on important aspects of the institutional culture of the State and the politics of knowledge construction.

3 - A robust extension of 1, and a different application of the technology

While Robbins, Hoeschele, and Barrett et. al. focus on the state's use of these technologies, Matthew Turner focuses on a different part of the puzzle.
He provides a critical evaluation of the increasing use of remote sensing and GIS

technologies by environmental research community in African Sahel. Similar to Robbins and Hoeschele, he moves away from common approaches in social sciences that frame the technology as completely lacking in agency and serving simply as tools that further political-economic interests of the powerful, he argues that the 'uneven adoption' of these technologies due to certain characteristics of the technology *and* the adopters 'has allowed their adopters to use them as effective resources to bolster their scientific claims and shelter their methods from scrutiny.' (Turner 2003, 1) He draws evidence from secondary reference sources and from his own long field experience in the Sahel. However the fact that Turner provides very detailed evidence of the uneven adoption and also remains attentive to other aspects of the process distinguishes his work from the others.

He traces the historical roots of contemporary scientific environmental practices to colonial scientific traditions. Typical characteristics of colonial research in the Sahel were 'one-time, visual descriptions of the landscape.........vegetative cover as a measure of environmental change........observations..near roads.......little understanding (of)..rural production systems.........reliance on spatial correlations between patterns of vegetative parameters and signs of human land-use'. (Turner 2003, 3) Reasons for such research were due to the combination of a vast, complex landscape, financial and transportation constraints, colonial views of the local people, and colonial political economy and a reliance on equilibrium models of ecology.

He sees a continuation of the colonial mode of scientific environmental research today. He argues that it is not 'simply a legacy of the past. The nature of remotely sensed data has obviously played a role.' (Turner 2003, 5) Uneven adoption of the technologies is revealed in the common practices of visual interpretation of spectral reflectance values without taking into consideration that other factors such as vegetative cover, soil background, atmospheric properties contribute to reflectance values. Often no ground data is collected to aid in the interpretation of satellite images, or for purposes of accuracy assessment. Land cover, the variable most easily identified through visual interpretation of a satellite image is often equated to environmental change and human activity, and no importance is given to processual understandings of environmental change that require interaction with people on the ground. This increasing trend of environmental scientific research that is employing these technologies is also legitimating what is increasingly being accepted as objective, scientific explanations for environmental change in the Sahel. In the face of this dominant trend, processual, idiographic field-based studies are being pushed to the margins.

He also argues that while remote sensing technology is inherently a socially reductive technology not capable of capturing social phenomenon, GIS on the other hand makes possible causal analysis of socio-environmental phenomena. But this too is used in a shallow manner. Most commonly used for attractive visual representations and if at all used to explain causality it is through data-driven variables and / or spatial correlations. Moreover a particular imagination of the Sahel as 'remote,' and coarse resolutions of remotely sensed images are reasons for causal analysis to be conducted at coarse scales. Very little social data is available at these coarse scales and lack of data is cited as a reason for socially sterile explanations of environmental change. If at all any social variable are used they are crude variables such as population densities, population distribution, livestock concentration points, etc. Also, the author argues

that scientists have fixed assumptions about the form of data that can be used in a GIS and since this kind of data is not readily available they use the technology as legitimation for their limited analyses. Many of Turner's arguments can be applied to the ambiguities I perceived in the environmental research community's use of spatial technologies in India.

One of his conclusions, not unlike what Robbins and Hoeschele conclude about the Indian state's adoption of these technologies, is that these technologies have 'not revolutionized the ways in which we analyze people-environment relations in the Sahel but actually further entrenched traditional modes of analysis.' (Turner 2003, 6) A unique aspect of his argument that sets him apart from Robbins even is that he introduces the complexity of the landscape / region (in his case, the Sahel) as a factor that genuinely limits research. '(T)he task of relating broader political economic changes to changes in local land use and in turn, to on-the-ground environmental change is extremely difficult. Some have even argued that without specifically tying resource use patterns to environmental change, political ecologists are just as prone as their predecessors to misread the human signature on semi-arid landscapes.' (Turner 2003, 7)

Turner's broader approach thus makes for technological recommendations, as opposed to Hoeschele for instance who stresses most on institutional remedies. Representation of 'a more socialized landscape' is possible if we choose to work with remote sensing data of higher resolutions (Turner 2003, 7). He is also hopeful of the potential of GIS to facilitate socio-ecological analysis of the nature that Blaikie proposes in his famous book 'Political Economy of Soil Erosion in Developing Countries.' (Turner 2003, 7) However he cautions that all this will hold only if we move beyond a shallow use of the technologies and instead pay more attention to the details.

In his conclusion, with a view to offer recommendations based on actual practice, he provides insights from his involvement in a multi-disciplinary project that employed these technologies to conduct a 'political ecological analysis of nutrient cycling and management'. (p.7) GIS allowed him to scale up the 'field-based focus of agronomists and the household-level..focus of the economists' and to get the quantitative researchers more interested in the interdisciplinarity. However his experience as the 'GIS person' was not without frustrations which he attributes to 'problems stemming from the systems analytical features of GIS' which are often what attracts many researchers to these tools (Turner 2003, 8).

In my reading, the problems he presents as 'stemming from the systems analytical features of GIS' do not seem to be entirely technological. In all his examples there are elements of interaction between the actors who use the technology and the technological features. Also, I am not entirely convinced that a GIS freezes certain system analytical features that cannot be modified. Investigating this assumption requires dipping into another level of detail which is probably beyond the scope of Turner's paper - delving into the blackbox that is the GIS - the assumptions that are locked in a specific GIS software package and the practices by which these can be modified. Although Turner alludes to this he does not really tease it out in his conclusion: 'Self-critical engagement with GIS as tool can allow one to resist reducing the structural complexity of social life through simple quantification of

individual behaviors. Still, even in less ambitious use of GIS for socioecological integration, there is **inherently** a simplification of social reality which may limit their viability.' (emphasis mine, Turner 2003, 8)

While Robbins and Maddock argue that there are technological developments that can make for politically enabling classifications of land cover and that the issue is more to do with whose knowledge is put to use, Turner argues that there are inherent limits to the technology. The difference in their arguments could be attributed to the fact that they are researching two different applications - the former focuses on just classification of land cover, whereas the latter, the more complex task of analyzing and explaining socio-environmental change. Inspite of this I argue that although Turner pushes the debate much further by paying attention to several different factors, and engaging with the details of the technology and technological practice in greater detail than the other two authors, it is limiting that he ends up premising all his arguments on frozen conceptualization of the technology.

4 - Critique of the technology through an alternative conceptualization of representation

Zubrow argues that an alternative conceptualization of representation could provide a more nuanced understanding of these technologies and technological products, and thereby adds a constructive dimension to the polarized debates between GIS practitioners and social theory critics. His case is the Wisconsin State land cover map project called WISCLAND, the mapping methodologies and practices of which he pays specific attention to.

As an insider to the project, he had access to reports, maps, technical protocols, and technical staff who produced the map. He did not observe the real time construction of the map. However his post facto analysis of the construction of the map is not a simple step by step description of the different stages in the construction of the map. He uses a framework that remains attentive to the tensions between forces of complexity and simplification that are simultaneously at play in each stage/act of map production. His emphasis is more on the forces of complexity in knowledge construction as social theory critics and users of these technologies and maps are all too familiar with the forces of simplification (often termed 'reduction')

A component of his explanation of the forces of simplification that is not typically found in the work of social theory critics of GIS is the focus on aspects of the technological process that are integral elements to any act of representation. For example, the technique of using spectrally consistent classification units (SSCUs) is an important step while working with large volumes of data. Moreover these techniques represent conscious efforts by the technical staff to find techniques that are rigorous as possible given very real constraints such as 'the weather, incomplete secondary data source, and diffuse expectations (externalized and internalized) for a certain level of accuracy', and official procedures. (Zubrow 2003, 288)

The user cannot assume that the final product is a simple, natural representation of the world. He cautions against assuming a simple one to one correspondence for a combination of reasons. One is that a map that covers such a large extent invariably pulls together data from many different sources that many

different people have worked on. It is a complex combination of many different interpretations. So the user needs to be aware that a stand of 'x' trees in one part of the map may have a slightly different relationship to the landscape when compared to the another stand of 'x' trees in a different part of the map. Implicit in this is the argument for providing adequate metadata (data about data) to the user, to maintain the links between the landscape and the representation of the landscape, to highlight the choices that have been made in the process of representation.

Similar to the tension between the forces of complexity and simplification that are at play in the processes of mapping Zubrow highlights the tension between the same forces embedded within the technological product using a cocktail of theoretical approaches (not really a feature of the other papers reviewed). Using Scott he conceptualizes the map as tool for simplification whereby the chief proponent of the map is 'arguing for centralization of the land cover data; ....a map that is legible by many organizations; ...for a uniform representation.' (Zubrow 2003, 290) He also borrows from textual analysis to illustrate how the map appears to have arisen out of 'nature', has no author and 'establishes its authority'. '(E)ach pixel is uniformly colored and uniformly sized, creating a steady, consistent march across the image'; 'no area is left out'; 'the color scheme plays off our conventions'; 'the text, ...surrounding the image, never actually labels any element of the image'. And following Latour, and Star, he argues that through various methodologies the remotely sensed image is converted into a standardized product which and thereby further 'separated' from the original context. One of the reasons that the land cover map becomes attractive is because it is an immutable mobile. Time, an element that is often not foregrounded in a map makes for a timeless representation and thereby establishes the authority of the map.

Inspired by cartographic theory Zubrow asks - Yet, how stable is the abstraction that the map contains? An important part of his argument is complicating the powerful view of a map as a simplified product: 'Since the story is so powerful, how can alternate views be seen?' (Zubrow 2003, 291) The map's authority arises from a network of actors, a chain of events. It does not directly arise from reality. It represents a chosen view of the landscape - certain variables have been highlighted, and others have been silenced. There is no single story that emerges to the reader through the cartographer. The meaning of the map is varied and lies in different interpretations of different users.

'The silences or absences are as important as what was included for critiquing the map.' (Zubrow 2003, 292) He says it is difficult to see the silences or what is left out in a satellite image based map because no pixel is left unclassified. But borrowing from Bowker and Starr's work on classification and categories he argues that the reader must pay attention to residual categories such as the 'other' class to understand choices of exclusion, objects that complicated or challenged the standardization. The choices made and complexities created are due to the different dates of all the sources of data included in the map, different technical analysts working on different parts of the image, etc., Hence there is spatial and temporal complexity embedded in the map. If we look closely it is a highly 'fractured', 'heterogeneous' landscape, not a simple one. The main thrust of Zubrow's argument is that by 'analyzing the methodology, process, and final product' users and critics of these technologies and technological products can appreciate the efforts to keep the map as local as possible and tied to the

landscape as much as possible ‘although the map seems stable across space and disciplines’. (Zubrow 2003, 294) In doing this Zubrow captures parts of the process that many critics of these technologies do not.

Of course, not all technical analysts might do work like this and this argument does not mean we do not pay attention to political economic forces at play and whose knowledge is put to use. However it behooves us to move beyond certain entrenched assumptions and theoretical approaches and be open to the spaces where knowledge is continuously produced and used. It remains to be seen if the analysts in Robbins’ and Hoeschele’s cases do work like this. These authors did not enter this space to find out, although they imply that the analysts did not. A real time ethnography could also help flesh out all the processes such as social, political, etc., which he only alludes to.

Discussion of Review

One dominant explanation is the 'collusion' argument or the 'selective adoption' argument wherein only certain aspects of the technology go hand in hand with interests of the entity (experts, State) employing the technology in order to tell the story they want to tell. One broad finding of this school, to quote Turner in his conclusion is these technologies 'have not revolutionized ways in which we analyze people-environment relations (in the Sahel) but have actually further entrenched traditional modes of analysis.’ (p.6) Within this approach I find subtle conceptual and methodological differences.

Due to restricted access and secondary material Hoeschele is only able to establish a correlation between the forces of collusion and does not engage much with the technology. Robbins' argument is more compelling as he interviews State officials, factors in a historical institutional cultural analysis and also engages with technical details. Turner extends Robbins framework through a historic political economic analysis that also gives agency to the landscape. One limitation in Turner's approach is the ambivalence in how he conceptualizes technology. While in a significant part of his analysis he engages with technological details and like Robbins engages with interaction and provides many constructive critiques on how to use it an enabling manner, his conclusion is based on a normalized view of the tools.

I am not entirely convinced that a GIS freezes certain system analytical features that cannot be modified. Investigating this assumption requires delving into the black box that is the GIS, understanding the assumptions that are locked in a specific GIS software package and the practices by which these can be modified, which is probably beyond the scope of Turner’s paper.

It is in this regard that I am drawn to another stream of explanation which does not however directly converse with engagements of the collusion argument but is more interested in addressing limitations in classic Information Systems theory approaches that focus on implementational issues. Martin borrows from ANT to widen the range of actors and how they are conceptualized. His explanation in turn is that ' knowledge is locally and socially constructed and society is created by science and vice versa.’ (Martin 2000, 717)

Zubrow enters the debate with a similar purpose. Whereas Martin's thrust is

through networks and includes reworking where agency resides, Zubrow's is a more explicit focus on rethinking representation. His work pushes me to think about how stepping back from commonly used categories, and engaging with the limits of how we conceptualize objects can open up some refreshing ways to grapple constructively with complex techno-social phenomena, develop a more informed understanding of technological processes and products instead of concluding that these technologies are inherently reductive.

This review of literature then pushes me in certain directions to frame my research. The work of Turner, Martin and Zubrow particularly, engages with some of the ambiguity I perceived as a project staff. In a significant subset of my observations I allude to the point that the State Space Agency's practices reveal an interest to construct a symbolism around the technological advancements. The symbolism is betrayed by the scarcity that I had to negotiate as a RS/GIS staff of an environmental research project. This theme is not fully addressed in the above literature review. Science Studies literature published in the Indian subcontinent however engages with this as it is strongly linked to the specificity of place - Science as a project of modernity is closely entwined with 'development' project/s of the colonial state and the independent state. This corpus can be roughly categorized into works that study the colonial period and those that study the contemporary period. While historical work claims that science is not objective, but contested and negotiated and with multiple meanings (Kumar 2000; Prakash 1999; Edney 1997), contemporary work claims that scientific practice (and development), largely the domain of the State, is undemocratic. Repoliticization can only occur through opening of the review of science to laymen and contestation of science by other traditional systems of knowledge. (Visvanathan 1990; Nandy, 1990). Similar themes are discussed in the two works that I reviewed which are based in India – namely Robbins & Maddock 2000, and Hoeschele 2000.

While I think it is important to remain sensitive to the critiques in the contemporary work, my work experience in the spatial technology sector in Bangalore prompts me to take seriously the insights from the historical literature. A focus on the actual practice of development and technology, besides just the philosophical underpinnings of both projects, reveals a picture that is more complicated than just one of dominance and exploitation by the State. The processes of development and technological practice are mediated by several actors on the ground, and unforeseen complications arise due to many logistical, technical and political reasons. I argue that extending analysis of science to include technology, and opening the analysis of technological practice and contemporary development to include everyday realities is necessary for the repoliticization of science and development, and inclusion of layman's perspectives. As articulated in my introductory chapter, this brings me back to the question of framing phenomenon as mixed, which then requires mixed analytical constructs of study. Thus, in order to strengthen my research framing I borrow significantly from the fields of Science and Technology Studies (STS) and Critical Development Geography (CDG). In the following two sections I provide a review and discussion of approaches that I have surveyed in these two fields before I explain my research design and methodology.

Section II - Science and Technology Studies

STS is a broad field of study. Two main trends typically identified in reviews of this field are the earlier phase that was centered squarely in the tradition of sociology and thus heavily bent towards questions or issues in scientific practice that were amenable to quantification. The second trend that has emerged in many ways as a response to the limitations of the first, tackles more directly the content of science and deals with questions of scientific knowledge construction (Latour 1979). I have focused on the latter for ideas that will help me understand the process of knowledge construction.

In the previous section I highlighted my interest to borrow from theoretical approaches that provide openings to understand the complexity of technological practice on the ground, rather than approaches that dichotomize technology and society. For this reason, I have focused on a subset of approaches in STS that are attempts to move beyond the entrenched philosophical debates between realists and constructivists, in order to develop responsible and politically enabling understandings of science and technology. I have reviewed three theoretical approaches that have most appealed to me because they allow openings for the actual practice of technology: realist constructivism as exemplified in Paul Edwards 1995; heterogeneous constructivism as exemplified in David Demeritt 2001; and the translation approach as exemplified in Bruno Latour 1999.

In order to move away from instrumentalist critiques of science, binary oppositions, and the debate about if there is a Truth out there and how to capture it, these researchers attempt to develop a more nuanced and responsible understanding of science / representation. A key similarity is the pragmatism that under girds them which is evident in the assumption that abstraction is a necessary aspect of representation in order to understand the world. All three approaches emphasize historical analysis to illustrate the conjunctural nature of research, and the layered nature of the network of phenomena, ideas, and actors; and force us to pay attention to the materialities and practical engagements of what is entailed in science / representation.

While Edwards' project is more to illustrate what a detailed enquiry into the content of science could reveal, Demeritt and Latour try to tease out the philosophical and political implications of realist-constructivist debates that they argue create dichotomies such as nature-culture, science-politics. Instead they force us to think seriously about what it means to be human, of what the 'social' comprises? Demeritt's alternative conceptualization is heterogeneous constructionism wherein the world and our representations of it are mutually constitutive, while Latour's approach instead relies on 'symmetry' wherein no distinction is made between the science and the social. Latour is of the view that a science studies that separates the science and its social context is left with a zone of hybrids which it then resorts to explain in purely social / political terms or in scientific terms. Rather he finds it more productive to follow representation in every stage and understand the 'dialectic of gain and loss' (Latour 1999, 70) i.e. in every stage in the process of representation, 'something of reality has been preserved but it's form is altered' (Latour 1999, 36).

When approaching Edwards' work through the lens of the larger political

question that Demerrit and Latour explicitly foreground I find that he does seem to retain a separation between the world and representation. Even though he argues that data and models have a complex relationship, he maintains that at a fundamental level data is derived from observation, and models from theory. Reading through Demeritt's analysis of climate change research I find that he captures recursivity in a stylized manner and between 'upstream' and 'downstream' locations, i.e. between scientists and policy makers. He does not focus much attention on the mutual constitution between 'nature' and 'culture'. Even though Demeritt's analysis argues for a wider range of spaces and actors than Edwards, Demeritt still says heterogeneous constructionism is 'ontologically realist about entities, but epistemologically antirealist about theories' (Demeritt 2001, 311). Latour's framework pre-empts this separation between ontology and epistemology based on the assumption that the world cannot be separated from how we come to know it. Science and the social context can't be teased apart and are analyzed in the same breath. I find Latour's framework of representation most compelling and refreshing in order to understand the complex work that goes on in the production and reproduction of the spatial technology sector in India, particularly in the spheres where it is proposed as useful for rural development. I argue that in order to understand the messiness on the ground and thereby pick up on openings that are political for the marginalized we must begin to use representational frameworks that are new and not entrenched.

In order to engage with and borrow from Bruno Latour's work one has to be aware of its historicity – specifically, how Latour has both rewritten articulations of his approach and also responded to critiques of his writings. While it is beyond my scope here to engage with his entire body of work, I will explain some of the key elements of his approach that have appealed to me and also purposefully situate them in specific publications or moments in his intellectual history. In making this choice I highlight the importance of and specificity in how people write about ideas, and how readers choose to read between the lines and interpret and borrow ideas. I would also like to stress that my reading and interpretation of Latour's writings is intertwined with my training as a Critical Development Geographer, and the fact that I have framed the phenomenon of my inquiry as both development and technology practice. This differentiates me from many of his critics.

Foremost amongst the concepts I have borrowed from Latour is his representational framework, namely the approach of translation. While his representational framework is commonly referred to as Actor-Network Theory (ANT) I refrain from using this term as I want to steer clear of the many debates that have ensued over ANT, and more importantly because I have found the fluid and political essence of Latour's representational framework emerge most coherently in his essay titled, 'Circulating Reference: Sampling Soil in the Amazon Forest' which appears in his collection Pandora's Hope (Latour 1999). My reading of this particular essay of Latour provided me with the essence of a representational framework that would allow me to make sense of the practice of development and technology on the ground.

In this essay, using a case of scientists in Brazil trying to understand forest - savannah transition he shows how scientists in their practice borrow from all objects – natural, rhetoric, and resort to all means – to the material, the political, to rhetorical, to make their representations. The idea of circulating reference, and dialectical

representation proved powerful to the student of CDG in me who felt something was missing in my readings of critical social analysis – the something to interrogate the intimate and intricate connections between content and context. While I had read much theoretical material that told me context matters, when it came to understanding content I was often left with studies that slipped back into interrogating context such as in the case of many of the pieces I have reviewed in Section 1 of this chapter. In fact philosophical differences are evident in the framing of research questions that guide Edwards' and Demeritt's research. While Edwards' objective is to understand the construction of the GCM and *its role* in the politics of climate change research and policy, Demeritt asks '*Why* (despite what is known today) were GCM projections of a slow, linear response to increasing GHG concentration **so** *readily offered and so gladly accepted* by those concerned with managing global warming?' (Demeritt 2001, 326, emphasis mine)

Edwards' analytical framing yields the insight that political debates of policy makers overlap neatly or enmesh with epistemological debates. Demeritt too makes this argument but complicates the relationship between science and policy further by providing some reasons for why modeling epistemology is 'both scientifically and politically impoverished' (Demeritt 2001, 318) and showing that scientists choose the GCM also because of some tacit assumptions about what policy demands. These are valid insights and provide answers to complex phenomena. However, Latour's framework that topples the dichotomy between context and content proved very refreshing and immense with political possibilities. I argue that there is a philosophical and political difference between casting questions as above mentioned and setting up research objectives as follows: 'To *understand science*s, ...to understand this complex web of connections without imagining in advance that there exist a given state of society and a given state of science.' (Latour 1999, 90, emphasis mine) At no point can you tease apart the social and the scientific. "Complex forces mobilize all objects" (paraphrased from Latour 1999, 89) Latour urges us to widen our conception of what and who comprise society and where agency resides by paying attention to the daily workings of every stage of representation.

It is important to dwell on the debates that have ensued about Latour's framework of translation and circulating reference. Steven Yearley says of Latour in his review of Pandora's Hope, "(H)e offers scant rewards or incentives for following his maneuver." (Yearley 2002, 167) The maneuver he is referring to is Latour's focus on the construction of knowledge through translation. Steven Yearley's critique of the import of Latour's approach is lost on me for reasons stated above - specifically my positionality as a Critical Development Geographer. I do not read Latour's intention as offering rewards or incentives. Instead his intention is much more focused on explicating a philosophy of Reality. By it's very purpose his work begs to be used and applied in any setting / research that frames representation at the heart of its project. It provides opening for those interested to take it in different directions, which is what I achieve in my dissertation.

A second very important critique of his approach that comes from the debates surrounding ANT, is that it is apolitical. For example, Casper in a review of Pandora's Hope asks of Latour, "As intrigued as I am by Latour's ideas, I find myself wondering....where he stands (certainly not in "society" which he has eliminated) and what he stands for. It is astonishing that a book so full of political ideas spanning

millenia can feel so ...apolitical. What are we to make of all this theoretical tour-de-force? Where do we go from here?” (Casper 2000, 755) Once again I argue that such readings of his work are acontextual. We must situate the work in its history and what it's purpose is being defined as, and what it is responding to. In their ahistorical reading of his work, it is readers such as the above who seem to throw out the politics. I do not read Latour as having eliminated “society”. Instead I read him as redefining how we understand “society” and the “social” and widening its meaning.

Latour, in another one of his early pieces which I find evocative and effective asks - 'how can society be improved?'(Latour 1991, 3) He argues that society cannot be improved by consent, but by increasing contradictions, and by multiplying the mediators. Here he situates the purpose of his work, and what he is responding to. He says political philosophy has to consider its boundaries – it has to consider what it can't answer instead of its hegemonism. His argument is that post Enlightenment, social scientists invented hermeneutics as their method to distinguish themselves from the natural sciences, but this method has outlived its calling. “Indeed, it is one of the obstacles standing in the way of the "impact of science studies on political philosophy", my present subject.” (Latour 1991, 6) Leigh Star agrees with Latour in a review of 'Science in Action', which is often referred to as the precursor of Pandora's Hope, that “this work in sociology of science' (should be considered) 'a general social theory', should be at 'the heart of sociology' and 'science (is) not a special case' (Star 1988, 387)

Latour uses Foucault to argue that there is indeed a political constitution of truth, or in Foucault's words – 'political economy of truth.' “The question is no longer to free truth from the system of power- it would be a chimera since truth itself is power - but to separate the power of truth from the hegemonic forms (social, economic, cultural) inside which it circulates today. In brief, the political question is no longer that of mistake, illusion, alienated consciousness or ideology, it is that of truth itself.” (Foucault[1970] 1986: 26 in Latour 1991). Reading from this, I also argue, following Star that we should not take literally the call to study human and non-humans. It is not some literal template. Non-humans were hidden and spoken for / represented in the examples that Latour looked at (West, Modernity, scientific practice in the Laboratory)....but in essence Latour is interested in uncovering erasures and hence we must be open to the work that is done, and the erasures created – it does not need to simply include the study of humans, and non-humans. This is very much like Latour explaining to the student in 'Reassembling the Social' that we should not confuse the method for the object – 'network' (Latour, 2005).

I also find useful Callon's conceptualisation of power in his landmark article on translation, in which he too borrows from Foucault in Political Economy of Power, “The repertoire of translation is not only designed to give a symmetrical and tolerant description of a complex process which constantly mixes together a variety of social and natural entities. It also permits an explanation of how a few obtain the right to express and to represent the many silent actors of the social and natural worlds they have mobilized.” (Callon 1986, 19) And when Callon says, “we systematically forced ourselves to judge neither the positions taken by the actors nor to reduce them to a particular 'sociological' interpretation (Callon 1986, 17), he does not mean that one should not do the work he suggests in order to bring about change for other marginal actors, other than things. This is what I find political about the approach, that there is

an opening to free ourselves from *a priori* entrenched sociological analyses, and then use that analysis to inform work on the ground.

It is because of my framing of the phenomenon of my inquiry as both technology and development, that I am able to interpret his writings for the openings it offers, and have not been bogged down by the language that is often critiqued for its rigidity, or mimetic qualities. I have only read Latour's work as offering openings for reinterpretation and application in diverse settings and phenomena, and not just the laboratory. I argue that there is nothing prescriptive about the translation approach and that Latour's writings are to illustrate a philosophical and political position, and provides openings for reinterpretation. In asking a question about technology and development in practice, I was most motivated by the lead provided by Latour and hence ask an open research question – How is knowledge produced and rural development practiced using spatial technologies of remote sensing and GIS? In final analysis of these debates, one of my contributions in this dissertation is to show how Latour's theory of translation can be productively used for political reasons if it is given its due place and extended, through a robust reading. I have used the openings provided by the Latourian theory of translation in combination with current theories in Critical Development Geography that argue for an analysis of development practice through a robust framing of space. In the next section I will explain some of these theories and also situate my choice of theoretical framework in current debates on development.

Section III - Critical Development Geography

As I am most interested in looking at the *practice* of technology and development, I am drawn towards approaches that foreground materialities. Here I choose to make a clear departure from the dominant post structural turn in development studies as illustrated in the work of Ferguson and Tania Li. Ferguson in his book 'Anti-politics Machine' looks at how an international development project originating in the West constructs the conceptual apparatus where the region to be developed is defined as underdeveloped, and the institutional apparatus to develop the region. In this construction, the project was set up to provide technical solutions to "problems" which were not technical in nature (Ferguson 1994). Li's analysis of rendering technical in her book 'The Will to Improve' is similar to Ferguson's work on construction of backwardness. Rendering technical (construction of 'participation' is one such way) is how the state balances the needs of maintaining sovereignty and of distributing welfare. She shows the consequences of this in society such as community revolt (Li 2007). Where she proves to be a second generation Anti-politics Machine and takes forward Ferguson's work in a way that is relevant to the new times (after the period that Ferguson studied) is looking at the practices of the World Bank in recent times – where their methods keep up with post-structural critiques of development on the one hand, while continuing on the other hand, it's disciplinary discourse of social capital (Watts 2009).

Ferguson says that while it is common to view the 'less developed country' as the object on which the development project is acted upon, his work shows that the project was 'itself acted on'. This made the project staff frustrated, but Ferguson argues that, "The apparent blindness to the political nature of the problems encountered was found at all levels....and the officials who ran the programme were

no fools. The explanation lies rather in another social fact, namely, that the project, by its nature, was not equipped to play the political game it suddenly found itself in the midst of." Ferguson's contribution is to bring attention to the instrumental effects, following Foucault in 'Discipline and Punish', rather than only on focusing why a project fails. My main problem with Ferguson's work is that he puts a lot of intellectual energy in showing us how the development machine is constructed and in doing so he puts all the agency in this machine that is created, and separates it from the development professionals in a sense. In short, I think Ferguson talks of power in a disembodied manner, which is also the problem with his sci-fi metaphor of the machine. "(L)aunching an intervention that may have no effect on the poverty but does in fact have other concrete effects. Such a result may be no part of the planners' intentions – indeed it almost never is – but resultant systems have an intelligibility of their own." (Ferguson 1994, 256) While he points out that the development professionals are not fools, he does not specify about what they are not fools about.

It is on this point that Li differentiates her project from Ferguson's. Part of Li's project is to show how 'the will to improve', a very old idea, is a legitimate project. She argues that while Ferguson 'rejects conspiracy' unlike Escobar, he still explains unintended effects of development without clearly linking agency to development actors. She cites Dupont and Pearce who argue for including in social explanations "reference to agents who are capable of making calculations" and agents "who *react* to, capitalize upon and rationalize their responses to whatever circumstances they find themselves caught in."(Li 2007, 144) Dupont and Pearce explain that Ferguson's work displays a functionalist tendency in employing a Foucauldian lens. Li, unlike Ferguson uses a medley of theoretical approaches that move beyond a Foucauldian analysis to include Marx and Gramsci, although Watts, in his review of her book says she has not done justice to the inclusion of a Gramscian method (Watts 2009). At different occasions she gently critiques Foucault and Marx for lacking a bit in empiricism, and it is Gramsci who provides empirical openings for her. "(A) Gramscian approach yields an understanding of the practice of politics and the critical insight on which it depends as specific, situated and embodied." (Li 2007, 22-23) Li is interested in much more of a complicated process than 'Anti-politics Machine' - she is interested in actors, their agencies and most importantly their relationships in order to dwell on the "contradictions inherent to the will to improve" (Li 2007, 29) Using her findings from a very different spatio-temporal location than Ferguson, Indonesia, the extension she offers to Ferguson's critiques of development, and also other critiques of development is her attention to both technical and political processes that she identifies in development projects, and her differentiation between the two.

I make this choice to move away from the post-structural framework as discussed above as I find these approaches do not capture the specificity of the situation that I saw on the ground in the spatial technology sector in India, as articulated in Chapter 1. While it is compelling to make the argument that the spatial technologies of remote sensing and GIS are being used by the Indian State or other development organizations to construct problems on the ground as 'technical', and thereby depoliticize processes in areas 'to be developed', my work experience in the spatial technology sector pushed me toward approaches that allow me to work with the messiness of practice and materialities. Moreover I am interested to look at how development plans are made using these technologies, and am interested to get into the daily practice of it. I argue that Ferguson's work needs to be extended by opening

up the machine and multiplying the mediators, and spatializing the machine. Whereas Li's work extends Ferguson's, it still maintains a divide between the technical and the political. Li uses Foucault to study the 'rationale of government schemes' and Gramsci to study the social history of the place in which the schemes intervene. She says that they are 'distinct kinds of inquiry, and they require distinct sets of tools.' even though she tries to look at the place of intersection in order to avoid privileging one over the other. (Li 2007, 27) I argue that this still retains a separation reminiscent of Ferguson's analysis in Anti-politics Machine.

While Li's argument might be relevant to the specificity of time-place that she interrogated, my position in the development landscape in southern India pushes me towards approaches that work at the intersection of Marxist political economy and post structural theory or in other words Critical Development Geography. These approaches argue for conceptualizations of development processes through a robust working of space, which has many consonances with the spatiality inherent in Latour's framework of translation. For example, Gillian Hart's concept of articulation and relational ethnography presents a much more compelling way of bringing Foucault and Gramsci together. I argue that these spatial approaches move beyond the divisions and allow for intellectual projects that do not presuppose distinctions but allow understandings through following the messiness of how processes take shape. Li refers briefly to Doreen Massey and her conceptualization of space, but does not take it further. (Li 2007, 28)

I now move on to a selection of theoretical approaches that I have reviewed in order to strengthen my theoretical framework. Pred and Watts' and Hart's theoretical frameworks are similar in that they attempt to extend robust understandings of Marxist political economic analysis through the entwined integration of culture and place (Pred & Watts 1992; Hart 2001; Hart 2002; Hart 2004). Nagar et. al. bring to bear a feminist perspective on mainstream economic literature on globalization in order to integrate culture, identity and meaning, and pay attention to excluded spaces (Nagar et al 2002). Sivaramakrishnan and Agrawal also work at the intersections of materialities and meanings, and infact boldly state that modernity is still a very valid category in India, the geographic location which inspires much of their argument (Sivaramakrishnan & Agrawal 2003). I reiterate that one similarity that strikes me about the approaches that I have reviewed is that they attempt, from slightly different vantage points, to grapple with questions of development through explorations of enabling framings of space. They all arise from frustrations with approaches that freeze societal processes, specifically explanations that are premised on a monolithic view of development and capitalocentrism, that ignore historical specificity and create dichotomies such as global-local. Discussions of materialities, culture, power, and agency under gird all these explorations for enabling 'spatial' frameworks. I highlight below some of the analytical constructs that emerge as relevant for me in these approaches.

Hart, heavily influenced by Gramsci makes use of the concept of 'articulation' in her framings of development. Sivaramakrishnan and Agrawal following Foucault in *The subject and power* argue that modernity is 'constantly in a state of production' (Sivaramakrishnan & Agrawal 2003, 19). These two approaches reveal striking parallels to me. It seems to me that Sivaramakrishnan and Agrawal, using Foucault, only further diversify or diffuse the processes that Hart attempts to capture through

the lens of articulation. This is substantiated in Hart's essay where she critiques neo-Foucauldian work on neoliberal governmentality as caricatured and crudely opposed to a caricatured Marxism (Hart 2004, 93). On the other hand she argues that there are 'some striking parallels between Foucault and Gramsci (specifically in *Society must be defended*) and she points to pieces of research such as Hansen and Stepputat and Watts as examples that have tried integrate political economic studies with post structuralism (Hart 2004, 93-94).

While Pred and Watts conceptualize agency as 'structured capacity of subjects' in Reworking Modernity (Pred & Watts 1992,16), and Nagar et. al. argue that actors need to be viewed as 'people who are embedded in social relations of gender, class, race....as well as in multiple networks for coping with, reforming, or resisting global processes' (Nagar et. al. 2002, 269) Hart and Sivaramakrishnan and Agrawal extend it further. Hart's ideas of agency are implicit in her discussions of how social scientists can best understand identity, culture and meaning. She urges us to move away from 'institutionalist definitions of culture as 'embedded' within structured social relations' and stylized representations to more processual understandings (Hart 2002, 818). The methodological insights she provides also enrich her discussion. Sivaramakrishnan and Agrawal explicitly state 'there is a possibility for a theory of resistance that is not entirely encapsulated by particular fields of power.' (Sivaramakrishnan & Agrawal 2003, 43)

Theoretical differences notwithstanding all approaches suggest detailed ethnographic work to understand the complexities of development processes. A key feature of Hart's critical ethnography is to not 'take as given discrete objects, identities, places and events; instead it attends to how they are produced and changed in practice in relation to one another' (Hart 2004, 98). Hart also makes a very relevant point about the practice of research and representation inspired by Stuart Hall's interpretation of Marx's ideas on representation in his introduction to the critique of political economy- she argues for representations that retain a strong link with the 'concrete', that remain faithful to the historical and geographical complexity behind the 'concrete', and that do not create abstractions that exclude links to the historico-geographic complex that the representation is itself part of (Hart 2004, 97). This parallels Latour's arguments of representation.

It could be said that Hart provides a metadevice in terms of methodology of research and representation while Sivaramakrishnan and Agrawal offer the more specific device of stories in relation to theoretical views that are similar to the critical ethnography that Hart and Nagar et. al. argue for - specifically to destabilize commonly used categories, to remain sensitive to unpredictability and to include the messy details of the process of understanding and representation.

One of my foremost interests in these abovementioned theories, particularly the work of Hart, and Sivaramakrishnan & Agrawal, is the emphasis on viewing development as process that is taking shape. I see a clear consonance between these approaches and Latour's and Callon's call to view reality/representation as a process taking shape. I call this 'taking shape' movement and highlight this as one touchstone for me, in deep conceptions of spatiality. Using this lens of process taking shape, I find that Li and Ferguson work with the assumption of a split between representation (the development project) and reality (the context / region to be developed). Even

though Li is interested in analyzing the contradictions of development processes, she dwells on the concept of a boundary between the developed and those who seek to develop the underdeveloped (See for example Li 2007, 31, paragraph 1). This split might not equip me, as a researcher, to pay adequate attention to certain processes on the ground as they emerge, especially because I am interested to interrogate the process of planning and knowledge construction in development - aspects that are often taken for granted and under-examined.

Hart, on the other hand, alerts us to the dichotomies that have been constructed between space and place, and instead presents an alternative using Lefebvre's conception of space as space-time. She uses Merrifield's work on Lefebvre. Hart demonstrates that "(S)pace and place are *both* conceived in terms of embodied practices and processes of production that are simultaneously material and discursive.....Places are always formed through relations with wider arenas and other places: boundaries are always socially constructed and contested; and the specificity of a place – however defined – arises from the particularity of a place – however defined – arises from the particularity of interrelations with what lies beyond it, that come into conjuncture in specific ways." (Hart 2006, 994-5) What is really fascinating for me is that the manner in which Hart and Massey theorize space parallels the manner in which Latour theorizes technology. Both bring in social relations, and this is the second touchstone for me, in deep conceptions of spatiality. In Hart's words, "In this conception, particularities or specificities arise through *interrelations* between objects, events, places, and identities; and it is through clarifying how these relations are produced and changed in practice that close study of a particular part can generate broader claims and understandings." (Hart 2006, 996)

Section IV - Articulation of Research Question

To reiterate from Section 1, I argued, based on my experiences in the spatial technology sector, that a focus on the actual practice of development and technology, besides just the philosophical underpinnings of both projects, reveals a picture that is more complicated than just one of dominance and exploitation by the State. The processes of development and technological practice are mediated by several actors on the ground, and unforeseen complications arise due to many logistical, technical and political reasons. I found in my experience in the spatial technology sector in India that the proclaimed power of these technologies is not easy to create on the ground. Opening up the analysis of technological practice and contemporary development to include everyday realities is necessary to understand the mixed phenomenon and its repoliticization - the repoliticization of science and development / science for development / science of development. In Sections II and III, I engaged with debates in STS and CDG, in order to develop a theoretical framework that would allow me to extend current findings in GIS-Society literature that I reviewed in Section I. I use theories in STS and CDG to cast my research question in a broad manner and thereby move beyond the technology-society dichotomies. I found that I was most compelled to study the ambiguities through a question of representation and robust spatiality and in this I am strongly influenced by Latour's framework of translation (Latour 1999), Gillian Hart's framework of relational ethnography and Sivaramakrishnan & Agrawal's concept of regional modernities. Inspired by these approaches I asked a broad research question:

How is knowledge produced and rural development practiced using these

spatial technologies?

Section V - Methodology

As the theoretical approaches I borrow from focus on 'practice', theory and methodology are not really separate but emerge as intertwined. The combined frameworks of STS and CDG advocate ethnography as a methodology to understand the everyday details of the entwined processes of technological and developmental practice. I also draw from the specific methodological insight that 'close attention to a specific set of practices, places, and connections, can be used both to shed light on how broader processes are constituted in practice, and to suggest practical action." (Hart 2002, 15)

As mentioned in Chapter 1, since I did not gain access to State institutions using remote sensing and GIS, I chose to conduct an ethnography of spatial technology based planning in an NGO that offered me access. Thus in order to understand in detail how knowledge is produced and rural development practiced using these spatial technologies through a focus on a specific 'location', my ethnography is situated in a cluster of villages in Koppal District, Karnataka state, where an NGO called Jalaa has been working towards sustainable environment and livelihoods for more than 2 decades and is employing spatial technologies to construct rural development plans[4].

The following quotations define for me the content of ethnography:

> "The ethnographer's work is to understand the 'decisive go-between... In actual practice.. one never travels directly from objects to words, from the referent to the sign, but always through a risky, intermediary pathway...One needs to go back to the field and carefully follow, not only what happens inside collections, but how our friends are collecting data.. itself." (Latour 1999, 40) Knowledge derives from such movements, not from simple contemplation of the forest." (Latour 1999, 39)"The succession of stages must be traceable, allowing for travel in both directions. If the chain is interrupted at any point, it ceases to transport truth – ceases, that is, to produce, to construct, to trace, and to conduct it" (Latour 1999, 69).
> "What has been revealed through the study of practice is not used to debunk the claims of science, as in critical sociology, but to multiply the mediators that collectively produce the sciences" (Latour 1999, 309).
>
> "The project of critical ethnography...is precisely one of 'advancing from the abstract to the concrete' in the sense of building concrete concepts that are adequate to the historical and geographical complexity with which they are seeking to grapple. This is not - pace Mitchell (2002) - a matter of asserting a split between reality and representation. Instead it posits a dialectical relationship between the concrete-in-history and the production of knowledge - a knowledge that remains '

[4] Names of places below the district level, and names of all people in this dissertation are psuedonyms.

> “merely speculative, merely theoretical”...so long as practice does not, dialectically, realize it’ (Hall, 1974: 151). Relational understandings of the production of space are central to critical ethnography, along with the specific concept of articulation..” (Hart 2004, 97).

Inspired by the robust spatiality in the theoretical approaches of Latour, and Hart, and Sivaramakrishnan and Agrawal, I extend understandings of the phenomenon of technology *and* development by reconceptualizing the space in which they are studied. Given the developing country context that I am positioned within and the *rural development* sector in which these technologies are gaining purchase in India I argue that understandings of these technologies could be extended by studying their use 1) in a space where the lines around institutions and actors are pushed back and blurred a bit, i.e. institutions and actors are conceptualized in a less stylized manner, 2) in a historic space layered with the actions and beliefs of a range of actors such as state agents, non governmental planners, farmers, and the environment, and 3) as an enquiry into how knowledge is continuously produced and used by a range of actors in this historic space. Given the above I do not separate the plan from the landscape in which it circulates.

The ethnographic data that I present has been collected over a period of five years. I spent most of the initial years only focusing on participant observations, after which I gradually began to punctuate participant observation with semi-structured and unstructured interviews. I conducted participant observations of the planning process in the NGO and spent time hanging out with the GIS staff of the NGO and the field staff who implemented the watershed structures. In order to understand farmers processes of soil and moisture conservation I undertook landscape traverses with farmers across different cross sections of the highly undulating landscape. I also conducted unstructured and semi-structured interviews with different members in the NGO staff such as the Director, the watershed engineer, field staff. In the villages I conducted unstructured and semi-structured interviews with fourteen farmers spread over ten villages of the 2000 ha watershed. In order to understand the space in which farmers made their daily livelihood decisions I also conducted semi-structured interviews with other actors in the rural landscape such as agricultural extension officers, money lenders, seed and fertilizer sellers, and local government officials.

Notes on my Positionality

During my first visit to Jalaa the purpose of which was to meet the Director Ashok to discuss possibilities of researching Jalaa's practices of spatial planning, I came to understand the manner in which work was done in the NGO. My meeting was in Jalaa's office in the state capital, Bangalore. However Ashok stressed that the city office was only a temporary setup for certain practical purposes such as meetings, and accounts. He said that the real hub of the NGO was in the north interior rural parts of the state where they worked on the ground. At the end of our meeting although he agreed to allow me to conduct my ethnographic research in Jalaa his advice to me was to visit these rural areas before I made up my mind about researching the organization He said that I should have a first hand view of the landscape and the actors in that landscape before I made my decision. I thought it good advice. Jalaa had campuses in 4 different rural locations across two adjacent districts. I visited the campus that was the watershed hub of Jalaa. All the watershed

projects they had implemented were around this campus and the watershed staff lived and worked on this campus.

The closest railhead to this location is 2 hours away and so I was instructed to buy a ticket on an overnight bus that would drop me off at a town on the national highway that is half an hour from the campus. In the morning I was picked up by a staff member and driven to the campus in a NGO jeep. The campus was a cluster of thatch buildings located on a piece of farmland about 3 kms from a small market town. I was presented with a view of a gently undulating landscape interrupted by some low hill ranges. Bhagat, the watershed project leader met me after breakfast and handed me a NGO publication that documented the GIS prototype. He then introduced me to field staff in the watershed team. They were all young men in the 25 – 35 age group who were from villages in the same district or neighboring districts.

I lived on the NGO campus during my field trips. The watershed field staff became my peer group within Jalaa. While my interactions with Bhagat and Ashok were rather structured, by default I hung out with the field staff. Meetings with Bhagat and Ashok were almost always predetermined and upon my request or theirs. But my daily routine during fieldwork mostly involved sitting with field staff in their office space, and traveling with them to the villages for field work. Since I lived on the Jalaa campus with field staff they were also my social group – we would have meals together and chat in informal spaces. As buses were infrequent to the villages, Ashok had given me permission to travel to the villages on the Jalaa motorbikes. As I did not know how to ride a motorbike my numerous visits to the villages were always as pillion rider on a motorbike driven by one of the watershed field staff. Due to this practice, in the initial stages of my fieldwork in the villages, field staff also served as informants and interpreters. As I, and they, became more confident of my field research skills, they would drop me off at the villages and farm plots, finish their work and return to pick me up before heading back to the Jalaa campus. I would often discuss my research ideas with them as they were shaping up in my mind.

I found that while the staff (80% of whom were men) were friendly and eager to get to know me, there was also a level of restraint in the initial years. Firstly, I realized that some of the restraint was because I had a direct connection with Ashok, the Director, which was anomalous in the Jalaa staff culture that was hierarchical. So until they understood my politics they refrained from being spontaneous in their conversations with me. At several occasions I would reiterate the politics of my ethnography, and that it was important for me to protect the privacy of each of them because I was researching different levels of staff within the organization I also explained my efforts to protect their privacy. As I had taken the position of being an active member of their organization I would voice my concerns in meetings, and they gradually realized that my method was not a solely extractive exercise. I also found that over time my sympathies were more for this level of staff than any other in the organization Secondly, my relationship with them was also mediated by each staff's level of comfort in interacting with women. While some staff were rather comfortable and organic and treated me as fellow professional, some others were unsure about how to relate to me, which also adversely impacted my levels of confidence. After some extended periods of angst in trying to negotiate this, I decided to pursue my ethnographic research only with the staff with whom I could make a connection.

I began my acquaintance with the rural community by piggy backing with Jalaa field staff during their field visits to the village settlements and agricultural plots. I was introduced as a student, hosted by Jalaa and there to understand agricultural practices of rural communities and how spatial technologies were used for watershed development. I found it much easier to begin my research in the NGO spaces. I was extremely self-conscious of facing farmers in the villages and talking to them as I had no experience in agriculture. I was only able to overcome this by learning and sharing with Jalaa field staff. They encouraged me to make a fool of myself, and also spent a lot of time in sharing their knowledge of the intricacies of life on the land.

Ludden in his book Agrarian History of South Asia, makes the point that the manner in which urban middle class folk view the 'rural' is necessarily steeped in the project of modernity and do view the 'rural' as the other. (Ludden 1999) I found that at times, during field work, I could not understand what people in my field site were telling me unless I made a leap of faith, and gradually waited for the meaning to percolate in my mind. I found that I did not have the necessary assemblage of concepts / symbols in my mind to grasp fully what they were saying at first hearing. It is only slowly over the course of five years of field work that I began to hear what they were telling me, and in conducting my ethnography I have been inspired by Anand Pandian's work on the Kallar community in south western Tamil Nadu, India where he undertakes beautifully the project of representing Kallar identity and how it is entwined with ideas of development (Pandian 2009).

Chapter 3

A Geography of 'Backwardness'

I argue that a grounded understanding of the content and practice of the spatial technologies is only possible with an equally adequate understanding of processes in the landscape in which these technologies circulate – hence a background sketch of the study area. In borrowing from theoretical approaches in Critical Development Geography that foreground materialities, I state at the outset that my prime concern is the well being of the people in the rain fed location in which I conducted my research. Farmers across the board shared with me that they wanted more stability in agricultural income, and that they wanted to be able to fix capital and save money, which would help them tide over lean periods. I use this as my frame of reference in this chapter, which provides a background sketch of the study area, and also troubles the manner in which this region has been characterized as backward.

When I began my fieldwork I realized within a few days of being in the NGO Jalaa, that the regions' backwardness was a huge identifier for the NGO and its staff. The lore in the NGO about its origins was that Ashok, the Director set up Jalaa in these parts of the country because, statistically it was one of the most backward districts of the country. Ashok himself validated this story for me. He was a journalist and development worker in disaster relief since the 1970s. He founded Jalaa in 1986 to help vulnerable communities in dry land areas improve their livelihoods. The NGO's development initiatives began in a cluster of villages with a focus on children with disabilities and public health. Over time they have shifted to an integrated development framework, which includes AIDS counseling, agriculture, micro credit, and governance and they now have a presence in 6 districts in the state of Karnataka. I noticed the recurrence of the backwardness yardstick in many NGO meetings, when Ashok would often roughly measure the impact of their interventions with the changing statistics of the district.

In development studies literature, one of the most prominent studies that troubles the idea of backwardness is Ferguson's 'Anti-politics Machine'. In order to highlight the instrumental effects of development projects, Ferguson shows how the World Bank first constructs a conceptual apparatus in which the region to be developed is represented as a 'less developed country' (LDC), and then constructs an institutional apparatus to implement development in line with its definition. Using Foucault in 'Prison Talk,' Ferguson provides a discourse analysis of a World Bank report on Lesotho. Ferguson draws attention to the importance of analyzing why certain actors construct such a discourse and want to maintain it, and what the 'closures' are in such representations. He says that this is the more important task rather than arrive at the conclusion that the people who wrote the World Bank report do not have their facts right and are incompetent, or identify the disjunctures between development discourse and academic discourse. The construction of Lesotho as an LDC is an apolitical act, and the 'rules' of constructing the 'discursive normativity' have to be excavated (Ferguson 1994, 30). He is also careful to locate the specific discourse in time and space – construction of Lesotho by development aid agencies in the 1970s.

In pay attention to this act of situating the discourse, I highlight that in the case of India, this project has to be undertaken with an awareness to the post Independence history of state sponsored development. The idea of backwardness has a different discursive history in India, and given that state sponsored development was, and continues to be albeit in different degrees in the post-Liberalisation period, the main vehicle of development, I choose not to unproblematically follow Ferguson's 'Anti-politics' path of analysis. In order to extend Ferguson's approach as per the specifics of the Indian situation I borrow from Akhil Gupta approach's of interrogating postcolonial development discourse in India.

Following Akhil Gupta, and in keeping with my theoretical position as delineated in Chapter 2, firstly, I take the view that "discourse" is not separated from "reality" on the ground. Gupta argues that there is an "(I)neluctable role played by narratives as symbolic technologies for the representation and understanding of social processes. For example, policies and plans of "development" rely on certain commonsensical stories that explain both why things are the way they are and how they can be changed. Explanations of development rely heavily on a stereotypical narrative of the individual nation, abstracted from a mythical history of "the West" and the statistical representation of sectors and nations on the map of the world." (Gupta A 1999, 342, n20)

Secondly, the concept of regional imbalances or uneven development has been a fundamental concept in spatializing capitalist development (Smith 1990). Underdevelopment is inherent to the processes of capital accumulation. Given the mixed economy path that the Indian State took post Independence, there is a peculiar slant to the discourse of under development. My study area, like many other backward areas of the country was left out due to certain logics of the development state. It has been purposefully left out, and hence termed backward. It is only in that regard, that we can call this region backward, not in terms of any essential quality of the landscape or the people. Noticing the effects of its development strategy, the State constructed the concept of 'regional imbalances' and 'backward areas' in the early years of planning, in fact as early as the First Five Year Plan, in order to redress the situation[5]. 1968 marked the year when steps were taken to identify backward areas in the planning process. However, this process has been critiqued as being implemented inefficiently due to 'inadequate institutional arrangements.'(Backward Areas 1975) It is also important to note that the Indian State's strategies to redress regional imbalances cannot be separated from issues of sovereignty, and populism has been an important strategy in this regard. As Gupta argues, "If postcolonial modernity is defined by the centrality of "development," then populism, especially agrarian populism, is its most important feature. (Gupta A 1999, 34)

Thirdly, it is important to note, following Gupta, that in the specific lived modernity of the people of this country, we must pay attention to how people such as farmers identify themselves as 'backward' and 'underdeveloped'. Gupta critiques the view that the discourse of development is external to rural populations in India. "Developed" and "underdeveloped" have been distinctions that have been used by the

5 The definition of backward classes of Schedule Tribes (ST) and Schedule Castes (SC) represents attempts of the post-independence Indian State to be inclusive of historically disadvantaged social groups.

Indian nation-state, not just international development discourse (Gupta A 1999, 6) This is related to complicating ideas of modernity, and paying attention to the regional modernities that are highlighted by Sivaramakrishnan & Agrawal (Sivaramakrishnan & Agrawal 2003) Development is a key category in modern India – it is central to the idea of modernity and the experiences of modernity in this country.

Fourthly, in a predominantly agrarian country, agriculture has been a very important sector for the development of a modern nation. Gupta provides an analysis of the debates around development planning in the years preceding independence and immediately after independence (Gupta A 1999). The central point of these debates was about the relative emphasis to be given to industrialization and agriculture in order to set the country on its path to development. While one position emphasized industrial development, the other position emphasized agricultural productivity in order to provide adequate surplus that would in turn spur industrial growth. While the First and Second Five Year Plans emphasized rapid industrialization, efforts were made to also increase the productivity of agriculture. However, many of these efforts were premised on social reorganization since most of the financial investments were diverted towards industrialization. Failure to raise agricultural productivity by the end of the Second Five Year Plan partly created the conditions for the introduction of Green Revolution. While this point is a brief summary of Gupta's analysis, my central purpose is to illustrate the modern Indian state's emphasis on agricultural productivity. This is important in order to contextualize the landscape in which I conducted my research – a landscape bypassed by the Green Revolution.

Outline of Chapter

In the rest of the chapter, I provide a brief example of how this region has been characterized in planning and development literature of the state and contextualize this in the colonial history and prehistoric past of the region. Then I provide a background sketch of the region through an explanation of aspects of physiography, climate, soil, and cropping pattern. In this explanation I show how this area has been represented as backward because it is anomalous in terms of the aspects that have typically been regarded as productive by the development state. I use a combination of secondary data and ethnographic data. While I find useful the careful discourse analysis, and the meticulous analysis of social history of the people of a region of Lesotho in the Bovine Mystique section of 'Anti-politics Machine', my position in a semi-arid location of southern India forces me to must pay attention to Gupta's work to extend Ferguson's approach (Gupta A 1999; Ferguson 1994). My ethnographic data illustrates that farmers do interpret their situation and identities in terms of the state's discourse of development and productivity. In other words, following Akhil Gupta, the state policies and discourse cannot be separated from people's practices, meanings and identity on the ground. I conclude this chapter with an analysis of farmers practices of purchasing agricultural inputs and sale of agricultural produce in a rather precarious dry land political economy in order to demonstrate their daily practices of work and survival.

Development Indicators

My study area lies in the interior semi-arid parts of the South Indian state of Karnataka, in a region referred to as Hyderabad Karnataka. The Hyderabad Karnataka region comprises four districts which were formerly part of the princely state of the Nizam of Hyderabad, and hence were not governed by the British for any significant period of time. Post Independence, during the reorganization of states on a linguistic basis in India, these districts became part of the Kannada speaking state of Karnataka. Karnataka is a state that was created from Kannada speaking districts that fell under five different political territories during the colonial period. Regional imbalances in the states are still partly explained through the histories of these different regions. In order to provide a starting point, I share below some of the development indicators of this region as published by the Census of India, and the Human Development Report of Karnataka State.

The districts of Hyderabad Karnataka are some of the least developed districts in the State as per the Human Development Report (HDR). A High Power Committee for Redressal of Regional Imbalances (HPCRRI) was set up by the Karnataka State Government in 2000. The HPCRRI devised an index of development based on multi-sectoral indicators measured at the taluk level[6]. My study area falls in Koppal district. This district was created in 1997 when it was hived off from Raichur district. It has a total population of about 1.2 million and a population density of 215 sq km. As per the 2001 Census, this district ranks amongst the bottom five district in terms of literacy rates. It's female literacy is third lowest in the state and percentage of agricultural laborers highest in the state. Koppal district ranks in the bottom five districts of the state in terms of HDI in 1991 and 2001 (Government of Karnataka 2005a, 18).

The nearest urban center to my study area is the taluk head quarter which is about 35 km away. It is a Community Development Block head quarter and has 164 inhabited villages under its jurisdiction, the total population of which is 2,18,148. A very telling development statistic for me about this town, which I frequented, is that in 2001 it has 1,467 latrines of which only 300 are water borne. It also has five banks, 1 agricultural society and 1 non-agricultural credit society. Most people in the villages I researched could meet many of their market and banking needs in Kamalapura[7], a smaller market town within a 15 km radius from all the villages. In the Census of India, Kamalapura is not counted as urban, but a 'village with more than 5000 population'. Kamalapura has 1 Primary Health Centre (PHC) and 2 Primary Health (PH) sub-centers (Census of India 2001). It has two commercial banks and 1 co-operative bank. It has drinking tap water. Farmers travel on a daily basis to source seeds, fertilizers, and pesticides and sell their agricultural produce in the Kamalapura bazaar. One campus of the NGO I researched is also located in Kamalapura.

A Brief History of Representations of the Region

This region's natural resource base has quite consistently been characterized as 'marginal' in planning and development literature related to the State. This is because

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6 An administrative level immediately below the district level
7 From the level of this town and below I have used psuedonyms.

of the anomaly in terms of many factors such as rainfall, soil, and irrigation - that are considered productive from the perspective of the Indian development State. These anomalies explain why this region was 'by-passed' by development projects including the Green Revolution. Secondly, programs that have been designed to develop backward regions have also been premised on normative ideas of productivity as defined by the modern Indian state. Consequently, representations of the landscape and the people have been defined as unproductive.

For example, while the District gazetteer assessed in 1970 that low, variable rainfall, highly fragmented landholdings and poor land management practices were prime reasons for 'agricultural backwardness' (Abishankar 1970), a recent study in the district refers to unsustainable practices of ground water use, continuing poor land management practices and a culture of short term strategies of desperation by farmers as the main issues in this agricultural landscape (Premchander, Jayaseelan, Chidambaranathan 2003). Even watershed development programs, which are framed as the second generation Green Revolution aimed at developing agricultural productivity and livelihood security of dry land areas that were left out of the first Green Revolution, are premised on an explanation of inaction or inadequate action by the people. Whereas academic research on dry land agricultural areas makes the argument about lack of agricultural development models that focus on agro-ecological and social specificities of place in dry land areas that have not been suitable for the first Green Revolution (P.S. Vijay Shankar 2005; A.R. Vasavi 1999) They argue that if development programs are tailored to the specificities of these dry land then these areas could actually show an improvement in development indicators and not continue to remain backward.

The backwardness of this region also needs to be contextualized in the history of colonialism and modernization in the country through the last three centuries where state powers favored areas rich in natural resources which aided better expansion of commercial activities (Ludden 1999, 90). The Hyderabad Nizam government is known to have provided no protection to peasants and tenants, and conversely significant support to landlords, unlike in British territory where they was scope for negotiation (Ludden 1999, 99) The lack of investment and commercial activity further exacerbated the dry conditions of this region and created the many famine that are known to have occurred in this region.

The following excerpt from the Karnataka state Human Development Report of this region is a good representation of official characterizations that hark back to this history in a normative fashion - "The Gazetteer of India gives a vivid account of the famines and scarcity conditions that prevailed in this region from the 17th century. Drought and great famines devastated vast areas in this region on a continual basis... In recent times, the most severe occurrence of drought was in 1970-71. Scarcity conditions prevailed in the 1980s and again affected the region from 2002-03 onwards when the entire state experienced severe drought. To compound the suffering inflicted by nature, the princely state of Hyderabad, unlike the princely state of Mysore, was interested neither in developing the region economically, nor in investing in human capital. Today, the term, 'Hyderabad Karnataka' is used to describe the three districts...and the new district of Koppal, which has been carved out of Raichur.[8]"

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8 As my study area falls in Koppal district, which was carved out of a larger district called Raichur district

(Government of Karnataka 2005a, 6) It is beyond the scope of my research to engage with archival material to understand the rationality of such representations.

However I argue that in the uneven development landscape created by the movement of capital, we must not discount the agency of dry land farmers who have consistently worked the land with their meager resources. Ludden says of this general semi-arid region, "In the dry peninsula, the overall expansion of cultivation was driven substantially by such poor peasant families; they provided a huge aggregate demand for rural credit and they produced a large proportion of the cash crops that went to market, particularly cotton, ground nuts, oil seeds, castor, linseed, and sesame." (Ludden 1999, 96)

When I began to search for data and writings on this region I found a very interesting article by a group of anthropologists and archaeologists who have worked in the same region, and who have applied a political ecology framework to understand a socially mediated landscape. I thought it ironic that while my study area has been considered a 'backward' region in post Independent India and largely under represented in research work, the surroundings of this region are a hotbed for archeologists! There is much more data if you travel back in time to the Neolithic and Iron Age. This group's work provides a very interesting historical context to agricultural practices in the area that are today interpreted as unsustainable, as highlighted above.

Using a political ecology framework Bauer et al provide an archaeological analysis of human environment relations in the Neolithic, Iron Age, and Early Historic periods of this region (3000 B.C to 500 A.D) – the southern Deccan. They look at evidence about agriculture, animal use, monuments and the production of social difference. Empirical evidence for the Neolithic period demonstrates that societies settled away from major drainage sources and relied on rain-fed agriculture and large pastures for pastoralism. Agriculture was practiced at the foot of sloping features in order to make use of run-off / soil moisture. People chose to grow rain fed crops such as millets, which reveal a less intensive agricultural and water regime. Monsoon was weak in the Neolithic period (Bauer 2012, 21) Ash mounds made of cattle dung were present.

Empirical evidence of the Iron Age points to a change in the settlement pattern, where possibly due to changes in technology and intensification of agriculture, settlements moved closer to drainage sources and people constructed structures for water storage and soil collection. Winter crops that were introduced from the north needed irrigation as this region receives much of its rain during the summer months of June to September. Cattle played an important role economically and symbolically. Also, the disappearance of ash mounds after the Neolithic period indicates that the cattle dung was being used as manure for agriculture. Both items – dung and water – seem to have shifted gradually to perform more economic functions as agriculture became more intensified. Today there isn't enough dung or water! The authors point out that these changes were related to gradual socio-political differentiation in society, which involved the organization of labor. During the Early

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in 1997, I sometimes refer to statistics and descriptions of Raichur district in describing my study area.

Historic period, from which textual sources are found there is evidence of dynasties, and religious monastries.

They illustrate two things well here to complicate the relationship between societies and the environment. One, they show that the megalithic structures, atop which rock pools were constructed, are cultural artifacts and not geomorphological formations. Two, unlike surrounding areas there is less xerophytic vegetation near these rock pools. This is also a cultural artifact because the practice of creating rock pools for water storage contributed to moist, clayey soil in that area, and hence this vegetation. So they alert that it would be faulty to assume this is natural vegetation.

Bauer and colleagues research also indicates that the hills with more evidence of habitation and intensity of use during the Iron Age show less soil and more exposure of rocks, leading to the conclusion that intensification of agriculture did produce soil erosion. There is also archaeological evidence of soil retaining stone structures, which bear a resemblance to the stone bunds of the area today. “soil stripping associated with agro-pastoral production and the construction of retention walls” (Bauer 2010)

I use this groups' research to argue that this is a very ancient landscape that has many, many layers of human intervention, and the natural resource base that is being worked by the farmers I spoke to, is not something that only they have created, but is a product many societies and their respective socio-political structures. This history is important in the context of some typical characterizations of this dry land / 'backward' region of India as I have stated at the outset of this chapter.

Physiography and Soil

Physiographically my study area is part of the Deccan plateau region of the state and is also referred to as the *maidan* – which means flat, open space. It lies to the west, and in the rain shadow, of the Western Ghats, which is a wet, highly biodiverse region of the country. In Karnataka, the *maidan* is classified into the northern *maidan,* which is highly eroded and lower in elevation, and the southern *maidan* which is more rugged and higher in elevation. My study area falls in the northern *maidan*. This part of the Deccan is an ancient geological formation comprised of very old granite and gneiss rocks (Spate 1967, 22). The granite and gneiss are interwoven in some places with the older Dharwar shcists, which are igneous in origin in this region (Chaturvedi 1956,14). It is a gently undulating plateau, and is punctuated with low hill ranges, and monadnocks of granite boulders.

My study area falls in the region between two large rivers that drain peninsular India – the Krishna and its biggest tributary – the Tungabhadra. The region at the confluence of these two rivers is a fertile alluvial belt historically called the Raichur *doab*. My study area lies just west of this fertile belt and does not have an extensive cover of alluvial soil. Secondly, although the Deccan plateau in general is known for its fertile black cotton soil, which occurs from the weathering of basalt rocks of the Deccan Trap, my study region does not fall in the black cotton area because of its local geology. According to Chaturvedi, this region has predominantly red sandy loam from the parent material of granite and gneiss, local properties of which depend on the parent material in that area, i.e. the type of granite rocks. Red soils are formed

primarily from leaching whereas black soils are formed by deposition (Chaturvedi 1956). This has a bearing on the fertility of both types of soil. Farmers in the study area explained that good black soil is the easiest to plough as it is soft and pliable. Red soil needs more work – it becomes hard in the fallow season, and so farmers have to wait for a small rain before they begin to prepare the field again. Also ploughing it after it receives some moisture helps keep the moisture in the soil as red soil does not retain moisture as well as black soil. It looses moisture sooner.

The following quotations of farmers I spoke with illustrate the implications of red soil for agriculture in this region. This demonstrates that farmers do interpret the characteristics of red soil vis a vis assumptions of productivity, nevertheless they turn this interpretation into practices and work with their red soil despite difficulties, rather than manage the landscape in an 'unsustainable' manner. Sudhakaragowda, an experienced farmer in the area said, "In those days, when it was a 6 month crop, those with black soil could afford two crops, because they would have some soil moisture even after 6 months. When hybrid seeds came, people with red soil also could afford two crops a year because of the shorter duration of the crops."

Sudhakaragowda, also with reference to the hardness of red soil, said when his father would farm, he could not manage certain parts of his land because he did not have the technology to level the land. "It would have taken him a long time to do so with his pair of bullocks. Today I can hire a tractor and pay Rs. 250 per hour and thereby cultivate my land more intensively. But farmers in neighboring Bijapur district who had widespread black soil were able to do all this even 30 years ago. They were able to do it because they have good black soil which is more pliable, and for which they prepared a particular type of plough – '*tagadu hakki kunti-ge*'. The red soil here is a bit hard and hence requires more labor and timely rainfall."

Based on the rough rules of thumb for cropping patterns, there are no restrictive rules for black soil unlike red soil. Lakshamanna and Lakshmamma explained, "In black soil any crop is fine - green gram, sesame, pearl millet, sunflower. They say the main limitation of red soil is that its moisture retention capacity is less, and it needs good rains and a crop like green gram (*thingal hesaru*) needs much moisture. So no point planting bengal gram and green gram for red soil. Black soil is preferred for both these crops as well as wheat. With black soil and one good rain the soil will retain lots of moisture. For the rest of the crops we don't really worry too much - whatever soil it is we grow these crops." This is one reason I do not see a large scale replacement of pearl millet and sorghum by green gram, as has been noticed in the neighboring districts of Dharwad and Bijapur (Deshpande & Rao 2004).

Bhavani, a woman farmer in the downstream village of Gulithota said, "Those who get yields sooner are able to get a better price for their produce. Those who get a yield a little later lose out a bit. Those who have softer soil / earth are able to get a yield soon. Those whose soil is a bit *birsu* (hard) get yields a bit late. My soil is soft so within 3 months I get a yield. But some people have to sit and wait for 4 to 5 months. Hard (b*irusu)* soil does not 'drink' the water well so what do you do? More water runs off. Soft soil is able to 'drink' the water well and give results. The hard soil can only be improved with farm manure."

Rainfall

As in any part of the country, the southwest monsoon from June to September and / or the retreating monsoon from September to November are the main sources of rainfall in this region. Annual rainfall for Raichur district is 579.3 mm. But as Morrison highlights looking at average annual rainfall figures for this region is misleading in a sense because of high variability (Morrison 1993). It should be noted that variability means not only that rain doesn't come when it is expected to come but there is a variability in terms of actual rainfall received. Just as the Gazetteer has accounts of famines and droughts in the past, it also talks of when the region has received untimely heavy rain. During my fieldwork too, I have been witness to untimely spells of very heavy rainfall which have ruined standing crops.

This region has a bimodal rainfall pattern – a minor peak in early June, and a higher peak in late September or early October. Chaturvedi points out that this region receives the lowest rainfall from the southwest monsoons, as it is easternmost in the rain shadow region, and also received the lowest rainfall from the retreating monsoon as it western most in the region. The rains from the southwest monsoon are orographic in nature, and the intensity of rainfall in the rain shadow region east of the Western Ghat range is controlled by the height of the hills, and the intensity of the monsoonal winds. Since the Western Ghats are not as high in north Karnataka, Gulbarga and Bidar districts get good rainfall even though they are in the rain shadow. But not so much Koppal district because it is further east. The reliability of rainfall is highest (although actual amount received may not be high) in the months of September and October as the monsoon subsides.

On reading representations of rainfall patterns in this region I notice a tendency to frame the low and variable rainfall as a problem and as something unexpected. However, many sources of rainfall information clearly specify that this is expected rainfall pattern given the geographic position of this region. The Raichur District Gazetteer published in 1970s says, "Sufficient rainfall for the normal crop is generally expected only once in three to four years. Most of the precipitation is during the end of the rainy season" (i.e south west monsoon season) (Abishankar 1970, 140). The Gazetteer also says, "A proper knowledge of the relation between crops and weather-risks the farmers face at successive stages of plant growth, is necessary for profitable farming" (Abishankar, 1970, 139).

Though rainfall variability is a feature of this landscape, all farmers I spoke with maintained that it is more erratic now than 3 to 4 decades ago. Mukundappa, said in those days the rains were quite regular, now its like a gamble, and if the rains are inadequate they have to migrate for work. Despite the variability of rainfall, farmers wait and watch and adjust their sowing and cropping decisions to try to maximize their yield. 'Waiting and watching' is normal practice here. Lakshmanna of Kaadugere told me, "Last year (08-09) the first season rains came only towards the end, so we sowed pearl millet from which we got a good yield. We also sowed sunflower and some foxtail millet. Then in the second season we sowed sorghum and bengal gram. So overall we managed to get a good yield last year." These practices of dry land farmers demonstrate a contestation to the productivity narratives that are fixated on certain definitions of rainfall. Moreover it is farmers who commonly use the fertilizer - diammonium phosphate (DAP) for soil (typically those who practice

irrigated agriculture or those who do not have any or enough organic manure), who sometimes do lose out if the consequent spells of rains fail. Then the crop dries and dies. If they apply organic manure instead of DAP it is able to provide a little moisture for the soil.

Sometimes, the entire first season is a failure because of inadequate rainfall or excessive rainfall. As a Lambani farmer told me, “rains are unpredictable, so if the first season is a loss due to excessive rains, and then the second season is good because of the residual moisture in the soil. Mukundappa says, “it is difficult and not in our hands, it is only in our hands when we have harvested the crop and it is in our house – only then do we have guarantee.” Although the abovementioned strategies are normal in this region, farmers also refer to times of drought when things have become more severe.

Irrigation

My study area falls in the Krishna river basin and Tungabhadra sub-basin but gets no irrigation from any of these rivers. Of the entire district, only 26.7% is irrigated. The rest is rain-fed. Of the irrigated areas, 29.8% is irrigated by canals, 64.6% by borewells, and 0.5% by tanks (Agricultural Contingency Plan for District Koppal 2011). This demonstrates that most of the irrigation is through private initiative of the farmers. My study area is drained by a small seasonal river (classified as a stream by the Karnataka state Irrigation Department) called the Kadambahalla[9] and its tributaries, which is in turn a tributary of the Tungabhadra. Reddy & Murthy state that the interior parts of Karnataka that fall in the rain shadow region of the Ghats comprise the second most arid part of the country, and so large dam projects such as the Tungabhadra, Upper Krishna, are meant to provide irrigation to these parts. The Tungabhadra Irrigation Project, built in the 1960s comprises a big dam across the river with a canal network of 337 km and a command area of 362,795 ha (Salient Features 2012). Raichur district specifically benefits from the Tungabhadra left bank canal, and the Upper Krishna Project First Stage. Reddy & Murthy say that canal and tank irrigation predominate in the wetter parts of the state where the topography is also conducive – in the western and southern regions. One explanation for this geography of irrigation canals is that black soil areas are more conducive to canal irrigation (Reddy & Murthy 1967). My research area falls in the northeastern portion of the district which has red soil, and hence is away from the areas that benefited from this intensive development project. The only reservoir in my study area has been created by damming the Kadambahalla just downstream of my study area. It was constructed in 1976 and 13 kms of canals were constructed to irrigate the 2064 ha downstream. My study area does not receive any irrigation from this reservoir as it is upstream.

A very small percentage of the 13,402 ha watershed that I researched is irrigated by tanks. There are only four tanks in the area built by the Karnataka State Minor Irrigation Department over the last three decades. Only 268 ha are irrigated by 4 different tanks in the southern belt of the watershed. Some wells development programs were initiated by the government in the 1960s in the area that was ‘left out’ and from the 1970s onwards bore wells fueled both by government credit and local

9 A psuedonym

money lending rapidly dotted this region. This made possible a second crop in an agricultural landscape predominantly dependent on one rain fed cropping season.

Livestock and Manure

All farmers, in their conversations never failed to stress the importance of manure particularly for red soil and therefore the requirement to keep livestock. Sources of manure for farmers are crop residue and large and small livestock. Large livestock are also valued as draught animals and used for transport. However, the rainfall pattern has always made for a rather precarious situation as far as livestock are concerned. Large livestock are typically sold at times of drought or low agricultural productivity as farmers do not have enough crop residue to feed them and drinking water also becomes scarce. Livestock ownership is a signifier of economic status in these villages and an important investment and a tradable commodity. In one of the villages in my study area – Heggapur, almost all farmers engage in livestock trading. Livestock trading fairs are a common feature in this region.

The preference is for manure, rather than chemical fertilizers because it has longer lasting effects, and unlike fertilizers provides soil moisture. Prakashappa said that the sooner you apply *gobra* (livestock source manure) the sooner you will be able to get good yields. He never applies fertilizers and only uses manure. He told me that those who don't have livestock are the people who apply fertilizer. The difference between the two is that with fertilizer you can get 1 crop, but with the manure you can get 2 to 3 crops – the effects of manure will last for 2 to 3 years. Plus with fertilizer you need rains or irrigation, otherwise the soil will become brittle, etc., Mudukappa says, “those who use chemical fertilizers are more into moneyed agriculture and who don't want to deal with difficulties.”

Many of the farmers who apply manure do not have enough for all their plots, so it is common practice to rotate the application of manure. Kempapura Basavamma has two buffaloes, and uses manure for her plot of 8 acres. But the manure is not enough for all the land so they rotate the application every year - for black soil parts once in 6 years, in red soil, once in 3 years - the *gobra* lasts for so long. Virupaksha also has 8 acres and buffaloes, but says he can only use manure for 5 acres at a time, per year. So he too rotates. However, Basavamma says that they also apply chemical fertilizers because they have no choice with hybrid seeds, particularly pearl millet and foxtail millet. If they do not apply chemical fertilizers then the yields are lower.

Lakshmanna explained that since ease of ploughing is one of the first concerns for farmers they apply manure in order to make the soil more pliable. This also helps the soil structure retain moisture when the rains come. If in a year they do not have enough manure from livestock (*tippe gobra*) then they buy DAP which they use as a substitute for manure. However, they say that when if they apply DAP and the rains fail then the crops also dry up. Livestock manure, on the other hand, will provide some moisture to the crops even if the rains fail. So they prefer livestock manure and use DAP only because they sometimes do not have enough manure. They also plough the soil with two types of ploughs – one to loosen up the soil, and the second type to create furrows which will trap the rain and help it soak into the soil.

Shankaramma says she does not apply chemical fertilizers at all for her land. She has one bullock – and gets about a tractor load of manure, which she applies to her land. It is not enough but they make do. Then they ask for small livestock to graze their land in the off-season – so that helps a bit she says.

Hybrid seeds for sorghum and pearl millet do not produce as much fodder as the native seeds, and have created a rupture in the earlier relationship between land-livestock. Mudukappa, a seventy year old farmer I spoke with lamented about how the new seeds do not give any fodder. Pearl millet particularly produced large quantities of fodder. "Yes, we get more yield and more money, but what about livestock ?"

Kesava Iyengar, an economist was commissioned by the Nizam of Hyderabad to undertake an economic investigation of the territories of the Nizam. In his 1931 study he demonstrates that even at a time when hybrid seeds did not exist, this region suffered from scarcity of fodder due to poor rainfall (Iyengar 1931). Inadequate fodder was a big concern for the State at that time and the Agricultural Department tried to extend the area under fodder crops, provide fodder at subsidized rates and also source fodder from other places. Drinking water was a big problem in most of the villages that were surveyed in this study. Because of this problem cattle also suffered. The Well Sinking Department of the State provided some measures in some of the taluks, but not much in this subregion.

A study conducted by the NGO Jalaa in 2005 showed that 85% of households owned livestock in 2003-04. Large livestock are dependent on crop residue for fodder, while small livestock graze fallow lands, non-arable land and common property scrub forest which is under the jurisdiction of the forest department or revenue department. Data from this study shows that during the drought years of 2000 to 2003 there was distress sale of livestock due to poor harvests and consequent reduction in fodder supply. Migration also went up during this period. There is a 20% decrease in livestock numbers between 1994 and 2004. Large ruminants decreased by 23% and small ruminants by 13%. But after that period the numbers of small ruminants has picked up and this is explained by the increased availability of credit through the SHGs. Fund utilization data from the Jalaa-run SHGs show that a significant portion is spent on the purchase of small ruminants. About 70% of the livestock related loans from SHGs are for sheep rearing. In the 21 villages of the Jalaa watershed project, 10.5% of total livestock are oxen, 8.6% are cows, 3.6% buffaloes, 33.5% goat, 35% sheep, and 8.8% other livestock. This distribution shows less dependence on crop residue fodder. Livestock density in the 21 villages is 2.9. Most of the livestock are native breeds and there are very few cross bred varieties in this region. Large livestock are still valuable as draught animals because of low levels of mechanization in this region. Even if farmers do not own large livestock they do rent from others. Tractors are owned by a handful of farmers and are also rented out.

Cropping Pattern

Crops such as pearl millet and sorghum have been cultivated for centuries because they are ecologically suited to semi-arids and hence resistant to pests, diseases, and drought. The archaeological study by Bauer et al cited evidence of pearl millet cultivation in the Iron Age. Ludden refers to pearl millet as a primeval arid zone crop which produces with almost no rain (Ludden 1999, 23). Pearl millet and

sorghum are still regarded as the traditional staples in this subregion and have been traditionally intercropped with smaller millets and pulses such as foxtail millet, tur, green gram, horse gram, etc., Farmers view them as less risk and grow them with minimal intervention or inputs. Hence cost of production is low. There are two main cropping seasons in the year – the kharif season which is during the southwest monsoon from June to September. The second season is the rabi season which is during the northeast monsoon from October to January.

Sorghum is a crop that requires moisture more than rainfall. It requires well drained fertile soils with a rainfall of 60 to 90 cms. It's yield is supposed to be the highest amongst cereals although not as high as rice. Reddy & Murthy make a distinction that in this region sorghum is grown in the more fertile soil and is the dominant crop, and pearl millet is grown in the less fertile soils, and is the second most important crop (Reddy & Murthy 1967). Pearl millet can grow with even less rainfall than sorghum. The per hectare yields are also lower than sorghum. Pearl millet is the main crop during the first season, whereas sorghum is typically grown in the second season. Before the introduction of hybrid seeds in the 1980s crops from the traditional variety of seeds had a growing period of six months. The crops from hybrid seeds are all mostly of three month duration.

Mukundappa, one of my informants in the study villages, explained to me that hybrid pearl millet, hybrid sorghum, and corn do well in soil that is deep, and where the moisture goes down to even 1 ft depth because they have root structures that are able to make use of that soil strata. Hence these crops do not require much rain. Instead what they need is correct quantity of timely rain. If there is too much rain, then the roots will spoil and the plant will die. So it is not possible to grow these crops with heavy rain. During my field work too, I have been witness to untimely spells of very heavy rainfall which have ruined standing crops.

The Oilseed Revolution in India in the 1970s marked the first time this area was covered under any kind of state sponsored agricultural production program. The Oilseed Revolution was launched in response to the stagnancy in the productivity of the Green Revolution crops in other parts of the country. Under this program, production of oil seeds was encouraged by supply of hybrid seeds and an attractive pricing policy. The 'Technology Mission on Oil Seeds' was launched in 1986. Following these interventions gross cropped area of oilseeds in the country increased from 10.4% in 1980-83 to 13.3% in 1990-93 (Bhalla & Singh 2010, 43). In this region, sunflower is the crop that has made huge inroads under the Oil Seeds Revolution. Of the total area under sunflower in this district in 2008-09, 72,100 ha are rainfed and only 23,700 ha is irrigated.

Groundnut is another important oilseed. However its history in this region predates the Oilseed Revolution. There is reference to groundnut cultivation as a cash crop in this region during the Nizam's period in eighteenth century (Iyengar 1931). Chaturvedi says that Hyderabad State was one of the main producers of groundnut in India from 1930s to 1950s and that in Hyderabad, Raichur is one of the four districts that grows groundnut (Chaturvedi 1957). The Raichur District Gazetteer says that groundnut was suggested as a remunerative crop for red soil areas that fell under the command area of the Tungabadra canal system (Abishankar 1970,177) Groundnut is grown both as irrigated and rainfed crop, and yield almost doubles with irrigation.

Maize and paddy are two other cereals that have been introduced in this region post 1960. Although maize is a coarse cereal, Deshpande urges that the behavior of maize needs to viewed carefully *vis a vis* the other coarse cereals because of its industrial preference as a source of starch and he seems to allude that maize might be replacing the other coarse cereals (Deshpande & Rao 2004). While I have not come across any statistics for corn, it is a crop I have noticed in small quantities in my study area.

In the last couple of decades due to spread of bore well irrigation in this region, farmers have started growing paddy and wheat, and onion, which is counted as an horticultural crop. Triangulating data from the table below, and cropping data for the taluk of my study area (which I have not included in the interest of maintaining anonymity for the NGO and farmers), it emerges that a significant area under cultivation in the study area continues to be rainfed. The crops that rely more on irrigation such as paddy, bengal gram and vegetables show higher percentages in the other taluks of the district that receive some irrigation from the Tungabhadra Canal. Furthermore, crops such as maize which are supplied to industry also do not find a big presence in the taluk of my interest which primarily contributes jowar, bajra, other millets, and pulses, and is also heavy on sunflower and groundnut – two major oilseeds.

Introduction of Hybrid Seeds

The Raichur District Gazetteer specifically talks of a High Yielding Variety (HYV) program in Raichur district in 1965-66 which focused on hybrid jowar, hybrid bajra, hybrid maize, and hybrid paddy "for increasing food production in the district." (Abishankar 1970, 220) Four seed farms for multiplication of seeds were set up in the district but today most farmers refer to private seed companies when they talk of the seeds they buy. The Gazetteer also notes that targets set by the hybrid seeds program could not be achieved due to variability in rainfall. There was some success with bajra and overall there was an increase in production between 1966 and 1969. The increase in yield however made an impression on the farmers. "In order to cover more and more areas under these high-yielding varieties, the hybrid seeds, particularly of hybrid jowar and bajra, were sold at subsidized rates so that the poor cultivators could easily purchase them and sow them in their fields. Even selling the seeds at subsidized rates would not help the farmers much unless timely and adequate loans are given to them to pursue the agricultural operations."(Abishankar 1970, 221) So loans were advanced to farmers under the HYV program. Also, a few standard mixtures of fertilizer dosage were devised to increase yield through top-dressing of crops.

I found a time lag between official narratives for the district as a whole and farmers' memories of introduction of scientific inputs. Although hybrid seeds for the crops grown in this district were available in the mid-1960s, they were introduced to this subregion only in the early 1980s[10]. There is internal variation in this district in terms of policy implementation – as revealed in the section on cropping pattern the

[10] Official narratives I have referred to are for the district as a whole. I have not been able to verify with official data at the taluk level.

taluks in this district that were to benefit from irrigation were prioritized over the rainfed taluks such as the one that I worked in. All farmers told me that agricultural extension officers visited their villages and fields with packets of hybrid seeds in the mid eighties in order to explain the benefits and ask farmers to try the new seeds. The extension officer who worked in this region at the time said that earlier the cropping pattern in this region was very simple – sesame, sorghum and pearl millet. He added that people were quite reluctant to switch to hybrid seeds initially.

Table 1: Area under major field crops in Koppal district, 2008-09

Crop	Area (in '000 ha)					
	Kharif Season (June to Sep)		Rabi Season (Oct – Jan)		Summer	Year round
	Irrigated	Rainfed	Irrigated	Rainfed		
Paddy	35.80	0.20			35.00	
Jowar	4.00	11.00		50.00	1.50	
Bajra	1.00	58.00				
Maize	10.00	12.00	4.00	1.60	2.00	
Bengal gram				20.00	0.80	
Sunflower	13.80	25.00	2.00	47.10	7.90	
Groundnut	5.00	24.00			21.00	
Cotton	1.45	0.35		16.80		
Sugarcane	0.90				0.40	
Fruits						11.3
Vegetables						2

Source: Agricultural Contingency Plan for District Koppal, 2011

A point that emerged clearly from all my conversations with farmers is that shorter duration of the hybrid seeds meant less dependence on the variable rainfall. Farmers say that earlier they had to wait for at least five or six rains for a single cropping season but now they can manage a crop even with two or three rains (again calculated on the basis of bi-weekly spells of rain). The second benefit that has been established is higher yields. Based on rough estimates by farmers the yields have tripled due to hybrid seeds, and two-season cropping has replaced a single season of 6 months. The cropping pattern during the earlier period, would be a six-month crop of either pearl millet or sorghum, tail ended with mixed crops of pulses and lesser millets. Today the mixed cropping is done usually with the crop in the second season, and mostly at the behest of women farmers who are looking out for household food supply.

Gradually with more experience on the field and sifting through more explanations with farmers I understood that since the native seeds produced longer duration crops they suffered more when rainfall patterns fluctuated. A seed trader in Kamalapura told me, “There is nothing such as hybrid seeds requiring irrigation. It is the same seeds to be used for rainfed farming and for irrigated farming. Even company seeds require timely rainfall. It is just that they are quick yielding seeds.” Sudhakaragowda, a farmer said, “The hybrid seeds also need timely rain to give good yield, and both types of seeds give good yields if the rains are good, but the only difference with hybrids is shorter growing period, so variable rainfall can cause less havoc.” Some farmers still have native seeds for all the traditional crop varieties, but none have native seeds for pearl millet! Native varieties of pearl millet are rare to

find. Shankaramma says, “People have themselves become hybrid today. The people who eat food from 'home' seeds are different. The 'outside' seeds are for 3 month crops – so the food is different[11]. Outside seeds are not so great yet we sow them.”

When farmers used native seeds they were not dependent on the trader for purchase of seeds. Kesava Iyengar's 1931 report also states that in general farmers were skeptical of sourcing seeds from outside and it was the norm to use home seeds (Iyengar 1931). As mentioned earlier, the practice of mixed cropping was modified after farmers switched to hybrid seeds. Earlier there were no pests because people practiced mixed cropping with all the food they needed for the household. Today, the farmers operate in a space between the grain trader (also a moneylender), the fertilizer and seed trader, and the Agricultural Extension Office to meet their demand for agricultural inputs and to sell their produce.

Crop Economy

Despite the fact that pearl millet and sorghum are high in nutrients and good livestock feed, and drought resistant, mainstream agricultural economists label them as 'inferior' crops and the dry lands where they are grown are labelled “by-passed regions” with reference to the Green Revolution areas. They are called inferior because these crops could not achieve the yield levels of rice and wheat hybrids, and secondly policy measures to provide adequate access to the hybrid seeds and associated inputs did not materialize successfully. The number of cultivars available for coarse cereals is low compared to number of cultivars available for wheat, paddy and other commercial crops. Also, of all cultivars available in the country only 4% of pearl millet seeds, and 24% of sorghum seeds were distributed in Karnataka state in 2004 (Deshpande & Rao 2004)

The price structure and market conditions are not attractive for these crops. These crops are also largely grown by small and medium farmers, and hence their productivity and attractiveness has a bearing on the lives of these farmers. Cost of production is less and also affordable to purchase – so the price is low. It is a bit of a conundrum – because if they are to be lucrative crops then their pricing has to change – which means they enter the mainstream market and thereby become unaffordable for the producers as a source of food, unless they are made available through the Public Distribution System (PDS). The other argument to give more recognition for these crops is to include them in the PDS of the country. This was done for the farmers of the Green Revolution Belt where the PDS was set up to absorb their production of rice and wheat and good minimum support prices (MSP) were set. Hence these farmers were protected by the State.

Another big hurdle for coarse cereals is the MSP offered by the State – the gap between the MSP offered for rice and wheat on the one hand, and coarse cereals on the other hand has widened since 1992 (Deshpande & Rao 2004). But a bigger issue is that farmers in this region sell most of their produce in local markets and this is unlike the bulk quantities of paddy and wheat that are sold in regulated agricultural markets (Bhalla & Singh 2010; Deshpande & Rao 2004) It is also typical practice for

11 As mentioned in the earlier chapters, farmers call native seeds 'home' seeds, and hybrid seeds 'foreign' seeds or 'company' seeds.

farmers to sell their harvest immediately after harvest and because of this supply at the same time, prices are never high (Patil 2007). However, I find that reasons provided by such agricultural economists does not fully capture the situation on the ground. Patil, for example points to the lack of storage and transport facilities as one of the main reasons for immediate post harvest sale. Another reason he cites, and which is also very commonly cited by policy makers, is that farmers have poor information about prevailing market prices and just sell their produce in local markets - "Farmers are not trained in the marketing system" (Patil 2007, 7). In his analysis of regulated markets and pricing of sorghum in North Karnataka, Patil also finds that time of sale does not feature as an important factor for Agricultural Produce and Marketing Co-operative (APMC) traders in deciding the price for sorghum, and when it does feature the difference in price between selling immediately after harvest and a later is not much. This means that sorghum is a grain for which price is low irrespective of whether it is sold at peak or lean season. His study also shows that traders arbitrarily fix prices, and while they at least employ eyesight grades for commercial crops such as groundnut and cotton, any form of grading is totally missing for crops such as sorghum and maize.

Deshpande & Rao's village level data from a neighboring district on prices expected by farmers, and actual sale prices realized, and the paid cost (actual paid out cash costs of cultivation which exclude the costs of labor / opportunity costs of labor) reveals that 'price expectations of the farmers are framed more on the basis of the paid-out cost plus a premium above this expected by the cultivators. ...the premium is much lower than the opportunity cost of labor computed at market wage rates. The opportunity cost of labor is lower because of the low wage rates prevailing in the labor market.... farmers do not received their expected price... but most of the time they recover the paid cost at least on quintal to quintal basis... for the little quantity that they market, the prices received are higher than the paid out cost for such quantity" (Deshpande & Rao 2004, 58).

However, productivity graphs, post introduction of hybrid seeds for sorghum and pearl millet in the state of Karnataka look favorable. Deshpande & Rao say that with little protective irrigation these high levels of productivity can be sustained. But cropping patterns have been changing with the spread of bore well irrigation. Once farmers invest in bore wells, they switch to paddy, and green gram in this region. This has not been the case in my study area as bore well irrigation has not spread so rapidly. It is in the context of protective irrigation that watershed interventions make better sense than bore wells.

Invisibilized Reasons for Immediate Sale of Crops in this region

Polly Hill, an authority on dry land production economies, explains in her comparison of locations in Nigeria and south Karnataka that one constraint that dry land farmers face is the seasonality of dry land crops, and also the limited season in which crops can grow, unlike the more humid and moist regions of the country where people have access to a wider set of crops and vegetables throughout different parts of the year (Hill 1982).

As I have mentioned earlier on in this chapter farmers who get yields sooner get better prices for their produce, and those with softer soil are able to get sooner

yields. There are also differences between seasons. People are generally eager to sell their kharif season produce as soon as possible as this is the first income in the year. By the end of the lean season most farmers are strapped for cash. The practice of buying seeds just after the rains come is normal practice in this region for majority of farmer, even those like Balamma who have enough financial cushion. In the earlier days, there were few big farmers with large land holdings that had cash in hand who could buy inputs directly. Today, the agrarian landscape is comprised mostly of middle and small farmers, with very few capitalist farmers who live in Kamalapura, which can be characterized as a sort of outpost village of the larger integrated economic system (Rao, V.M. 1981). There are no sharp contrasts in pattern of

Table 2: Number and area of agricultural holdings by size group for study area, 2005-06

Type of Holding	Average size of individual holding (ha)	Number of Holdings	% number of holdings	Area of Holdings (ha)	% of area
Marginal (<1 ha)	0.65	10468	20.41	6775	5.73
Small (1–2 ha)	1.43	18950	36.94	27174	22.97
Semimedium (2-4 ha)	2.75	15368	29.96	42230	35.69
Medium (4-10 ha)	5.71	5826	11.36	33289	28.13
Large (≥10 ha)	13.01	681	1.33	8859	7.49
All Classes	2.31	51293	100	118326	100

Data extracted from Department of Agriculture and Co-operation 2005-06

landownership with concentrations of large and very small farmers or landless people.

A *dalal* I spoke with in Kamalapura explained that people like him were integral to the rain fed agricultural economy. “Farmers usually come to the *dalal* in the beginning of the first season. For the second season they have money from their harvest so they don't come. Now some people have bore wells. But before, this was totally a rainfed agriculture area, and there were hardly any irrigated farmers. It was at that time that we were an integral part of their agricultural system- where they would not have cash in hand – so we would loan them inputs, and then after harvest they would come to pay and we would subtract the cost of the inputs and settle their accounts.” Farmers usually come to the *dalal* in the beginning of the first season. For the second season they have money from their harvest so they don't come. “As soon as the produce is given money has to be given to the hands of the farmer. They come to us to sell because they have a need for money – so we absolutely have to give them money.”

A fertilizer seller, who is not a *dalal*, shared his impressions, “Amongst farmers, about 20% practice agriculture with adequate amounts of capital, 80% of farmers are dependent on *dalals*. One change today is also the uncertain rains. So for example, a farmer who needs some money suddenly will go to a *dalal* who he has a relationship with and ask for Rs 1000. So, until the rains come and he gets his crop it is difficult if he is cash strapped. One person says nothing has changed in the relationship between *dalal* and farmer. One person says with the Extension Office, there is a slight decrease in the dependence on the *dalal*.” In the ultimate analysis I find that this political economy, along with highly variable rainfall creates a rather precarious situation of low capital formation for most farmers of this region.

Purchase of Inputs

One point to bear in mind is that in this local economy it is not easy to differentiate farmers' practice of buying inputs with their practice of selling their produce because of low levels of capital circulation in this landscape. While I have tried to present the details of this local economy through separate treatment of actors such as the trader and the extension officer, on the ground it is really a web of interconnected practices. Polly Hill, who is known for her work on dry land mode of production, explains that one constraint that dry land farmers face is the seasonality of dry land crops, and also the limited season in which crops can grow, unlike the more humid and moist regions of the country where people have access to a wider set of crops and vegetables throughout different parts of the year (Hill 1982). By the end of the lean season (summer months of March, April and May) most farmers are strapped for cash. Only some big farmers with large land holdings and who have cash in hand can buy inputs directly. The majority of farmers buy inputs for the first season on loan and because they cannot take a risk with the rains the practice of buying seeds just after the first showers is normal practice in this region for majority of farmer, even those like Bhavani who have enough financial cushion. Farmers also want to sell their kharif season produce as soon as possible as this is the first income in the year.

Historical Continuity of Farmer-Money Lender Relationship

The Raichur district Gazetteer conveys very categorically that there has been a fairly acute need for credit amongst rural people and agriculturalists in this district from the early 1900s (Abishankar 1970). At one point the gazetteer says that it was so common that agriculturalists thought it was not possible to practice agriculture without credit. However, the Gazetteer does not tease out whether the need for credit was solely because of the rain fed nature of agriculture or also because of the system of revenue collection. But there is reference to the fact that the Hyderabad state did bring in some disciplinary measures such as the Land Alienation Regulation in 1936 to prevent the money lenders from taking away land and thereby forcing cultivators to become agricultural laborers. There is another reference to Mysore Money Lenders Act 1961 again to regulate money lenders' practices and interest rates (Abishankar 1970, 315) In 1958-59 the number of licensed money lenders was about 200 in Raichur district. Most money lenders were also traders. The Gazetteer says that at this time rates of interest were between 18-24%. Besides money lenders, there also existed private lenders, which is the case today also. I noticed that some rich farmers in villages lent on an informal basis to other farmers.

Since the purpose of Iyengar's study was to submit an economic report to the Nizam of the princely state of Hyderabad, a significant part of his report talks of debt in the surveyed villages. He found that most of the debts were household expenses, marriage, and only about 10% were for cultivation expenses. This could be explained by the fact that farmers were skeptical of buying seeds outside then, and it was the norm to use home seeds which did not come with a set of mandatory inputs. "Land mortgages for productive purposes are a few. For household expenses rarely does a raiyat go to the extent of mortgaging his land. In the above analysis 43 debts are due to household expenses. That is, the cause for more than 50 per cent of the land mortgage cases is total or partial failure of crop." (Iyengar 1931, 14) So what this is telling us is that cash for household expenses comes from cultivation, and when

cultivation fails then they are strapped. So this also shows that there is such little capital formation – hardly does a farmer borrow a loan to make an investment for productive purposes – because sustenance itself is a problem.

The dependence of livelihood on rainfall is illustrated in this quote of Iyengar:, “Monsoon rains begin rather late in Raichur. 9 out of 12 villages grow more kharif than rabi – so there is more money made from the first season. This survey was conducted between June and August, which is when debts, as recorded, suggest that indebtedness before the cultivation season was high. In other words they represent the indebtedness after harvesting and threshing and annual payments to *sowcars* and before the commencement of the next cultivation season. When this survey was done all farmers were “anxiously waiting for rain. Most of the borrowings are taken on personal security and hardly any raiyats agree to pay the amount after their next harvest because they can never be assured of a good harvest. Money lenders prefer to give the loan based on personal security. Even co-op societies find it difficult to collect timely payments of loans from cultivators” (Iyengar 1931, 14). “The raiyats are well meaning in their debt transactions, but general and repeated default is due to the poor and uncertain yield of land” (Iyengar 1931, 18).

The report also points out that more than 1/8th of the debt incurred from money lenders is in the four months following the harvest of the second season crop and goes on to surmise that this is due to the poor harvests - “Unless special measures are organized for substantially augmenting the very poor crops now being reaped, there is little chance of this debt ever being cleared by the Raichur raiyats.” (Iyengar 1931, 15) About 35% of the borrowings have lasted for 1 year. Only 1 % of the borrowings have lasted for more than ten years, and about 20% of the borrowings have lasted for four months (i.e. In the lean season). Iyengar remarks, “The biggest constraint for livelihood in this region is water for drinking and irrigation.”(Iyengar 1931, 4) The report cites uncertain rainfall and poor fertility of soil as main deterrents for agricultural production.

The Farmer-Money Lender Relationship in Recent Years

In the recent past, before the introduction of hybrid seeds, farmers came to the traders to get loans for household purposes, and would sell their agricultural produce to these traders (*dalals;* or grain trader/moneylender) to try to close their loans. I spent some time talking to different traders in the bazaar area of Kamalapura. One of them told me, “Only some farmers would take loans from the *dalal*. At that time they took loans to run the household because circulation of cash was less as many others have said. So to repay they would have to come with their produce. But those who did not take loans also came to the *dalal* to sell because there was no other option. There was not as much development in agricultural markets at that time. Kamalapura was the nearest market town, and beyond it Lakshmipur, and Shantipur. People from almost 50 villages would come to sell to the traders in Kamalapura, and come to sell their produce in the Kamalapura shanty. Farmers would come from villages within a 15-20 km radius and in those days transport was mainly on bullock carts. About 4 or 5 farmers would pool their produce on one cart and come together. About 20 years ago there were only 5, 6 or 8 *dalal* traders in Kamalapura. There was nothing fixed about which *dalal* a farmer had to sell his produce to.”

A *dalal* I spoke with in Kamalapura explained that people like him were integral to the rain fed agricultural economy. "Farmers usually come to the *dalal* in the beginning of the first season. For the second season they have money from their harvest so they don't come. Now some people have bore wells. But before, this was totally a rain fed agriculture area, and there were hardly any irrigated farmers. It was at that time that we were an integral part of their agricultural system- where they would not have cash in hand – so we would loan them inputs, and then after harvest they would come to pay and we would subtract the cost of the inputs and settle their accounts." A fertilizer seller, who is not a *dalal*, shared his impressions, "Amongst farmers – only about 20% practice agriculture with adequate amounts of capital. 80% of farmers are dependent on *dalal*s. One change today is also that rains are more uncertain than before. So, until the rains come and he gets his crop it is difficult if he is cash strapped. If he needs money all of a sudden he will go to the *dalal* with whom he has a relationship and ask for Rs.1000." Another trader who was also part of this conversation added, "Nothing has changed in the relationship between *dalal* and farmer.", while a third corrects him to say, "After the recent changes in agricultural extension there is a slight decrease in the dependence on the *dalal*."

Polly Hill stresses that it is important for farmers in dry land regions to have access to informal sources of credit so long as the terms of credit protect farmers from losing their assets. The other point that Hill makes which is relevant to credit provision in rural areas is that the policy framework within which formal credit began to be organized for the rural backwaters, derived from the colonial mindset which typecast creditors and debtors with strong moral undertones (Hill 1982).

Once seed companies came to this region, they worked through this local farmer – trader relationship to sell their seeds. *Dalal*s send a slip through the farmer to the fertilizer and seed shop where the required quantities are sold to the farmer on credit. The amount is settled between the *dalal* and the seed shop and the *dalal* then settles the farmers' due when the farmer brings his harvest back. All the seed shop owners I spoke with said that the Oilseed Revolution had made an impact in this region - "because of that state sponsored program we saw a sudden change - many companies coming to these regions to market the seeds, and the change in cropping pattern and shift to hybrid seeds, and traditional practices disappearing". One of the traders told me, "In the beginning we were traders who would buy produce from farmers. Once seeds companies penetrated this area, they supplied their seeds to traders like us who would in turn supply it to farmers – so through the same *dalal* system of exchange. Then after some years, some of the *dalal*s set up separate fertilizer shops." A government license is required to set up a fertilizer or seed shop. Fertilizer companies go to villages and advertise their products. They also come to market towns for advertising every time they introduce a product. There is some sharing of information between company, trader and farmer – these guys give advice that company passes on to them, they also give advice, and also direct farmer's question to company – so they function as dealers.

Business of fertilizer shops picked up speed by the late nineties and some of the shop owners told me that this growth is associated more with the trend in horticulture, and not really with the traditional crops. Pomegranate was a big trend in the Kamalapura area from the late nineties, and much of the produce was also exported. However the farmers who grow this are a class that are completely absent

from my study villages. They are all mostly situated in Kamalapura, and more of the capitalist farmers class (the type of farmers that Agriculture Department terms 'progressive farmers'). They are clustered in small towns such as Kamalapura and characterized by large landholdings of 50 acres, and capital reserves, as horticulture needs a gestation period of at least 2 years. In fact some of the fertilizer traders I met were also horticulturists; a case of capitalist farmers in the region controlling the supply of inputs and sale of agricultural produce. These men told me that climate conditions in this region make for large diurnal variations and because of this pest attacks are common. Hence farmers have to spray their crops. This aligns with the fact that many dry land farmers told me that they do not spend much on external inputs and prefer farm / livestock inputs. In terms of food crops it is irrigated farmers who spend more on external inputs.

***Dalal*'s Business Practice**

The *dalal*'s primary business is not money lending, but grain trading. The *dalal* has two licenses – one is a procurement license and the other is a commission license. The *dalal*s also only deal with farmers who cultivate grains and cereal which can be stored up to a year, and not crops such as onion which are considered 'wet' produce. So farmers who want inputs for onion go directly to the fertilizer seller. Giving loans to farmers is not a big part of his business, and he says it has reduced significantly over the years. More than buying from the farmers, he buys from other traders who farmers sell to. This is because of the local agricultural economy's dependence on rainfall. The 1931 study too refers to the fact that *dalal*s can only rely on their money lending business to a limited extent.

One of the *dalals* I interviewed still gives out loans to farmers with whom he has a good relationship. I ask him on what proof he gives the loan. He says, "it's all based on trust (*visuvasa*) – no agreement, no documents, no signature. Interest is not part of his system. If I know a village, and that village has a need for cash, and I expect to get grains from that village from which I can make a profit, then based on that I will give them loans for agriculture, and will settle it when they bring the harvest. The main interest for me is agricultural produce. I make calculation based on a guesstimate of the acreage in that village and what produce I can expect from there." After I push further he says, "Look, interest comes into the picture when even after a year past his harvest a farmer has not come to me with his produce or any cash." Within this framework he gives loans for non-productive needs of farmers also.

He says it is not necessary for his shop to give many loans. It is more important to cultivate relationships with 'good' people – farmers who are correct with him about their dealings. *Dalal*s do not want the stress or risk of many loans if it means dealing with unreliable clients. Nowadays farmers come to a *dalal* for loan, and then go to another person and sell their produce – this he doesn't like and considers unreliable. He says that is how 'fast' farmers have become today. When I probe further he explains, "See if he has taken a loan from me for inputs, and poor guy, by chance if he suffers some unexpected losses in his cultivation, and is not able to make the expected harvest, he will go to another person and sell his harvest, and then come to me and pay up the money. Another situation is when the farmer borrowed a loan of say Rs. 50,000, and makes a good crop. Instead of coming back to me, he splits his crop into two and sells one batch each to two other *dalal*s. He might

make about 60k in that sale. Then he will come back to me and lie that he got a poor harvest and will pay back little by little every year!" So what is choice for the farmer is considered unreliable behavior by the *dalal*. He adds, "Now that farmers either have more cash in hand, or have the option of availing of subsidies from the Extension Office, they have the freedom to sell their produce directly in the market." The farmer does this to get out of the clutches of the *dalal* who would otherwise clear his loan, and also bank his excess profit of 10k. So, instead of being enslaved by the *dalal*, in a sense the farmer makes the *dalal* enslaved to him – because he pays the *dalal* bit by bit every year. So he only restricts his relationship with the *dalal* to one of paying off his debt, and protects himself from the injustice of the *dalal* not giving him interest that he gives the *dalal* as savings. This also means that today because there are many more *dalal*s, there is more competition and 'choice' for the farmer. Also he does this because he does not want to forego his profit to the hands of a *dalal*, and he wants to close the loan on fair terms.

So he wants clients and he wants reliable clients – earlier the meaning of reliability for the *dalal* was only that they would bring back enough grains to cover the loan they had taken. But today with more *dalal*s/traders in the business, the meaning of reliability also means that the farmer should come back to him to sell the grains and not go to another *dalal*. That is why he says giving loans itself has reduced over the years. So this situation of the farmer having more choice due to more *dalal*s does fit what Hill agues for which is sources of informal credit that protect the farmer. Here what protects the farmer is the presence of choice. It could be that more money lenders sprung up because of higher yields due to hybrid seeds, and cultivation of crops such as sunflower and groundnut. So this is an example of how changes in the crop economy have created favorable changes and more choice for farmers, and thereby contribute to 'leveling' the playing field for farmers as Ashok argues. However, it is important to note that the catalyst for this leveling has happened due to policy changes in agriculture such as the introduction of new crops, and farmers working with it. I move now to the workings of Agricultural Extension in this landscape to demonstrate other choices that some of the farmers have.

Agricultural Extension

The farmer – *dalal* (grain trader/moneylender) relationship is the older relationship in the landscape. The relationship with the agricultural extension officer is much more recent – this came through very clearly in farmers' narratives. Currently agricultural extension is provided through the Raita Sampark Kendra (RSK) which translates to Farmers Contact Centre. The RSK network in this region was established in 2000. Prior to that, agricultural extension was organized on the lines of the Training & Visit System (T & V). There were about 35 extension officers per taluka, and 5 to 6 officers per hobli[12]. Today each extension officer who handles one RSK is responsible for four to five gram panchayats, which are typically the number that make up 1 hobli. In the RSK system, in each RSK there exists a supervisor, a *krishi adhikari (*translates to agricultural expert), and a staff member from the gram panchayat who helps out.

12 An administrative subdivision under district and taluk – a cluster of gram panchayats.

Agricultural Extension Officers under the RSK system are not trained as often as they were under the T & V system. The emphasis is more on staying informed of all the available agricultural inputs and subsidies provided by the government. He says his extension office is under staffed, and he along with one helper oversee thirty nine villages in Kamalapura Hobli. When he explained his work load to me he made it a point to stress that it is because of this that in the RSK system the onus is on the farmer to come and meet him and talk to him and get advice. He also confirms that the active provisioning of subsidies began when the organizational structure of agricultural extension changed to the RSK system.

“When they sow in the first season we offer small and marginal farmers (< 5 acres) Rs. 5500 worth of seeds at subsidized rates and also Rs. 1000 as a grant. So per quintal there is a difference of almost Rs. 2000 between our seed cost and the seed cost in the bazaar. So if you notice farmers will not prefer to go to the bazaar. Not only seeds – but for seed treatment, trichoderma, all other equipment they come here. If he wants to buy a tractor we offer subsidies for that too. Even if a farmer wants some equipment for value addition of his crops such as making *rotis*, or vermicelli, we provide machines for these tasks. He says this is how we send 'messages' to the farmer. And most of the 'messages' that reach the farmer are from the RSK! Each and every farmer comes to the RSK (he is emphatic). When I go to the villages, they have come here to my office! And in the last 4 to 5 years the subsidies have increased further. So he feels that this system has succeeded more than the T & V system. In the T & V system we would go to the village and explain techniques to a bunch of farmers sitting there, and they would have to spread the message to others, but that did not succeed very well.” However, some of the farmers I spoke with weren't effusive about the RSK.

The RSK also gives loans to farmers with very low interests. The District Gazetteer states that despite the government's promotion of co-operative societies and land development banks in the 1960s the old method of taking loans from money lenders persisted because of well-established reasons, i.e. people think processes are too cumbersome and do not provide money quickly. Also co-op societies have not functioned well and have not disbursed loans at the correct time. The establishment of the co-operative societies in the sixties shows a clear basis towards areas irrigated by the Tungabhadra Canal (Abishankar 1970).

Today under the RSK system loans are only available to those farmers who have become members of the Agricultural Co-operative Society and thereby shareholders. Loans are advanced to buy seeds and manure, etc., A few farmers told me that for a loan of Rs 2000, the interest is Rs 150 (7.5%) and they get three months to pay it. Witnesses at the time of loan purchase are responsible to ensure that the person pays back the loan with the interest on time. In the beginning you can get a loan for Rs 2000. If you pay that up properly, then next year you can take a loan of Rs 5000. If you do not pay up your loan for one year, in the next year you are not eligible for a loan. The same farmers told me that *dalal*'s monthly rate of interest is 3%. When they take their harvest back to the *dalal* he will subtract the loan amount and if there is a balance due to the farmer, the typical practice is for the farmer to ask the *dalal* to keep his money like a bank. The farmers say they as might spend their money easily on frivolous things, they believe that their money is safe with the *dalal*. When the farmer is in need of money he goes back to the *dalal* and asks for the amount he

needs. But unlike a bank the *dalal* does not provide any interest for the money the farmer has deposited with him.

Farmers have slowly started going to the Co-operative Society to take loans. All members form a committee and they vote for office bearers in that committee. They told me that the interest rate that the Co-operative charges is lower than the interest charged in the Jalaa administered self-help groups (SHGs). Besides of course that membership in the SHG is only open to women.

The Space between Agricultural Extension and *Dalal*s

One of the biggest thrusts of the RSK is assistance to small, rain-fed landholders. The subsidies and grant for seeds and fertilizers is meant to be a very targeted structural intervention in this region where for decades the *dalal* and farmer relationship has been representative of the low levels of capital circulation in this region. Krishnappa, a Jalaa staff member who spent a lot of time with farmers as part of the Community Monitoring Program confirmed for me that the businesses of the traders has gone down a bit after the RSK opened – because the RSK sells subsidized seeds and fertilizers and pesticides. But when he looks at the process that comes with accessing the inputs the story is different – one needs to pay cash upfront at the Extension Office. But with the seed trader the inputs can be purchased through the age-old process of the *dalal* advancing credit. Does the subsidized price offered at the Extension office fit the pockets of farmers who are typically strapped for cash at the beginning of the first agricultural season? Krishnappa says that he has noticed that some farmers who have cash in hand post migration in the lean season prefer to go pay cash to the Extension office and buy seeds, instead of going to the *dalal*. Farmers also told me that the quality of seeds sold in the RSK is not as good as that sold by the traders.

Farmers also told me that they go to the *dalal* because he has more variety in his supplies of seeds, fertilizers and pesticides. I had also heard from Jalaa field staff that the seed varieties supplied in the Extension Office and by each seed dealer / trader depended on the connections between each of the actors and seed companies. Each actor would only push seeds by companies with which they have established networks. Information on agricultural practices surrounding a particular crop and / or seed are also shared with farmers based on these networks. For example, farmer Prakashappa of Kaadugere told me, “The extra information that a *dalal* or trader might give us also depends on our connection with him. Suppose there are five farmers, and if the *dalal* knows one of them very well then he will only give that person extra information. If one wants seven packets of seeds and the trader has information that a new company is releasing seeds, then the trader will tell this one farmer who is well-known to him, to buy four packets now and come back later for the new seeds. But this one farmer would pass on this news to his farmer friends and the news is likely to spread this way. Similarly, officers in the Extension Office will tell us about the seeds from companies that they promote. For example, after having received news from the Extension Office, a farmer in the neighboring village was vouching for seeds from Surya Seed Company. I tried it but it gave me a low yield. There was another company called Narmada Seeds which for 5 packets of seeds gave me a harvest of 6 tonnes. I was happy with this. Despite of all these network based practices we, as farmers mainly pay attention to the yields of the different company

seeds. Once I got good yields from Narmada I stopped listening to others' messages. I will go by my own experience. People will say buy Surya seeds and you might be able to win a cycle or a television. Farmers get excited and enter their phone numbers with the company and later when they call, the company will say, 'who are you, we do not have your name on our list!' and cheat them. So we do not pay too much heed to these sorts of marketing strategies. We don't also discuss too much with each other. We each go to Kamalapura and make our own input decisions. We just follow our minds."

Deshpande in his study of coarse cereals in Karnataka state points out that a very small % of cultivars available in India enter the market in this State (Deshpande & Rao 2004). A study of the political-economy of cultivars marketed is important to fully understand what Ashok of Jalaa means when he says that farmers are not able to cross-verify information that affects them, but that is beyond the scope of my study. Instead, my focus here is to demonstrate how farmers negotiate the situation at hand in their immediate locale.

Two other points made the Extension Office pale in comparison to the Kamalapur bazaar where all the traders were clustered. Firstly, many with medium landholding sizes felt no connection with the Extension office because of its strong thrust on small and marginal landholders. They were dismissive of me when I brought up the topic of agricultural extension. However, I noticed a situation of near universal access when the State was dispensing compensation to all farmers after a severe flood that had wiped out most standing crop one year. Secondly, as substantiated in existing literature, many farmers still perceived the Extension officer as a person captured by elite in the village. I learned from many that during the T & V phase of Extension, extension officers would mainly liaison with the rich farmers, of which there are few in this region. Whenever I asked farmers about agricultural extension, one of the first responses would be, "People like us do not visit the Extension Officer. It is only for the *gowdas* (landlords, and now loosely used to refer to large landholders) to visit and chat endlessly with the Extension Officer. Sudhakaragowda, who belongs to an elite caste group and who is also currently a rich farmer in Bannigudi told me that he has a good relationship with the Extension Officer. However he too states that very few people have the practice of dropping in and chatting with the Extension Officer during their trips to Kamalapura. Only people who know the Officer drop in for a chat and get ideas of new practices. These are typically the people who move around a lot, have contact with outsiders and are in the habit of collecting information[13]. "It's simply not the habit here. I have cultivated my relationship with the Officer and now I know him and he knows me. When he comes to our hamlet he asks for me."

Banks and Micro Credit

Before I move to farmers' practices of selling their agricultural produce, I will briefly touch upon two other institutions – banks and microcredit institutions – that function as sources of credit in this landscape. Kamalapura has two commercial banks and 1 co-operative bank. Farmer Sudhakaragowda told me that there are many more opportunities for loans today. There are banks but it is not convenient for farmers in villages to get bank loans. One of the big problems is distance. Kamalapura is 16km

[13] I develop this idea in Chapter 8.

from Bannigudi. “Tungabadra Grameen Bank which is meant for small farmers, tells us the government has not given us enough facilities to travel to your villages, and that they can only do business with villagers who live within a 9 km radius. Go ask State Bank they tell us. If we go there, they say ' oh, no we have enough of our headaches with our usual clients. We can't start doing new business and cope with it.' Once they say that we feel put off. So we are forced to go to the *dalal*. If they welcome us and encourage us the first time we feel like we can go back and try...but that is not the case with the banks. So very few of us have experienced the convenience of banks.” It is telling that this is the experience of a successful farmer in the region.

Jalaa started micro credit groups in these villages about ten years ago. Towards the last phase on my field work Jalaa was winding up its operations and it's campus in the watershed hub as funding was drying up. As part of this winding up, during one of the Community Monitoring Program (CMP) meetings, they evaluated the functioning of the micro credit groups just to get a sense of the how self-reliant the groups had become. Amrithamma of Neelapur had attended this meeting and this is how she recounted her experience at the meeting, “We talked about how to continue without Jalaa. - The basic practice is that each of us have to contribute Rs.10 every month for savings. We have collected Rs 7000 in our micro credit group. Jalaa has been here for more than 10 years. I remember how they conducted street surveys and formed the groups and taught us the basics of saving and the micro credit groups. Before that, if four men are sitting around we would be scared to walk that way. Now there is no fear, and no one questions us. Access to loans is possible these days - we can get big loans of Rs 10,000, Rs 20,000 to Rs 1 lakh from the credit groups. However, not all women have the same sense of awareness and we do have tiffs in our groups.”

Amrithamma also has an account in a nationalized bank called the State Bank of India which has a branch in Kamalapura. She said, “This is because we need access to two financial institutions, because the amounts we can borrow from one would not be enough for us, and sometimes it is useful for us to borrow from one to repay the other. But I am still not too confident about going to the bank and checking my account, even it is my own savings. There is a difference you see between learning and having been aware of something from when you are young, and hearing and learning things from someone now.” Many women farmers told me that the SHG has been a catalyst for saving through financial institutions and has propelled some to open accounts in the few State run banks in Kamalapura. Shankaramma, has been taking loans from the SHG every year for seeds and for children's education. She claims that she has stopped going to the *dalal* after she became a member in the SHG. I had not heard this from any other farmers. Shankaramma said that she had closed all her loans with the *dalal* in the previous year and now if she wants credit for agricultural inputs she takes a loan against a her gold jewelry from the Women's Co-operative Bank formed by Jalaa.

Sale of Agricultural Produce

I now shift to the space in which farmers sell their produce. Despite the fact that pearl millet and sorghum are high in nutrients and good livestock feed, and drought resistant, mainstream agricultural economists label them as 'inferior' crops and the dry lands where they are grown are labeled “by-passed regions” with

reference to the Green Revolution areas. They are called inferior because these crops could not achieve the yield levels of rice and wheat hybrids, and secondly policy measures to provide adequate access to the hybrid seeds and associated inputs did not materialize successfully. The number of cultivars available for coarse cereals is low compared to number of cultivars available for wheat, paddy and other commercial crops. Also, of all cultivars available in the country only 4% of pearl millet seeds, and 24% of sorghum seeds were distributed in Karnataka state in 2004 (Deshpande & Rao 2004).

The price structure and market conditions are not attractive for these crops. These crops are largely grown by small and medium farmers, and hence their productivity and attractiveness has a bearing on the lives of these farmers. Cost of production is less and also affordable to purchase, hence the price is low. It is a bit of a conundrum, because if they are to be lucrative crops then their pricing has to change, which means they enter the mainstream market and thereby become unaffordable for the producers as a source of food, unless they are made available through the Public Distribution System (PDS). The other argument to give more recognition for these crops is to include them in the PDS of the country. This was done for the farmers of the Green Revolution Belt where the PDS was set up to absorb their production of rice and wheat and good minimum support prices (MSP) were set. Hence these farmers were protected by the State.

Another big hurdle for coarse cereals is the MSP offered by the State – the gap between the MSP offered for rice and wheat on the one hand, and coarse cereals on the other hand has widened since 1992 (Deshpande & Rao 2004). But a bigger issue is that farmers in this region sell most of their produce in local markets and this is unlike the bulk quantities of paddy and wheat that are sold in regulated agricultural markets (Bhalla, 2010; Deshpande & Rao 2004). It is also typical practice for farmers to sell their harvest immediately after harvest and because of this supply at the same time, prices are never high (Patil 2007). However, I find that reasons provided by such agricultural economists does not fully capture the situation on the ground. Patil, for example points to the lack of storage and transport facilities as one of the main reasons for immediate post harvest sale.

My ethnographic data shows that reasons provided by agricultural economists to explain farmers' selling practices reflects certain normative assumptions about farmers' lack of competence and does not fully capture the situation on the ground. Farmers I spoke with indicated to me that most of them sold their crops immediately after harvest, particularly in the first season, because they needed the income. They also explained the details of their selling practices as follows, "Those who get yields sooner are able to get a better price for their produce. Those who get a yield a little later loose out a bit. Those who have softer soil / earth are able to get a yield soon. Those whose soil is a bit *birsu* (hard) get yields a bit late". A *dalal* I spoke with in Kamalapura explained that people like him were integral to the rain fed agricultural economy. "Farmers usually come to the *dalal* in the beginning of the first season. For the second season they have money from their harvest so they don't come. Now some people have bore wells. But before, this was totally a rain fed agriculture area, and there were hardly any irrigated farmers. It was at that time that we were an integral part of their agricultural system- where they would not have cash in hand – so we would loan them inputs, and then after harvest they would come to pay and we would

subtract the cost of the inputs and settle their accounts. As soon as the produce is given money has to be given to the hands of the farmer. They come to us to sell because they have a need for money – so we absolutely have to give them money."

A fertilizer seller, who is not a *dalal*, shared his impressions, "Amongst farmers – about 20% practice agriculture with adequate amounts of capital. 80% of farmers are dependent on *dalal*s. One change today is also the uncertain rains. So for example, a farmer who needs some money suddenly will go to a *dalal* who he has a relationship with and ask for Rs 1000. So, until the rains comes and he gets his crop it is difficult if he is cash strapped." A second trader who joined us in the conversation maintained that nothing has changed in the relationship between *dalal* and farmer, while a third insisted that there is a slight decrease in the dependence on the *dalal*."

Another reason Patil cites, and which is also very commonly cited by policy makers, is that farmers have poor information about prevailing market prices and just sell their produce in local markets: "Farmers are not trained in the marketing system" (Patil 2007, 7). In his analysis of regulated markets and pricing of sorghum in North Karnataka, Patil also finds that time of sale does not feature as an important factor for Agricultural Produce and Marketing Co-operative (APMC) traders in deciding the price for sorghum, and when it does feature the difference in price between selling immediately after harvest and a later is not much. This means that sorghum is a grain for which price is low irrespective of whether it is sold at peak or lean season. His study also shows that traders arbitrarily fix prices, and while they at least employ eye sight grading for commercial crops such as groundnut and cotton, any form of grading is totally missing for crops such as sorghum and maize.

I got a more nuanced understanding of how much information farmers get about markets from a *dalal* in Kamalapura who said that the market does not present itself neatly to anyone - "When there were no mobile phones in the past, and hence less communication, market rates were stable, and the farmer was also able to rely on a stable rate. Even if there were fluctuations rates would move by Rs 50. Today with the mobile phone communication is so fast, and every ten minutes we get a new message. Rates move by Rs 200! Because of the mobile phone, farmers also have access to a lot of information. Sometimes they inform us about rates in some markets. Some farmers make enquiries in market towns up to a 30-40 km radius, and go to sell their produce wherever the rates are high. For example, if you take onions, sometimes when the rate falls here, they get phone numbers and visiting cards of traders who come and go, and they may decide to send their produce to Hyderabad, or Bangalore. If one person gets a visiting card, the whole village will have the number. The biggest change in the market happened when the mobile phone came into our lives.

"But unfortunately what has happened is that agricultural trading has become like share markets trading – rates are not that constant and highly unpredictable. Sellers and buyers get so much information within 10 minutes on how much acreage of a crop in another state, how much harvest, how much crop has been deposited in the APMC. Kamalapura has 2 APMCs – you take any crop – yellow pigeon pea, bengal gram – the news spreads, and traders will seek the areas where lots of it has been produced and will be interested to purchase there as they can get a lower price. So buyers always like to flock where lots has been produced." While I noticed that not all farmers had mobile phones, I will agree with the *dalal* that the farmer community in general was well tuned to market rates. However, a fundamental aspect

is that many of the markets these farmers sold to are local and not regulated, which is why it is more important to for the farmers to keep track of rates, and also exhibit the following behavior that Deshpande's study captured.

Basanna, an experienced farmer in Gulithota explained his frustrations with the APMC - “We wait with what we harvest for 1 or 2 weeks to see if prices go up, if not we have to sell because we need some income. We all decide when to sell individually, no group decision, if we make a group decision based on one person's inputs, and suddenly from above there is some change, they don’t buy that grain or something, then we are all in trouble. If the government provided some protection then its ok, but that is not there. The APMC - they don’t tell us anything, they are all hand in glove with certain farmers and networks. Because of these networks even if we want information from APMC we have to pay some bribe. The rates they publish in the papers are old rates - last week's rates. If there was some set and stated policy - so much procurement at so much rate - then that’s good, but that doesn’t happen in our area.”

Deshpande & Rao's village level data from a neighboring district on prices expected by farmers, and actual sale prices realized, and the paid cost (actual paid out cash costs of cultivation which exclude the costs of labor / opportunity costs of labor) reveals that 'price expectations of the farmers are framed more on the basis of the paid-out cost plus a premium above this expected by the cultivators. The premium is much lower than the opportunity cost of labor computed at market wage rates. The opportunity cost of labor is lower because of the low wage rates prevailing in the labor market. ...farmers do not receive their expected price...but most of the time they recover the paid cost at least on quintal to quintal basis...for the little quantity that they market, the prices received are higher than the paid out cost for such quantity” (Deshpande & Rao 2004, 58). This shows that farmers are not really making big profits from sale of coarse cereals.

However, productivity graphs, post introduction of hybrid seeds for sorghum and pearl millet in the state of Karnataka look favorable. Deshpande & Rao say that with little protective irrigation these high levels of productivity can be sustained. But cropping patterns have been changing with the spread of bore well irrigation. Once farmers invest in bore wells, they switch to paddy, and green gram in this region. This has not been the case in my study area as bore well irrigation has not spread so rapidly. It is in the context of protective irrigation that watershed interventions make better sense than bore wells.

Discussion

I return to the point with which I began this chapter – that farmers across the board articulated a need for stability in agricultural income, and being able to fix capital and save money which would help them tide over lean periods. Historical data reveals that people in this region have for long had to deal with variability of rainfall. Due to this, the position of livestock has been precarious. This has had implications for manure, and thereby fertility of red soil which loses moisture rapidly. Cropping patterns and farmers work practices have evolved to cope with this ecosystem. As chapter 7 will illustrate in more detail people have been practicing soil and moisture conservation within their means. However, this region was by-passed by the first

Green Revolution because the natural resources and work practices were deemed anomalous in terms of conditions conducive for high yields and productivity. Even when hybrid seeds were extended to non-Green Revolution areas, this area was not considered suitable because high yields were not possible in this rainfall regime. Hybrid seeds really took hold in this region only by the 1980s. Today, farmers do identify change - people now use mostly hybrid seeds since it gives them two crops a year. While the preference is for organic manure, they do juggle the application of organic and chemical fertilizers depending on the rains, access to manure, the condition of their crops, and the amount of cash in hand at the time. The precarious of their situation dictates quick informed calculations and practices. The space they reproduce is very an evolving space that borrows from a combination of inputs – both old and new – all aimed towards being assured of a good harvest.

In examining farmers' practices of buying agricultural inputs and selling agricultural produce, I find that farmers actively negotiate structural constraints in this region. State policies have not been targeted in addressing the needs of dry land farmers. Hence farmers in their daily practices move between the state, market and development agencies such as Jalaa, picking and choosing and playing off different actors in order to survive. It is not uncommon for some small and marginal farmers to buy seeds in the quantity they are entitled to in the Extension Office to later sell it at a higher price to other farmers, thereby making money. This was also reported to me in terms of other state sponsored subsidies such as 'ashraye' homes. Secondly, loans are taken from the *dalal* and used to purchase seeds at the subsidized rates from the Extension office. Thirdly, farmers said it was important for them to have access to more than 1 SHG and *dalal* because they could borrow from one and return to the other. So these are all practices that are characteristic of a system of scarcity. But this does not mean that farmers here are to be characterized as backward.

Instead it demonstrates a very active negotiation of the political economy and an active working of the dry land landscape. Hereby I set up an argument for interventions that must pay attention to the specificities of place, following A.R. Vasavi and P.S. Vijay Shankar (Vasavi 1999; Vijay Shankar 2005). Farmers work within the constraints of this semi-arid landscape and have created a specific time-space geography. Chapter 7 and 8 further flesh out details of farmers' practices which pose a strong critique to classic definitions of productive landscapes in natural resource management paradigms of rural development. It is within this active geography of 'backwardness' that I will now turn to the details of my ethnography of spatial technology based planning in the next chapter. The details of this chapter serve to contextualize the history of the NGO Jalaa's assumptions of this landscape and its people, of rural development, and their work in this landscape. While in this chapter I have extended Ferguson's approach by borrowing from Gupta, and demonstrated the interactions between people and policies in this landscape, the following chapters build on this as I explore the messy details of development and technological practice using the case of Jalaa.

Chapter 4

Technological Translations

In this chapter, I begin my exploration of how knowledge is produced and rural development practiced using spatial technologies, through a historical analysis of a development NGO's planning practices. Through this historical analysis I will tease out the ways planning practice, on a daily, local basis, rework and reproduce models of spatial technology based development. My ethnographic analysis is informed by aspects of deep spatiality that I interpret in Latour's translation approach, Hart's relational ethnography and Sivaramakrishnan & Agrawal's regional modernities. I follow practices of actors in Jalaa by paying attention to processes as they take shape, and relationships that hold together diverse actors. In this chapter, I focus specifically on the ideas and practices of Ashok, the Director of Jalaa. Also, as the spatial technologies are used for watershed planning this chapter will also remain attentive to the manner in which the use of these tools rework certain assumptions of watershed development.

I also wish to highlight that the development space I interrogate is that of a non-State actor, although I do remain aware that NGOs are 'producers of social meaning and of self-making possibilities for various groups, both internal and external to the State.' (Leve & Karim 2001, 55) Just as I situated the landscape and the people of this semi-arid region in their political economy in the previous chapter, I briefly situate the political economic space occupied by the NGO Jalaa. It is imperative to demonstrate that Jalaa does not fall into the category of big NGOs or development aid agencies that we are commonly used to reading about in development literature (Ferguson 1994, Li 2007, Mosse 2005). Compared to entities such as the Canadian..., DFID, Jalaa is an NGOs that is part of the voluntary organizations outside the political process, that mushroomed in the seventies and eighties in India.

Ashok, a journalist by training, and development worker in disaster relief since the 1970s, founded the NGO Jalaa in 1986 to help vulnerable communities in drought prone areas improve their livelihoods. He set up Jalaa in these parts of the country because statistically Raichur district was one of the most backward districts of the country. The NGO's development initiatives began in a cluster of villages with a focus on children with disabilities and public health. Over time they have shifted to an integrated development framework which includes AIDS counseling, agriculture, micro credit, and governance and they now have a presence in 6 districts in the state of Karnataka. From project reports and stories that NGO staff shared with me I understood that Jalaa developed its programmatic focus based on staff members' understandings of issues in the region. Like many smaller NGOs in the country they have been dependent on foreign aid agencies for funds, which in Jalaa's case have been mostly European. They have also functioned as partners in State sponsored development programs such as watershed development. Given this dependence on external funding, for over a two decade period they have had to continuously reproduce their identity in order to both operationalize their philosophy of development, and remain financially sustainable within the changing political

economy of funding. Another important feature of Jalaa is that it is predominantly staffed by people who are from the semi-arid region in which it operates. As my ethnographic analysis will illustrate this has important implications for Jalaa's understandings and representations of the region in which they intervene. Using this characterization I argue that within the political economy of NGOs in the country, Jalaa does occupy a relatively precarious position of alterity.

Anthony Bebbington and Rajni Kothari argue respectively in two essays that are spatially and temporally distant, that NGOs make use of the unevenness of development to set up shop. Since they are dependent on fund flows they are also not vested to make serious interventions in the regions that alter the political economic backwardness of the area, but are instead invested in constructing success (Bebbington 2004; Kothari 1986). David Mosse, in his ethnography of development in western India draws our attention to the practices of the social construction of success in development programs, and Tania Li, in the 'Will to Improve' demonstrates how development programs in Indonesia are focused on creating 'responsible subjects' and in the process depoliticize the political economic reasons for existence of inequality, and limited access to resources (Mosse 2005; Li 2007). Using the framework of deep spatiality as I articulate above, in what follows in this chapter I trace the technological translations of Jalaa, which occupies a space of alterity. In doing so, I complicate the above mentioned ideas of development practice, and technological practice in development. In following the technological translations of Jalaa, I focus on watershed planning models for which the NGO utilized the spatial technologies of remote sensing and GIS. I also complicate the arguments about spatial technologies as reviewed in GIS-Society literature in Chapter 2 – specifically the arguments that these technologies are inherently reductive, serve to entrench the instrumentality of powerful actors such as the State, and that they do not offer any revolutionary openings.

Early Explorations

Ashok, the Director of the NGO, *Jalaa*, traces their explorations in agriculture and GIS planning to 1989 when they began experimenting with dry land agricultural practices along with an expert from the Central Research Institute for Dry land Agriculture (CRIDA). On a one acre plot they explored the potential of different agricultural and soil conservation techniques towards drought proofing the area and boosting incomes of farming families. He explained that the CRIDA agronomist undertook a systematic experiment which comprised of yield cuts[14] to assess the improvements in crop productivity. This experiment was to reduce the vulnerability of red soil farmers in a drought prone area. The small technological changes suggested by the scientist to the farmers were across the slope ploughing, bunding and silt traps - all measures to improve the texture of red soil and thereby improve its moisture retention capacities, and reduce erosion. They also described seed treatment methods that would decrease the chances of crop failure. Systematic yield cuts revealed that it was indeed possible to increase productivity and farming incomes through these environmentally sustainable dryland agricultural techniques and wanted to **replicate** such practices in a cluster of villages in that area.

14 Yield cut is a method of measuring crop yields through repeated yield measurements of the same acreage of land, such as a 1m by 1m plot of land, after every new treatment/ experiment.

This was when Ashok felt the need for a map that would give him an idea of the region populated by the twenty or so villages. "If I had an overview of how water flows, if I had an overview of land, water, trees, then I could come up with an integrated plan. I did not know anything about GIS then but I always thought through the logic of the **'overview'** - so that I could 'see'. " He looked at what was readily available to the public - a Survey of India topographic sheet of 1:50,000 scale but found that this was too coarse a scale for him to work with. In many conversations Ashok highlighted his desire to scale up and replicate successful models. It was important to him that Jalaa be able to affect change at larger scales and to change the statistics, for e.g., reduce the number of people living below the poverty line in an administrative unit. This desire prompted him to move beyond his reliance on experts such as the agronomist, technologies of change such as bunding and seed treatment, and technologies of validation such as yield cuts. He wanted to extend Jalaa's reach through a reliance on 'visual' technologies that allow him to see, collate and aggregate, and database technologies.

Ashok contacted the Regional Remote Sensing Service Centre (RRSSC) in Bangalore in the early 1990s. RRSSC is a Department of Space (DOS) institution set up to make use of remotely sensed data for natural resource management needs of the country. At that time Indian Space Research Organization (ISRO) was generating multi-spectral satellite images at a spatial resolution of 36.35 meters. The staff at RRSSC were interested in this NGO's project as it gave them access to the field and a chance to apply their expertise and verify the application potential of the country's remote sensing satellites. However, when RRSSC understood the level of detail that Ashok was interested in, processes at a farm plot level, they told him that he would be better served if he walked the land. The NGO was already walking the land. Although these satellite images gave Ashok an up to date view of the landscape which the outdated topographic sheets did not, he found that his planning needs were at odds with the end needs that the satellite images were constructed to satisfy - mostly district level planning needs[15] of a district official such as a Collector[16]. They also found that if they were to get any results at their scale of interest, it was more due to ground truthing than the content of the satellite imagery itself. They were not sure how much of an edge the satellite imagery really gave them. So the NGO shelved their interest to work with these spatial tools.

Ashok said that his experience with the CRIDA scientist made him realize that agricultural interventions are very complicated and dynamic. They found that it was complicated to "influence" farmers to change practices and that they sometimes could not fully understand farmers' decision making processes. "We do all of this and then tomorrow rain won't come…too many variables in agriculture. So I say let the farmers deal with the variables (smiles) and I will deal with things that are more constant and that have to do with the foundation of agriculture. Without the foundation of land, water, trees there is no agriculture. So I decided to focus on building those foundations." This insight significantly influences Jalaa's approach to development in the following years and has implications for the nature of planning they practice.

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15 A district is an administrative unit just below the level of a state. Sizes of districts are highly variable. Maps prepared for district planning are usually at a scale of 1:250,000.

16 A District Collector is an Indian Civil Services official who is responsible for development planning and governance of a district.

When Jalaa got an opportunity to facilitate State sponsored watershed programs they were able to go down this path of building on the foundations of agriculture – land, water, and trees.

In 1995 Jalaa got an opportunity to get involved in a watershed development project implemented by the Karnataka State Government and funded by a European development funding agency. In this program, while the Government planned and implemented the watershed treatments, NGOs were the chosen agents to oversee the 'participatory' aspects of the project and 'interface' between the State and the 'community' during implementation. Even though they would not have the opportunity to do any planning, Jalaa thought this a good opportunity to build on the insights from their work with the CRIDA scientist. This marked their formal entry into the watershed development sector in India. Since then they have planned and implemented watershed projects over 20,000 ha and more with funds from State agencies and other funding agencies. The total Kadambahalla watershed project that Jalaa subsequently administered in three different stages covered 13,402 hectares and 21 revenue villages. All farmers I spoke with consistently said that this is the first major State / non-State intervention in this area.

The history of watershed projects in India has dovetailed with large dams. Watershed projects were originally designed to prevent siltation of large dam reservoirs (Rao 2000). During the severe drought of the late 1960s these projects were also used to provide employment to rural peasants. From the 1990s watershed projects have been framed as holistic projects that address issues of integrated development and improvement of rural livelihoods. In 1994 the Report of the Technical Committee on Drought Prone Areas Programme and Desert Development Program, also popularly known as the Hanumantha Rao Committee Report, recommended '(p)lanning on watershed basis through the participation of the people at all stages, active involvement of the voluntary organizations and coordinated effort by the administration.' (Government of India 1994, i) Some of the watershed programs that were seen to be successful and hence formed the basis of recommendations in this report were NGO based initiatives. The participation of NGOs in watershed development is thus related to the broadening of the content of watershed programs to an integrated development approach, and also the widening the area covered under watershed development in the country. C.H. Hanumantha Rao, one of the chief architects of this report envisions the watershed development movement in the country as an extension of a type of Green Revolution in order to boost livelihood security and agricultural productivity of dry land areas left out by the Green Revolution (Rao 2000).

The watershed concept mapped onto Ashok's overview logic, as watershed planning comprised a spatial element to planning, and his interest to work with the foundations of agriculture - land, water, and trees. Jalaa's practices reveal that the many development projects / programs they undertook were also R & D initiatives through which they reworked and reinterpreted watershed development and spatial technology based planning. Hence my ethnography of Jalaa's watershed planning practices could also be read as a history of watershed development in a dry land area of India.

Watershed Planning Models

One of the fundamental aspects of an STS approach is to open up the black box of a model and understand the assumptions that are embedded in it and the manner in which these assumptions interact with practices that work these models. I begin my analysis of Jalaa's planning practices by delving into the watershed planning models that they experimented with. In opening up these models, I also pay attention to the 'translations' between the many actors who mediate the plan and its implementation (Latour 1999).

Before I get into the details, a quick note on how work was organized in Jalaa is in order. Bhagat's designation was Team Leader (Watershed) and he reported directly to Ashok. Immediately below Bhagat a member of the field staff, Guru, was designated as Assistant Team Leader. The rest of the field staff reported to Guru. The watershed team comprised of six to seven members. Four of the staff had been working for nearly a decade in this team. Some of the older watershed staff had moved to other sectors within Jalaa. Jalaa's work was thus implemented through this layered structure of staff.

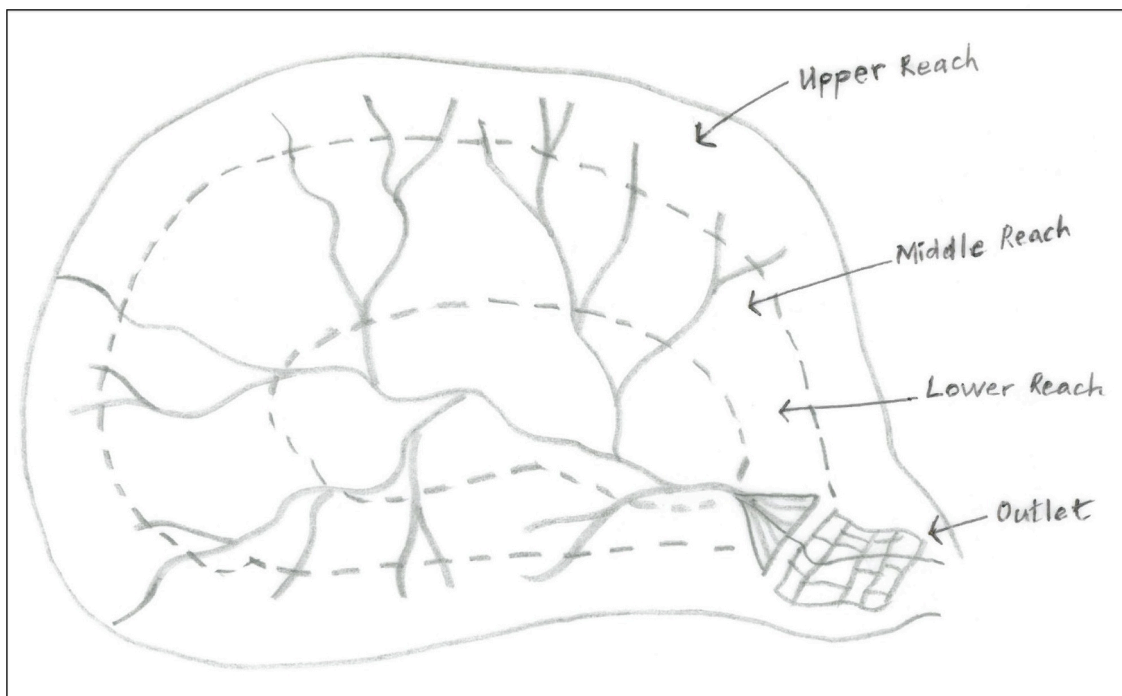
Gross planning

After their first foray into watershed development in 1995, Jalaa got an opportunity to implement another state sponsored watershed under the Desert Development Program (DDP). Unlike the previous project, this gave them the opportunity to plan the watershed interventions and implement them. They hired their first civil engineer to spearhead the program. Many of the watershed field staff who have worked in Jalaa for almost a decade were first recruited for this project. Bhagat, a young civil engineer was one among those recruited. Fresh from engineering school he had spent a few years working as an irrigation contractor planning and constructing field channels for one of Karnataka's major dam irrigation projects. He said that his civil engineering degree did not specifically train him in watershed work but picked up his skills on the job. The project prescribed that the NGO follow a method of planning called gross planning. This marked a shift from their CRIDA experiments where their focus was more on individual plots of farmers. In the current project they had to view all plots in a 500 ha watershed unit and the relationships between all plots as a system, which was defined by the field of watershed development.

Spatiality in Watershed Planning

Bhagat explained that the basic scientific concept of a watershed as a landscape unit is its ridge to valley definition. The first component of a watershed is a ridgeline, which is the natural boundary of a watershed and also the slope dividing line. The second component is the outlet - the location of the outlet defines the size of the watershed. The third component is the different 'reaches' of a watershed - upper, middle, and lower reaches. The reaches are defined by the contributing area or catchment area. The watershed activities (also called structures / treatments) are planned with respect to the contributing area or catchment area. All types of watershed treatments are conservation based - either conservation of soil or conservation of water. A large part of Bhagat's watershed planning activities comprise decisions about the type of treatment, its size and location.

Bhagat adds that "farmers usually focus only on treating their own lands. However, their treatments will be damaged by soil and water runoff if upstream plots of other farmers are not treated. Because of slope, someone is affecting someone else. I have to take care of the complete contributing area of any location, otherwise my treatments are not going to be sustained. Water flows according to slope. Managing water is managing slope. So slope is the main reason one needs to be aware of catchment area. That is the scientific way. If slope percentage is zero then zero conservation measures are required[17]. In a watershed project the slope percentage decides the quantity of treatment to be taken up. Even in the cost norms of watershed projects the Government states that if slope is 1 to 8 % the budget should be Rs.15,000 per ha, if slope is 8 to 12% budget should be Rs. 20,000 per ha. The science of the watershed is to manage water - allow water to flow in some place, allow it to stand in some place, and harvest it in some place." Bhagat views the space in a watershed through slopes or gradients. That is how he simplifies a watershed and thereby plans structures that will control the movement of soil and water. I was struck by the degree of order and control that was envisaged in watershed planning.



Sketch to illustrate spatiality in watershed planning

Representations in Gross Planning

How does Bhagat translate his 'view' of the watershed to a watershed treatment plan? Since he was working within a country-wide paradigm of watershed development that emphasizes NGO and local community participation he is bound by the prevailing practices of community meetings. Before the start of a project in a village Jalaa calls for a public village meeting (a *gram sabha*). At this meeting they present the concept of a watershed, its rationale, the location and types of activities that will be implemented. Bhagat would explain the minimum technical requirements for watershed treatments in local terms. He said this would get the farmers thinking so

17 This statement is contestable, and needs further investigation and discussion.

that they could contribute towards site selection with their knowledge of the landscape. The idea behind community participation is to create a sense of ownership amongst the people on whose lands watershed structures are built so that they will be motivated to maintain the structures and realize the benefits. Here we see Bhagat, in his position as civil engineer and project manager, taking this idea and translating it to a procedure where he explains the *minimum* technical requirements in *local* terms in order to get the inhabitants of the landscape to provide a *view* of the landscape for him and his team.

In this meeting the NGO also works out a planning schedule with the farmers. The practice is for 4 to 5 NGO staff to stay in the village for 5 days. They divide the entire watershed area into groups of 10 survey numbers and announce the dates they will visit each area. The expectation is that farmers will be on their lands to provide inputs when the staff visit to make the watershed treatment plan. At the end of this period, the staff prepare a summary for the entire 500 ha watershed comprising a list of all planned watershed structures. This is then presented to the community in another *gram sabha* meeting. Farmers do debate locations of structures and Bhagat says most often than not they suggest the best possible locations for structures, locations that even visiting technical officers of the State would approve of. He also found that such structures tend to be used by farmers and hence are long lasting. After the village agrees, Jalaa asks them to pass a resolution that the watershed will be executed in the manner discussed.

The summary list comprises a table with the type of structure and number of structures per type, and the rate per structure and total amount. The list is not spatial, i.e. it has no mention of where each structure will be located. In the *gram sabha* some farmers are interested in knowing where certain structures will be located. The NGO will the mention the location of the structures. Jalaa staff carry with them the cadastral map of the village during their traverses and they mark rough locations of the structures. Bhagat said that they rely on these rough markings and their memory of the landscape. He also stressed that seldom do they forget locations after traversing and working in an area on a specific project. The rough markings on the cadastral map are reproduced in a blue print and submitted along with the summary list to the State Department in order to get approval for the plan and budget.

Whose responsibility ultimately?

I asked Bhagat, ultimately whose responsibility it is to make sure that the entire watershed is treated according to the watershed logic that he prescribes to? Is every location / farmer represented in the gross plan. Bhagat says it is his responsibility. What devices does he rely on to ensure completeness?

Bhagat says that he and his team mark all the different treatments with different symbols on the cadastral map. He then checks if each of the reaches of the watershed -upstream, middle and lower - are given the appropriate treatments. For example, he will make sure there are vegetative barriers in the upper reach, rubble field checks (RFCs) in the lower reaches, etc., “When we see the map we will be able to figure this out - whether we covered the entire watershed reach-wise. Based on this I can make changes if I feel there is something out of place in a particular reach, or if there is a treatment gap. We also traverse during implementation and after

implementation. At the time we will check treatment density, i.e. distance between two structures and if for example it is large, we will suggest intermediate structures."

Bhagat also remarked that people in the village would observe this process and work things out in their heads. "For example, some clever people such as *gowdas* (erstwhile landlords) would come forward and say 'I know the location for the check dam' - he will have a personal interest - it will be close to his land, or he will be interested in taking the contract for it. But since I also notice these dynamics I would put my foot down and try to balance the plan so that it is equitable to all people in the watershed." Ashok said that in most villages, the planners (NGO staff) were able to 'save' this process. But in one village, a *gowda* owned about 1000 ha of land, and the rest of the village was essentially his bonded labor, and later Jalaa found out that their staff member followed everything the *gowda* wanted for the watershed plan.

Let us hold on to the idea that gross planning happens through translation between the landscape, the revenue map, traverses on the landscape, memory, the list of structures, budget list, Bhagat's ideas of watershed, his representations to the locals, locals identification of suitable locations, village power play, and Bhagat's perception of politics and equity. 'Participation' envisioned in the watershed paradigm is negotiated by two groups coming together, but never really opening up the black boxes on either side. Negotiation on the farmers' side is limited to only the location of the structures. Farmers cannot have a debate with Bhagat about why, for example, his view of the watershed is premised on slope, and not another aspect such as soil. Bhagat for his part, puts his foot down based on his *perception* of village politics, as opposed to being a participant on equal footing with the people in a village meeting. The design of the state sponsored watershed project structures such interactions on the basis of rules for funding, reporting, and social process.

In the light of two following developments in Jalaa's history of spatial planning,I argue that that gross planning model did not provide agency to the landscape, or to the people in the landscape. Higher resolution satellite imagery and the model of net planning addressed these limitations of gross planning.

Revisiting Satellite Images

While the previous section provided an idea of how spatial planning was carried out on the basis of one planning model, this section describes the second chance that Jalaa got to explore the usefulness of satellite remote sensing data – data that would potentially change the planning model, and in Ashok's mind a model that would allow them a better 'view' of the landscape. This section will necessarily involve a detour into the details of remote sensing and GIS, before I come back to another watershed planning model. In 1997, some time after their involvement in the DDP project, one of the senior practitioners in the NGO arranged for a hands-on training session at the Karnataka State Remote Sensing Applications Centre (KSRSAC)[18], Bangalore. This time the NGO staff decided they would sit with the technical staff of KSRSAC and work hands-on with the data and see what they could use for their plans. Moreover, by 1997 ISRO had increased the spatial resolution of

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18 KSRSAC is a State government institution modeled on the lines of RRSSC. It's mandate is more specifically to provide services to the line departments of the State.

multi-spectral data to 23.5 meters, and had also developed a panchromatic (b & w) band of 5.8 meter spatial resolution. The combination of these two types of data turned things around for the NGO and rekindled their interest in spatial data and spatial planning.

Ashok found that the 5.8m panchromatic data allowed him to 'see' with enough detail the landscapes in which he wanted to intervene. So he, along with Bhagat, a soil scientist, a geologist, a geo-informatics specialist, and a software programmer, developed a prototype of a remotely sensed watershed development plan. They picked an area in which they were already implementing another development program, in order to prepare a watershed development plan. This prototype in many ways defines a paradigmatic moment for Jalaa. It brought together their experiences in development work, watershed experience and the combined technologies of remote sensing and GIS allowed them to 'see'. The prototype occupies a significant place in all their successive experiments in spatial planning and it was the presentation of this prototype that lured me into this ethnography.

Now we can 'see': 23.5m multi-spectral image merged with 5.8m panchromatic image

The prototype is essentially a spatial database, created in a GIS environment, through which the agrarian landscape is represented. In the five years that I was associated with Jalaa I gradually understood what this prototype represented for various actors - for some such as I (in the first few months of research) it was an

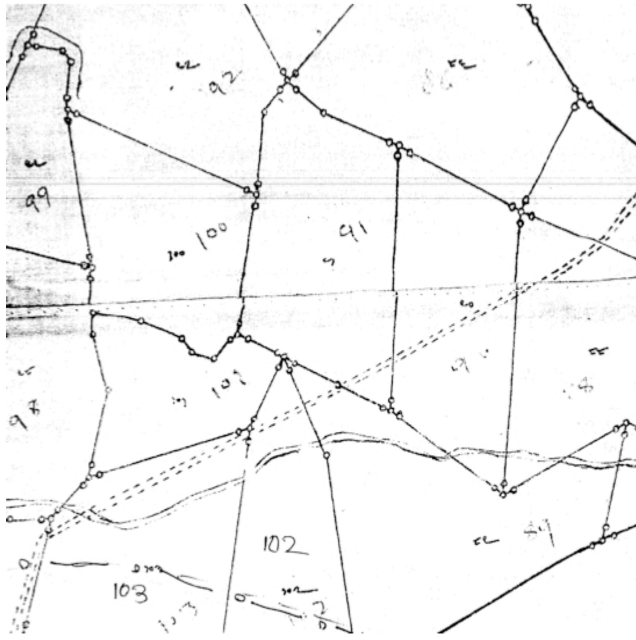
orderly, well crafted, and aesthetically pleasing representation of the landscape. I was smitten by its order and power (Harley 1989). For some others such as Jalaa field staff it represented a rather passive, bland view of the landscape.

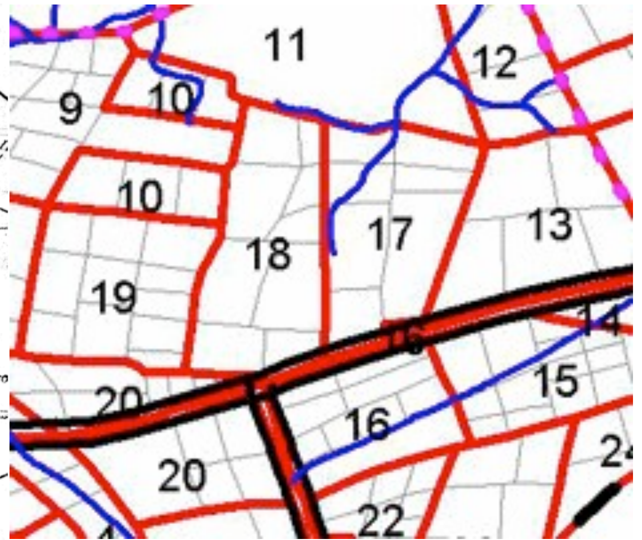
The team used the high resolution satellite imagery to extract a set of thematic layers that would represent the agrarian landscape. Data from these thematic layers, and from ground surveys populated the spatial database, which was intended to be used for watershed planning. In the following section I will explain some of the ways in which this spatial database gave more agency to the landscape and agrarian population compared to gross planning and the typical GIS data that characterizes many State interventions (as I have explained in Chapter 1).

Indicative Plot Map

The first representation that was extracted from the satellite images was a plot map. Extracting the plot map from the satellite image was what allowed Ashok to 'see' the landscape in which he wanted to intervene. The plot boundaries are visually interpreted[19] and then ground truthed. The team called this representation the indicative plot map. Indicative, because they found, after ground truthing, that it was 80% accurate. For Jalaa, this is the advantage of the 5.8m panchromatic imagery and a crucial layer that allows a social grid to be overlaid on the physical landscape of a watershed. This proved to make a drastic difference to Jalaa which had previously tried to make do with cadastral village maps of British vintage. The cadastral maps (or revenue maps as they are also called) only have survey number boundaries. Today, after two to three generations of fragmentation, each survey boundary is populated by several land owners and plots. Being able to update these land ownership boundaries potentially allows Jalaa the space to tailor their interventions to the specific situations of individual households. This interest in property ownership boundaries represents a departure from conventional uses of satellite remote sensing images such as land use and land cover. It also addresses criticisms of land management programs that derive data from satellite images – namely that they privilege the mapping of biophysical processes and thereby invisibilize social explanations of environmental change (Litfin 1997; Rindfuss et. al. 1998). It is thus not a deductive process of mapping as Robbins and Maddock have argued of the Forest Department in Rajasthan State (Robbins & Maddock 2000). The state of the art was not dictating development practice here. Instead Jalaa had opened up the GIS blackbox to widen the representation of an agrarian landscape.

19 Individual plot boundaries are identified by low, foot high soil bunds that are built by farmers to demarcate plot boundaries. These plot boundaries are easily visible in high-resolution satellite images.





Cadastral map with survey number boundaries

Indicative plot map with individual plot boundaries and survey number boundaries

Plot-household Relationship

As I thumbed through the report of Jalaa's prototype, not only did I find pretty maps, but also found signs of a deep database, at the level of farmers' individual plots. As I began to get acquainted with the prototype two things stood out for me: 1) the set of variables that were measured and mapped in the database extended across the physical and social realms. Besides the indicative plot map, the prototype comprised several other representations of the landscape such as gender and caste of plot ownership, landholding size, landuse, soil, run off; and 2) every variable was represented at the level of the plot. In my experience in the spatial technology sector in India I had rarely come across representations at such a large scale. I was also excited to learn that data such as runoff and soil, not available at the level of each individual plot, were transformed and represented at the level of each individual plot. This meant that the team had designed the database to enable such transformations. A crucial aspect of the database design that enabled such a transformation is the plot-household relationship. This emphasis on database design revealed the sophistication with which Jalaa approached GIS and demonstrated to me that the NGO did not limit their spatial database to typical designs that dominated the spatial technology sector in India.

That the basic unit of aggregation was each farmer's plot-household complex demonstrated a certain complexity in the NGO's understanding of agrarian processes. They valued the stories and decision making of individual households on the ground. This basic relationship unit also dictates their data collection and data recording methods. It allows the overlay of the social with the biophysical and allows the integration of ideas of environmentalism and equity. An understanding and design of GIS that derives from the field and thence from a database is uncommon in this sector

in India. I was pleasantly surprised to see a development NGO having put serious thought into what they wanted to measure in the agrarian landscape, how to measure and how to represent, and towards what end?

Other Variables

Some of the thematic variables they had chosen to include in the prototype were standards used by the Indian Space Research Organization (ISRO) in watershed development projects such as the Integrated Mission for Sustainable Development (IMSD) (discussed in Chapter 1). Ashok said, "When we started with satellite images we went down the IMSD route. We asked ourselves – okay, from this data source what all can we interpret? So soil became an interpretation from the satellite image. Land Capability Classification (LCC) was a byproduct variable from soil. Hydro geomorphology could also be interpreted from satellite imagery. Food, fodder and fuel budgeting was also based on ISRO and research done by University of Agricultural Sciences (UAS), Bangalore."

A study of practice is "to multiply the mediators that collectively produce the sciences" (Latour 1999, 309) The team at Jalaa, because of their proximity to the landscape and its people, were able to 'revolutionize' a spatial database by choice of scale and design of relationships in the database. This gives agency to the people who work the landscape, and the landscape in these villages. However, I argue that in studying the practice of planning that uses these technologies, we have to understand the 'complex web of connections' that make this practice possible (Latour 1999, 90). It is through this 'web of connections' that I now move to trace how other actors in Jalaa work with this database.

Making and Using the Prototype

I now return to where I left off from gross planning. How has planning changed with these new actors, i.e. the database, and the new models? Both the Director and the civil engineer said that after completing this intensive R & D process they did feel that it was a theoretical exercise. They did not really use this database for planning watershed structures. They did not know what to do with it in practice. Bhagat in particular continued to use gross planning techniques for planning in their next watershed project. He talked about how creating this prototype involved a different set of representation practices. This method was heavier on data collection and data processing. "It was difficult and tough on the field and I also used to wonder what we are going to do with all this data? When the programmer would ask us - where is this data, and that is missing, etc., we would be perplexed - not knowing what she was talking about." In the five years that I was associated with the NGO this was a recurring theme with every programmer and the field staff. For the programmer every piece of information had to fit. Every connection and relationship had to be neat. The field staff were not used to thinking about the data in such a manner. They had the context and hence didn't need everything to be represented and made apparent. The database imposed a different kind of order than they were used to. These tensions persist for Bhagat and his team.

What was the point then of such a fine representation of the agrarian landscape when in practice they were losing their way around what they were used to doing. In

wanting a spatial overview, the R & D process made them realize that there is much that comes with the 'view' in a digital realm - the data. The Director wanted to see the lay of the land, and the way the water flowed, and the way the land sloped, etc., But the view doesn't appear from just 'seeing' - it appears from a representation - and in the process of representing, there are several issues and contestations. Their style of working provided the space for them to grapple with the multiple negotiations and translations in the process of representation. Rather than work out in a neat, ordered manner, the process of spatial planning defied any stability.

I will provide a few examples of how different actors saw different meaning in the representations/models. Certain models in the spatial database were modified or refined, and certain others were left untouched. On realizing that some models were theoretical, Bhagat and the field staff changed the way they related to their work and the spatial database. They often referred to changes in their practices of data gathering and in some case they chose to reinterpret the models, or take 'short-cuts' - "When I know it is not going to be used, how does it matter how I collect the data for this model?" In some other cases, they disagreed with the underlying concept of a model, and when they could not resist it in discourse *vis a vis* staff in higher positions of power, they would resist it through practice. On the other hand, when I would try to represent these differences of opinion using my position of 'power' in the institution I would receive well thought out substantiations from the Director who often refused to take into account such resistance by field staff. And in certain instances Bhagat gradually found some models useful. I provide below a few examples to illustrate these processes.

'Households At Risk'

One example is the construction and use of the Household at Risk (HAR) model, which is a measure of the risk status of a household, or rather crudely put, how a household is positioned to cope with livelihood issues. HAR is a composite of the caste, class and gender of the head of a specific household and the value of each household is mapped on to (or transformed to) the plot or all the plots that he/she owns. HAR was meant to complicate a planning process that up to this point was based on a set of physical phenomena such as slope and catchment area.

Ashok, Bhagat and the field staff have different opinions on the usefulness of this variable in planning. Ashok's opinion is the reason this model finds a place in the prototype to begin with, and it leads from the experience of rich farmers trying to co-opt the gross planning process. Bhagat says that initially he did not know what to make of the models in terms of actual practice, but once he saw the results represented in the maps he says he began to appreciate the spatial insights. "My thinking began to change slowly. The socio-economic data represented on the plot map gave me a sense of what to prioritize in treatment decisions. I was able to internalize these priorities, especially HAR or household vulnerability and plan accordingly." It is important to note here that Bhagat uses the word 'internalize' – he did not change his method of gross planning on paper, but the contextual decision making in his mind was altered upon seeing the results being mapped. The point, however, is that it was not made legible. Field staff are of the contrary opinion and talk of this as more of a theoretical variable - “A small farmer will not want a farm pond in his land as it will eat into his already small acreage. We do not keep track of

this when we fill in the survey formats or plan interventions while traversing. There are technical rules for the siting of each type of structure – and that is what we follow." Field staff say this because their position in the NGO only gives them the space to do the surveys and input data into the database, and provide planning inputs to Bhagat.

'Lands At Risk'

A second example of a contested model is 'Lands at Risk' (LAR). I asked Bhagat to explain the LAR model to me, as well as read the technical report of the NGO in which I found an explanation of the model. LAR is calculated on the basis of a Land Capability Classification (a model within this model) and run-off. I will limit the discussion to run-off. Run-off is calculated as the product of the intensity of rainfall (I), a coefficient value that describes the condition of the soil (C), and the area from which the water has run off (A). The NGO wants to calculate a run-off value for every farmer's plot. Certain choices have been made about where to source data from and how to measure each of these variables across space and how to represent them across space.

The intensity of rainfall value is collected from the local meteorological office - hence it is a value measured at the taluk level[20]. Since all farm plots fall under the same taluk, all plots are assigned the same 'I' value in the database. As per the 2001 census there are 177 villages in this taluk, the area of which is 2388 sq km. So the 'I' value represents a spatial unit that is 2388 sq km. Embedded in this choice is the assumption that intensity of rainfall is a phenomenon that may not exhibit significant variation over the watershed area of 1000 ha. If it did, there would probably arise the necessity to measure directly from the field and not rely on secondary data. This assumption is also intertwined with the feasibility of directly measuring rainfall from the field.[21]

The C value is dependent on the soil condition of each plot. This may vary from plot to plot. Soil condition of each plot is derived from a soil map prepared by a soil scientist who was hired by the NGO for the specific purpose. A GIS allows one map to derive a value from another map based on a spatial link, i.e. same geographic position. So, in the GIS the plot map is brought into contact with the soil map and each plot on the plot map picks up a specific soil value from the geographic position that it comes in contact with on the soil map. This value is also stored in the plot map database.

In terms of soil conditions, the NGO made a decision that soil maps prepared at the small scale of 1:250,000 by the National Bureau of Soil Survey (NBSS) are inadequate and instead hired a retired soil scientist from NBSS to walk the fields and prepare a large scale soil map at the same scale as the cadastral maps. The soil mapping units are also transformed to the plot layer, so that each plot layer can be labeled with a predominant soil type. The third variable for calculating run-off - area - unlike the other two, was measured at the level of each individual plot. So, if a particular plot is 3 acres, then it's area value is entered as 3 in the database. This

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20 A taluk is an administrative unit that is a subdivision of a district, which is in turn a subdivision of a state.

21 The NGO, in collaboration with the Drought Monitoring Department of the Karnataka State Government, has worked on an appropriate technology project of installing rain gauges in farmers' lands.

choice is a point of debate in the NGO. Depending on the position of each plot in the landscape, whether upslope or down, the water that flows over it is not only from the rain that falls on it but also from those areas upslope. So there are some who feel that the area value should be the area of the micro-catchment area from which the water collects and flows to affect any particular plot. Thus the entire area of study should be demarcated into micro-catchment units (ridge to valley landscape through which water flows) and each farm plot should be mapped with the area value of the micro catchment in which it falls. It is probable that the decision to map the area value of each individual plot was made because they wanted to relate every process to the individual plot. However there is also the possibility of measuring the area variable at the scale of the micro watershed and then transforming it to the level of an individual plot, as in the case of 'I' and 'C'.

The debate is not yet resolved and inspite of this the LAR map is constructed as mentioned above. All three variables for each plot - I, C, A are multiplied in the database and the product - the LAR value is mapped onto the respective farm plot. This LAR map is supposed to aid Bhagat when he makes the watershed plan, i.e. locations for structures such as bunds should be decided based on which plots have high LAR values and such. Bhagat says he traverses the field with a plain plot map without the LAR values. He puts the LAR map on the back burner for a while. He explained that he walks the field, understands the lay of the land and then marks out the locations of the watershed structures onto the plain plot map. I recall my first trip with him to the field. We walked the fields as he pointed out energetically to the slopes and the low hills and undulations and how water flows through this landscape and how he designs bunds to reduce slope and to increase soil moisture, and waste weirs at the end of fields to send excess water to the next field or how he chose to channelize water into farm ponds. He even said half jokingly that his vision was to

The undulations that Bhagat traversed

not have any rain water leave the area, 'no running water, send everything underground'. It was then that the impact of watershed development hit me - it truly aimed to alter a landscape, and specifically, moving water. I also wondered what could be more honest than the passion with which Bhagat expressed himself while traversing the landscape. A finely thought out and intensely debated database perhaps?

The discussion about LAR revealed to me the tensions that Bhagat has had to cope with. Having walked the land with him and listened to his explanations of watershed design principles and gross and net planning I was able to understand how LAR (and specifically how it is measured) could be limiting for him. Given the responsibility he had to shoulder in every project and given the manner in which the LAR model is constructed, he was not entirely comfortable putting all his faith in the LAR map. That is the reason he walks the land and follows his older method of slope and erosion features. Also LAR by plot is not suitable because the plot structures are bunds and these are decided on slope and vertical interval. Even though Bhagat may find certain methods or theoretical models inadequate, given that it takes a few iterations to convince Ashok of their limitations, he has to continue to make the work happen on the ground according to certain principles and also make his work happen in the institution, i.e. report to the Director that he is using the tools.

In another instance, Bhagat shared with me that this variable became useful as an arbiter in the last stages of planning. He says to me with a smile that the LAR map is used in this stage as a control for budgetary reasons! If the LAR map gives him the license to remove certain proposed structures in order to keep costs within the budget he does so. The result of this last stage of calibration is the plan that is implemented on the ground.

David Mosse talks of brokers who operate in the realm of development practice and who make it possible for policy to implement practice (Mosse 2005). Setting this idea aside for a minute, I examine the relationship between the database and the role that Bhagat has been recruited to perform in Jalaa. I think one cannot call Bhagat a broker. I do not want to reduce Bhagat or his field staff to brokers. Broker signifies a separation between worlds and the middle man works between these two worlds. But using Latour 1999, I argue that *understanding* Bhagat and his field staff and their practice gives them the agency that is due. I think a database does not have a place for instinct, whereas Bhagat has instinct. We can build sensitive databases with well meaning and finely defined variables, but are databases meant to function as automatons? I contend that they are meant to function with people who make them and people who use them. Has the idea of an inclusive database that takes into account inequities of farmers done its work when Bhagat internalized its idea? I argue yes. By aggregating all the data about individual households and their landholdings and transforming this data into an index – there is power in this form of abstraction – it helps us understand a pattern. It is this abstraction and evidence that drives home the point to Bhagat and is more powerful than Ashok sitting Bhagat down in a meeting and telling him to pay attention to the poorer farmers while siting soil and moisture conservation structures. It allows us to see without the clutter of the individual variables. One can argue that this admission of Bhagat amounts to what Latour means when he says, "Knowledge derives from such <u>movements</u>, not from simple contemplation of the forest" (Latour 1999, 39)."The succession of stages must

be traceable, allowing for travel in both directions. If the chain is interrupted at any point, it ceases to transport truth – ceases, that is, to produce, to construct, to trace, and to conduct it" (Latour 1999, 69). Technological solutions that people such as Ashok visualize are premised on an assemblage of actors. Actors who have their own agency. It is not possible to control or erase experts such as Bhagat and their translations through legible technologies such as GIS. There is something valuable that experts bring to the process of representation. This is different from Mosse's analytical category of brokers, which is related to his larger argument of how actual workings of development do not follow policy.

I now step out of the database and the plan and return to the story of watershed planning models. Watershed projects because of the scale of intervention, and the organizational setup are typically all funded projects, where funds flow through a State agency or a bilateral agreement between a State agency and a foreign funding agency, and routed through an NGO. The implication of this is that terms for planning are dictated by funders. One such funder that came with significant planning influences was the National Bank for Agriculture and Rural Development (NABARD)

National Bank for Agriculture and Rural Development (NABARD)

NABARD was set up by the Government of India in 1982 to provide credit flows in order to promote agricultural and non farm activities specifically in rural areas. In 2000, NABARD created a Watershed Development Fund (WDF). The objective of this Fund is outlined as follows in the NABARD watershed guidelines: "The Fund will be utilized to create the necessary framework conditions to replicate and consolidate the isolated successful initiatives under different programs in the government, semi-government and NGO sectors. Thereby, all the partners involved viz., watershed community, central and state government departments, banks, agricultural research institutions, NGOs and NABARD can act in concert to make a breakthrough in participatory watershed development." (NABARD 2006, 5)

The Indo-German Watershed Development Project (IGWDP) is the basis for NABARD's model of watershed development. This project was implemented by NABARD in partnership with Watershed Organization Trust (WOTR), an NGO. One of the main aspects of the detailed planning guidelines of NABARD's Watershed fund is the concept of 'net planning' or 'survey number-wise planning' which required watershed treatments to be fixed to each plot in the landscape. This concept which was designed for greater financial accountability and representation of individual property owners, provided an opening for Jalaa to utilize its plot based database in a more intensive manner. This brings us back to representation of the landscape and its people in a fine-grained manner – at the level of the individual plot and households.

Net planning

In net planning for private property, the survey team has to visit each and every plot with a survey format and hold discussions with the farmer. The surveyors, i.e. Bhagat's team of field staff, draw a detailed plot diagram on the reverse enlisting existing treatments (recording length and volume, and number) such as farm bunds. The survey also includes collecting data about soil texture, depth, slope, and land-use

and a treatment demand listing from the farmer and a negotiation in terms of what the project can provide. The assumption is that the farmer gives his consent at the time of planning. This process has two implications, says Bhagat, the location of the structures is recorded and fixed for each and every plot at the time of surveying; and there are minimum deviations between planning and implementation.

In the net planning survey sheet, the surveyor has to discuss the proposed treatments with the farmer. Suppose the decision is to construct a 200m long field bund, he has to enter 200m in the dimensions column. Depending on whether the soil is red or black he will write the cross section for the bund (standards for which are already established). These two variables are multiplied to get the volume, which is then multiplied by established unit rates to arrive at the total cost. This is how a detailed estimation for each plot is done at the time of planning. Treatment estimations for all plots are collated and comprise a report called Proforma 10. The links for Proforma 10 (basically a spatial treatment wise report) are thus traceable to the survey sheets. However only the format design is specified by NABARD. The implementing NGO is left to its own devices to automate this process in the digital realm if it wants to. Jalaa's typical practice was to prepare manual records of the survey sheets and planning calculations, and automate the reports in MS Excel.

Difference between gross planning and net planning

Bhagat said that the big difference between net planning and gross planning is that there is more deviation between the plan and implementation in the case of the latter. In gross planning he would have planned 10 farm ponds to fit within the specific budget head. These are just 10 farm ponds to be built somewhere. Whereas in net planning he can specify in whose plots the 10 farm ponds will be located. In the gross planning blue print treatments are roughly located in the survey numbers. While a village level meeting is conducted during gross planning, these locations are not always negotiated and consented to by everybody in the village. So there is a greater possibility for deviation at the time of implementation. The farmers are usually not present when field staff traverse the field and decide on structures. So when staff go to the farmers field to implement the treatment the real negotiation takes place and could result in a deviation. Moreover, the survey team doesn't spend much time traversing to plan for farm bunds, which is the predominant private property treatment. The assumption is 100% treatment, i.e. every plot gets farm bunds. Traversing is mostly done only for drainage line treatments. But in net planning the farmer consents at the time of planning itself. So there will be no deviations in net planning.

One difference between net and gross planning is that in the latter there was more office work for Bhagat and his survey team. The first step is working out a budget for different type of treatments and fitting it into the total budget stipulations such as farm bunds for 400 ha and must be within Rs.20,00,000, 10 farm ponds within Rs. 50,000. Everything has to fit into the overall ceiling of Rs. 25,00,000. Then for each treatment, before implementation staff have to go to the field, take measurements and prepare a detailed estimation which should include length of treatment, cross section of treatment, volume of the treatment, which is then multiplied by unit rate, and each farmers labor or monetary contribution. The grand total from this exercise is the total net grant amount for the watershed. In the case of

SI No	Plot No.	Survey No	Area	Slope	Depth	Texture	Erodability	Class	Present Land Use Area	Proposed Land Use Area Ha.	Proposed Land Use Area Ha.	Existing				Proposed				Additional Volume	Cost Per Unit	Total Cost	Cost Per Ha	REMARKS
												Type	Length	Cross Section	Volume	Type	Length	Cross Section	Volume					
82	16	8/3/A		B	d3	c	e1	III	C2R	C2R	0.40		0	0	0	FB	40	1.07	42.8	42.80	23.1	989		
83	17	8/3/A											0	0	0	WW	3	1.79	5.37	5.37	249	1337		
84	19	8/3/A								AgF	0.41		0	0	0	FB	45	1.07	48.15	48.15	23.1	1112		
85	16	8/3/A	0.81										0	0	0	BP	40	1	40	40.00	10	400		
	16 Total																					3838	4742	
86	17	8/3/a		B	d2	c	e1	III	C2R	C2R	0.40		0	0	0	FB	40	1.07	42.8	42.80	23.1	989		
87	17	8/3/a											0	0	0	WW	1.8	1.79	3.222	3.22	249	802		
88	17	8/3/a								AgF	0.41		0	0	0	FB	45	1.07	48.15	48.15	23.1	1112		
89	17	8/3/a											0	0	0	WW	1.2	1.79	2.148	2.15	249	535		
90	17	8/3/a	0.81										0	0	0	BP	50	1	50	50.00	10	500		
	17 Total																					3938	4866	
91	18	8/3/e		B	d3	c	e1	III	C2R	C2R	0.30		0	0	0	FB	30	1.07	32.1	32.10	23.1	742		
92	18	8/3/e											0	0	0	WW	1.8	1.79	3.222	3.22	249	802		
95	18	8/3/e								AgF	0.30		0	0	0	WW	1.2	1.79	2.148	2.15	249	535		
96	18	8/3/e											0	0	0	FB	35	1.07	37.45	37.45	23.1	865		
97	18	8/3/e	0.82							DLH	0.22					DLH	35	1	35	35.00	30	1050		
	18 Total																					3994	4874	
98	19	8/4/A		B	d2	c	e1	III	C2R	C2R	0.40		0	0	0	FB	40	1.07	42.8	42.80	23.1	989		
99	19	8/4/A											0	0	0	WW	1.8	1.79	3.222	3.22	249	802		
100	19	8/4/A								AgF	0.46		0	0	0	FB	45	1.07	48.15	48.15	23.1	1112		
100	19	8/4/A														BP	45	1	45	45.00	10	450		
101	19	8/4/A	0.86										0	0	0	WW	1.2	1.79	2.148	2.15	249	535		
	19 Total																					3888	4521	
102	20	8/4/a		B	d3	c	e1	III	C2R	C2R	0.40		0	0	0	FB	30	1.07	32.1	32.10	23.1	742		
103	20	8/4/a											0	0	0	WW	1.8	1.79	3.222	3.22	249	802		
105	20	8/4/a								AgF	0.46		0	0	0	BP	30	1	30	30.00	10	300		
106	20	8/4/a											0	0	0	FB	35	1.07	37.45	37.45	23.1	865		
107	20	8/4/a	0.86										0	0	0	WW	1.2	1.79	2.148	2.15	249	535		
	20 Total																					3244	3772	
108	21	8/4/E		B	d2	c	e1	III	C2R	C2R	0.40		0	0	0	FB	40	1.07	42.8	42.80	23.1	989		
109	21	8/4/E											0	0	0	WW	2.1	1.79	3.759	3.76	249	936		
110	21	8/4/E								AgF	0.45		0	0	0	FB	45	1.07	48.15	48.15	23.1	1112		
110	21	8/4/E														BP	50	1	50	50.00	10	500		
111	21	8/4/E	0.85										0	0	0	WW	1.2	1.79	2.148	2.15	249	535		
	21 Total																					4072	4791	
112	22	9/1		B	d3	c	e2	III	C2R	C2R	3.00		0	0	0	FB	250	1.07	267.5	267.50	23.1	6179		
113	22	9/1											0	0	0	WW	6	1.79	10.74	10.74	249	2674		

A sample of Proforma 10: spatialized watershed treatment plan

net planning, planning and estimation happens simultaneously. Bhagat says he prefers this as each plot is looked at as a watershed. The net planning format also allows him to easily check if he has missed any of the plots. In the gross planning 500 ha is treated as one plot and the rates are per hectare. Whereas in net planning the rates are per cubic meter of earth used to build the structures (the scale shifts to a rather micro unit here). And in net planning the detailed treatment plan and its cost is traceable or fixed to the survey sheets and each plot. But in gross planning it is not possible to get these details. So once again, the point is that the database does do 'some' work for Bhagat.

Bhagat says that the legible/ traceable format of net planning does not centralize control with a civil engineer[22]. He says that even if he resigns from his job someone else can look at the detailed treatment plan and implement it. More importantly, this format is easy for a NABARD official to conduct monitoring inspections as the survey sheets, and Proforma 10 have references and locations. Bhagat says it is easy to cheat in watershed work. It is possible to take an officer to any plot and claim it is plot 'x' on the plan. But during net planning monitoring the inspecting officer walks to the field with survey sheets (that have the plot map and locators such as electricity poles to identify the plot) and Proforma 10 – so he knows which plot he is visiting and has the dimensions and costs of proposed and implemented treatments. NABARD monitoring is a lot stricter. If there is a deviation even by chance, inspectors demand that the cost be recovered from the farmer.

In gross planning, Bhagat would have implemented all the 20 RFCs that would have submitted in the summary report and blue print, but the locations may have been shifted due to negotiations with farmers at the time of implementation. Sometimes he would be forced to implement only 19 RFCs since he would not have been able to convince 1 farmer. He says 'this type of deviations becomes an administrative problem, not a technical problem or a social problem'. The State department will interpret this as 'the planning was not done properly'. This will become a black mark on the implementing NGO and sometimes the State will also ask the NGO to recover the funds for the 1 RFC – 'it is not as per the plan. Who has given you permission? This is public money.' Here the concern behind the control is that financial accountability for the funder, and Bhagat's practice are constrained by the political economy of funding. The concern about public funds is also about representing the people but the connections get lost – the connection between people, the state, and public funds, and the state department pulling up an NGO representative for deviations. Is it only in such a society with these severed connections that a database finds its real calling? If we maintained all the linkages would we need a database for planning? I raise these questions to answer them in layers in this chapter.

NABARD's spatial format is different than Ashok's interest in the spatial overview. Ashok's interest was to have a synoptic view, to see how land slopes and how water flows, and then in making legible the conceptual decision making for watershed treatments, as opposed to the financial legibility that NABARD was primarily interested in. Ashok lamented that the net planning format provided the best opportunity to make use of their plot map framework – the social grid, and they could

22 I argue that in practice, Bhagat or his equivalent cannot be replaced completely by this legible/traceable format. There is work that the expert and the format do together.

have taken their prototype places, but at that point they lost their geo-informatics person to a higher paying job in a geo-informatics firm in Dubai.

Balancing the Plan or Deviation from the Plan?

I return to the assemblage that makes and implements the plan. Net planning by NABARD brought new voices into the plan – voices of the funders who want to know where the funds are going, and voices of the farmers, so that the funders could put their money where the farmers wanted it. Can there by a direct correspondence between the funder’s voice and the farmer's voice? In this section, I once again return to the translators who are multiplying this connection between the funders and farmers.

Despite the nuances of net planning, Bhagat had to balance the plan. He explained that when they undertook their first NABARD project they had about 8 survey teams work in different parts of the watershed on net planning. His job was to monitor all the teams and the process. When he collected all the net planning survey forms and manually prepared the detailed treatment plan and costing he found that the total cost of the watershed was working out to more than twice the budget amount (Rs.1,20,00,000). The NABARD budget was only Rs. 50,00,000. He said its easy for the net planning teams to plan treatments as per the ground situation without thinking of the budget but his job of making it all fit within the budget is the tougher job. So he sat with the detailed treatment plan and a few of his experienced colleagues and began to device certain rules and limitations (either cutting down costs of structures or length/volume of structures). They worked backwards – 50 lakhs for 1000 ha – so roughly Rs.5000 per ha. They found that 120 cum (cubic meter) of earth work for 1 – 8 % slope was a good thumb rule. He also consulted other experienced NGOs who had worked with NABARD and State officers in order to corroborate this thumb rule. He says when you work with a team it is important to give every field staff this thumb rule and it is to be used more as a ceiling rule, not as a fixed rule.

Watershed design rules are thus intertwined with financial outlays. Bhagat says that wherever there are cost norms watershed there is always the need to balance your design based on watershed principles and financial thumb rules. This is inescapable. 'Nobody will give you whatever you list in the treatment plan. This is a wish list – grant it to me!' He added that he has learned this balancing act over the years. 'You will learn how to deal with it as you take on more projects. It comes out of necessity.'

I talked to Sukumar, a field staff with about ten years of experience in Jalaa's watershed programs. He said, “Bhagat has given us some thumb rules for private property planning - We know how many cubic meter of bunds have to be built per ha of private property. Based on this rule we sanction the bunds for the plots. This thumb rule is linked to the cost / ha sanction that is decided in the proposal stage of every watershed project. The treatments we propose do not always fall exactly under the sanction plan, but it is more or less so.” I ask whose job it is to reconcile the difference. He says that since they are told these thumb rules prior to visiting the plots for net planning, they do net planning keeping in mind the cost / ha figure. Net planning may dictate that we may go a little over or under the cost/ha, hence a 150 m may become a 250 m long bund. Suppose it is a small plot of 2 acres and we have

proposed a 250 m long bund, then we have to think about cost / ha. Similarly if it were a 10 acre plot and only a 100m long bund- we then have to think. So overall - we have to see that there are no large deviations. For this we have to do some balancing. Bhagat will come to know about how much balancing is required only in the last minute. But as a whole, if there is only 1 or 2 % over the fund sanction then it is not such a serious issues, and usually it is always like this. The deviation is never more than that. The plan is questionable only if there is a 50% deviation from the sanction. The reason for this is because we do the planning by visiting the plots - say for example, there is a 2 acre plot, and the slope is very steep, I will tell the farmer only 2 trenches can be allotted to your plot - that is the sanction and the farmer accepts. So there is no deviation. We get to understand the farmer's information, his name, his plot, his situation, what slope, what treatment, how long a bund, and also we know how the guideline for cost / ha. Cost / ha thumb rule is only for bunds and waste weirs, which comprise the bulk of private property treatments."

What emerges for me in tracing this assemblage of actors is not just who they are and what they do. What becomes apparent in this tracing is the nature of what strings them together in this assemblage – the nature of the relationships – each actor occupies a specific structural location with respect to the others, it is this relationship that simultaneously controls their actions and gives agency to their actions. For example, Bhagat is bound by funding guidelines and having to follow Ashok's mandate and execute the watershed plan. All the while the landscape and the movement of soil and moisture is giving him certain signals. He then makes some decisions to balance the voices all around him. The field staff too, do a similar job of balancing in their structural position. I now turn to Ashok's view of these processes.

'Deviation' in Planning

Whether it is gross planning or net planning, work still needs to happen between the planning formats and the land – the farm bunds, waste weirs, farm ponds, rubble field checks, and *naala* ponds (stream ponds) need to get constructed. Bhagat and his team of barefoot engineers, the field staff and selected male farmers, are the main players in this series of translations. Most of the structures, except masonry structures such as check dams or naala bunds, are built with on-site earth and stones or involve on-site excavation. Labor, which is the most important element, is organized from the village. The biggest burden the NGO field staff have to shoulder is managing labor and executing the construction of the structures. From the accounts of field staff this is a political process that requires a great deal of patience and diplomacy. Field staff have to negotiate between the farmer - the owner of the plot - laborers, terrain, soil, weather, watershed design principles and funds.

To me, these negotiations are an integral part of the plan and the planning process. When I initiated a conversation about these negotiations with Ashok and Bhagat, Bhagat like me thought that these negotiations were normal and quantified the deviations to be roughly 10%, with net planning having fewer deviations than gross planning. But Ashok had a very different opinion. To him these negotiations meant that there was something wrong with the planning process, and specifically that planning was not transparent and equitable.

According to Ashok GIS/spatial planning is relevant only till the plan is created, and all factors (such as equity) should be included in this stage. “Once the plan is made, then only monitoring is left, i.e. have the funds arrived? How much work is getting done? What stage of implementation? etc., If everybody has genuinely talked about the treatments and been a part of the process then why will there be negotiation or deviation. There may be 1 to 2 % deviation but certainly not 10%. If deviation occurs then it is not deviation, but it is grace in favor of Bhagat or the field staff who say ' I am doing this because I am the organizer, I have some power and so will use that power on the ground.' The farmer might say 'I want it here, I don't want it there' and staff may give in to some of the pressure from the farmer. But this for me comes from an absence of participation in all the stages of planning. It also means that we may have not adequately addressed the social processes in a project such that farmers who agree to a treatment stick to their decision.” Hence Ashok, from his position within Jalaa, thinks of this balancing that Bhagat and field staff do, as deviations in planning.

Why does Ashok not want to acknowledge the different actors and the many movements in implementation? He is not able to acknowledge the relations that hold the farmers, field staff and the plan together. The farmers may need time to think about whether they want a farm pond or not. The farm pond is not an established structure of this landscape. It is something that has been introduced by watershed programs. The only information they get about this structure is from the field staff and Bhagat, and they have to toss it around in their heads and in the political economy of their plot and decide if the farm pond and its effects is appropriate for their plot. We know by now how Bhagat makes his plan. He takes time to weigh decisions and their implications. Field staff too have their set of considerations. But Ashok does not see all these considerations. He seems more interested in an abstract idea of 'participation', rather than the practice of it. This abstract idea of participation is also entwined with Jalaa's fiscal health and survival.

Web based GIS and Video Game GIS

This discussion on deviations is also relevant because it explains part of Ashok's interest in keeping the GIS prototype alive in the organization. The most recent form he has begun work on, just as I was wrapping up field work, is a web based planning GIS, through which Ashok envisaged a non-dependence on experts so that there would less deviation. I would like to point out here that Ashok's motivations for the web based GIS are also based on his frustrations with retaining staff – another typical issue in the political economy of NGOs. Moreover, by the mid 2000s Indian NGOs were witnessing a leaner funding environment. Ashok explains his interest in a web-based GIS as follows: "the basic idea is that you don't need to wait for a geo-informatics person to generate your maps. All you would need to do is to log onto the web and generate your maps. At one point we were also thinking of having an online digitizing tool where someone could scan a revenue map and draw over it. Then this need for Autocad software and outsourcing digitizing is also not required. So, technically we could allow anybody anywhere to come up with any of the maps. All s/he has to do is to go to our website, download survey formats, go to the field and collect the data, then upload the survey formats and presto all the maps can be generated. Actually if we were to do all this, then we would also be able to execute the video game dashboard scenario, where farmers and planners could sit together in

the village square and visualise the before and after situation of a particular proposed treatment."

Ashok says that the Indian Government spends Rs.1000,00,00,000 on watershed development. At the approximate rate of Rs. 50,00,000 per watershed, this amounts to funds for 200 watersheds. Ashok hypothesizes that if he approaches the Watershed Department with his video game information system and proposed a cost of Rs 5-10 per map (the prototype comprises a suite of 20 maps) he would charge Rs 500 – 1000 for each watershed. "All we need to do is digitize the plot map for each watershed and convert it into a shape file which we could then charge Rs. 500 or 1000 per watershed. The moment we make a shape file it will automatically give you plot numbers. Then the user can actually click and select for which plots s/he wants to print out survey forms. Infact we are also looking at an Optical Mark Recognition (OMR) technology for survey forms to make the process easier.

"In net planning the process requires that a field staff sit with the farmer and do a priority listing of what the farmer wants. The farmers usually want everything possible! Then it is the field staff's responsibility to negotiate with the farmer and say 'we have only so much money, so you have to pick and choose what you want.' But If you do this process with our web-based video game logic then every time you key in a treatment request your software will show you the outcome of that request based on some rules we would have fed in, for example, if you have the budget for it, or how if the location is suitable, or what the downstream effects will be. Similarly, if you remove a treatment, then the software will show you the results. In this way, the farmers get to sign off on the planning." Ashok is exuberant at the end of our conversation: "I would love to sit down on the ground with farmers and project this whole thing on a village wall with a LCD projector. I think we would have great fun doing this! Just think of it as a video game! Everybody is sitting together and making the decisions. Issues of equity would be answered, issues of 'Lands at Risk' have been answered, drainage, Dry Land Horticulture, everything."

Funding

In the decade following the creation of the prototype, the NGO continued to generate the prototype for every watershed project they implemented. All funders allowed a budget line (or line item) for 'reporting'. These funds were used to create the spatial database. Over the years this prototype acquired a reputation of an income generation tool amongst the NGO staff. Funds saved from the 'reporting' budget line were ploughed into the overheads pool of the institution and helped ease administrative costs of the NGO. This practice, among other features of the NGO, allowed the NGO sovereign space and did not make for mere implementation of ideologies of funding agencies. It also shows Ashok made use of certain normalised spaces of NGO practices (reporting as a necessary part of NGO reproduction) in order to critically explore those very practices.

Also, in every watershed project irrespective of whether the funders / guidelines called for using spatial tools for planning, Ashok would always take the opportunity to make a presentation of the prototype in the interest of influencing funders to propagate this type of planning. The team, and particularly Ashok, was constantly engaged in tinkering the prototype in every new project to frame it in a

manner that made sense to themselves as development practitioners, and also wanted to engage other organizations (State and non-state) in the rural development sector in the use of the prototype. I found that both practices (of making it work within the NGO and 'selling' it as a planning tool to other organizations) were inextricable. I find that this is representative of the space that a NGO occupies in the development landscape in India. The very act of inception of an NGO and the precarious political economic space that it functions within the development landscape requires this constant work along with doing work on the ground.

As the previous sections in this chapter have demonstrated, I find that this constant reworking is not merely to keep the NGO afloat. And because it isn't just this, Jalaa's history of working with these tools allows openings to understand meanings of technology and development in a way that matters for a political practice for all mediators concerned. The following section is an example of the reflexivity of the organization. Ashok, as the key figure in Jalaa is also the most adept in taking a set of ideas and practices, and packaging them in order to empower farmers, and to solidify Jalaa's standing in the non profit sector. I argue that it is not possible to tease apart these two practices of defining the meaning and materiality of this socio-technical phenomenon.

Trench cum Bund: Do they need a plan?

About the time that Ashok began to think of a web based GIS, he and Bhagat also experimented with a watershed design concept that they called 'Trench cum Bund' (TcB). TcB represents a shift from the design of a watershed that is 'reach'-based (upper, middle, and lower) and comprises layers / tiers of structures with different sizes and functions, to one simple prescription for every farmer's plot - a trench cum bund which serves the combined functions of soil conservation, increase in soil moisture, and compost pit. Why move from a complex decision making process and design to a simple 'one-fits-all' design of a trench cum bund in every farmer's plot?

In the course of their experience with implementing State funded watershed projects they found that by the time you implement the scheme a significant percentage (nearly 40-60%) of the government funds don't really reach the intended cause due to corruption. They argue that in this political economy the structures that are eventually constructed are only a shadow of what they are supposed to be. The problem with government funding is that on the one hand implementing NGOs have to adhere to the norms which dictate an elaborate design of watershed structures of different types and functions, while on the other hand you have to work with a corrupt system. Tied into this type of design is the State agenda of showcasing the watershed paradigm - typically government watershed schemes gives grants for only 500 ha in one region since it intended to be an example for the region. Given this, once funds are given for one project they will not fund another project in the same area for many years to come. So there is no concept of comprehensive treatment which is vital in watersheds (i.e. upstream and downstream connections), not to mention the above point of poor quality structures.

When NABARD was instituted, Ashok was optimistic that they could influence NABARD with their findings and argue for a new framework. However

NABARD which first started with a grant model to implementing agencies shifted to a loan model and also got mired in debates about who the money should be routed through for implementation – whether it should it be the gram panchayat (local village level governing bodies) or civil society organizations and so forth. Jalaa became frustrated with the situation. Their lament became, 'If a Rs 200,00,00,000 institution such as NABARD is not able to bring about change what can an NGO achieve?'

So they proposed the concept of TcB - where just one structure is built on everyone's plots and instead of relying on external funding the costs for this one simple structure would be met through farmers micro credit (Jalaa also runs micro credit institutions in the area). It is also a single-point simple technology which Ashok and Bhagat feel all farmers can relate to and thereby be convinced to take the initiative of applying for a micro credit loan. Although Bhagat felt that the programmatic aspects of this framework are practical he is not entirely convinced it replaces the functions of the more established reach-wise design principles of watershed. They are also not entirely convinced that farmers will be willing to take loans for TcBs given the recent history of farmers' suicides in the country.

When they presented this idea to other NGO partners who are active participants in the watershed sector in India, their idea was dismissed. The major arguments were that when government funds are available civil society organizations should take an active role in channelizing those funds for watershed work. Secondly, if a complex idea such as watersheds is presented in a simplistic manner to the government, there is space for misinterpretation - it may be co-opted for further mismanagement.

The NGO has not really implemented TcB as a program given all these debates. However, I find it has a place in this discussion because of the potential openings it provides to understand the NGO's practices of 'governing' itself. Ashok explained to me: "So our evolution is that from all those things we came down to one thing - the TcB - and the reality of it is that watershed which was really the core business of all our GIS work, is now reduced to one thing for which we don't really need GIS! But it is not a critique of GIS. First we tried it out as a watershed planning tool, then as a credit inventory tool, and we tried to look at it for so many other of our own needs. Now with TcB we don't need the setup we created - how do we retain everybody in Jalaa? All we need is our civil engineer to give one training sessions to the farmers, people have to be convinced and then we bring in an earth excavating machine and make the TcB - it will cost about Rs.400 per acre - its been brought down to this level - so simple and strong and we think it is a good solution. The implications of this, is that you can now implement an entire watershed program (for an area of 500 ha) for just Rs. 6,00,000. Interestingly, with a watershed project budgeted at Rs 6,00,000 it would not seem attractive to an NGO. It is not viable for us. It will only meet the cost of an organizer, not our institutional costs. We can't afford to have a watershed team. So we have come to a point where we have to suspend the need for a GIS as a planning tool, and if the TcB is working at a farmers' sustenance level, which is really the only thing you can guarantee, then you do that at a cost where it is not even viable for an NGO to do it!" Bhagat and the field staff are indispensable so long as the spatial database is defined within a context of 'needing to plan' and where the plan is created by planners.

In their most recent model, the NGO (which continues to exist) has spun off a business enterprise with a development agenda, which provides GIS services to other clients, i.e. they are now experimenting with selling their GIS-based watershed plan to other users. They claim that with this model for the first time they can say 'this is the data, take it, you are the client and you do what you want with it'. They feel relieved that they do not have to deal with the messiness of implementation anymore. In this manner, they could even become a service provider to the gram panchayat. They feel that they are more comfortable in this role - it is like providing infrastructure where there is a role for it. 'We won't be going to the farmers anymore because we know they can't pay for it. Instead we will go to those who work with farmers who have a need for this'. This also means they don't get tied to a specific region. They say, 'It is putting in a telephone connection - then we can charge just for the usage, and not the application itself.' Ashok realized it is not viable to represent farmers directly. This last idea of his demonstrates that he thinks it is more viable to represent farmers by providing a service to those who represent farmers, i.e. the gram panchayat or local government! He is moving another step farther – introducing one more actor in the network, and widening the hybrids in between, but unable to see the mediators between him and the farmers.

Discussion

My theoretical framework positioned me to ask a wide question – how is knowledge produced and spatial technology based development practiced? This wide framing allowed me to step back from predetermined ways of conceptualizing actors, and pay attention to the translations in their daily practices of knowledge production. In applying this robust spatial framework, one of the most significant findings for me is the continuous movement in the manner in which Jalaa packaged the technologies in rural development planning. Fujimura sets out that '(a) package of theory and technology is a clearly defined set of conventions for action that helps reduce reliance on discretion and trial-and-error procedures.' (Fujimura, 1988: 261) While Fujimura's case looks at conceptual models in cancer research, Ashok in Jalaa is looking at packaging the most stable package of spatial technology based development planning. Ashok, the Director in Jalaa emerges as a strong actor in the translations that I have captured in this chapter. Attention to his practices particularly, reveals two things that offer more complexity to arguments that we encounter in the literature on spatial technology applications in the natural resources management field, such as what I have reviewed in Chapter 2.

Unlike Robbins and Maddock, and Hoeschele's arguments about the Indian Forest Department, or Turner's arguments about the elite environmental research community in Sub-Saharan Africa, all of whom dirty their hands in employing spatial technologies to represent landscape and its people, in the case of Jalaa, it becomes difficult to fix Ashok's instrumentality (Hoeschele 2000; Robbins & Maddock 2000; Turner 2003). Robbins argues, "One of the strongest lessons from environmental history is that the power to define the environment is often the power to control it." (Robbins 2003) In the case of Jalaa, they keep altering their definition of how they want to control the environment. This is what I find different about Jalaa's case. Ashok's proximity to the actors and objects he wants to represent provides one revolutionary glimpse about the techno-social phenomenon I set out to understand in this dissertation. His proximity to these actors differentiates him as someone who did

not jump on the spatial technology 'bandwagon'[23] as packaged by the Indian Space Research Organization (ISRO). While the heavy engineering to build and launch remote sensing satellites in ISRO combined with the shallow land use models they propagated left me perplexed as I describe in Chapter 1, Jalaa's work with a range of actors showed me how a landscape of scarcity can be represented in some complexity by giving agency to its many constituents. A deep database was created not out of heavy engineering or an obsession for accuracy, but out of proximity to its constituents and an understanding of spatial relationships as they are continuously produced in a landscape[24]. Another fact that was refreshing for me during my time in Jalaa's GIS lab was the team's acceptance of the idea of imperfection. Harley makes the critical point that we must read maps as representations and pay attention to the silences and alternative readings rather than take maps to be reality (Harley 1989). I argue that the lack of an obsession with accuracy amongst Jalaa staff is because they are so used to an environment of negotiation which arises from an awareness of relationships.

I also take this point about awareness of relationships a step further to address debates about participatory planning. While there are critiques of Participatory Rural Appraisal (PRA) techniques as disciplinary tools of development (Mosse 2005) my theoretical framework combined with the specificities of Jalaa's practice demonstrate that the socio-technical relationships that make possible a deep database are 'participatory' beyond the strategies typical of disciplinary participation, i.e. farmers sitting together in a circle with NGO staff and providing inputs about themselves to fit into a predetermined framework – traces of which I see in both Hoeschele's 'intimate sensing' and Robbins' and Maddock's 'local' classification of forests used to counter 'Forest Department's' classifications of forests (see Chapter 2 for details) (Hoeschele 2000; Robbins & Maddock 2000). In other words, I argue that representing others can be politically enabling even if the represented are not physically involved as in PRA processes, so long as the process of representation is dialectical, in the Latourian sense – that every stage in representation allows movement to be traced both ways - “The succession of stages must be traceable, allowing for travel in both directions. If the chain is interrupted at any point, it ceases to transport truth – ceases, that is, to produce, to construct, to trace, and to conduct it” (Latour 1999, 69). Dialectical representation also cannot be reduced to the tool, or the user. It comes together and allows for participation in the particular assemblage and in the relationships, for example – in Bhagat and his gradual internalization of the Households-at-Risk model (refer to p.12 in this chapter). I argue that in our eagerness to bring in 'local' people and their 'local' categories we must not be blind to the participatory possibilities of dialectical representation.

While I argue the movement in models / packages in Jalaa is a political act, particularly vis a vis the Indian State's manner of packaging these technologies, I do not intend to reify the position and practice of Jalaa. The movement is also because of the political economic difficulties that Ashok encounters and struggles to control as a Director of a non-profit organization – limited access to funds, high turnover of staff, cost of technology, negotiating political alliances in the NGO-funding sector, and the

23 “A scientific bandwagon exists when large numbers of people, laboratories, and organizations commit their resources to one approach to a problem” (Fujimura 1988, 261)

24 Here I refer to elements of Jalaa's database design such as the indicative plot map, plot-household relationship, Households-at-Risk, and Lands-at-Risk, as discussed in earlier sections of this chapter.

marginal semi-arid environment he has chosen to set up his NGO. While other literature because of its predeterminations showcases organizations as freezing packages with certain erasures, my framework follows movements in the packaging. What do we learn from this movement? We learn that there is nothing inherently reductive about these technologies, and that when we look at the relationships which tie up various objects and actors it is possible to catch glimpses of revolutionizing representations of the world we live in. These glimpses come from our capacity to see contradictions that do not cohere (Latour 1991).

The movement occurs because Ashok is able to see the relationships that holds things together. It is for this reason that his instrumentality cannot be neatly fixed unlike others studies such as those by Hoeschele or Robbins (Hoeschele 2000; Robbins 2000). It is also for this reason that my project unlike David Mosse is not about demonstrating how actual workings of development do not follow policy, and how success of development projects is constructed through policy devices (Mosse 2005). Instead, as mentioned above, my objective was to follow actors and their articulations. And the objective of people in Jalaa was to follow how to represent themselves, and represent actors in the landscape such as farmers, soil, and water. My research also serves to complicate the dominant theories in development which argue that development agencies are vested in constructing backwardness and doing little to change it, in order to preserve themselves and / or depoliticize development (Bebbington 2004; Ferguson 1994; Kothari 1986; Li 2007). In the case of Jalaa, development professionals are acutely aware of the complexity that farmers in dry lands have to negotiate in their daily lives, and are also in many ways precariously balances in a development landscape. This presents a more complex view of the reproduction of development, the ambiguities in Jalaa's practice given the space of alterity they occupy in the NGO political economy, and also demonstrates that actors are acutely aware of their political projects.

Fujimura, using Callon and Latour argues that 'a major strategy used by scientists in fact-making is to translate others' interests into their own interests. More generally, translation is the mechanism by which certain entities gain control over the way society and nature are organized, by which “a few obtain the right to express and to represent the many silent actors of the social and natural worlds they have mobilized” (Callon, 1985: 224)” (Fujimura 1988, 263).[25] Ashok, used these technologies and his long understanding of this landscape and its people to craft a techno-development package which he can propagate. He used the technological packages to sort out power in his organization and in the landscape. His proximity to the landscape and its people made him realize that he can't control farmers' decisions because he can't control rain. So he decides to control soil and water – the foundations of agriculture. In controlling these foundations he realizes he can't control the experts who represent these landscape elements. He wanted to control Bhagat's agency and those of other experts in the name of speaking for the farmers. In so doing, he wanted to speak for himself too – represent himself as a development professional who has cracked the code for speaking for farmers in a semi-arid landscape. So he wanted to dismiss with the experts and go back to the basics of a simple bund. In going back to the basics he realized he can't sustain Jalaa and its staff because the basics do not need Jalaa's infrastructure. To circulate in the watershed development sector however, one

25 This insight, a fundamental contribution of STS approaches, is also highlighted in Edwards et al, 2009.

needs an infrastructure! For example, the response he received from other NGOs in the watershed development sector in India, for the Trench-cum-Bund idea – his leanest package which was stripped off as many actors as possible, was as follows: 'It would be a naïve move given the Indian State's current emphasis on funding for dry lands and watershed development. It would push the State to absolve its responsibility towards these underdeveloped areas of the country.'

This response left Ashok disappointed and urged him to move on to his next package of an information infrastructure for local government offices. While he carries on with new ideas for packaging, I as a student of rural development part ways with a few valuable insights from the many movements I noticed in Jalaa: I studied a space in which contradictions do not cohere (Latour 1991), and in which packages do not move a great distance in space and time without contestations and negotiations from different regional modernities (Sivaramakrishnan & Agrawal 2003). Technology and development are very alive in their relationships, and the idea of the Trench-cum-Bund represents a conjunctural moment in Jalaa's history - a revolutionary moment made possible by Ashok's attention to the relationships that hold things together, which challenged Jalaa's existence. That this moment was acknowledged by Jalaa and Ashok, demands attention from those of us who attempt to understand the workings of development.

Chapter 5

Tracing the GIS: Watershed Implementation

Chapter 4 concluded with the idea of the Trench cum Bund (TcB). TcB was the culmination of Ashok's continual efforts to use GIS and the GIS-based plan to represent Jalaa and the farmers. In this chapter I continue my exploration of how knowledge is produced and rural development practiced using spatial technologies, by tracing the materiality of the GIS and the GIS-based plan. In other words, while Chapter 4 demonstrates movement in planning models due to an awareness of the relationships that holds actors together, this chapter dwells more on the materiality of the relationships.

During the course of my field work in Jalaa I was searching for the GIS and the GIS-based plan. Where were these 'things' that Ashok was talking about? I began by searching for legible traces of these translations. But I found in practice that even with net implementation of the net plan, the most legible of the planning models, there was no reliance on a GIS in the mainstream sense, for example - proprietary GIS software, or even - at a more fundamental level - maps. Instead the making and implementation of the plan took place through highly contextual, dynamic, and fluid relationships mediated by field staff, the traces of which were not always legible. In searching for the GIS, I am specifically influenced by the work of Harvey & Chrisman who argue that in response to the dichotomies of the GIS debates and the idea of a 'universal toolkit' GIS, that 'locally contingent and complex social forces make a different GIS every time.' (Harvey & Chrisman 1988, 1683)

In tracing these relationships I also include an analysis of other objects that mediated planning. In this I am strongly influenced by Latour's view of the 'constitution,' which comprises the web of human and non-human actors who are held together by 'a political constitution of truth', which is not dissimilar to what Foucault termed 'the political economy of truth'. (Latour 1991, 13) Latour argues that when we study 'science in the making', the old dichotomy of scientists studying non-humans and social scientists studying humans, begins to unravel (Latour 1991, 9). In this chapter I make a very simple point, well established in sociology of science - I found that it was this 'constitution' that held the GIS together and ensured that 'a watershed' materialize in the landscape. In the conclusion, I will tease out the implications of this simple point for watershed development and rural development in the Indian context.

The content of this chapter also extends the point I make in the conclusion of the previous chapter: The Jalaa GIS team's acceptance of the idea of imperfection. Harley makes the critical point that we must read maps as representations and pay attention to the silences and alternative readings rather than take maps to be reality (Harley 1989). I argue that the lack of an obsession with accuracy amongst Jalaa staff is because they are so used to an environment of negotiation which arises from an awareness of relationships.

The second argument I wish to make in analyzing the materiality of the relationships that hold the GIS plan together is that my focus on relationships, which

in turn arise from my framing of deep spatiality, moves beyond the dichotomies of representation and reality, between the plan and implementation which permeate the post structural critiques of development (Ferguson 1994; Li 2007). The space between all the actors and objects in the process of planning and implementation, or in other words the relationships that hold them together, are being continuously produced and negotiated – and therein lies the political reproduction of development.

From Surveys to the Spreadsheet

As mentioned in Chapter 5, the technology of net planning is aimed at including the owner of the plot in the decision making of the watershed treatments. Field staff conduct the net planning surveys and enter the net planning data into MS Excel worksheets. During net planning, locations of treatments are decided based on watershed design principles and budget allocations. Net planning survey sheet forms (in paper format) exist for each and every plot. Adjustments are made in the MS Excel sheets as explained by Sukumar (refer to Chapter 4). I realized that the Excel sheet is the plan and the budget. No other GIS or database software was used. The budget is prepared in volume (cubic meters) of treatments. Field staff are then in charge of constructing the structures on the farmers' plots and in common property areas.

Watershed development programs have devised social technologies such as village level institutions in order to 'ensure' participation of the beneficiaries. In this project a registered society called the Village Development Society (VDS) was set up in each village to oversee implementation and manage funds. In the VDS meetings Jalaa staff orient the farmers on watershed design and specifically explain the importance of constructing all the structures. Sukumar explained, "We tell them that for 1000 ha to become a watershed all the planned structures have to be constructed. We cannot miss out on any of the structures. In this manner we create awareness among the VDS members and the various user groups. But often times at these initial meetings things are rather fresh to the farmers and they may have less capacity to understand what we are saying. This is why working through labor gangs helps us convince the farmers at the time of implementation. Also the farmers are more likely to accept when they hear it from one amongst them."

Another field staff, Babu added that all farmers had to okay the watershed plan and budget before construction begins. Babu felt that these village level meetings are good public fora to present the plan for the entire watershed and to debate and make collective decisions. He recounted that there were many instances where farmers have questioned what they have perceived as a lack of treatment on their plots. Some other farmers have voiced their opposition to treatments planned on their plots. Suppose it is rainy season and rains are good, farmers will ask that they postpone the construction of watershed treatments as they want to tend their plots. Babu said that there was good attendance during the second phase of the watershed project. Once all the actors at this meeting take a decision, the VDS passes a proposal. Then a J*alanayana Anushtaana mathu Nirvahana Samiti* (Watershed Planning and Development Meeting) is held at Jalaa at the project level. Here it is decided if the amount that comes from the funder can be passed by Jalaa to the VDS. At this meeting there will be Members from the funding agency, Jalaa and the VDS. Review meetings were also carried out once in six months.

This project relied on another institution called People's Technical Resource Group (PTRG) which comprised of five members in each village who were trained by Bhagat in the design principles of watershed development. These members would be on the field to guide and monitor implementation on a daily basis. They were selected by all the farmers in each village on the basis of their knowledge and strengths. For example, a person who knows all the plots and survey numbers in a village was be chosen. Typically every village has a few of these people who are called upon to settle boundary disputes and such. Babu said that PTRG members were invaluable during the net planning surveys since they know the landscape. Since Bhagat trained them before net planning began they were also able to suggest good locations for the watershed treatments. If the plot owner was not on the field during staffs' net planning visits, PTRG members would more than fill in with the contextual information about each plot. During implementation sometimes mistakes were made about siting treatments and PTRG members were able to solve such mistakes.

Construction of watershed treatment structures, such as trench cum bunds and farm ponds, are done by farmers from the project villages. Based on the presentation of the watershed plan in the village meetings, the VDS and PTRG members will make rough calculations about required labor and begin recruitments. Farmers organize themselves in labor gangs which are managed by supervisors. The labor gang supervisors are told how many trenches to cut (to build farm bunds) and where, and how much labor should be used. Sukumar explained, "In a village, there will be about 100 to 150 people willing to work. But it is difficult to give work to all of them at the same time. We are one or two staff per village so it is really difficult to manage so much labor. So we ask the supervisors to form groups of about 30 or 50 people. We should have labor who can do different things – people who are masons, those who can cut farm ponds, those who can plant saplings, etc., A group of people who can cut farm ponds would come and request us just for farm pond construction works. Depending on the size of the gang we assign a specific number of plots and treatments per plot. When the farm pond gang is formed, we will give a list of the farm pond locations to the supervisor and tell him 'these are the locations, and this is the contribution amounts[26] that each of the plot owners have to pay: Rs. 1670, Rs. 2000, etc., so see if they pay, and organize the labor and start the work - it is your responsibility.' So there is an element of the gang leader putting some pressure to motivate the plot owner, and if the plot owner is motivated to give his contribution, then there is work for everyone and the work begins. When the plot owner agrees the gang leader will come and inform us and work will begin."

Sukumar said to me "watershed work is not about doing magic, it is all based on process, and these structures that are built are really the product of a long range of social processes." This is also related to the fact that watershed work is commonly viewed as employment generation work amongst the 'beneficiaries'. It is because of this perception that there is so much negotiation that has to happen to ensure the 'construction' of 'a watershed'. The staff may refer to the excel sheet which is also a spatial format, but there is no real use of a GIS or a spatial decision making system in a digital format.

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26 Farmers are required by the program to pay a contribution towards the watershed structures that are to be implemented on their plots. This is meant to create a sense of ownership. Contribution can be in terms of labor or money.

“Magic ?” - A labor gang at work

I learned from the field staff that sometimes farmers would make adjustments and deals amongst themselves. If the plot owner is not ready to pay his / her contribution (most often s/he doesn’t have the money at that time) then the supervisor will pay for him just so that the work can begin, and he will collect the amount from plot owner later. Similarly if a farmer is away and his plot has been selected for a farm pond, then a brother will pay the contribution so that the work can begin on his land. Most often contribution is in the form of labor. The labor gangs are given a sense of how much work there is and how many months they can expect employment. The labor gangs have to work with the plot owners. In the hilly areas, there is less of a problem for field staff as it is mostly government land. But when it comes to the private property all staff mentioned that it is more complicated for them because the farmers tend to indulge in a lot of 'annoying prattle'.

Sukumar narrated some examples of the daily complications that field staff would face. “If the farmer disagrees with a treatment on his plot there is a problem. Then the labor come to the field staff and tell us there is a problem where we planned a particular farm pond. We then tell the labor to bring the farmer to us for a discussion. So we hope that the problem is first sorted out by the labor, or the PTRG, and if not, then we intervene. We tell the farmer, 'See, we have planned farm ponds in eight to ten plots in the entire watershed. Our intention is not to create a loss for your plot. Our intention is to improve things for you. You will be able to harvest water, you will be able to harvest silt, you can diversify to dry land horticulture in order to make use of increase in soil moisture, etc., and in the future you will thank us, so please

consider this.' If it is a big landholding of 10 to 15 acres the farmer usually agrees, but if it is a small landholding of only 1 - 2 acres, then the chances of him agreeing are less because the amount of land he will lose to a 30 x 30 farm pond would mean a significant reduction in his cultivable area. Even if the farmer has another plot of larger size he would still feel the pinch with a farm pond in his smaller plot, because the location of a farm pond is in a low lying part with a significant catchment area of runoff and so the farmer already knows he is harvesting good silt and moisture there, and his agricultural yield is high. The high yield from this small patch would often equal the yield of his larger plot. So the farmer would sometimes try to trade the farm pond location with his larger plot. Such conflicts over farm pond locations are common because the locations are most often near the outlets of watersheds which are prime areas for farmers where they grow crops such as wheat and paddy." So the field staff understand the farmer's situation and suggest a trench cum bund instead. But there have also been situations when farmers willingly come and ask for a farm pond in their plots, even if it is not part of the watershed plan.

Sukumar says that despite this knowledge of farmers' preference or lack of it for farm ponds, the watershed plan does not exclude farm ponds from small landholdings because the plan is based on landscape principles, i.e. according to 'watershed criteria'. "Then in the implementation things may change according to the farmers' willingness and then we deal with it". Field staff told me that there are rarely any conflicts over locations of bunds. There may be conflicts only over farmer contribution. Farmers know the bund technology and typically s/he is not going to worry about 10' x 10' of land, as opposed to the 30' x 30' for farm ponds. This illustrates that on the one hand they separate the landscape principle from the politics on the field, and on the other hand, in practice, they actually integrate and balance the two realms. This is an important point to hold on to. As I have shown in Chapter 4 , Bhagat in his planning also does not make legible this integration. Instead he said that he gradually internalized many insights from the deep database. This again substantiates the point that we need to view the work of the plan/database as a techno-social relationship, instead of looking at it in isolation.

In looking for legible traces from the plan to the field I asked Sukumar, "So at any time, do you give the labor gang leader any sort of paper with the plan of structures or list of structures? Without answering my question directly Sukumar says, "we give a plan to the supervisor, because it is his responsibility. If less or more work is done in terms of the dimensions of the structures then we will question him. I ask again, "So is there a list in his hand? Which plots, and number and type of structures per plot?" Then Sukumar says, "Yes, there is a list. I tell the gang leader you will have to cut only 10 trenches in this plot. In case there is a need for more, or the plot owner requests more, you must inform me when I do my field visits in the morning. So when I visit the field we have conversations about possible modifications to the proposed plan. I make some adjustments. For example, if the plot owner says one more trench is required I will ask them to cut half a trench to make half a bund and when we build a waste weir we may get some extra mud which I will ask them to use for the remaining half bund." I ask Sukumar how he will keep track of such changes as it has implications for the budget. He says, "I would have given each supervisor a strict list. So even if he goes beyond a little I will question him. I will say - 'I am the one in charge and how can you listen to the farmers and the laborers, you are accountable to me, labor has to listen to you, not you to the labor. The guy who marks the trench is

you, the guy who oversees everything is you, then how come you are showing me this change?' This is the way we will talk to the supervisor. So if there is that half trench difference, we will tell them to fill up the rest half with the waste weir mud. That extra half trench will not make a difference to the budget." There is no legible trace of this negotiation or that the field staff is in charge of implementation.

Travails of Labor Gang Leaders

Typically PTRG members just collect labor, make groups and keep doing the work and moving on. But sometimes PTRG members could be strong or could be weak, some may not be interested to lock horns with labor and deal with all those problems, so they will tell field staff to find other people to do the supervising work. Field staff told me that if one takes on this kind of work in the village, it is highly possible that his name will get tarnished. Sukumar explained, "For example, if we tell the gang leader the dimensions of the trench, he has to follow that to the 't', and so he has to be tough and firm with labor. He will have to manage disagreements. And everyday he has to see all their faces. It is not an easy job to be a PTRG member or supervisor. On the one hand he has to face labor, and on the other hand he has to face us field staff. I have seen many instances. We may have suggested the position of trenches, and the laborers may have said they can't dig there. The supervisor may suggest easy locations to his relatives and tough locations with hard, rocky soil to the others. The labor will notice this and oppose this. These kind of experiences are also part of the game. Farmers will also weigh their options depending on the nature of the gang supervisor, before they join a particular gang.

"If the supervisor makes a small mistake the labor will oppose him when we come for meetings or at the time of making payments. Labor observe everything that goes on. Satisfying everyone and going along with all the labor is not an easy task to do, its a big headache. We have entrusted him with a gang of 50 laborers and given him a register with everyone's name. He has to be able to give work for those 50 people, and only if the owner of the plot gives contribution, can he start giving work to the labor. If he is not on the job, the labor will start accusing him of incompetence and ask for him to be changed. So the pressure will be on the supervisor to set up 4 - 5 plots at a time to give work to labor. There is a lot of pressure on the PTRG members that finally it comes to a point where they wonder if they should live in the village or leave the village! None of the members knows what to expect in the beginning. As time goes on and these processes take shape people begin to understand how things pan out."

I was curious why, when farmers had a rich, continuous history of bunding, there were problems on the field during implementation of programmatic watershed structures. Madhaviah said, "When farmers come as labor to dig trenches and build bunds in public works programs, they come only as labor. It does not matter if as farmers they have full knowledge of where to build bunds, and how to build bunds. It is the project's job to tell them where to cut trenches, not the labor's job. So they work only as labor, and that too only if you pay them. So the project staff have to always supervise them. Sometimes if amongst the labor, they are some people who are very knowledgeable they may say – 'this location is not the best, let's shift it here and such, but then it depends on each one's personality – there are also some wily people who will also say 'its not my problem, let me just do the work that I am getting paid for'.

There are some farmers who have might have served in Jalaa positions and know the dimensions of good bunds - 5 ft wide, 20 ft long and 3ft deep – but even they are apathetic sometimes. So it is difficult to say – it depends on each farmer's personality and we have to work with all types of people.”

Note how the 1000 ha of the watershed is first captured in survey sheets, put into a spreadsheet, and then made into a plan. This plan, in order to be implemented on the landscape over 1000 ha and in order to create a 'watershed', then requires the work of many groups of people and devices – Bhagat, survey formats, the field staff, bill book, payment muster, the VDS, the PTRG group, labor leaders, and labor gangs – all organized or held together by different inter-locking rationalities such as the objective of the C.H.Hanumantha Rao report on watershed development, the focus of the nation-state to increase the productivity of dry lands through soil and moisture conservation efforts, the need to create a sense of ownership amongst farmers, the NGO's need to legitimize its presence in the landscape, farmers requirements for labor, and the list goes on. Each of these inter-locking rationalities have a very local meaning, and they work together in concert. A strong case in point is the struggles over labor and payments amongst farmers who have historically built bunds on their lands. The meanings of what holds them together with their landscape is totally different when they go to the fields to do watershed labor.

Recording and Payment Devices

As the ratio of field staff to land area to be ordered under the watershed plan is very small, people like Sukumar had to rely on a few recording and payment devices to get their job done. While talking about the process of field translations field staff often referred to the measurement book, bill book and payment muster. I learned that these were two devices that made part of the process legible. Babu is a field staff who because of his interest in journalism had cultivated an interest in collecting documents related to his work. He sat with me one afternoon to discuss these devices. He said recording during watershed implementation involved making daily notes of how many labor teams in total were working on the field, how many laborers showed up for work, how many laborers worked on each treatment, and recording the progress of work per treatment per individual plot. Each day's recordings would help them plan work for the next day. They would have a budget copy or plan (the MS Excel sheet) the format of which is: plot number, area of plot, length of proposed bunds, and volume (cubic meter) of proposed bunds, and similarly for other treatments planned in that plot. The staff have to refer to the budget copy on the previous day and inform the selected plot owners that they will be coming to their plot the next day to commence work. So if the farmers need to prepare their plot, weed, or so on they should do so. The budget stipulated a specific volume of bunding work, so it is crucial for field staff to refer to this before work commences. If they make mistakes they could end up sanctioning more work with labor and overshooting the budget.

The field staff provide information about payments to labor. The labor payments are typically weekly or biweekly and are disbursed a day before market day. There is a budget for each structure, and supervisors and field staff keep a record of how many laborers and how much time each labor participated in the construction of a specific treatment. Based on this record the amount budgeted for a treatment is divided amongst the labor. Farmers can shift from one gang to another, and there are

disparities amongst farmers in terms of their earnings from the watershed projects because there are some who seek more work, and some who push themselves to work more than others. The work is also on a piece basis, and not on a daily wage basis – once a specific structure is assigned to a group they can take however long they want to complete it. Piece basis depends on their efforts. Were it daily wages they would stretch out their work say field staff. Staff and the supervisor provide the labor with dimensions of the structure to be constructed as per the Excel sheet plan and they will take measurements once the work is done, which is recorded in a measurement book and then used for calculation of weekly payments.

Staff are on the field every day to check specifications of the structures such as the dimensions of the bund and dressing of the top of the bund. If there is a third person at the time of measurement it is useful. Staff told me that if it is just villagers, then there will be conflicts. Managing people was tough in the beginning. All staff said that if they went for measurement in the afternoon tempers would be high. They found it useful to have a plot owner at the time of measurment as the owner will look out for his/her plot.

Staff also used a device called the bill book in which they recorded contributions of the plot owner and details of labor work done in a plot. Babu explained the bill book as follows, "Suppose we have to cut 500 cum of bunds in a plot, we record it here and show it to the plot owner and say you now have to contribute 25%. There are two items here - a owner contribution receipt, and the details of the payment muster on an individual laborer basis. In another related device, the payment muster**,** each laborer would have signed after having received the payment. Each page in the payment muster is a survey number of a plot. So on any one page there will be signatures of several laborers who would have constructed treatments on that plot. The VDS members sanction payment. They are signatories who approve payments every week and sign checks to operate the bank account with the watershed funds. Field staff support this process. One day before payments we have a VDS meeting and we tell them how many survey numbers have been treated and we show them the measurement book and tell them how many acres have been treated and how much amount is required. Then they will draw and disburse."

The payment system and database they maintained depended on manual devices such as the measurement book and payment muster, and it was not a relational database. This meant that if a laborer had worked on many different survey numbers, during payment day, he would have to wait till payment was disbursed for each of the plots he had worked in. The staff did not calculate the total payments for a particular laborer and give it to him at one shot. This would mean an additional work burden for field staff who already said the record keeping work was immense and they would often have to work late into the evening doing this after a long day of traversing the fields. The staff explained that their interest was to have a synoptic view of how much was spent on each plot or survey number, and not so much to understand how much each laborer made. This again reveals the priorities of land treatment and budget financials in the project, and not the labor wages aspect.

The payment master is itemized according to each activity in each plot, - so, page 1 is for survey numbers 1 and each record will be each treatment, and the details of the work each laborer put in for the construction of this treatment. So, they can

total the amount spent for each treatment on a plot, and also get the grand total of total funds spent in a plot. This is easy for staff to shift into the excel sheet budget under spent budget column, which can be easily compared with the column that has figures for proposed budget. Based on this comparison they will be able to know what funds are remaining and where they can spend the funds. Towards the end of our discussion Babu remarked, "this type of excel sheet format is not useful for us, it is useful for managers who plan funds and budget. For us payment muster, and bill book are important so that we can do the work."

Use of Maps on the Field

In the midst of all these actors and devices, I couldn't quite believe that maps hardly made their way into the process of translations that comprised spatial planning. The MS Excel sheet was the spatial database that proved to be a frame of reference, and as explained above the rest of the processes were mediated by a continuos interpersonal negotiations and a few paper notebook devices. Field staff became quite used to my plea for maps. They would sympathize with me and would patiently provide guidance as I poked around for traces of these planar objects. Babu told me that when the implementation was in progress field staff would conduct periodic meetings in the villages to surmise progress. At these meetings they would draw a village revenue map on a wall in the common area where the meetings would be conducted and show the progress on the maps marking all the structures as and when they were getting done. He said many farmers would see this and come to enquire when work was going to commence on their lands. He made it a point to differentiate though, that maps were used only for this sort of reporting, and not for implementation. Only the budget worksheet was useful for implementation.

As I arrived in the area after the implementation of the second phase, I only got to see the painted wall maps of fully treated villages. I sat in front of the wall and copied the map onto a paper map that I had created. I did this for a few villages. Then I walked through the plots trying to identify the treatments and I realized that the wall map was only indicative! On another occasion, very early on in my fieldwork, I took the prototype document (refer to Chapter 3) and trudged to the field to identify all the treatments as per the treatment map. Sukumar accompanied me as he was very familiar with this area. Then too I realized, much to my disappointment, that I could not find the treatments in the exact position at which they were marked on the map. I gradually came to terms with the fact that Jalaa used maps only as indicative reporting devices, and that the maps were not an integral part of their decision making system, which in turn was not a streamlined automated spatial decision making GIS!

Never once did field staff tell me beforehand that I would not find what I was going to look for. Why? Did they find that I was lost in my belief? I believe that a part of the answer lies in this. Part of the answer also lies in their culture of knowledge sharing which is non-confrontational, especially when it came to someone who they perceived was an authority figure. I noticed this too in meetings where staff would not disagree with their supervisors on an issue, but would debate the issue intensely on the field afterwards.

Working on Farmers' Mindset

Besides the implementation of the watershed, bulk of the work that field staff had to do was working with the mindset of farmers. Here I talk about the political work that staff had to undertake on the ground as stewards of the development projects. Conversations with staff about this work revealed to me that their ideas and practices also constitute their attempts to situate the site of political action in development.

Sukumar said to me one day that bulk of his experience comprised 'working' with farmers' mindset – the type of work that involved a lot of motivational conversations to make them change their mind (*manovarike*) and help them build trust in the NGO and its processes. He said initially farmers were always suspicious of watershed projects. Given the collective historical memory of tax collection by the Hyderabad Nizam and their association of this practice with farmers falling into debt, they thought NGOs will also push them into a similar situation. At a more specific level, all is well and friendly with the farmers until the time comes for beginning the civil works in the watershed project such as construction of bunds. The reason for this, according to Sukumar, is because money is involved. "So we, the field staff, have to converse with them, and give them time to build trust gradually, after a few labor payments. Basically farmers don't want 'hard work' but they want the payment. Also, there is a sort of group mentality – one person would like all the others to follow what he does. If there is one person who is not interested in hard work, then he will start influencing all the others also. But we can't ignore the trouble makers, we have to work with them."

On observing staff and interacting with them I found that each of them had their own styles of motivation. During one of our last few conversations I asked Sukumar how he felt about leaving this development job of ten years and beginning his new government job. He responded saying, "I have learned a lot here, more than enough. I have not thought about how to take this forward. I need some time to think. When I go to a new job I need to first see the situation there, what is the atmosphere? How are the people? What are their skills, etc. and then decide. I have to study that situation. If I want to understand a person I have to first study that person. Only if I go meet him where he is will he actually work with me. For example, when I was working in the DDP project early in my career there was a landlord in the village who was the Gram Panchayat (GP) president. I studied him and then got to understand how he behaved, how other GP Presidents behaved. If one guy made a bad remark to me, I had to be patient. I felt like quitting the job then, but I waited for a year and half until I understood the situation well, there were so many difficulties because of people there, but I had to observe and see how to interact with them and get to be one with them, to get them to work with me. If they played cricket, I would go and play with them for an hour or so. I built my relationships so well that even when I asked the GP members for the office keys at midnight to catch up with some work, they would oblige me - because I went up to their level. No point going against them then they will also go against you. So this is my method of work whether it is a development job or government job."

He went on to stress that unless one worked in this manner there is no scope to achieve much in development work. "If you don't work with them, they can do so

much against you. They can make bad remarks. You have to be nurturing - 'what man, why are you upset, ask me what you want, do you want a trench, is your supervisor not agreeing, come to me, come and ask me.' When you talk like that then automatically they will want to work with you and listen to you. So if you want to study people, you have to go meet them at their level. Its not possible to go the full distance but some ways at least... then as you work with them, things will get clearer and clearer...and then you can get the job done."

Surya, another staff member added, "We have to be very firm about our processes and what we want to achieve on the ground. We can't waver even a bit and we can't be naïve to think that all the people are alike – we don't know which way a person may sway. One group of people will corner you this way and another group another way and they will try to co-opt you." So Sukumar always chose to represent the NGO and its programs as 'neutral' and 'objective' because money is involved and he does not want to be seen as someone who mishandles money. For this reason also he said that he made no alliances with any of the farmers and tried to maintain a 'clean' image. He would repeatedly tell the people in the villages that 'all are equal', 'these funds are for all of us'. He said that amongst the people in the villages there are constant allusions to corruption and he saw that as a way of locals trying to collude with him to misappropriate funds. So Sukumar's approach was to neutralize the politics on the field by presenting a depoliticized view of the NGO. I thought that his was a cautious approach since he was an outsider to the area. Madhaviah, who was from one of the project villages had a different approach to dealing with 'people problems'.

Madhaviah said, "The attitude of the farmers matters. In some villages farmers show interest in the public works programs and each family has been able to earn Rs 5000 and Rs 6000. In one village where people were not cooperative the total amount earned in the entire village was Rs 14,700. The Government dispenses schemes, but it is intermediaries like us who make it happen on the ground. We keep roaming the villages but no one talks to us. Only those who are interested will come talk to us, do the work and earn the benefits. Do you know how happy that couple is today. Do you know whose steeply sloping land that is? They are very happy that work got done on their land. People have to match our interest by doing their work well. As much interest as we are showing in the recording and reporting they have to show in the labor. Instead some trouble makers scuttle the work and engage in lot of fighting and accusations that we are not measuring the trenches properly. That is because they want money without doing any work.

"One of the women kept shouting at us that she had dug 14 trenches but we only saw and measured 10 trenches! I have developed a method of handling such troublemakers. I just quietly walk away. If they want to show interest I work with them. If they are being unfair, then too bad. Since I am from the same area I already have a sense of each village and the different people. Some people will repent and come back because of this practice of mine where I quietly walk away. They have to show ownership, otherwise no work will happen. It is their land. If the owner of the plot is standing there and motivating the laborers then it will make a difference. The owner also should cut, and cut well. In Kadambahalla it is not like that – the owners cut just like the laborers – with no interest. So what I tell them is – you are the owner, so you cut the trench first without telling the laborers, then you show them. And if

they don't cut well then you yourself tell them not to show up for work tomorrow. If they do that then my job becomes easier, there is no role for me!”

A recurring theme in staff explanation for why motivational work was required is 'farmers want more money, but less work.' They say that farmers always show initial resistance to participation in development projects, and in response frame it as 'farmers need to show ownership'. How do staff situate farmers' resistance, and farmers' consequent expectation of development interventions? In other words, how are the farmers' expectations of development interventions different from the objectives of the development agency which is what the field staff are meant to translate on the ground? Staff's understanding of the farmers' situation then has a bearing on staff strategies of effecting development and this illuminates staff ideas and practice of political action. Such practices of development staff are also substantiated in Mosse with regard to participatory techniques that are 'disciplinary technologies deployed to produce 'proper' beneficiaries' (Mosse 2005, 5). My discussion in Chapter 4 on the 'glimmer' of the deep database being participatory in comparison to the disciplinary techniques of participations is also relevant here.

Farmers' Expectations of Development Interventions

In every conversation I had with Madhaviah about the nature of development interventions he categorically maintained that there would be very little interest from people in the villages if the interventionists only came to give awareness about soil and moisture conservation or agricultural practices. He said, “No one will work with a development expert if s/he just talks through his/her mouth, walks through their fields and says 'add this to your soil, grow this crops, build a bund here'. No one will make up their minds based on what the expert just says. Very few people, maybe just one or two might be really interested to follow what you are saying. There has to be some sort of a project, a purpose, a framework, and some funding. Individuals just coming and talking makes very little impact. Even when Jalaa proposed the idea of a loan-based watershed where each farmer would apply for a loan to build bunds on their lands not a single farmer was interested. Although they will take loans to drill bore wells in their land they will never take a loan to build a bund because the returns from bunds are very long term, unlike bore wells.

He also clarified for me that he thought there was nothing wrong about people coming to areas and starting development projects. When I broached the topic of grass roots work and collectivizing amongst themselves so that there would be a sense of ownership, he said, “It is not necessary that people should only work in the areas they are from. Wherever they choose to undertake development interventions they will be able to achieve some results only if they organize themselves in a particular manner. You need to think through the problems that village people face and organize yourself in a manner that will attract their interest given their problems.”

“Even though these development projects are not all based on right assumptions of village society they do achieve something because of their project framework. When interventionists come to our village and talk about soil and moisture conservation, do you know what people will ask for? They will first ask 'will you give us funds to build the bunds? Will you give us seeds?' This is how they will gauge the objective of the interventionists through their talk. There may be one or two

farmers who have the resources to implement changes just spoken by someone and to take the risk and depart from what they are currently practicing. The reason the farmers are practicing what they are, is because of their socio-economic condition. It is not out of their choice. So to make them change their practices you need to convince them of the risks and the returns which have to be fairly short term. The reason watershed programs are so successful is because farmers get work, and their lands get improved.

"But having said this I do feel that is it is wrong for people to show interest when there are funds or projects. It is always much better for people to take on something when they are truly interested in it. People have to be aware and learn about new things and thereby cultivate a sense of interest and ownership – that is the best way. But sadly only a few people are able to be this way because there are so many difficulties for people. How can we think everything is mine, this whole world is mine and will be served to me on a platter. We have to think of so many things – family, food for everyone at home, so many expenses, clothes. Everything is linked. Suppose everybody has the interest like we have been talking about, and so everybody builds bunds on their lands, then there is no need for a project, funds, etc., But then where will their food come from when they are building bunds? What do landless people do? For the landed farmer who is to take the food he grows to the local shanty? Who is to pay the interest on earlier loans? So that is why when there is no work on the land, people do not sit and build bunds. They migrate and go work somewhere else because the festival is coming up and they need to make some extra cash to meet expenses for the festival or a marriage in the family. So this is a community which has to continuously be on its feet for its livelihood."

Discussion

I began this chapter by asking the question -Where was the GIS and the GIS-based plan that Ashok was talking about? I did not find many legible traces of it. Instead I found a network of 'things' held together by many inter-locking rationalities. Foucault explains governmentality, 'as a right manner of disposing things so as not to lead to the form of the common good, …..but to an end which is 'convenient' for each of the things that are to be governed.' (Foucault 1991, 95) These are many inter-locking rationalities that govern the actions of all the actors and objects that are held together in this watershed development program. While I have felt that Foucault's powerful analysis of governmentality does not guide me in empiricism, Latour's framework of translation provides the empiricism when he urges us to trace the networks that create the order. This is my project in this chapter in tracing the materiality of the GIS in watershed implementation. While this is the straightforward point I set out at the beginning of this chapter. I also spell out the implications of this for watershed development / rural development in India.

Watershed development as it is implemented in this case is typical of many watershed projects in the country, and also state sponsored public works / employment guarantee programs. Due to this framing, a significant component of the relationships of governmentality is the labor gang relationship as illustrated in this chapter. This is why I saw a complete dichotomy between labor practices of the same farmers in their work on their plots (refer to Chapter 7), and during the course of the watershed program. As field staff pointed out farmers often want to be paid and do

not want to do the hard work. Bunds that are built from 3 ft deep trenches are more durable than bunds that are built from 1 ft deep trenches[27]. The implications of this on the landscape are often that the bunds do not stand, in the case of the latter scenario. This is the implication of disciplinary participation. Let us contextualize this with the argument I make in Chapter 4 about the nature of participation - that the socio-technical relationships that make possible a deep database are 'participatory' beyond the strategies typical of disciplinary participation.

Employment in watershed programs is not employment that farmers have the choice to seek. State sponsored public works programs are not benign. The deep database and the labor gangs are held together by the same larger framework of governmentality that holds these watershed programs. Field staff says farmers do not want someone to come and just tell them about soil and moisture conservation, they will only pay attention and listen if there is a 'program'. So there is something about modernity that is still wanted and needed by the farmers. Hence this program is still doing work, and serving many constituents, including the landscape. I argue that in this modern context, there is a small glimmer in a deep database because it does its work along with Bhagat and the field staff and the farmers in making bunds and other watershed structures that will eventually stand the test of the movement of time, water, and soil. In so standing, they will work to help farmers fix capital in this 'backward' region of the country – that is the glimmer.

I also bring this back to address the second argument I set up at the outset - my focus on relationships, which in turn arise from my framing of deep spatiality, moves beyond the dichotomies of representation and reality, between the plan and implementation which permeate the post structural critiques of development (Ferguson 1994; Li 2007). It is the NGO staff staff's acute awareness of politics and negotiations that make this local GIS work. It is also this awareness that critiques the idea of a universal toolkit GIS, and a certain reliance on legible traces as representing the plan. While Ferguson focuses on many versions of organizational charts, which frustrated development officers prepared to deal with their failures, I focus here on the relationships that hold together the many actors and make the watershed materialize in the landscape – the watershed intervention that does create a structural benefit for farmers in this dry land area.

27 This does not happen all the time. It depends on the relationships and negotiations amongst laborers and field staff. Here I am hypothesizing for the discussion

Chapter 6

Bringing the Field In

In Chapter 6 I looked at the assemblage of actors that do the work of a GIS in a semi-arid location of south India. In this chapter I look more closely at the positions of Bhagat and his team of field workers in order to understand what it means for them to be doing the work they do, in the interest of exploring invisibilized spaces in development practice (Dove 1994; Nagar et. al. 2002; O'Reilley 2004; Robbins 2003). While the previous chapter looks at the practices of the same group of actors within the framework of 'searching for traces of the GIS and the plan', this chapter listens more closely to each of their voices. It excavates their experience of alterity. I attempt this through two threads – Firstly, since all of them entered the NGO by happenstance and not choice, how did they learn to do this kind of work? In answering this question, I use the trope of knowledge 'conversion'. Bhagat, the watershed expert converts his knowledge in order to share it with his team of field staff so that they can implement a watershed on the landscape. This process of conversion is very much a part of the inter-locking rationalities I speak about in the previous chapter. Following Latour's method of translation I pay attention to what is gained, and what is lost in this process of knowledge conversion. We all interpret knowledge, but what characterizes knowledge conversion in positions of alterity? Secondly, their position of alterity, particularly that of the field staff, makes them proximate to the intended beneficiaries of Jalaa's watershed project. Given this similarity, and staff's structural position in the NGO as people who have to implement the development plan, what do staff think of their work in this landscape? In answering this I will situate the site of political action amongst field staff.

This chapter rests primarily on the stories of two field staff – Sukumar and Madhaviah – with whom I interacted the most. I have interspersed their stories with experiences of other staff wherever possible, to extend my insights.

Recruitment and Qualifications of Field staff

Bhagat was the team leader of the watershed wing in Jalaa and reported directly to Ashok. Bhagat executed all the watershed projects with the help of about six to eight field staff, who were all male. Most of the field staff were young men who had grown up in the same area as the project villages. Maybe one or two of them were from within a radius of 60 kms. One of them was from one of the project villages. I asked Bhagat about criteria for hiring field staff in the watershed wing of Jalaa. He said that in terms of educational qualifications the applicants absolutely had to have completed Pre-University Course (P.U.C), the equivalent of high school. The staff that Jalaa had hired had either completed P.U.C or a bachelor's degree in the Liberal Arts or Commerce. Bhagat explained that the minimum requirement of P.U.C is because watershed implementation involved a lot of arithmetic calculation. One or two field staff quit Jalaa every three years or so and a new field staff would be recruited.

As I had noticed that all field staff were from villages in surrounding areas I asked Bhagat about Jalaa's recruitment policy. He said, “We do not have any fixed rules, other than the P.U.C requirement. People who require employment apply for jobs. We will assess the person and then give him training for one month. A senior staff member will impart the training and provide feedback to the organization The most important thing that Jalaa is concerned about is behavior of the person, not watershed knowledge and such things. If he / she is a good person, then they continue in the job after the training period.”

Besides field staff, Jalaa also solicited volunteers from the project villages. Although they did not discriminate based on gender, most of the volunteers who signed up to work with Jalaa were men. The volunteer’s job is to act as a link between field staff, farmers and farmers who worked as labor in the watershed projects. Bhagat explained, “Since he is a local person and knows all the actors he will be better able to identify locations to site watershed structures, garner support from farmers, motivate them, negotiate interactions and collect contributions from the farmers, and also sometimes form self help groups (SHGs)[28]”. Bhagat said the volunteer concept existed in most state funded watershed projects and Jalaa was first introduced to the concept in the Drought Development Project (DDP) in which the epithet for volunteers was *jalanayan mitra* – watershed friend. A volunteer's salary is only a small, nominal amount - Rs. 500[29] or less in the past. Bhagat has also trained the volunteers in some basic watershed techniques such as how to give alignment for trenches, how to maintain the top level of the bund, shaping of the bund, and dressing of the bund.

Stories of Entry

I now shift to the stories of field staff and begin with their stories of entry into Jalaa. Under what circumstances did they join Jalaa? All their stories demonstrate that they became development workers by happenstance, and not out of choice. This point is important to characterize their position of alterity.

Bhagat was recruited at the time of the DDP watershed project along with many field staff, a few of whom still work in Jalaa. Although it was a state funded project the selection process was done by Jalaa. Bhagat was deputed as a team leader for one taluk and a team of field staff were constituted to work with him. He recalls, “I was totally new just like all of them. I had six staff under me but I felt just like one of them as I was also new to the job. So seven of us went together to Shivsagar and we rented out an office space”. Jalaa conducted a training session for the new recruits in 1995 for seven days by inviting a watershed expert from Bijapur. The state government conducted watershed training in the soil and water conservation training institutes administered by the University of Agricultural Sciences (UAS) in Bijapur and Mysore. Bhagat said, “It was in that training that I understood the basics of watershed development, right from the identification of watershed to development of

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28 In order to facilitate participation and ownership from farmers, they were expected to pay a contribution towards the watershed fund – a percentage of the costs of watershed works to be implemented on their own plots. The contribution could be in cash or in terms of labor. This is a common feature of most watershed projects – state sponsored or otherwise.

29 An amount of Rs.500 could buy 3 on-way bus tickets to the state capital of Bangalore, situated about 500 km away or could buy about 20 lunches in a local restaurant in Kamalapura, the small town in this area.

structures. It was totally new for me. I did not know what a watershed was before that! And when we got recruited the watersheds were already identified[30]. Jalaa had identified the watershed and then they had recruited the staff."

I asked Bhagat if as a trained civil engineer there were technical concepts he could relate to within the field of watershed development. He said, "I was aware of certain terminology such as catchment area, vertical fall with respect to the irrigation structures – which are also a type of watershed. In a sense watershed engineering and irrigation engineering are same[31]. In irrigation we manage with the river water, here we manage the rainwater – both are similar. The training was theoretical and practical and was very good. All seven of us underwent the same training. I was given a book prepared by UAS which contains all the specifications for watershed structures – where boulder checks have to be located, where farm ponds have to be located, etc., I used to always refer to the book, and over time I have converted that knowledge for myself practically. That was how I became converted into a watershed person." What stands out for me in Bhagat's explanation of his beginnings in this field is his reference to 'conversion' – how he became converted, and he 'converted' the knowledge he received. I explore this practice in the following sections. I now shift to the stories of the two field staff – Sukumar and Madhaviah, to follow 'conversion'.

Sukumar

Sukumar, a field worker with the longest tenure in the watershed team was always very generous with his time. He attended the *Jalaa* job interview after he completed his undergraduate degree. The job for which he interviewed was a field staff position under the DDP project that was to be implemented by Jalaa in the mid nineties. He said he did not even know what the job entailed but he attended the interview just to give it a shot as the job was not too far from his hometown. He did not even know if it was a government job or a private sector job, and if it were a permanent position. Although it was a low salary of Rs. 1200 per month he said he accepted the job because his younger brother was still studying and he had to help out with the finances at home. He went home to pick up his stuff and was stationed at Marathur. A few years later his younger brother got accepted into a Bachelor of Education program. Sukumar continued with the job so that his brother could complete his degree.

Many young men like him were selected to work in the DDP project and all of them were new to this kind of work. All of them lived together and formed a mess (common kitchen), which provided their food. They were together for five months while undergoing training. They had to visit the project villages and make maps. He had never before seen a map and had never once visited his own family's plot of farm land. A civil engineer who was their boss accompanied them to the villages and taught them about land development, revenue maps, property ownership records, and about watershed treatments.

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30 This coupled with the use of ISRO remote sensing data for watershed delineation in India leaves no space for other actors in identification of watershed boundaries.

31 The fact that Bhagat on the one hand says that in a sense watershed engineering and irrigation engineering are similar, and on the other hand says that until this job he had never heard of watershed could be an indication about how watershed as a concept has been idealized, symbolized and compartmentalized in planning.

By and by he came to realize that his was a job in a non-governmental agency that does development work. Until this job he had never heard of development work or been exposed to it. “I slowly began to understand that this was work that the government does not do. The Government only does about 20-30% of the work in a project and the rest is given to implementation agencies such as *Jalaa*. When I was growing up I was aware of state sponsored projects but I never really paid much attention to them. My life was all about going to school and college, roaming about with my friends, and making and keeping friendships. We did not really plan our future. My college was in a nearby town so I used to commute daily. That's all I did. When my family became aware that it was an NGO job they were not too happy because they realized that there was no scope for me to earn more money, and that job security was also a concern.” But Sukumar said the risk was his, so he decided to stay on. He was not sure if he would land another job if he quit the NGO. In his third year he met Bhagat under whom he had to work. He said he liked working with Bhagat and their personalities 'clicked' and from then it was no looking back – he got comfortable in the job – he enjoyed the learning on the field, and also the community on the Jalaa campus. He said he felt like he belonged to a community that was actively involved in something. In the mean time his brother finished his Bachelor of Education and asked Sukumar to return to their home to look for another, more lucrative job. But Sukumar decided to stay on in Jalaa, and instead helped his brother find a teaching job in their hometown.

Madhaviah

Madhaviah is a field worker from one of the Jalaa project villages – Bannigudi, who was very interested in my research. He first joined Jalaa as a volunteer in the second phase of the Swiss funded watershed project. During the first phase of the same watershed project Jalaa came to his village to do household surveys, form street groups and conduct village meetings. The Bannigudi volunteer who was recruited to work for Jalaa in the first phase of the project was shifted to a staff position because he had a Bachelor's degree and Jalaa wanted him to organize micro-credit groups. At that time Jalaa asked Madhaviah if he would be interested to fill the volunteer position. Madhaviah said he was interested to conduct meetings and do the jobs of a volunteer so he took up the job.

Madhaviah describes the role of a volunteer as a link between the organization and the people, passing on information about the village that is required by Jalaa, and disseminating the information from Jalaa in the village. Jalaa had a rule that volunteers had to attend weekly meetings on the Jalaa campus and monthly training sessions, and had to conduct 2 village meetings (*gram samasthe*) per month. The trainings focused on how to form farmer groups, women's micro credit groups, how to create solidarity and team spirit in groups, how to communicate with people in groups, etc., Jalaa hired consultants who would regularly come to conduct the training sessions for volunteers and field staff.

Madhaviah said when he joined as a volunteer new ideas took shape in his mind, new imaginations - 'if we do all this, this is all it takes for the people to become strong.' He was inspired. “They gave us training on people skills and community work, and then separately they gave us training on watershed work - about the flow of water, catchment area, how many trenches we need for bunds, etc., Jalaa taught us a

lot of things about community mobilization also. What is the point of speaking to one person? If we communicate to four people then something may come out of that. Similarly what is the point of one person building a bund. If one person cuts the trench, a second person can heap the mud and make the bund. So it is better to work with people."

I asked Madhaviah why he thought training was required for these sorts of people skills. "Don't we use these skills on a daily basis when we live in a neighborhood or community?" I asked. He retorted, "You may have not needed these skills, because from the beginning you have been born into a good family, and studied well and you have understood many things. In my family I am the first one to study. There is no one to teach me anything. My parents teach me things according to our traditions. But they do not teach me how to go to the district head quarters and talk to the district officials."

On a more personal note Madhaviah explained that one of the reasons he was so enthusiastic about participating in activities beyond his call of duty was because his situation at home was complicated. Being with the field staff and immersing himself in work was one way out for him he said. "I had the hope that learning a lot of new things would bring improvement for me. I was the sort of person who did not have interest in anything – no heart in my life. I had become like that. I was unable to continue my education. My family had financial difficulties. I had many dreams when I was young but when I grew up and realized that I had been married as a child. I lost interest and became very dejected that I could not follow my dreams. I could not let go of things at home. I felt let down and disappointed. Many boys around me were studying and getting degrees and jobs. So when Jalaa happened I felt that it was interesting, and I also felt that the money I earned would allow me to make some improvement on the financial front." When the second phase of watershed implementation began Bhagat invited him to work as one of the field staff on the watershed team. Unfortunately he could not take up the offer as his father fell very ill and underwent surgery. Bhagat gave him an extension within which he could take up his offer but that too didn't work for him. Someone else got the job and he continued as a volunteer. A few years later Madhaviah eventually joined the team of field staff when one member quit because he had been accepted for a government position. He said that since all the staff knew him so well they were very keen that he fill the vacant position.

Throughout my field work I would chat with other staff and in those casual conversations I came to see a pattern in their joining Jalaa for work. They either joined Jalaa with no idea of what the work entailed or if they were from the project villages work in Jalaa presented an opportunity for income that was consistent but not sizable. This sort of an income was better than risky environment of agriculture or very small scale private entrepreneurship such as setting up a chai shop or provision store, or migrating to an unfamiliar urban environment without being assured of job security. Although Jalaa did not present them with the ultimate in their aspirations it was a comfortable way stop. It also provided them with a sense of purpose and identity which they all articulated as an important 'perk' and which enticed many to carry on in Jalaa despite the other disadvantages.

Bhagat's Methods of 'Conversion'

I now return to Bhagat's practice of knowledge production and sharing with his team of field staff. Bhagat said that initially he used to always refer to the University of Agricultural Sciences (UAS) watershed handbook which was given to them during their initial training. Over time he converted that knowledge for himself practically. Why this conversion? After the initial training at the University of Agricultural Sciences, Bhagat began working with his team in the DDP Project. When I asked him about his early days of working with his field team he recalls, "During the DDP project, we used to have a system in our team – we set aside one day for a review meeting, one day for training. During the review meeting I used to ask our team members what problems they were facing, and during the training meeting I used to conduct training, which was actually more like trouble shooting. We used to find immediate, practical solutions. Then I would visit the specific site in the watershed with the specific team member who had the problem and I would explain the solution and also reiterate siting rules and technicalities. So my emphasis was more on the field." So here clearly the conversion was because novice field staff grasped things practically and there was also an assumption that the space to be occupied by field staff was clearly defined in the hierarchy. In order to discharge his responsibilities, Bhagat had to teach and train field staff so that they could carry out the work. How can Bhagat order a 1000 ha watershed by himself. He is powerless in that sense. But he is powerful at the same time by being able to train the staff to effect the change over the 1000 ha. It is the nature of the relationship that holds Bhagat, the field staff, and the landscape together that creates the space for 'conversion'. In the rest of this chapter, I will continue my discussion of Bhagat's and field staff's through the trope of 'conversion', and in the process tease out the implications of what is lost and what is gained for different actors through conversion.

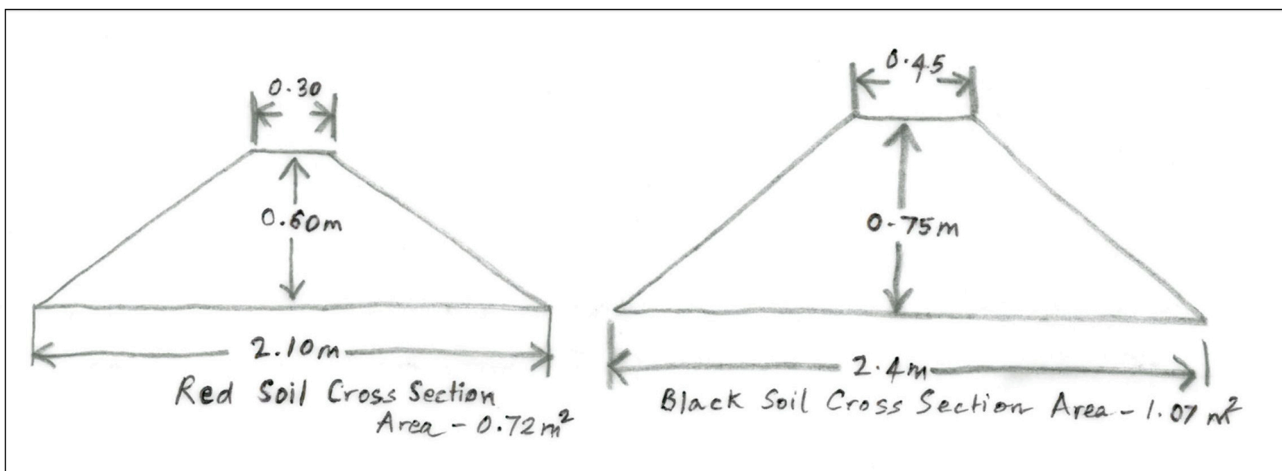
Bhagat said that most of the doubts of field staff were related to implementation and construction techniques. For example, they were not sure how to start constructing the bund. In the landscape which was undulating they did not know how to level the bund to the side that slopes. They would supervise the construction of bunds without making sure that the two ends of the bund joined the side slopes, but at the same time they knew something was amiss. They came to Bhagat who told them that they must fix the height of the bund from the lowest portion in the cross section, i.e. from the lowest point in the valley. He also explained to them that instead of digging the trenches (from which the earth to build bunds would be excavated) at regular intervals, trenches should be closer in space in the valley portion as the bund is highest in the valley and would need more earth for construction. The distances between the trenches would need to be increased wherever the height of the bund decreased. If Bhagat did not train field staff in such details, the bunds would not be able to stand in the landscape. The movement of soil and water would override Bhagat's plan, and the bunds would collapse. The landscape and its dynamism warranted training based on practice, not just a manual published by the University of Agricultural Sciences.

Bhagat tells me, " It is actually simple. Farmers know all these things." But in the case of field staff he had to make explicit certain points implicit to practice. While farmers themselves have the knowledge they are not able to put it in practice because of the political economic constraints they face – this I illustrate in Chapter 7. Whereas

the working of an external intervention, because of the political economy in which civil society organizations are situated, rests on the work of novices (instead of experts) who have to be trained in the practicalities (tacit knowledge) of soil and moisture conservation.

Bhagat provided me with a few more examples of field staff doubts - “The plan would say one farm pond in survey number twenty. Survey No. 20 could be a five acre farm plot. Staff were not sure how to identify the suitable sites for a farm pond within this plot. I taught them to identify water courses such as rills flowing through the plot and in that course to identify the lowest lying level. This is where we have to situate a farm pond. In identifying the position of waste weirs in bunds staff would always select the outlet at the lowest part of the valley. I would tell them this is wrong as we have to shift the position slightly. Although the position they select is intuitively correct the reason we shift it slightly is to prevent the further widening and deepening of the gully / valley.”

Bhagat's practice of conversion also utilized templates for staff. I noticed two types of templates - one which falls in the category of appropriate technology – simple technologies due to lack of funds, and novice staff. The second template was meant to achieve standardization due to the project style of functioning that Bhagat had to ensure. Given that he had to manage the utilization of significant amount of funds over 1000 ha watersheds with a team of five or six field staff he chose to work with the second type of template. Bhagat explained to me that he had prepared templates in order to make work more accessible for field staff. For example, he prepared a bund measurement template out of a clothes hangers to measure the dimensions of bunds. The standard cross section for a field bund is 0.72m, which is derived from a bund height of 0.6 meters, a base width of 2.1 meters, and a top width of 0.3 meters. These dimensions have to be measured to check the cross section of the bund. If there is gap between the template rod and the earth, staff would know that the bund needs to be corrected.



Sketch showing cross section diagram for mud bunds

I wanted to understand how Bhagat viewed his practice of 'conversion' *vis a vis* other knowledge / work environments. I discussed with Bhagat his practice of 'conversion' given his work context which was defined firstly, by a context of relative

scarcity of funds (cost of material, availability of material – appropriate technology), and secondly, a context where all field workers were novices. Bhagat compared his learning environment in college from his method of conversion and training of field staff. He said, “ I found it was very difficult to learn. I don't know why (bursts out laughing!) Sometimes I used to be so scared when our lecturers came to class. It was a very bookish environment. I referred to many texts and many previous years questions papers while preparing for my exams. Now that I am free of that environment, I feel it is not so difficult to teach others. It easy to teach through practical methods - how to identify alignments, how to mark levels, etc., - and it is easy to learn also through practical methods.” Here Bhagat is valuing tacit knowledge and field practice over expert and authoritarian models of civil engineering, irrigation and watershed development. From this point of view, perhaps I can argue that field staff received better quality training from Bhagat. This echoes in field staff reflection of their jobs and their practice. However given the political economy of the NGO, there is little done to build on this experience of staff and to formalize it so that they can actually use this experience in the job market, so it appears just as a casualty of their labor. It is Bhagat who has a Bachelors degree in civil engineering, unlike the field staff. What implications did this degree have?

In his response, Bhagat compared the knowledge and experience of NGO staff context with that of staff in a State Watershed Department. He explained that in the State Watershed Department all the staff from the top level to the level of the Agricultural Officer (AO) are qualified with formal degrees. The AO can be compared to Bhagat's position of Team Leader and are responsible for organizing field work and implementing the project. Staff who worked below the AO are comparable to NGO field staff and also usually only have PUC or B.A or B.Sc degrees. However he stressed that the Department imparted a lot of intensive technical training to all levels of staff. As a result of this training he had seen even PUC educated field staff mark contours. But as soon as he had said this Bhagat added, “But I have trained some of our staff to also mark contours! I taught them with a hydro marker which is basically two wooden poles with water tube mounted on them, and a measurement tape. Then you identify the points. I trained the staff to use this in just one day. Umesh, along with Rajanna used it to mark many contours for the construction of Continuous Contour Trenches (CCTs) in Megepalli. I also taught both of them to use the dumpy level. That too is very simple – only the stock has to be shifted left, right, front or back until we get the same reading. No formal engineering.” Bhagat said he learned about the Hydro Marker in an informal way when he met some staff of another well established NGO in the watershed sector. “We would meet for meetings and we used to talk about our work, and exchange ideas on field technologies.”

Field Staff's Knowledge of Watershed Engineering

In order to understand practice from the field staff position and their opinion of 'conversion', one day I asked Sukumar to take me to the field to show me how to propose watershed treatments, as they did in the net planning process. When we got to the first plot Sukumar says, “take a look at the entire plot. You will come to understand where to site the treatments.” Standing in the middle of a farmer's plot I felt a bit frustrated and lost when he said that. He noticed my body language and realized that it would not seem apparent to an inexperienced person such as I. He said

to me that his method of learning was through experience and practice. He then told me that his real learning happened on the field through interactions with farmers. He understood when his boss taught him where to position bunds but things became clearer to him only when he went to the field and talked to farmers about their practices and requirements. Only when one of the farmers told him - 'I want a bund across the slope at this location', did it really crystallize in his mind - ‘oh, ok, bunds are built across slope’.

“No Formal Engineering”: Jalaa's Afforested Continuous Contour Trenches

Then he continued to instruct me, “You have to pay attention to the slope. See, this slope is a 'deep'[32] slope – maybe 2 – 3% slope. So for this situation we can place a bund at the end of the slope. Then we must ask the question – is the one bund enough? In the case of this 'deep' slope it is not enough – we need intermediate bunds, i.e. given the rainfall and slope the one end bund will not last. It will get damaged. So an intermediate bund is a must for this plot”. He then proceeded to tell me how to position the boundary bund. He suggested an L-shaped bund at one corner of the plot extending along the two sides of the plot from the corner. “This way the bund will not be inconvenient for the farmer's agricultural practices. The bund will also serve its purpose. If it creates problems for cultivation then the farmer will not maintain it. He will bring it down.” I realized that all Sukumar's explanations always factored in the farmers' practices.

32 The purpose of my analysis here is to show how Bhagat and the staff talk about their work. How they talk about their work is a representation of their knowledge and skill sets. So in some instances I have chosen to show how Bhagat and Sukumar or Madhaviah explain the same procedure to me.

He went on to talk about how to construct the bund and explained what I had earlier heard from Bhagat, “The top of the bund has to be a straight line at one level. So at the lowest point of the plot, i.e. downslope, the height of the bund will be at its tallest, and the height will keep reducing as the bund travels upslope - it has to merge with the ground eventually. You’ve seen a snake, haven’t you? – the bund is like a snake's back that becomes thinner and thinner and merges to the ground. The further downslope, the spacing of the trenches will have to be closer, so that you get more soil from the trenches to build the bunds, because the height of the bund will have to be higher. In this plot, the catchment is not that large, and the subplots are not that big so you don’t need too many intermediate bunds. We cut 2ft or 3ft trenches which will retard the speed of rain runoff and also harvest rain water thereby increasing soil moisture. In this manner the bunds also will stand, and not be broken. 5.5 cubic meter pit can harvest 5400 liter water he says. We convince the farmers to maintain the pit and not close it up by saying that the farmer can harvest lakhs of liters of water from these trenches.”

It is one thing to learn how to do individual tasks, but what about the contextual planning that Bhagat had described to me when he took me on a traverse and where he talked passionately about altering a landscape and the flow of water. In order to demonstrate Sukumar's sophistication in this kind of contextual planning, I now return to my traverse with Sukumar in which I asked him to teach me net planning methods. As we walked on we came upon a mud bund that had breached. Sukumar pointed to a location where 30*30 trench could be dug in order to fortify the bund. He explained that either this bund would need a the trench cum waste weir to drain out excess water or a farm pond on the upstream side which would act as a trap for the excess water and thereby reduce the velocity of the flow. “We can’t give treatments that work against the flow of water, we have to work along with the flow of water. If we oppose the water, then somewhere along the line some structure will break. We have to support the flow of water.

“Actually a farm pond would be preferable at this location, and we can't just treat this stream with a farm pond at this location. Given the size of catchment of this stream we need to build two boulder checks before the farm pond. So, if we build a few boulder checks spaced out in the stream course before the farm pond, then silt will get trapped in stages, and allow clearer water to settle in the farm pond. If not, this farm pond will get fully silted within one year. He said silt traps and water ways would also enhance the design at this location. Silt traps are different from boulder checks. For a 30 * 30 farm pond, usually a 5 * 5 silt trap (nothing but a tiny farm pond) is dug out and finished with stone pitching upstream from the farm pond. It is then connected to the bigger farm pond. This will act as a silt trap which would be easier to desilt. You will understand better when I show you the design in our design booklet. Typically when we situate farm ponds in farmers' plots all we do is look for a slightly depressed or low lying portion which also has a significant catchment. We don't bother with silt traps and such. But the reason I am suggesting silt traps in this location is because the slope is high. Wherever we situate farm ponds, we usually recommend dry land horticulture to make use of the increase in soil moisture.”

The other benefit of boulder checks, Sukumar said, is that they will help level the land and make into different usable levels. The formation of small drainage lines could be prevented by these treatments and instead you get level land. If you leave

this type of small drainage untreated, then as you go further downstream it will become bigger and bigger. Instead you can sow little more at least, as the silt level rises and your land becomes level. All you have to do is keep raising the height of the boulder check everyday as more silt gets deposited. Does this mean Sukumar's knowledge is as good as Bhagat who has trained him? Also, how did field staff view their knowledge of watershed development? This is addressed in the following section with the framework of a topography of power in the NGO.

A Variegated Topography of Power

I began to notice a tendency within the NGO to keep field workers in their structural positions – almost like development labor. This is part of the inter-locking rationalities I highlight in the last chapter. The hierarchy in Jalaa is designed to get the work done on the landscape. But on paying closer attention to the daily interaction amongst staff also revealed that the practice of power was not unidirectional, rather it was a variegated topography of power.

Amongst the watershed staff, there were two levels of unstated hierarchy that I began to perceive over the course of my field work. Bhagat had split the group into two roughly defined groups – one group mainly worked on NABARD watershed projects, and the other group worked on the Swiss funded project. The second difference that I came to understand gradually was that the NABARD field staff also worked with less supervision and Bhagat had trained three of them in doing the final budget calculations in Microsoft Excel worksheets[33]. I focused more on the Swiss funded watershed projects because the project area was located closer to the Jalaa campus. Hence I got to interact with some staff more than the others.

As mentioned earlier the ability to do the final balancing calculation of the watershed treatment plan in MS Excel was taught only to a couple of field staff. Others like Sukumar said that not knowing that skill made them incomplete as watershed experts. Take for instance Babu, a field worker who said to me, "I attended a watershed training workshop organized by NABARD in Bijapur. Most of the people at the workshop were engineers. I was one of the few field and / or social work people but I was able to understand all that the engineers talked about. I think this is just from my experience. The only thing I do not know is doing the final calculations in MS Excel." Similarly, one day Sukumar told me, "I have almost 90% knowledge of watershed work – I can site structures on a blueprint map, and on the ground, and also supervise the construction of structures except check dams and *naala* bunds. I can site check dams and *naala* bunds but I cannot plan the design of these structures. I am still not confident about estimations of all structures. This is the one thing I have not learnt. If I can learn estimation then I will be thorough."

However they never stated this with any serious feeling of disappointment or frustration. They only talked about it in a reflective manner. They were also keenly aware that this was left out of the package of what was within their reach within their working and learning environment in Jalaa. It was clear to them that there were other forces which were out of their reach and differentiated them from Bhagat. Sukumar recounts his experience when he started his initial training in Jalaa, "Existing staff

33 Later I learned that staff felt this valuable training and differentiated themselves based on this skill.

were mostly big people who had big degrees such as Masters in Social Work (MSW). People like me were not oriented immediately. How could we? I had not done courses like the MSW people. They all get specialized training and knowledge. Only if you do courses like that can you think in a particular way. I could have done an MSW type of course after my degree, but I made a decision to join a job like this. So I learned from these people on the job. They told me what a 'user group' is, and what is the agenda of these groups, etc., Then the civil engineer taught me about topographic sheets, *khata* lists, how to manually reproduce and enlarge maps and blueprints. The engineer used to tell me - 'just do it, if it goes wrong, you will learn, don't worry'. That's how I learned - bit by bit."

He went on to explain the difference between his knowledge and that of Bhagat's, "I do not have the knowledge that Bhagat has in order to *persuade* the watershed inspection officer. "Bhagat who is a trained civil engineer can stand at a point and say how much catchment area, how much water, how much overflow. The way he will talk about all this will be different than I. Today, after all my years of experience, I can also talk like a civil engineer but I probably can't be as precise as one. Also it has taken time. When I joined I was really fresh and inexperienced."

While I move more specifically here to discuss the topography of power, I argue that practices of 'conversion' are imbricated in this topography. I noticed certain practices amongst managers that kept staff in their structural positions. One day when I was working on some data entry with the watershed field staff in the Jalaa campus I began to chat with Madhaviah who was the only one amongst the four who did not do any data entry. As I had never seen him at a computer I asked him why he stayed away. He told me that he thought he was not cut out for computer work and preferred to take care of 'field work'. I tried to persuade him to think otherwise and offered to sit with him one day and teach him basic computer skills. Kalburgi, the assistant project leader of the watershed team who was also in the office was listening in on our conversation. He then gradually came up to me and said, "Madam, Madhaviah's strengths are on the field. He is one of our best organizers and in managing our watershed team I try to develop each one's strengths and keep them in those roles". I thought this was very much a division of labor approach to Kalburgi's team management methods.

Yet, staff are very aware of their indispensability in the Jalaa hierarchy. Sukumar articulates very evocatively, "The civil engineer, the social worker with a MSW degree, and the accountant are all experts who function at one level of hierarchy within the NGO. But field workers such as I work at the field level with all three of these experts. So I do all the work while they train and oversee. So I am like the 'village pillar'. I put everything into action on the ground with the farmers."

I asked Sukumar what he does and who he goes to, when he encounters problems on the field. He said in the early days he would go talk to his manager - the team leader or assistant team leader. But by and by he has learned to tackle situations on his own. He then made a distinction between experienced team leaders and inexperienced team leaders. "The team leader's job is to attend weekly meetings, monthly meetings, and give reports. When 'X' became manager I would be the one who explained what we do on the field. I told him what to do if there is a problem on the field – how to handle the farmers. 'X' realized Sukumar's long experience and

chose to follow his advice. After this 'X' allowed Sukumar the space to advice him on what to do. On the other hand there also some managers who have used their power and lack of experience and not accepted advice from experienced field staff such as Sukumar”

I asked Surya and Sukumar if they learn new things in meetings, particularly monthly review meetings which are meant to also function as a forum where all staff get a chance to discuss and debate programmatic interventions. They responded, “You should discuss and debate if you are going to get any solution. Who are the people who can give you a solution. They should have some ‘standing’ - a civil engineer should be there, or someone who knows the field deeply, they can give you solutions. A project officer who has to run the monthly review meeting should have knowledge about all the sectors, only then all the staff will listen to him and engage in discussions. Instead if he is a person who the administration has just posted in this position all he can do is ask questions about watershed, how much was spent, how much was left out? Why?” I nodded and said, “Yes, I understand, the project officer should also have the interest and initiative.” to which they corrected me, “No he has to have the knowledge. Otherwise there is no point. He should know the issues. So, the NGO must not frequently change the project officer.

“The thing about Kalburgi Sir, the old project officer who quit, was that in the MRP he would keep posing new questions to us and he would make us think, and with one question of his, all of us would get together and think through it. We enjoyed that. He would complete the usual reporting of monthly meeting in the first 10 minutes. Report only comprises of financial and physical outlays and achievements, and anybody can give that, even if you don’t talk much in meetings you can simply give a report and it will be passed upwards. But the kind of experience that Kalburgi Sir brought provided solutions for us in work. Why are we all sitting together in MRP? We sit in order to talk together and think together and come up with ideas. The current project officer has experience only in the education sector and yet the top level has placed him in charge of this campus which is the watershed hub of Jalaa.”

Mobility for Field Staff

Over time I began to think it was rather unfortunate that despite their rich experience the fieldworkers had no formal recognition using which they could apply for other positions. When I asked Bhagat about this he agreed. He said their options were restricted to the NGO sector, where they could rise up to the level of Team Leader. He told me about a one-off situation where he had been able to secure a job for one of them, as an assistant to the AO in the State Watershed Department. But even this job was on informal terms. The AO was not able to keep up with all his work commitments that involved lots of traveling for meetings, and organizing field work. So he wanted an assistant who could take care of his field work commitments and he paid this assistant a percentage of his own salary. Such was the informality of the job, which is very different from an official position in which the staff are permanently employed or could be promoted. Bhagat said it was impossible for field staff to think of securing positions in State departments as they were very strict about educational qualifications.

Towards the end of my field work Sukumar had served notice to leave his job. He had obtained a government posting as the book writer in the gram panchayat of his home town. It is a job that many field staff would have loved to get because of its permanency. Such jobs were difficult to come by and Sukumar landed the job because his brother who was in that post passed away suddenly, and hence the job was offered to someone else in the family. This meant that Sukumar would move back to his hometown and have to take care of his family and his brother's. I asked Sukumar if he ever considered staying on in Jalaa to become promoted to a team leader's position? He said, “I have the interest but there is no life here...one doesn't know when they will remove you from your position. I am never assured of a job here. See what happens to some programs – they just close then all of a sudden because of funding issues. In spite of having stuck around for 12 years I feel we have to set up ourselves in our lives otherwise it is not wise...and better to leave in a nice way when things are well...that is respectful for me and respectful for *Jalaa*. Why am I leaving a Rs. 4000 salary job for a Rs. 2500 job? Its not on those terms only you know...The new job is a good option for the long term and there is scope to do work there. If I do something there, many people are there to appreciate and learn about. Here maybe just one or two people, and there was never scope for my ideas. Also, in my new job I need to work only from 10 am to 5 pm. In this job I had to be answerable for 24 hours since we all live together in a campus. There are always unexpected calls for some work to be done.”

I think it is relevant to revisit one particular aspect of Chapter 5 where Ashok expresses frustrations with financial models that will allow the sustainability of the GIS wing within the NGO. While the spatial technology wing has been financially self-sustaining Ashok expresses some frustration that they have to work on a tight budget while creating the database so that they can create the surplus to plough back into the NGO. He wishes that they could plough back this surplus into innovations in the spatial technology wing, instead of having to finance administrative costs. Savings are less in state sponsored projects such as NABARD because of strict budget limits. But in the case of non-state funders, the budget amounts are more products of negotiation. What then dictates Ashok's practice of negotiating a specific budget for spatial planning? Is it based on an informal culture of what the going rates are in the development sector? Is it based on what is 'reasonable' to ask? What then dictates what is spent and what is saved? (Much seems to be at Ashok and Bhagat's discretion). If the savings are instead ploughed back into higher salaries to retain staff, rather than innovations as Ashok says, would it not make for more sustaining innovations and GIS models? I argue, based on my field observations that Ashok's practice is representative of a certain non-profit cultural economy which is premised on a significant pool of under payed development labor.

During one of our conversations Sukumar asked me about my degree. He wanted to know what courses I had studied, and how my field work was helping me in my Ph.D. I told him about the courses I had taken in University and how fieldwork was a chance for me to understand the complexities of a rural landscape and rural livelihoods. I asked him if he was interested to study further. He said he used to have an interest but not any longer. 'If I am to go back to college I need the same environment and situation as before, when I was studying. Now my situation is different - I now have to save and make a living. So I have to act constantly in order to make a living. Which way should I go? Whichever way I think is right. There is no

scope to think and analyze which way is good or bad, whichever way is good for me and presents an opportunity for me to make a living that is the way I should choose. The situation is important for me. Situation is what a man makes of it. Man has to think at the moment, weigh each situation, and keep moving on. This is bad - okay I don't do it, this is good - okay I do it. Also, we can't just assume things are bad. We also have the power to think - so we should think and know how to cope with the situation, and make a living.

"We should be able to visualize - if I make this choice, this will happen, and if that happens then something else might happen and how will I deal with that - that sort of thought process will help us. If we go on thinking of only one situation then we can' t move forward. We have to keep moving forward and think about our future. There was much to study... I could have...but that is all behind me... I can't study now." This illustrates the world of choices, or lack thereof, in which field workers have to survive. This situation of field staff alterity is not very different than the situation dry land marginal farmers find themselves in, as Chapter 8 will illustrate. Given this similarity, and staff's structural position in the NGO as people who have to implement the development plan, what do staff think of their work in this landscape?

Situating the Site of Political Action Amongst Field staff

Since Madhaviah was one from one of the project villages, he provided me with a unique perspective about the workings of development. I was particularly interested to understand what Jalaa's interventions in terms of social processes (as opposed to the construction of watershed treatments) meant to him personally and if he thought they really provided the farming community something they valued. The reason I was interested in this line of enquiry was because engagement with development literature had left me skeptical about many social processes undertaken by NGOs as a means to further their goals, and which in actuality lay disconnected from daily life needs of the 'beneficiary' community (Ferguson 1994).

I asked Madhaviah if he felt he really needed to be trained by Jalaa to talk to people in his own village and motivate them to form groups to achieve something. I wanted to know how Jalaa's training was different from processes that existed in the social fabric of his village. Madhaviah differentiated the two processes. He said the things he has learned from the NGO are specific to the NGO's goals. So the techniques of forming groups with a purpose and motivating people with a purpose are different and cannot be compared with everyday activities in the villages. He values having learned how to conduct meetings, how to persuade people, how take minutes, how to moderate a meeting, etc., He sees these skills as part of the educated classes. Madhaviah was very engaged in his work and told me that it had provided him with a sense of purpose and achievement. He also pointed out that after Jalaa entered the villages, people have becoming more curious about issues. He said if someone from outside visits the village, many people would take the interest to find out, given the potential of funds or subsidies.

Both field staff and farmers have repeated to me in various instances the desire for a few energetic people to mobilize change in their community, as opposed to a more widespread grass roots based change. What is this desire representative of? Could it be a manifestation of the political economic adversity as explained by

Madhaviah above? Or does it reflect the permanence of a certain dependency on a growing socio-economic culture of brokering: “I don't want to do the hard work, I would prefer if someone else did it for me in return for a favor or a small price”? And what makes people like Sukumar and Madhaviah believe that this is a legitimate demand? Sukumar said to me, “If one wants to do development work one can’t be selfish. I have to think of others. I have to wait to see results. Any scheme you take, first you should make it useful to people – only then is it development work - that is what I have learned in my ten years experience. There are people who say - 'first for the house, and then for the people'. But there are those who don’t do anything for themselves but help everyone else. Such people will always enjoy a lot of support - they are wanted by the village, but not wanted at home! Some others are needed at home, but no one in the village will seek them out. Madhaviah in Bannigudi is one such person. People will have unshakeable faith in such helpers. To get to that position we should know how to behave and what to do. Development thinkers should behave like this.”

These conversations illustrate to me that field staff have been actively engaging with their jobs, the constraints rural communities face and the idea of development. While they are acutely aware of the situatedness / position of each actor they as individuals are also constantly trying to keep their heads above the currents. It is ironic that oftentimes I would think that their understanding of ground realities is highly nuanced but their powers to effect change are spatially and temporally limited because of the structural positions they occupy in society. It is within this structural context that Sukumar chose to resign from Jalaa and Madhaviah began to weigh his options as the funds were drying up in Jalaa. Towards the end of my field work Madhaviah started telling me that he was considering becoming a development broker or a contractor of sorts. He felt that he could put all the knowledge he had imbibed in Jalaa into good use for his community where there was a need for such brokers. He felt that he could gently steer the implementation of state sponsored schemes away from the corrupt members of the Gram Panchayat and towards the intended beneficiaries, the trust of whom he had plenty. He felt that the cuts that he would get from the gram panchayat members to implement the schemes would be legitimate since he would make sure that the schemes would get implemented and thereby he would also make a little money for his livelihood.

The Trend of Small NGOs

While Madhaviah's idea is more informal, a trend that I noticed during field work is of small NGOs comprising two to five people springing up in the region in response to calls by State agencies for implementation work. Through Jalaa staff and their social networks I would get introduced to a few people who worked in these NGOs. I asked Bhagat about the history of voluntary work in Raichur and Koppal districts in the recent past. He said Jalaa was established in 1987 and it was the only NGO in the area till about 1999. Around 1999 one of staff members of Jalaa left and started his own NGO. From 2000 onwards several small NGOs started operations. Bhagat traces this spurt to initiation of community participatory programs by the Government starting 1997 -1998. After this the SHG movement also started. In the last four to five years there have been instances of few more staff leaving Jalaa to begin their own NGOs.

Bhagat told me about one such person who began an NGO and started to implement development activities which were directed by the Zilla Panchayat (one administrative level above the Gram Panchayat). Bhagat said his work was good and he had also called Bhagat to request him for a NABARD watershed project and requested Bhagat to provide intellectual support. This refers to the process of sub contracting that has also developed as a feature of the new spurt in NGOs. There is an element of people soliciting work and projects that bears some resemblance to small scale entrepreneurship. It also reveals that even though people may not be experts in a particular field such as watershed development they foresee implementing projects with outside support. Given all that I had observed and learned about the community of staff in Jalaa I was curious how this person who had broken off and started a separate NGO went about the process of putting together project reports which is a crucial part of NGO existence. Bhagat explained that most of their project contracts are meant to be outsourced to NGOs by various departments of the State government, and many were from the District Panchayat and Gram Panchayat. Since the last ten years approximately 10% of the projects in the District Panchayat are allotted to NGOs for implementation. So there is no need to write many reports. If there is any reporting to do it would be a fairly straightforward format set by the concerned Department.

Sukumar shared with me a rather critical view of this trend of small NGOs springing up in response to the State Government outsourcing certain activities. He felt that they did not prioritize development work but were more focused on networking with corrupt government staff to make money. In these small NGOs, he explained that typically there will be one person who takes on all the roles - leader, coordinator, field worker, and he will implement the health components, education component, micro credit component, and everything else. He would form just 5 self help groups when he is supposed to form 25 self help groups. But no one will question him because he would have paid off the supervising officials. On the contrary, Jalaa was the only big, established NGO in the region and was known to be corruption-free. They have given up projects in the past when asked for bribes. So much so that when a state sponsored public works program was introduced in 2009, people in the villages wanted Jalaa to implement the program. Sukumar felt that Jalaa needed to maintain this reputation when it has made such inroads in village society.

I wondered after having seen the manner in which staff in development agencies were treated as 'labor' if this was a legitimate avenue for them? If one can't rise above certain structural constraints then the options that is one left with is to reinvent oneself within those structures perhaps? Does this explain how staff just circulate in the rural landscape in their search for different livelihood options in the rural development marketplace? This conversation with field staff reveals that their politics of development work is inseparable from their political economic context, and its attendant poverty. There is little that separates them from the farmers I discuss in the next chapter, so much so that development 'labor' must be viewed as one livelihood practice amongst others discussed in the next chapter.

Discussion

I began this chapter with an interest to understand what it means for Bhagat and his field staff to be doing the work they do. I wanted to excavate their position of

alterity through their methods of conversion. I asked - we all interpret knowledge, but what characterizes knowledge conversion in positions of alterity? I found that what is lost for the field staff is their mobility.

There is significant work in development studies that has tackled the position of development workers and their knowledge. However, implicit in many of these works, I notice a certain directionality in flow of knowledge and information which derives from fixed labels of difference in knowledge. For example, this is evident in Brodt's, and Robbins' work. Robbins says of the position of a middle level forest officer who occupies a contradictory position, “The ecological and social knowledge he carries with him is not filtered into the structure of decisions and, as he advances into the bureaucracy, there is less and less room for that knowledge in forming priorities. When Chaudri reaches the highest level in the system, at the district level, he may be transferred to a distant office where his knowledge is obsolete”(Robbins 2003, 394). I argue that this directionality is symptomatic of boxing an actor's agency in structures. Chaudri, in Robbins' case cannot erase his memory, and may use his power at a later stage to make some changes based on his knowledge from the ground, even if it is in a different 'local' locale. In making this argument I am inspired by Hart who urges us to move away from ‘institutionalist definitions of culture as ‘embedded’ within structured social relations’ and stylized representations to more processual understandings (Hart 2002, 818). And, in response I offer the variegated topography of power in understanding processes of knowledge construction and agency of development workers.

I take another case in point from Brodt's work which examines ecological knowledge of diverse social groups, including that of migrants, in a rural community in India. In her final call Brodt states, “(I)t may be most expedient for development workers to examine whether and how rural communities might manage to maintain elements of multiple perspectives in their local settings so that they could benefit from the increased knowledge richness, while at the same time addressing knowledge and resource poverty amongst their most underprivileged members” (Brodt 2003, 357). I notice that such a conclusion derives from viewing knowledge as a 'thing' and I argue that that it is instead imperative to ask why we must develop a rich and diverse knowledge base. Given my experience with Jalaa, I find it productive to align myself with environment-development research which is not necessarily preoccupied with distinctions between local and expert knowledge but rather focuses on the “production of knowledge in specific political-ecological-historical settings” (Sivaramakrishnan 2000, 62). Also, in STS approaches such Callon's, and Latour's 'translation', Fujimura's 'packages' and Star and Griesemer's 'boundary objects', I find actors and their knowledge are treated in a far more processual and political manner – as work people do in specific contexts for contextual reasons, and not as 'a thing' (Callon 1986; Fujimura 1988; Latour 1999; Star & Griesemer 1988). So, when I followed knowledge in action, and in translation I found practices of 'conversion' which does not label or dichotomise but instead focuses on practices and relationships. The process of 'conversion' represents a 'regional modernity' (Sivaramakrishnan & Agrawal 2003). Hence in answering my question - we all interpret knowledge, but what characterises knowledge conversion in positions of alterity? I found that what is lost for the field staff is not knowledge but what is lost is their mobility. However, they continue to circulate and negotiate. I make this argument to acknowledge the

burden of people like Sukumar and Madhaviah – they bear a great burden while in intellectualizing, their work is often boxed in categories.

This then has implications for field workers in Jalaa and their position as subjects of development. This brings me to the second question I asked at the outset - Field staff are not just watershed agents, they also function as development agents who work with farmers' 'mindset' in order to ensure that a 'watershed' materializes in the landscape. I asked what does it mean for field staff to be political? What does their development work mean to them?

Upon tracing the networks that make watershed implementation possible in Chapter 5, and the ethnographic data in this chapter, I argue that both Sukumar and Madhaviah display a great degree of political sophistication when at many instances they have alluded to the manner in which the watershed development program has 'partitioned' the agrarian landscape – such as when Sukumar said to me “watershed work is not about doing magic, it is all based on process, and these structures that are built are really the product of a long range of social processes”, and when Madhaviah said to me, “No one will make up their minds based on what an expert just says. ...There has to be some sort of a project, a purpose, a framework, and some funding. Individuals just coming and talking makes very little impact.” This is different from Ashok who, in his articulation of deviation in planning, invisibles the connections between the many different actors and objects that make the project come together. Sukumar and Madhaviah, with their limited power in this landscape, can see all the mediators. They, unlike Ashok, seem to have a view of the 'amodern' world. But their work demands that they understand the 'partitions' that come with development programs, and translate between the 'modern' and 'amodern' (Latour 1991). They negotiate modernity which is a very valid category in their landscape as argued in two recent influential works on development in India (Mosse 2005; Sivaramakrishnan & Agrawal 2003).

However, it is also important to add that this negotiation is not easy. Sitting on the margins of this semi-arid location I must acknowledge the burden for people like Sukumar and Madhaviah to circulate. While it is liberating for them to learn through practice it is also a burden for them to be negotiators. There is something transient about their work and their lives as they move between home and the Jalaa campus. We must acknowledge that this experience comes to them in a particular moment in their lives – in their youth just as they graduate as young men from high school and college, when given their location in the margins of the country they are insecure and have a huge burden to be productive. The NGO provides them a liberating space to work and learn through practice, but it is only a mid way point for them. They cannot go much further. Their relationship with Jalaa and development work is both intimate and removed at the same time. This point about working as 'labor' in NGOs and the points of divergence and convergence between the life cycles of development workers and life cycles of NGOs demands further attention. Development work utilizes this transience in time[34].

In conclusion I argue that it is an unfortunate contradiction of the world we live in that while people such as Sukumar are forced to circulate in the rural

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34 I acknowledge K.Sivaramakrishnan in helping me tease out this idea.

landscape, his long experience and sophistication facilitated my intellectual growth and provided political insights in a similar manner (for example, refer to last full paragraph of p.3 in chapter 5) to the writings of Bruno Latour. Both are intellectuals and practitioners I value in my learning, and it is because of the structural constraints Sukumar faces, that he does not enter my bibliography[35].

35 In developing this idea, I acknowledge a conversation with Nitin D.Rai

Chapter 7

Layered Landscapes of Soil and Moisture Conservation

In Chapters 4, 5 and 6 I followed the translation of the GIS and GIS based plan through the positions and practices of different actors in Jalaa: Ashok – the Director, Bhagat – the watershed engineer and field staff such as Sukumar and Madhaviah. Building on the insights of Chapter 3, I now continue my exploration beyond the 'margins' of Jalaa into the undulations of the landscape which is being worked on through the watershed plan. In this chapter I analyze my ethnographic data of farmers' practices of soil and moisture conservation in order to contextualize Jalaa's construction of a GIS-based plan for watershed development, in a semi-arid location of southern India. In this analysis I understand the landscape to be layered with the articulations of a range of actors such as farmers, NGO staff, soil, water, check dams, farm ponds. I specifically pay attention to differences amongst farmers in their practices of soil and moisture conservation, and the articulation of the farmers' work with the Jalaa's work on the landscape. In looking at farmers' practices and Jalaa's practices of working the landscape I also remain attentive to the agency of the landscape (i.e. movement of soil and water), informed by recent directions in South Asian environment-development literature which develops understandings of landscapes as constituted through 'contests over resources and identities' (Sivaramakrishnan & Agrawal 2003, 13) and as stated in Chapter 5, Latour's work which calls for a symmetrical analysis of human and non-human actors (Latour 1991). Before I get into the details, I would like to alert the reader that much of the content in this chapter will also serve to contextualize a point I raise about farmers' practices in Chapter 5, specifically that the meanings of what holds farmers together with their landscape is totally different when they go to the fields to do watershed labor.

When I began my fieldwork, the NGO Jalaa had already implemented a few watershed programs in this region. They had established an identity for themselves among the rural community as an NGO involved in watershed development, micro credit activities, and social transformation of *adivasi* women. After a few initial trips to some villages and conversations with field staff I decided that the best way for me to understand soil and moisture conservation practices amongst farmers was through field traverses on the agricultural lands and semi-structured interviews with farmers. I soon understood that interwoven with a certain predictability of daily life cycles of the rural community there was also a high level of unpredictability to their movements, given the marginality of their lives[36]. Hence I could not be assured of farmers' time for my research. I decided that I would follow a snow balling method where I would identify subjects as my research progressed. I also refrained from selecting subjects across axes of difference such as caste and class which are typical of agrarian studies. In doing so, I am influenced by Gillian Hart who argues for conceptualization of actors as not fully formed subjects or subjects embedded in predefined structures, but

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36 For example, due to overload, the electricity transformer would burst. Irrigated farmers who were dependent on electricity would gather together to device a strategy. They would have to find the cooperation of all dependents, and collect funds. Then one volunteer would have to make the trip to the nearby town to handover the bribe to the lineman of the electricity department and then follow up with him for a few days till he condescended to pay them a visit to repair the transformer.

instead as in a constant state of formation (Hart 2002). As I progressed with my traverses and interviews I found some patterns emerging and so my choice of subjects was dictated by these emerging patterns and also access to subjects. Some patterns shift and continue to take shape even as I write this chapter.

Various watershed project reports of Jalaa[37], provide an explanation for land degradation that follows this general trajectory – biomass decline leads to decrease in numbers of livestock and declining land productivity. Low productivity is a cause for low levels of livelihood security and hence seasonal migration, which in turn leads to lack of interest in land-based activities. This situation warrants watershed interventions in the region in order to improve farmers' livelihoods, land productivity and reverse land degradation. None of the reports attribute clear agency or causality for each of the problems. However a reading between the lines reveals a combination of climatic problems (primarily erratic rainfall) and inappropriate action and inaction of people, lack of awareness. So they need to be helped to 'become aware of the needs and appropriate treatment of their land and well versed in the conservation of soil and water leading to improved natural resource management'.

Jalaa's watershed projects had not covered all the villages in the region. While in some areas I was traversing a landscape layered with farmers' bunds and project bunds, in other areas I was witnessing a landscape that was modified by farmers. Although I did not focus on *a priori* axes of difference, my guiding focus was to understand differences in soil and moisture conservation, and I let the landscape guide me. So, during traverses I remained alert to differences in the managements of agricultural plots. Gradually I began to notice differences which I have captured in my analysis in this chapter. At the end of every section I also situate Jalaa's watershed treatments and how easily or uneasily they sit amidst the farmers' bunds.

Stone Bunds in the Hands of Farmers

The two main features of this region that influence soil and moisture conservation are the semi-arid climate and the undulating topography. The most common technology of soil and moisture conservation in this region is bunding. Bunds are wall like structures[38] that are built across the slope in order to retard the flow of water, and thereby reduce soil erosion. Since they retard the flow of water, they also increase soil moisture which is of great importance in this semi-arid landscape where agriculture has been predominantly rain fed and rainfall patterns are unpredictable.

During my first transect walk with an informant from the village I realized that farmers had already been managing the movement of soil and moisture, which was contrary to the impression that Jalaa had presented to me[39]. During my walk there was evidence of farmers' interventions in terms of bunds, and outlets/waste weirs, albeit in a coarser scale than Jalaa's treatment maps that abounded with watershed structures.

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[37] I have not cited these reports in the interest of maintaining anonymity of the NGO Jalaa.

[38] In this chapter, I have used the terms 'structures' and 'treatments' interchangeably.

[39] Jalaa staff presented this picture to me in the initial stages. It was only after I became well acquainted with the staff and the study area that staff shared with me their research of 'traditional' practices. Is this because of their assumption of the image of development work that needed to presented to outsiders?

These structures illustrated that farmers have had to make do with resources that they have and can afford. I noticed that complete maintenance was not the order of the landscape because it was not possible or affordable immediately. So some structures were patched up in a temporary way and some structures were left damaged.

All the farmers say that during their parents' time there were fewer bunds[40]. The bunds were mostly built of stone and across streams, most of which were seasonal. Sometimes bunds were built for demarcating boundaries and keeping cattle. The purpose of the bunds in stream courses was to reduce the velocity of runoff and thereby prevent soil erosion, trap alluvial soil, and increase soil moisture. An important feature of stone bunds is waste wier which allowed the water to pass through or drain out. Farmers categorically say that the purpose of bunds was not to stop stream flow / runoff. This indicates that slope, in isolation, was not a factor for farmers, but really the interaction of slope with soil. Nearly all farmers say that their parents had bullocks and would use bullocks and bullock carts to transport stones from hill tops to build the stone bunds. It was a slow and incremental process of building. They also harked back to the physical strength of their parents and contrast it to the fact that today one could only think of building a stone bund if one had money and thereby access to tractors and labor.

The landholdings in Kaadugere are mostly small. They tell me that if the landholding size is 3 to 5 acres it is considered to be a large holding. In the other upstream village – Megepalli – people have bigger landholdings. Arvind says that his village has historically been poorer than other villages in the area and that there weren't landlords in his village. (probably because the lands were so impoverished[41]). When Arvind was young he recalls that all the families in this village would go to the two neighboring villages (Sanchetti and Krantihalli) and get grains to eat and survive. "I did not suffer or feel the experience then but the elders faced difficulties. It is difficult to grow crops here. That is why they have built bunds. If you want your soil to become fertile it will not change over night. What we build now is for our children's benefit. There weren't as many bunds when I was young although bund building was common. Now people work here and there, and also migrate for work and somehow make money and make all these improvements on their land. It is a continuous cycle of work outside and work on the land. And people can't afford to change this lifestyle. That is why in the recent past conditions have improved (*solpa utthama)* and there is more comfort (*sudarsh*) in our village."

I ask Kamalappa and his friend Prakashappa, two other farmers in Kaadugere, if there are any stories in the village about bund building in the past. Kamalappa says to me in a definitive voice, "You have been to school, isn't it? You have been educated. Here we did not and do not have that environment (*vaathavarana*) – here it is about getting work, and getting food and making a living and getting by like that, and doing agriculture – that is the meaning of agriculture here." I realized that he was contextualizing bund building in their political economy for me and I was embarrassed about my naïve question I had asked. They can't remember when the practice of building bunds started in their village. Bunds were always there but the

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[40] It is important to remember that the size of landholdings was larger in those days.

41 In writing this dissertation I have felt at such junctures that I could make better connections with more archival data, but it is beyond the scope of my work.

A stone bund with waste weir: layers of stone stacked over generations

number of bunds have increased for sure. More than their parents generation, they seem to refer to their grandparents as the builders of the bunds we see today.

Prakashappa and Kamalappa compare the land in their village with some other mid and downstream villages in the watershed. They say that red soil is more prevalent in those villages and there are more wet gardens (*thotaa*)[42] there. "They get good yields with red soil, but we get less yields with white soil. Yes our soil is white soil, sort of whitish black soil. The red soil you see is just on the top – eroded from upstream and deposited here. The nature of the lands is such – what can we do if the soils are different between there and here?" Arvind on the other hand tells me that most of the soil in their village is red soil. He does not make the further distinction between white soil and red soil. He says Kaadugere is mostly red soil, only the upstream portions have black soil.

Because the soil is not deep and highly susceptible to erosion, bunds are built to prevent soil erosion and to harvest alluvial soil. Arvind says that bunding helps him harvest some black soil from the ridge (from Sanchetti) that gets deposited over his red soil. The more bunds there are upstream of a location, the finer the alluvial soil you can trap as the soil gets filtered through successive bunds. The farmers maintain that the alluvial soil is more fertile than the parent soil. He compares this alluvial soil (r*aki soil*) to the cream of curd (*keni mosuru*) - "the *keni mosuru* is so rich and special and has *sakthi* (strength)." Standing in Arvind's red soil plot I notice black soil only in the course of water flow. He says that the black alluvial soil is at least a foot deep as it has been deposited over many seasons. Farmers grow a different crop such as wheat or white sorghum in these alluvial patches to take advantage of the strip of black

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[42] Wet Gardens or *thotaas* are irrigated patches of land where farmers grow vegetable crops primarily for sale in the market. Hence *thotaas* are considered as assets.

alluvial soil. They will be able to harvest only a small amount as the area is small. Naturally then, the more upstream a farm plot is the thinner the soil will be. Arvind says that the soil in his upstream plots are only a few inches deep. So the yield is always better in his downstream plot. He says if your soil is eroded once, it takes at least fifteen to twenty years to again conserve and create soil.

Rains

Prakashappa and Kamalappa say that if the rains are not adequate then they just don't get a good yield from red soil. If the red soil is at least fertile then there is some hope. If not, there will just be a lot of weeds instead of a good crop. Every year they should get at least one rain in the first agricultural season[43] (this is reduced standards, not the norm) but this year they did not get even one good rain for the first season. The red soil farmers sowed pearl millet in the first season and got no results. In Prakashappa's land he sowed the seeds, the rains failed, his crop was damaged by a pest attack and so he lost his crop. Farmers with black soil do not face these problems. They also make a distinction between upstream and downstream plots with red soil. The yields are lower for red in the upper reaches but further downstream, even with one or two rains in red soil the yield is better. If there is at least one rain the downstream and black soil plots do manage some yield. The black soil farmers sowed white sorghum in the first season and got a better yield, but not the normal quantity.

Not only has the timing of the rains become unpredictable, the spatial distribution is also variable. Kamalappa says that compared to earlier days when it would rain each fortnight, the second season rains have increased and the first season rains have decreased. Prakashappa says that overall rainfall has reduced. The first season rains has reduced for sure, and second season rains seems to be untimely and hence damage the crops. I witnessed this pattern in the three years that I spent visiting the villages.

There are only two traditional wells in the village that were dug more than two generations ago. Borewells are a rarity in Kaadugere due to electricity shortage. Due to the large distances one has to draw lines, and install poles which is a big effort. Arvind says, "If the government opened their eyes a bit and provided about seven or eight wells through State sponsored schemes such as *Ganga Kalyani* – then it will be helpful for us." There is only one borewell in Kaadugere. The owner dug it using his own funds and he is the only one in the village with a wet garden. As he is downstream and close to the settlement it was not much of a hassle for him to organize power supply for his borewell. For others it is difficult – "if you have to draw out a power line and place poles for a distance of 5 km – where will a farmer go for money?" Census data reveals that of the all seven villages I studied, Kaadugere is the only village with no irrigation (Census 2001).

Given this situation in Kaadugere, besides preventing soil erosion the bunds also help increase the moisture content in the soils which is very crucial for farmers who practice rainfed farming in an area where the rainfall pattern has become highly

[43] The first agricultural season, called *mungaru*, is from June to September and depends the southwest monsoons. This is the main season when all farmers practice agriculture. The second agricultural season, called *hingaru*, is from October to January and depends on the retreating monsoons. Most farmers, but not all, cultivate during this season. The success of this crop depends on residual moisture in the soil if the rains fail.

unpredictable. Arvind says, "Whether the rain is more or less, we will be assured of moisture in that part of the plot. That is our main insurance and protects me even in a drought year. We are assured of one tonne of grain from the moist part of our plot." When building bunds they make a distinction between black and red soil, because the water retention capacity is lower for red soil and hence definitely needs stone bunds. Because of this difference, even if there are bunds red soils still need more frequent rains - "as much as possible, every rain is required for red soil. In red soil areas with bunds, you still need the first season rains, but you could do without some of the second season rains. So this is where you see the difference due to bunds." Gradually over the years, with the deposition of soil, plots also get leveled. However Arvind says that leveling the land is not the top priority in building bunds. It is important for the farmers to trap moisture in the soil and prevent soil erosion.

Bundle of Practices

Conversations with the farmers also revealed that bunding was not viewed as a stand alone solution for soil and moisture conservation, but entwined with a bundle of practices such as ploughing and manuring. How one managed the bunds depended on the interaction of water flow / runoff and the type of soil. I found that farmers were constantly paying attention to this. For example, Arvind explained that one has to build bunds, and then plough with the big plough (*dodda negilu*) and you have to do it every year. You have to keep ploughing to break up the stones, and the soil and create more soil. People do it continuously otherwise they can't survive in these reaches. Today, if their soil is very bad a few people use earth movers to till their land, or to level and create a plot. They will rent a earth mover just for an hour or two.

Arvind also practices crop rotation. After a few years of cultivating the staples he says that his land became a little ordinary ('*sadharana*'). So he sowed cotton as a rotation crop because he can grow it for two years without any farm manure. The crop waste and roots stay in the soil, decompose and provide nutrients to the soil. Prakashappa and Kamalappa add that it is possible to improve the moisture retentive capacity of red soil through the application of dung manure (*yendi gobra).* Prakashappa does it once in two years. The sooner you apply manure the sooner you will be able to increase your yields by a few tonnes. He never applies chemical fertilizers (*sarkar gobra*[44]). He only applies farm manure ('*ooru gobra*[45]'). They say those who don't have livestock are the people who apply *sarkar gobra*. I ask what the difference is between the two. They say with *sarkar gobra* you can get one harvest, with the *ooru gobra* you can get two to three harvests – it will last for two to three years. Plus with *sarkar gobra* you need rains or irrigation, otherwise it will become brittle and ineffective.

Bund Building Method

We then shifted to discussing the details of bund construction. The farmers tell me that there are no differences among people in their village when it comes to bund building activity. If their land situation deems it necessary then they build. How they

[44] In common parlance, chemical fertilizers are referred to as *sarkar gobra* which translates to Government manure.

[45] In common parlance, chemical fertilizers are referred to as *sarkar gobra* which translates to Government manure.

build may vary however, the details of which will emerge in the following paragraphs.

Arvind tells me that in Kaadugere stones are available more easily in plots with red soil. Because the red soil plots are stony, when they plough their fields they have to remove the stones in order to create more cultivable land. The stones are added to the bunds which in turn helps them harvest more soil. In land with black soil it is not that common to find stones because black soil is soft and deep, and of good quality. The parent material itself is different from that of red soil. This difference applies to all villages in this region.

I ask Arvind how much it would cost if farmers built their own stone bunds today? He says today it would cost Rs 1 to 1.5 lakhs. So it is not common that farmers build stone bunds from scratch today. Typically they only get stones to add to and repair and maintain the old bunds that were built by their ancestors. I ask, however if it would be possible for farmers to build the same type of stone bunds today. He says yes even if it is expensive it is still done today and the method of bunding also has not really changed over time, but it is done slowly – as and when they get stones, they spread it out through their life and generations. Prakashappa and Kamalappa clarify further that farmers have to plan and build bunds up to a certain level in one summer season. If they leave at a half finished level such as of an incomplete height then it is of no use as the bunds will get damaged in the coming season's rains. I think to myself that this is very different from a project style of functioning. Arvind explains that he built a 200 ft long bund on his land. He had to get stones from another of his plots as he could not source all the stones in this plot. He had to make about one hundred trips in a tractor for this purpose. But he says it was worth it because this plot that was barely giving him 5 tonnes of grain has now started to yield 20 tonnes.

I ask him if anybody goes out to purchase stone to build bunds? He says no. Either they use the stone from their own plots or cut stones off nearby hillocks in their village. If they own a bullock or can rent a bullock and a cart they use it to transport stones. But since the situation of people has improved (*aathmika paristhithi*) – those who can afford it hire tractors and earth movers for building bunds. “But in our village hardly anyone rents earth movers to level land” say Prakashappa and his friend. There is a tractor in the village nearby and if requested it comes to their village for work for four to five days. Prakashappa says that they also rent a tractor from Sanchetti. The poorer people build bunds using their family labor and all farmers build their own homes out of stone in this village, and not mud.

What about labor I ask? He says it is difficult to build by one self, so each farmer has to build it with help of his family members, or others from within the village, or sometimes they employ labor from outside. Prakashappa provides more details: “we need labor – so we will build with the help of labor, or we could also give it as a contract to someone in the village. If it is a big bund it will cost at least Rs. 20-30,000 and will take about ten to fifteen days with twenty people. The hiring of a contractor will depend on the number of laborers decided upon. I sometimes also do this type of contract work. Or sometimes I am also one of the laborers of the contractor. This is a practice within the village...depending on people's work and availability. And it is usually done in the summer season. It is like work – no need to migrate out for work if this is available in our village itself. If you get hired for four

days you could get Rs. 100 per day. If it is more number of days then maybe Rs 50, it also depends on the work, and how much we work. And in this type of arrangement, usually the stone is available on the land itself. The owner has to break the stone and the contractor will only be in charge of the building. But the owner will employ labor to help him cut the stones. They will blast the rock and that will make it easier to cut the rock. The reason for this is that it is less expensive. If they gave this job also to the contractor it will work out very expensive for the owner."

They say that the contractor system did not exist before. At that time it was more about paying labor rates such as Rs. 2, 4, 5, etc., Today if you do not give at least Rs. 50 people will not come to work. Today labor costs more. Only if there is small work to be done such as small repair work, or small additions, etc., do one or two people from a family do the work themselves. In any other situation they have to follow the above practice because of the quantity of work. Even if there are six people in the house, they have to be organized as coolie by a contractor.

I ask if farmers take loans to build bunds? Arvind says that they do take small loans every year as a part of their agricultural practice and gradually build the stone bunds. But they do not take loans specifically to build a bund. "If you take one big loan, then the interest is very huge for a person to bear. We cannot harvest so much to cover the interest rate. We are ordinary people. We see how much we make every year from agriculture and accordingly plan these kinds of expenses and improvements. But overall, taking loans is less in our village. Even paying loans through harvest (*bele saala*) is less. If we did that we would be tied to the money lender, no? Let us be independent and do what we can by ourselves and go on. The big loans are taken only for weddings, and functions. People prefer to migrate for work to add to the regular agricultural income to run their lives." Prakashappa and his friend say that typically farmers migrate to work, and build bunds with their earnings. This is more common than taking a loan to build a bund.

As I was walking back to the settlement from Arvind's plot I saw a family cutting a rock outcrop in a plot on the side of the road. It was a plot that was raised from the level of the road, and the soil looked thin (i.e. not very deep), and reddish. The plot was comprised of two levels. The upper level was terraced, and the lower level was narrow and sloped down to the road. There were four adults cutting the rock outcrop on the lower level. I stopped to talk to them. One of the women asked me for work. I told her that I have come to study and will not be able to find her work. They told me they all belonged to one family and decided to cut this rock as they needed stone for their house construction. This will also help them create more land for agriculture. In the past it has been difficult to plough and cultivate this land because of the rock. First they plan to clear this rock outcrop and stack up the stones, and when the time comes they will build a house. They show me that the soil is not deep at all, just a few inches. They say they can't even call their soil red soil as it is worse than red soil. They point to the upper terrace, and say it has been easier to farm there because of the bund that they had built earlier. It has helped them collect and create soil there. So they are also trying to level this lower piece of land. Once they cut the rock outcrop, they will plough their land and level it. When they use the *madiki* plough, that will throw up stones from below, which they will stack up in one corner. Although they do take loans from other farmers in their village they decided to do this

work using their own labor. They also decided not to hire an earth mover for the leveling as it is expensive.

All farmers tell me, when I ask how they determine the dimensions of bunds, that they do it according to the amount and velocity of water. They keep track of it every year during the monsoons and build accordingly. I ask Arvind and Prakashappa how farmers decide where to position these bunds? Arvind says farmers know how to identify the position by paying attention to the erosive capacities and speed of the water flow. Where there is a downslope, they know the water will stagnate or collect and gather force and therefore will erode, so they will build a bund there. They are also paying attention to the local situational topography which interacts with the velocity and flow of water.

But the point that Mukundappa, a farmer in another village, stressed on is that the position is only if a farmer decides to build a bund. It is not that farmers build bunds wherever necessary. They build only if they can and have the interest. This point was emphasized by several other farmers too. This point, and the practice of incremental building of bunds situates the bund clearly and squarely within the agrarian political economy of the region. But changes are occurring which I will address in the conclusion.

I asked, “If one wants to build a new bund, how do they decide its height and width, etc.?” Arvind said they make note of how the water flows and build the bund adequately wide. So the bunds upstream are not as wide as the bunds further downstream. The force of water is higher in the downstream portions, so the bunds there need to be stronger. Kaadugere Prakashappa and his friend explain further that if the volume of water is large then you need a wide bund (maybe two layer widths), otherwise just one layer width is enough. They know the volume of water as they see it every year. They will also look at an appropriate place to build – a trough with side support on both sides is best. They level it to the side of the trough, after they decide the height of the bund. Of course each farmer is constrained by his ownership boundaries, and is only interested to take care of his land. However, a bund depends on the treatment above it. A lower bund could be damaged if the farmer who has built the lower bund has not factored in the upstream treatment or lack thereof. If there is no bund upstream then the farmer will compensate in the dimensions of his bund.

Prakashappa says, “If the foundation and design is good it will stand. If it stands for the first two years then it means that it is built well and lasts. But if it keeps falling or needs repair every year then it is not constructed properly.” He points to the upper bund in his land which he built slowly. There is some mention of it having been started by his grandfather, and that he built it up slowly from stones that would crop up while ploughing. He has a lower bund too, and it is about trying to create soil at both levels. He seems to say that the height of his upper bund has to be increased because during the rains the water stagnated and his sorghum and pearl millet crops were ruined. He says that he needs to make it wider so the pearl millet won't get spoiled by the stagnating water. He says waste weirs are positioned according to where there is high flow of water. During my traverses I also noticed openings in the middle of stone bunds – the farmers don't call this opening a waste weir because these openings are sometimes made just for short time to drain out excess water from the

field, which is required as in the above case of Prakashappa's field where his pearl millet crop rotted because of excess water stagnating behind the bunds.

Stone bunds are built by just arranging the stones and without any cementing material. Sometimes mud is used to pack the stones but it is not that common. While talking to Arvind about one of my traverses in another village I started discussing details about the type of stones that can be used for bund building. Arvind said that the stones they use in Kaadugere are specific to the village and are not similar to other villages. “Our stones are different from theirs. Our stones will not get eroded and fall down in the course of the runoff.” Then he picks up the stones and shows them to me: “See how long and flat shaped these stones are – we place them in this fashion – along the flow of the water, so they don't get disturbed by the flow of the water, but if they are put across the flow of the water they will fall down”. I told him that the stones I had seen in the other village were noert exactly like this. They were rectangular and rounder than these stones. I asked him the names of the stones they use. He said there was no name, but when I prodded again later he offered two terms - “*chaap kallu*, or *udhdhan kallu*” which basically mean flat stone and long stone respectively. Round stones (*gundu kallu*) is used for building waste weirs. Arvind continued, “most of the layers are arranged along the flow of water, and at some intervals we place some perpendicular layers of stones, and finally we dress the top of the bund with smaller stones. This is the bunding design of our village. Nobody taught me how to build bunds. We look and observe and follow. What you build I see, what I build you see – like that.” There is a little boy standing next to us. I ask him if he knows how to build bunds. He smiles and shakes his head – (no). Arvind explains that he grazes small livestock. “But when his family builds bunds they will not leave him – he has to help.” Kaaudugere Prakashappa also talks of the same design, but he says that any type of stone is okay to build bunds with. The type of stone is according to what's available, but how you arrange the stones is the real technology which seems to be common across all farmers I spoke to in all villages.

Mud versus Stone Bund

But in villages where there isn't much stone, they cut mud and build bunds and only use stones for building the waste weirs. Prakashappa says, “We have lots of stone here. Farmers in other villages have to pay at least Rs 200 – 300 to procure one tractor trip of stones. It is difficult for them. They come here from other villages because we have so much stone. They come from Keredimba and Manipura. So they come and ask us, and if we do not need the stone on our lands, we will cut it and sell it to them. People in other villages don't even have stone to build their houses. If they do not have stones in their villages they will go get some broken pieces or fragments of stone (*siezi kallu, thundoo kallu*) from elsewhere and build waste weirs only”. So, they seem to say that the reason other villages do not have the same type of bunding landscape as Kaadugere is because they do not have access to stone resources. Kaadugere's marginality is also it's asset.

Prakashappa continues, “The thing with mud bunds is that they are okay for farm plots – because if the upstream is treated then these mud bunds need only stop the flow of water from that particular field, not from a bigger catchment – so they are okay. But these kind of bunds are not useful in the course of streams.” Kamalappa

Stones slanting upwards: a bund that works with the movement of water in a stream course

mentions that his uncle Avinash's land receives runoff from nearly half of Sanchetti village, which amounts to a hugh catchment of about 70 to 80 acres upstream. But mud bunds are also able to filter and thereby produce alluvial soil because they are designed with waste weirs.

The biggest point that emerged for me in Kaadugere is that people have had to live in a very marginal landscape with hardly any soil and with soil poor in fertility. So they have literally had to create land / soil to farm in. Bunds are not only landscape altering features here but also landscape creating features. This is the reason stone bunds seem ubiquitous in Kaadugere. The same forces that have caused soil erosion have also excavated the large quantity of stones - an expensive resource today – which are key to building stone bunds. In fact the coalescing of these two patterns is evident in all my data – the most marginal lands have had no soil, but plenty of stones which then help create soil / land. However 1) due to other reasons, there are lands and farmers who do not fit into this pattern as stories from other villages will illustrate, and 2) this does not mean that all is well in Kaadugere. As Arvind pointed out fertile soil is not created overnight. Given this and the change in rainfall patterns makes them more vulnerable than downstream farmers, and those with black soil or in downstream locations fare better.

The interviews revealed that although the landscape is actively being worked, it is still a process – people wait to collect a sum of money from their seasonal migration jobs, also with changes in the village political economy bunds have fallen out of their reach. Earlier where their elders would have bullocks and bullock carts and labor was cheaper, bunds seemed to be a more integral part of agrarian life. Today they have to plan, and rely more on funds as livestock numbers have drastically reduced, stone is expensive, and so is labor. While the changing nature of agriculture inputs has made them rely on local moneylenders and small hand loans, they do not take loans for bunds as the returns from bunds are spread over long term which cannot repay loans. Nevertheless, in comparison to the other villages I studied, I found that bunds are more central to the reproduction of agrarian livelihoods in this upstream village.

Jalaa in Kaadugere

Kaadugere is a village that was covered in the second phase of the watershed project. What form did the Bhagat's watershed structures take here? In the private property plots, Bhagat's intervention was limited to addition of earth over the existing stone bunds just for fortification. The second type of intervention was in gently sloping plots, where Jalaa had built mud bunds from 1 ft deep trenches – low bunds. These bunds which were about seven years old looked well stabilized with grass cover on them. I noticed that in the downstream portions of the village there weren't as many Jalaa bunds. Arvind said that the farmers of Kaadugere told Jalaa that they absolutely did not want mud bunds in the downstream locations because the soil they dig out from the 1 ft deep trenches would be fertile top soil that each of the farmers have harvested.

Arvind had showed me some stone bunds which he claimed were over sixty years old. He added that if Jalaa were to build stone bunds through the watershed programs, it would cost them at least Rs, 100,000 per bund. They cannot afford to build stone bunds under a universal coverage program, which is how their programs are designed. Farmers do it, because they do it incrementally over many, many years!

In Kaadugere, the long history of contextual bunding had gently nudged, or relegated rather, Bhagat's watershed treatments to the commons – Common Property Resource (CPR) land of the village. The CPR in Kaadugere was one patch of 42 acres. Jalaa had intensively treated the CPR lands with three check dams, trenches, boulder checks, sunken ponds, and farm ponds and a big stream (*naala*) pond. Arvind said, “Jalaa's biggest job in our village was in the CPRs. They came and saw our lands and saw that we had treated our lands, so they decided to spend most of the money on treating the common lands in our village. Bhagat has designed the structures well, so there is little repair work to be done. But we need to desilt regularly.” Despite this evidence it is important not to dismiss Bhagat's designs as being acontextual and programmatic, because his practice too evolved over the course of the project through his conversations with the GIS database, the landscape, and farmers. Kaadugere was one of his first project villages and hence the artifacts on this landscape represent Bhagat's early thinking.

Bund Building in the Course of Stream

After a few traverses in agricultural lands and interviews with farmers I understood that stream courses are high points of bunding activity. I decided to do a traverse along a stream course to understand farmers' bunding practices in this context. Mukundappa, a middle aged Schedule Caste (SC) farmer from Bannigudi village accompanied me on this traverse. Mukundappa was often generous with his time. He was interested in interaction and exchange of ideas. Every time I visited Bannigudi I would drop in on him for a chat. If he was free he would agree to walk with me to visit some fields or just chat in his home.

Due to logistical constraints we began our traverse in a mid stream location. Mukundappa explained that this stream flows from Megepalli *tanda*. At this point the water comes from a catchment of almost 1000 acres and flows at high speed. Upstream from here the stream is treated quite completely in Megepalli *tanda* and Kukrehalli *tanda*. A little upstream from where we are standing near the road to Kukrehalli there is a check dam (CD) that has been built on one of the stone bunds. This stream is a tributary of Kadambahalla, the main river in the Kadambahalla watershed.

We first stopped at a plot in the stream course that was owned by a Lambani tribal farmer. In fact as we walked I learned that most of the plots along the stream course were cultivated by Lambani farmers. Lambanis are a scheduled tribe that have settled in this region. They live in separate hamlets a short distance from the settlements of other farmers. These hamlets are called *tanda*s and are solely comprised of Lambanis. Mukundappa was unable to tell me when the Lambanis were given this land, he says they had this land even when Desai46 was alive, just like his caste was given land, maybe seventy to eighty years ago, because the Lambanis also do not come from an agricultural tradition. They were traditionally livestock herders and continue to herd, along with farming.

Mukundappa explained that Lambanis were prolific in bund building because create agricultural land for themselves, by progressing leveling the land in a stream course. It is possible that they are not traditional agriculturalists and hence have had to create land for themselves to farm in marginal locations. While I have not verified this point for this specific location, this hypothesis supports my argument of adversity being a reason for bund building, just as we saw in Kaadugere. Mukundappa said Lambanis have been building stone bunds for two generations. Since stone bunds were built to prevent soil erosion and trap alluvial soil they are viewed as 'land creation' structures particularly in stream courses. Gradually over the years as more soil and silt is collected upstream of the bund, level land is created from a gully or a stream course. The height of the bund is also gradually increased. The *Lambani* bunds were located in the lower upstream portion of the stream's course. The stream course we walked through was heavily stone bunded. As I walked along the stream I realized the ephemeral nature of these seasonal streams – unless you pay attention you won't notice it is a stream course in the dry season, as plots are created by bunding the stream course.

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46 Erstwhile landlord who owned a huge chunk of this region.

The first bund we stopped at had been constructed so that the Lambani farmer does not lose soil and and the manure (*tippe gobra*) he has applied to it, and will also be able to harvest some alluvial soil. Mukundappa says that he remembers this bund from when he was young - it must be forty to fifty years old. We talk about the height and dimensions of the bund. Their explanation revealed practices that are similar to those in Kaadugere – bunds heights are in response to volume and velocity of runoff. They explain the stone has to be flat (*chaapu)* and the method of laying the stones so that the bund does not fall. If they get big stones they build with it, if they get small stones, they can build with them too. I ask again, "do you need to pick a particular stone size depending on the speed of the water?" Mukundappa then says, "yes, we have to be aware of that but then we also need to get that type of stone, isn't it? That is always not possible. So there is nothing hard wired about this design. People build as per situation and availability of stone." Here he is highlighting the difference between how I approach the issue and how their context defines their actions.

There is a separation between knowledge and means at some point, but there is also a connection between experience and knowledge at another level. Farmers I talked to seemed to have the knowledge of the 'ideal' but they also had practices / methods that deviate from the 'ideal' when the context differs. It is the wealth of context specific experience that allows them, when they choose, to deviate 'successfully' or rather work *with* the landscape in a continuous manner as opposed to a one point treatment. We continue walking downstream and I ask Mukundappa what defines the spacing and sizing of bunds – because I saw one larger stone bund, followed by a smaller stone bund, and then a larger one – similar in size to the first one. He replies saying it is based on each farmer's capacity – what each one can build they build. I on the other hand thought that it was a technical decision based on water flow, etc., He stresses again, "if a farmer does not have the interest to build a bund, why would he? His land would stay as is. It depends on his interest and strength to work (*dudiyadhu sakthi)*. But when he builds he will make it serve the purpose as best as possible, within his means." This again echoes Arvind's explanation in Kaadugere.

Just as in Kaadugere, here again I encounter an attentiveness to farmers' practice of bundling – specifically, the interaction between soil and runoff and bunding. When talking of bunding practices these farmers differentiated between a normal flow of water whereby they will be able trap moisture and alluvial soil, and a high flow of water which will create more damage than benefit for the farmer. Heavy rains in the stream course create problems. The owner says that if 'big' water comes, the force is so high that it creates gullies (*dongus),* and Mukundappa adds that it is worse if the soil is not permeable to allow the water to seep in, which is the case in this plot. They have to fill the gully with new soil and then plough and sow the seeds. So I ask if he then has to raise the height of his bund. They say, "no, we can't raise the height of this bund anymore, then it won't be stable. The height of this bund is correct and enough for the size of this plot. We have created passages on the side of the bunds, for the water to flow and to reduce the force of water on the bund." He pointed to furrows on both sides of the plots. I noticed in this stream course all the Lambani farmers, who owned consecutive plots of land, had left space on both sides of their plots for water to drain out and flow. It looked like narrow furrows on both sides of the stream course with water continuously flowing through it. I thought this was a good design for the context compared to the CPR structures of Bhagat in Megepalli. This revealed two

very different contexts of bund building[47]. However what Mukundappa meant by height of bund being 'adequate' was that it was adequate if the owner desilted regularly – indicating that technical specifications cannot be viewed outside of practice. Whereas in watershed projects the technical is separated from the 'maintenance' that an NGO 'motivates' the 'beneficiaries' to undertake after the close of a project.

Jalaa in the Course of a Stream

What watershed treatments had Bhagat designed in Megepalli? I was particularly thinking of one steep stream course in the CPR. Bhagat had taken me there in response to my request for a traverse with him to learn about his watershed designs. It was very clear that the Megepalli CPR was one of his favorite showcase locations. He explained this CPR was treated as a pilot watershed, so it was indeed a showcase location. Here his innovation comprising a choice of low cost design – in the course of the steep stream along a slope of length 300m, he had designed vegetative barriers at the top, and then at four to five intervals along the course of the stream he had alternated sunken ponds and rubble field checks. The two structures were meant to act in concert to reduce the velocity of water and thereby prevent soil erosion. At the end of this steep slope he had constructed a check dam to harvest water. He explained that if he had not designed the vegetative barriers at the top, lot of siltation would occur in the sunken ponds and they would not be able to retard the flow. However, the RFCs made of rubble and earth were no match for stream velocity in seasons with heavy rain. When Bhagat took me for the visit, two of them had began to erode, and unlike the Lambani bunds which were in a constant state of repair, these RFCs looked desolate and abandoned, despite Bhagat's ingenuity at one point in time. The point here is within the pressure to innovate with budgets in an NGO and having to sometimes design a package to sell within the NGO watershed circuit, Bhagat had designed structures that could not tame the movement in this landscape, nor compete with the incremental and contextual method of stone bund building that has existed for several years.

Process of Bund Building and Creating 'Jameen' (Property)

I now go further downstream, to the plot where the stream makes a turn eastward, and we see a young Lambani[48] farmer working. Mukundappa says that this was a small stream, and by steadily cutting they have created the land and widened out the stream. Earlier there were lot of shrubs and bushes and it was not possible to cultivate. The stream was an erosion feature - a gully (*dongu*). By cutting the land back bit by bit every year he was able to widen and level it and create land for cultivation. And he hasn't encroached into anybody else's plot, he has done this work within the boundaries of his plot. We admire the construction of the stone bunds – the manner in which he has placed the stones, and designed the bund – it is broad and then slopes into a narrow bit at the edges. He got the stones from his land and the hillock that borders the land.

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47 Here I refer to the structures designed and built by the NGO. I am not sure if I should add another layer to this chapter where I compare farmers' bunds to the bunds designed by the NGO.

48 Lambani is a tribal community

They show me another patch of land immediately downstream from the previous land and Mukundappa points out the difference between the two to me, “See the land that has been 'created' and maintained because of the bund, and look at this plot without a bund.” I was surprised. Until he pointed it out to me I didn't even think of it as a plot of land. It just looked like a part of the stream course that was marshy and overgrown with shrubs. Mukundappa said had this owner the capacity of a rich farmer he could have converted this land in the course of a stream to a regular piece of land. However he does not have the “capacity[49]” (“*taakat*”). He emphasized that it was not because the owner was a Lambani tribal. “Whoever be it - whether Lambani or any one, if they had the money, they could build a bund, collect soil, create a plot here and grow whatever they want. But they need the *taakat*.”

I asked, “If this farmer were to improve this land what must he do?” Mukundappa replied saying, “He should have stones to build a stone bund. He must cut the stones and make a bund, and then bring soil and level it with a tractor. He has to remove all these shrubs. And then year after year soil will get deposited.” I ask, “How many years will it take him to do all this?” They both say he can do it this year itself but he should have the money. I ask, “What does he need money for?” They are both surprised that I ask such a naïve question. They explain that he would need money to rent a tractor to transport stones. I think aloud - “or he has to have a bullock.” They say “yes, but with a bullock and cart he can't finish his job this year. So, he has to pay for the tractor, he has to pay the contractor who will build the bund, then he has to pay laborers to build the bund and to clear out all the shrubs. Then to level the land he needs the tractor again, and then he will have to use his *madiki* plough to plough. Minimum amount of money he will need is Rs. 50,000. Only then will he get his land. Only then will it become a '*jameen*' (cultivable land). If he were to do it by himself with his family labor it will take two to three years.” For Mukundappa the decisive point seem to be finances. *Taakat* in this context meant financial capacity. Work was only a second route to creating *jameen,* although we had just witnessed its effects in the creation of the previous property.

Mukundappa and the few Lambani farmers who had joined our traverse said that bunding activity was more during their grandparents' time. Although there were no tractors and earth movers then, people built the stone bunds with their hands. The neighbor farmer says that today everybody migrates to work, and Mukundappa says that today people do not have the strength (*shakti*) to build. “Today we can't carry the stones that our forefathers used to carry before. Today you also need money to build a bund. In those days they worked their bodies to build these bunds. The environment has changed. The food we ate is also changed because of hybrid seeds.”

Since they are in a low lying portion, i.e. in the stream course they have to plough these lands more than other lands, because this soil gets very hard in the summer (b*irisu aagathae).* They have to use the *ranti* plough twice. For softer soil, only one ploughing with the *ranti* plough is enough. Mukundappa keeps saying that this soil becomes hard once the water drains out. He stresses the importance of ploughing the soil, whatever the nature of the soil might be, in order to increase soil's moisture retentive capacities. He differentiates between two ploughs - *ranti* and *kunti* – and explains why both have to be used. “If we only use the *kunti* the soil will not

[49] While '*taakat*' translated to capacity, farmers almost always used this term to refer to financial capacity

absorb retain the moisture and runoff will flow into the streams. It is better if we use the *ranti*, as it will create furrows that help trap the moisture."

At a distance, off to the side of the stream is another plot which Mukundappa says is his uncle's plot. At the downstream side is a big, old bund. It is more than thirty years old. This plot too is waterlogged because his uncle has not desilted and the waste weir is choked with soil. The crop does not look good and will not give a good yield. Mukundappa says, "there is no gain building a bund without a drain." The bund is about 14 ft wide – it is a fat bund. I ask about the dimensions of this bund and Mukundappa explains that a bund any smaller than this would not withstand the runoff here. Because the soil here is also impermeable, so you need a stronger bund here. If the soil were permeable or absorptive the water would stand and flow slowly, but here the water will run and come (*birisu barathu)* – so the situation differs depending on the soil.

Traversing along the stream course revealed to me that just as in Kaadugere, a marginal environment created a context within which bunding becomes a necessity. Faced with the necessity of making a livelihood in the stream course Lambanis probably became prolific bund builders. The stream course provides both an opportunity and challenges. While the farmer is assured of soil moisture, it is not a easy, direct realization of moisture. Moisture can be trapped only with a well designed bund, and the waste weir works in concert with the bund to keep the land adequately drained. So, farming in the stream course is a fine balance between soil, runoff and the bunds. It is as important to drain water, as it is important they receive rainfall. Farmers with their stone bund technology, focused on waste weirs, and drainage channels on the sides of their plots to let the water flow downstream from their fields. Bhagat, on the other hand, with his project political economy and its attendant mud bund technology in private property, along with waste weirs, also focused on trenches immediately upstream from the mud bunds. These trenches served three purposes – they provided the earth for the bund, harvested runoff water and sent it underground (as opposed to downstream to the next plot) to recharge subsurface sources.

Lower Midstream and Swamped

The case of inadequate labor and capital is reflected in the marshy plot immediately downstream as well. This 10 acre plot (about a third of which was ill-drained) is managed by a woman farmer – Shankaramma. The plot comprises red soil, white soil, and little black soil which is also not of the best quality. She says applying farm manure would change the alkaline nature of the soil and hence improve its moisture absorption capacity but she does not have access to farm manure since they sold their buffalo. "No seeds 'sit' in this type soil". Only in the slightly higher portion of land, immediately to the west of the black alkaline soil does she get some alluvial soil from the other stream which is well bunded. All her manuring is of non-intensive variety – she allows graziers to graze their small livestock in the lean season, and also make some green manure from agricultural waste. She has three teenage daughters, and one son who is only 8 years old.

Of all her children, only her eldest daughter provides labor, and income from seasonal migration. She told me, and several others in her village corroborated, that her husband is known to be disinterested in agriculture, and idles away his time in tea

shops. Shankaramma is an upper caste farmer and belongs to the Lingayat caste, which is traditionally associated with agriculture. She also comes from a family that was known to be wealthy in the village. However, because of lack of labor, and low levels of capital formation (she spends much of her money on educating three of her children) she is unable to improve her lands, and make them more productive. Overall, her disposition was one of fatigue.

As we were walking she showed me a possible location for an intermediate bund, and said if she built one there the water would stop and go, and thereby provide some soil moisture - “but god knows when we will be able to build that bund! If we will build it all!” Her present approach is piecemeal – wherever the slope dips on her undulating land they have created small bunds with a few stones that are available on their land, and have fortified these bunds with mud. It is not fully effective. She says the hope also is that they can keep adding stones to these places and making the bunds bigger, year by year.

When I talked to Mukundappa about Shankaramma's land he said that the low lying part has become terribly hard and uncultivable because of its alkaline nature. This type of soil does not need too much or too little rain. It does best with a medium rain. When there is too much rain it becomes hard and then is difficult to sow. He says the same problem occurs in his uncle's plot just upstream from this plot. According to him, the remedies are mixing fertile soil from outside, and also ploughing with a *ranti* and *kunti*. The other option is to grow hyrid pearl millet, hybrid sorghum, or *mikke jhola* as these crops do not require too many timely rains and have the ability to do well in soil that is deep and where the moisture goes down to even 1 ft depth. But if there is too much rain then the roots will turn into mush and the crops will die. He too says that it is unaffordable for Shankaramma to build a stone bund with waste weir to remedy the drainage problem. It would cost her at least Rs. 50,000. He says he too has a one acre plot in a similar condition and he chooses to leave it fallow when the rains are heavy as he can't afford to remedy the situation. He cultivates in other parts of his land. This reveals an non-intensive method of cultivation. It is for people like Shankaramma, who do not have the capacity to build bunds, and have plots in gently sloping locations of the watershed, that Bhagat's mud bunds couched in the universal coverage approach of watershed projects make sense. However, Jalaa had not covered this village under its watershed project.

Shankaramma points to her brother-in-law Sudhakaragowda's land, which is the neighboring plot on the downstream side, and says it receives a lot of good alluvial soil which he utilizes to grow ground nut and wheat. Unlike him, she doesn't have an old bund where she needs it! His old style bund is built across the stream and creates a *kere* (a gentle *depression which acts a soil harvesting structure)* where the alluvial soil is trapped. She explains that he rented a tractor and leveled the land, and moved the old stone bund to the more suitable location where it is now. “He has really 'managed' his land, and also 'managed' the course of the stream and channelized it in a particular way in order to harvest alluvial soil”. Also when it overflows he just sets aside that low lying portion of his land, and doesn't worry about it. She appreciates his work and says he has people in his home to help with the work, so he is able to do it. He has three sons, the first two seem to help, and sometimes also the third who is studying. She also added that after the third child he and his wife opted for family planning.

Her situation is different – it is expensive to pay for labor and get work done. She agrees that she can also improve her land but says the main problem is that they keep going off somewhere or the other – to migrate and work and make money to send their kids to school. “I'll do what I can and later it is in the hands of my children”. Her comparison with her brother-in-law reveals another important difference in bund building – labor and capital – both subsumed under what farmers refer to as capacity or '*taakat*' are very important determinants of bund building in the present day context. While labor is not necessarily correlated with any traditional axis of difference, levels of capital formation today in this region do not neatly map onto traditional axes of difference such as caste and landholding – illustrated in the comparison between Shankaramma and her brother-in-law. I address this in more depth in the conclusion.

What stood out for me was that despite all her inter-related constraints, Shankaramma's reasoning for low yields was unpredictable rainfall. I realized that this explanation was because she experienced significant difficulty in altering her other constraints. Her experiences form a part of the context from which the discourse of changing rainfall patterns and 'drought' arises. What I mean to argue here is that we must understand that 'drought' in this region is constructed by farmers partly due to the serious structural constrains they face. This also offers further substantiation for understanding agricultural practice as a bundle of intertwined practices.

No Stone Left Unturned

I was very curious to meet Susheelamma's successful brother-in-law Sudhakaragowda as several farmers in Bannigudi had pointed to him as the most experienced and knowledgeable farmer in their village. When I looked around his 10 acres of land I was surprised to find that it was probably the only or one of the few parcels of land that were completely terraced in the village. It was terraced in different levels and there was hardly any sloping land. Now this was a new variation for me and revealed the rare plot that was intensively cultivated in this predominantly dry land farming belt. Susheelamma has already highlighted the key factors behind Sudhakaragowda's 'impeccable' land management. However, I think it is worth sharing here his ideas of agriculture which are the reasons for his intensive cultivation. He appears to be the model farmer of the State, and in his case, caste and class are actively at play. This has serious implications for an evaluation of interventions in an agrarian economy of a dry land, rain fed landscape - interventions have not really made a structural dent.

One of the points he stressed on is that it easier for him to get higher agricultural yields than it was for his father. His father could barely harvest 100 tonnes from crops such as yellow pigeon pea, sorghum, pearl millet and foxtail millet in 30 acres. Now each one of the brothers produces 100 tonnes of all crops put together from 10 acres. When his father was farming the land was not level, soil was hard and had lots of weeds. “The practice of leveling was not popular in our village at that time. If was difficult to level your land with bullocks. So they just left it that way. Wherever the land cooperated they applied green manure and cultivated. However my father's generation had the knowledge. For example, in Bijapur taluk, in Hundgund they did all this even before thirty years. They were able to do it there because they

Intensive management: Gowda's fertile kere, well drained and reaping benefits

Non-intensive management: Waterlogged, and different crops to make use of different levels of soil moisture

have good black soil, so they prepared a particular type of plough – '*tagadu hakki kunti-ge*'. The soil here is red and so it is a bit hard". He also explains that weeds were a problem because it was difficult for large landowners like his father to manage 30 acres. "People can increase but land cannot increase, so as the landholdings become smaller, people are able to improve their lands". His job is comparatively easier by having to manage only a third of his father's. Moreover today it is possible to level one's land with tractors and mechanized earth movers, add green manure, and make one's land fertile. "This practice of leveling has become popular in the last fifteen years. Suppose I level 1 acre this year, then methodically apply green manure, my yield will double from 4 tonnes to 8 tonnes next year. The reason for this is that the water is able to go into the soil. If not, then the water runs off the soil and into the stream or river! We have to allow the water to go into the soil, and only then the soil fertility will increase. Also, the manure you apply for the land will stay on the land and won't get washed off. You will see the benefits of the manure for three years. So your costs also reduce in the long run."

If one wants to rent a mechanized earth mover for leveling s/he has to go to Kamalapura or Lakshmipur to arrange for it. It is easier to rent tractors as one or two farmers in each village own a tractor. In Gulithota, Mukundappa and Shivanna have tractors. The owner of the tractor will operate it and level the land. When Sudhakaragowda leveled his land he paid Rs 250 per hour. The prices have since risen to about Rs 275. Sudhakaragowda is an outlier in this landscape where most other farmers (except the extreme case of Lambanis in the stream course) told me that the last priority in bunding was leveling land. The majority worked with the landscape over longer units of time and space[50]. Another farmer walks up to us to listen to what we are talking about. He tells me that Sudhakaragowda's land used to be a low-lying alkaline wasteland where ten buffaloes would graze. It was Gowda who built a bund and changed the land. Sudhakaragowda tells me that the way to create new soil from an eroded subsurface is to remove the stones, and start ploughing. You will then be able to gradually create new soil. The fertility of the new soil will however be low so the farmer also has to improve its fertility by adding manure. That was the process their forefathers followed even if they did not level their lands and build bunds intensively. They spent all their time on their land and did not migrate to work so they were able to do it.

In terms of soil conservation structures in farmers' practices, the *kere* on Sudhakaragowda's land deserves special treatment because it is a prized object in this bunding landscape. Around twenty to thirty years ago when Sudhakaragowda started agriculture on his 'cemetery-like low land' one of the first things he did was build a traditional stone bund across the stream that flowed through his land. Other farmers refer to this bund as a *kere* bund and always associate such bunds with rich farmers and large landowners because it costs a lot of money to build. Building a *kere* bund requires that you widen the course of the stream by cutting back the bluffs on both sides, thereby facilitating large deposition of alluvial soil. Mukundappa told me that Sudhakargowda was one of the first farmers to make a kere in their village - "Sudhakaragowda's father was the richest farmer in the village. Sudhakaragowda knew that if he did this he would get all this fertile *raki* (alluvial) soil – so he used his

[50] By space, I mean the non-intensive cultivation method of someone like Mukundappa – in his 10 acres, since 1 was waterlogged he just let it be that way.

head and did this". With this bund he is able to harvest a lot of alluvial soil from Megepalli tanda and Kukrehalli tanda.

I then talked to him about moisture requirements for agriculture in the context of a changing rainfall regime. He says, "During my father's time we received more rainfall than we do today. But today because my land is level I can plough it well and prepare the soil, and so it absorbs good moisture even though the rains are less. In those days even though the rains were more they were not able to do anything with it – the rains would just flow into the streams. Today we may get the first monsoon showers (*Roni malle*), and then we sow seeds, and immediately after we need rains in about eight days, but that is not predictable. So the small seedlings that germinate die. Timely rain is required especially for red soil which is predominant in our parts. If we have level land that has been weeded, then that land is able to help these seedlings survive. But if it is land that cannot keep moisture, then tough luck. If you are not able to rent a tractor then you have to use your bullocks and plough and prepare your land to make it capable of holding maximum moisture. You have to first use the *madiki* plough and then the *kunti* plough. Out of the 10 acres, 8 acres of my land are rainfed. The remaining two acres I irrigate (and hence uses fertilizers)." Unlike Shankaramma, Sudhakaragowda's advantageous position allows him to prepare his land to work in concert with erratic and untimely rainfall.

Sudhakargowda tried to sink many borewells, all of which failed. Then the last attempt gave him about 1.5 inches of water. So he is very careful with his use of bore water. "In our region although borewells have become very popular in the last ten to fifteen years, bore water is only used as backup. Moreover bore water doesn't come in plenty so we use only what we want, we don't waste it." Sudhakargowda has built a storage tank in the upstream part of his 10 acres, using which he is able to efficiently irrigate his 2 acres. He is also protected from the power supply problems that wetland farmers typically face. He built it four years ago with the help of his son, and using his bullocks. It took them a month. Had he used a tractor he could have done the job in two days. This reveals his struggles, whereas other farmers only talk of his fruits. His story is one of capital and work.

A Fragmented Style of Non-intensive Cultivation

Until land reforms in the 1970s Mukundappa's father was a tenant farmer with the local landlord for over fifty years. Before the period of tenant farming they used to be small livestock grazers. Mukundappa belongs to a caste group that is categorized as Scheduled Caste by the State51. Post land reforms his father became the owner of total of 35 acres. Mukundappa has inherited this land with his two brothers. The three brothers still haven't separated their land records and manage their land jointly. When he was a young boy he would graze his family's small livestock.

Limits to Agriculture

On one of my first traverses with Mukundappa he took me to see what he called his worst piece of land. Having spent a significant amount of time at the NGO and not having had a background in agriculture, I was of the impression that poor soil

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and / or land quality meant low returns from agriculture and low productivity. After that traverse and conversation the message that I took home with me was that gains were possible with minimum intervention from dryland farming and poor resources if you were innovative enough to understand how to work with your resources. This way you could still make your land yield something instead of nothing. What really stood out for me in this 4 acre plot was how the stones and geology ruled the land, and what really kept me hooked to his narrative was how he kept talking about the stones. He referred to the stones as *poat kallu* which means a cluster of small rock outcrops. There were lines and lines of these protruding sharp edged slate stones on this tumultous plot that sloped in many different directions. I asked why he hadn't leveled his land. He said it would cost him a lot of money and that he had better lands to put his money and efforts into. Given the steep slope, much soil was lost during the rains exposing the stony subsurface. The soil was white and thin. He grew *urulai* for home consumption in the entire stretch of land.

Then I noticed that he had sown the crop along the slope which was against received wisdom. When I asked about this he told me that the stones ran in that direction and hence he had no option. He could only plough in one part of the land where the soil depth was 1 ft. He did not apply any manure for this land as it would hardly sit on the soil. Rain water was the only 'input'. But even the rain water was not absorbed into the soil as the soil was not conducive for infiltration. A non-perennial stream flowed through the plot. It was not bunded. Runoff from his land to the stream was high. He only had a boundary bund at the downstream end of his plot. Although this was an extreme case of poor land, Mukundappa's management style here was representative of what I later came to know as the practice of dry land farmers – non-intensive management as opposed to the rather intensive management of their irrigated lands, which were a small proportion. But what is more important for my enquiry than the non-intensive style of management is that despite the fact that his land was so marginal (just as in Kaadugere) and needed a bund, he had not invested in a bund and was getting a decent yield. This is a point of difference to note. This is because unlike Kaadugere, farmers here had access to better quality lands. In Kaadugere, most lands were marginal.

On another day when Mukundappa took me on a traverse of a stream we also visited his prime piece of land which is about 70 meters away from the stream. This is the land that he and his two brothers inherited from their father. This plot is divided into three subplots, one for each brother. Mukundappa's subplot has a gentle B slope. I asked, "So for this type of location what type of bunds do you build?" A farmer who had accompanied us said, "for these types of lands, if we use mud and build small bunds, that is enough." Mukundappa added, " Even if this land is not in the course of a stream we do need bunds in order to retard the flow of runoff during the rainy season. When we retard the flow of runoff it will give moisture to the soil as it flows. If not the flowing runoff will create erosion features such as rills and gullies. Water must stop and flow slowly. These bunds really help increase the soil moisture and that is when you get good yields, otherwise the crops will dry up. " The mud bunds on this land looked to be of some vintage as they were stabilized with fodder grass. Mukundappa confirms they are old bunds. The slope is now not so apparent, because some leveling has already happened due to bunding.

I point out to two slopes – one to the west of us with many stones bunds at regular intervals, and the slope that Mukundappa's plot is on, which does not have any stone bunds, but farther spaced mud bunds. The clarification they give me is that the former is a hillock that has been cut and leveled in order to create cultivable land. The cut stones have been used to build bunds which were required in that situation because of the steep slope. But on Mukundappa's land mud bunds will do. I saw a landscape pattern emerging which was not as apparent in Kaadugere, because of the situation being more adverse there: hillocks that were cut into and terraced with stone bunds, stream courses that had to be bunded with stone bunds, and minor slopes with small runoff streams that could do with mud bunds.

Where Jalaa's Designs Map onto Farmers' Designs

The bunding on Mukundappa's moderate to gentle slop plot is the one landscape where farmers practices of bunding neatly map onto Bhagat's bunding designs within the framework of a watershed project. But this doesn't mean there were no contestations during the execution of Bhagat's designs. In the early stages of the project, as seen in Kaadugere, Bhagat had designed mud bunds constructed from 1 ft deep trenches. The bunds were built from earth excavated from the trench, and the trench would serve for harvesting water, retarding velocity of runoff, and serving as compost pit. But soon enough Bhagat and the farmers realized the futility of the 1ft deep trenches. Within one season they got silted up, and the also used up valuable top soil. Moreover, the 1 ft high bunds were unable to withstand heavy rains. So Bhagat, following suggestions from farmers from a neighboring village not covered under this watershed project, changed the design to 3ft deep trenches. This meant that they were using harder subsoil for building 3 ft high bunds which would be stronger. This change occurred half way through the program, and created serious labor protests in one village. People did not want to work so much to build these bunds. It was hard work to cut 3 ft deep trenches. This became a controversy which was eventually sorted out by Bhagat and his field staff through a combination of diplomacy and threat of sanctions. By the time they had moved on to work in the next village, this idea of the 3ft deep Trench cum Bund (TcB) had stabilized amongst the population. It is ironic that farmers sing praises for 'Bhagat' and 'his' 3 ft trench cum bunds which survive to this day, while the inspiration came from their own lands. Moreover, this is one design that Ashok chose to 'package' in his GIS models as shown in Chapter 4.

A Coherent Style of Non-intensive Cultivation

Conversations with a young thirty something couple, Lakshmanna and Lakshmamma, who are first cousins of Mukundappa (and hence also Schedule Caste) helped me further develop the understanding of difference in agricultural practice that I had begin to gather from Mukundappa. One of the points that stayed with me about Mukundappa's land was that despite his availing of many state sponsored schemes for irrigation, his land revealed a very fragmented approach to management. Lakshmanna and Lakshmamma, on the other hand, said they did not like the hassle of applying for state sponsored schemes as it involved a lot of trouble. They however displayed a strong sense of team work and worked together like I had not seen in many other households. The couple say it is possible to manage farming all their lands, but if necessary they hire four to five laborers. They manage a total of 21 acres, a third of

which they own, and the rest they manage for Lakshmanna's two brothers who work out of town. All these lands are rain fed.

The land we were sitting on has white chalky soil just like Mukundappa's plot. It also has a significant degree of slope, and a stream which runs through has created a gully. Lakshmamma says you can make cement from the white chalky soil. I begin to talk to them about how they manage the soil in this landholding which is of C slope. Lakshmanna says - “whatever people say about improving its fertility, and whatever we can apply to it, we do.” But even though it is not of good fertility they are not frustrated with this soil given their limited means to level their land. This plot slopes quite a bit, here if we have to do any improvements it will cost us Rs 2000 or 3000 at the very least. They explain that were it any another soil type in the same location it would have been washed away. This is because they have not been able to do other interventions. What stood out for me in this adverse situation, was that this poor soil is like gold for them. This soil stands because of its texture. Lakshmanna keeps repeating that nothing can be done and that they have to work with the landscape - “it is like that - it will level slowly, it will take a while.” Given their limited financial means and labor shortage within the family this is their relationship to the land and their definition of their soil. This style is also variant of non-intensive dry land farming, and sharpens my understanding of the context in which incremental bunding takes place. Farmers are putting in effort on a daily basis, and they are making a living out of their lands.

The Bounty of Downstream

Gulithota the downstream village in the project watershed is Jalaa's largest support base. Basanna from here holds Bhagat in very high regard and cannot stop lauding Jalaa's efforts in soil and moisture conservation in his village. It is compelling to note that the meaning of water changes in this location. While many farmers in the locations we have traversed above talk of the importance of letting the water flow because they of their interest in alluvial soil and soil moisture, here Basanna has learned the benefits of sending the water underground. He says “Jalaa has taught us that water should not go forward at all...water that comes to our land, must be absorbed in our land - we have learned that from Jalaa...it should go forward only after it fills up the pit. Jalaa built a *kere* (pond) worth Rs. 50 – 70,000 for our livestock to drink water. Earlier we farmers did not have much, we would allow the water run off. Only those who have capacity can build stone bunds, but with Jalaa irrespective of everything, everyone got bunds. Migration in our village has come down after Jalaa started the micro credit enterprise. We use our earnings and put it into our land. This was not possible when we were going to the money lender. This has helped small farmers particularly. Large land holders do not need to belong to such groups. There are now 200 bore wells in Gulithota[52]. The micro credit staff give us useful information on agriculture, banks, etc., So farmers also join the micro credit groups to be in touch with Jalaa and the information it provides us. Here people have been converted – they want the water to go downwards, and not forwards – as they have tasted the water of bore wells.”

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[52] Micro credit started as an ancillary to watershed development, has been ironically used for borewells in this downstream village in which aquifers have been recharged.

Adisesha says that farmers in Gulithota are able to see the changes in their borewells after the watershed treatments (such as sunken ponds, stream ponds, farm ponds) of the Jalaa watershed program. There are about one hundred bores in the treated areas of Gulithota and these borewells get recharged with two to three good rains. With heavy rains the borewells have good water for the following two years. He claims that people are maintaining the bunds. With the rains only parts of some bunds get damaged and each family is able to repair it using the firmer soil from 3 ft depth. If they maintain the trenches immediately upstream from the bunds (and maintain them as compost pits) then it is even better as this prevents any damage to the bunds. They can also harvest a lot of water from these trenches.

A Contrarian Amidst the Newfound Bounty

When I interviewed Mudukappa of Gulithota in 2008, he was approximately seventy years old. He passed away in 2009. He has an intensively bunded plot on what was a very steep slope. My informants in the village, were rather enthusiastic when I asked if they would introduce me to Mudukappa. They said that since his eyesight and hearing are failing he is almost always at home. We walked to his home and sat down for a chat. My informants told me that they remember his bunds from when they were young boys. He was determined to create level land and cultivate on this hill, which is why he built bunds. In fact there is still some slope that he wants flattened out through bunding but now he has no strength. His land was just a hillock where cattle used to graze. He is one of three brothers. One brother got land on this side of his plot, and the other on that side of his plot, and he landed up with the slope in between the two. “He has created land and is getting food from it”, said one of the younger men. He cut the rock outcrops in his land and created stones with which he built the stone bunds. He did all the work by himself. This substantiates the point that farmers with most marginal lands build traditional stone bunds, just as in Kaadugere.

During his time there was no concept of set season for bunding work such as summer, which is the practice today. Older folk scoff at this idea today. Mudukappa said he was on the land all the time, and every day. When there was no agricultural work to do that, he would work on improving his land. “One was dedicated to the land and agriculture. Only today there are set and specified times for other activities. Today's young farmers sleep, they don't work like this. Because of the bunds, crops were able to grow, I was able to collect soil. Without the bund, the soil would get eroded. Now I have been able to save my soil, grow good crops that give good yields.” In the earlier days no one used to employ labor for building bunds. “That is what I knew, that is what I could think of, and so I did that.”

A debate ensued about how many others in his time built the same type of bunds. One of the informants said that Mudukappa was the most hardworking. Someone else said, “but his land was the steepest so it was required”. Mudukappa himself says not too many other people built this types of bunds, or developed their lands in this manner. “I can't be making *chai* and sitting and waiting for some landlord (*gowda)* to come and help me. Why would the government build us bunds? It is my land. If one wants to live and do something one has to act on it and do the work. I was given a really bad piece of land - a burial ground. I have converted this wasteland into my wealth. I have also been able to create extra land, more than the share of my brothers (because at the time of partition they did not factor in this waste).

Mudukappa's labor: Jameen created where none existed

Limits to Agriculture

Mudukappa's entry into bunding was from the basic need of creating land and conserving soil like many others I had encountered upstream. But I also wanted to understand his view of moisture requirements in agriculture. We discussed the limits to agriculture, *vis a vis* moisture requirements. When Mudukappa was working his land, he said rains were good. However he says agriculture with less rainfall is possible with hybrid seeds. He goes on to explain that there are differences in practices between his generation and the current generation - “In those days when there was no rain, at the time of need we would till the soil to survive. Nowadays people only plough twice or thrice, not as many times. Then we would plough at least seven times. If you plough many times, the soil becomes fine and the soil won't lose moisture, it become hard and develop cracks. People have forgotten how to plough now. If we build bunds, there is more moisture for at least six more months. Crops will stand for two more months even if there are no rains. Because of the bund, the water stands and it gives moisture for areas in front, i.e. downslope.”

Jalaa's Farm Ponds

Besides the bounty of downstream locations, all farmers told me that one of the key points of difference between their bunding practices and Jalaa's watershed treatment program were the water recharge structures such as farm ponds and *naala* ponds. These were not part of the soil and moisture conservation techniques of the farmers. They say that they have learned from Jalaa that when water collects in a farm pond it increases the soil moisture downstream which could be converted into a

thotaa, or a wet garden. A lot of fertile soil is also deposited and has to be desilted. This soil can be spread onto the part of the plot that is cultivated. Arvind said, "Our main intention in building stone bunds was to trap the soil. So we used to just let the excess water flow through the stone bunds in a slow manner, but these structures trap the excess water and make it soak into the ground. We did not have these purposes in mind."

Basavamma of Kempapura says, "yes, we have bunds, and when there is heavy rain, the water stagnates for one week. This does help increase our yields. Sunken ponds, and farm ponds constructed by the Jalaa watershed program help supply water for livestock. About four hundred cattle from three surrounding villages visit the farm pond that Jalaa built near her land. If the farm pond was not there we would use the river. We know about wells, and *kere*s, but farm ponds are new to us." Farm ponds however do not sit well in the political economy of this landscape as it their construction requires lots of collective labor, which is rare.

I asked Arvind if Jalaa built any sunken ponds, farm ponds and *naala* ponds in farmers' plots. He said since the location of these structures depends on water flowing from a specific size of catchment area, they cannot be built anywhere. They constructed a farm pond in one farmer's plot in a suitable location. The other farm ponds Jalaa constructed in his village are in the common lands. Arvind says there are noticeable changes in the vicinity of this farm pond. The farmer is able to harvest fertile alluvial soil when he desilts his farm pond. Soil moisture has also improved downstream from the farm pond and the ones in the CPR. There is less dependence on rainfall. If they get 1 good rain in June, crops are able to survive the rest of the first season. Similarly in the second season, if they get a good rain in September or

A farm pond: foreign to the farmers' landscape

October, crops are able to survive. I ask if, after seeing these benefits, farmers are interested to construct farm ponds on their own. Arvind shakes his head vehemently, “No, that will rarely happen. We farmers do not like building farm ponds as it eats into our acreage, it takes away precious land. But some people dig trenches to trap rain water. This allows them to plough soil that was originally hard.”

Discussion

An Active Working of the Landscape

One point that comes through clearly in my ethnographic analysis is that contrary to assumptions of watershed interventions in Jalaa's case and in watershed projects all across the board, it is in the most adverse parts of this landscape that I find intensive efforts of bunding. Unlike Jalaa's chain of explanation - low productivity is a cause for low levels of livelihood security and hence seasonal migration and which in turn leads to lack of interest in land based activities – farmers in Kaadugere, and in the steeply sloping stream courses, have consistently worked on their plots to create soil over years. They do migrate seasonally, but some of them told me that they use the income from seasonal labor to build bunds, and develop their lands in other ways. Interestingly in one of the villages which was such adversity – Kaadugere - I found a high density of stone bunds, and in this village Jalaa's watershed activities were relegated to the common property areas. The absence of a rich natural resource base being understood as backwardness is a cross-cutting theme across multiple ideologies of natural resource management. The explanation that typically follows is that farmers tend to give up. However the work of farmers in this region in creating and maintaining inter-generational assets in the stone bunds is a strong critique to such tendencies.

Bundling vs Partitioning of Landscapes

Farmers' practice of bundling needs to be contextualized with Bhagat's first explanation to me about watershed engineering (refer to Chapter 4, p. 5). He said to me in explaining the spatiality of a watershed, “Water flows according to slope. Managing water is managing slope. So slope is the main reason one needs to be aware of catchment area. That is the scientific way.” Where is this idea coming from? Hanumantha Rao, popularly known as the architect of integrated watershed development highlights that watershed development was originally part of large dam projects in order to prevent siltation of reservoirs (Rao 2000). Ernst traces the origins of watershed development to the scientific practice of representing landscapes as hydrological units as opposed to administrative units, and goes on to talk about hydrologic engineering and the model of Tennessee Valley Authority (TVA) (Ernst 2005). The TVA model was a huge inspiration for large dam projects in India, particularly the Damodar Valley Corporation (DVC) large dam project (Klingensmith 2003; D'Souza, 2003). D'Souza's work is particularly useful in this regard as he demonstrates the colonial powers' separation of land and water in the development of the landscape. While these linkages demand more attention on my part, I argue that Bhagat's method of prioritizing slope represents a continuity with this intellectual history of representing and partitioning of the landscape. I use Nandy's work to further substantiate this difference between Bhagat's practices and the bundling practices of farmers. Nandy in his critique of large dams talks of farmers' bunding

practices as a four thousand year tradition, bund deriving from the Hindi word *bandh* which means 'to stop,' or as farmers in my study area would say 'to retard' (Nandy 2001).

The Glimmer of the Database Assemblage

This discussion would not be complete without looking at Bhagat's practice of watershed planning in a historicized manner. Chapter 4 shows that while Bhagat did begin with an initial strong focus on slope, he did not stick with it. He talks of how the GIS database gradually altered his planning. The detailed plots maps and soil surveys made him widen his focus from slope to include the interaction of soil and other 'social' variables. I also reiterate from Chapter 5 that it is not just the inclusion of variables that make a deep database, but the manner in which they are represented, i.e. the relationships in the database, the abstraction that comes from the representation, and the relationships between all actors of which the database is one. The case of this local GIS thus provides a response to Turner who is hopeful of the potential of GIS to facilitate adequate socio-ecological analysis if we move beyond a shallow use of the technologies and instead pay more attention to the details (Turner 2003). This is also why I argue at the end of Chapter 4 that there is a glimmer in the database assemblages because it allows Bhagat to realize this bundle to a certain extent. The dissonance that remains between the two sets of practices is explained below.

Water vs Moisture

Amongst farmers, bunding is viewed within the context of a bundle of practices such as ploughing, drainage, cropping pattern. Soil is a big concern for farmers given the aridity and local geology of this region. In fact most farmers, except those in stream courses, said that bunds were firstly built to trap soil. The next priority was to increase soil moisture, and only the third priority was to level land. In the project set up Bhagat was focused on slope, and this was tied to water, and the movement of water. 'Water' is different from 'soil moisture', the latter being the priority for farmers in this semi-arid region with highly variable rainfall and a cropping pattern of millets that has evolved over many centuries. Bhagat always articulated that he wanted the water to seep underground and not flow. In fact the National Bank for agriculture and Rural Development (NABARD), one of the biggest funders for watershed development propagates the caption - “Catch Water Where it Falls”. Whereas farmers always told me that their intention in building bunds was to increase soil moisture, reduce soil erosion by reducing the velocity of water, and let the water flow.

Even the most prized watershed structure for farmers is telling – it is the *kere* as on Sudhakaragowda's plot, which is a shallow depression that is created by building a bund across the course of a stream where it widens, in order to trap all the rich alluvial soil. It is only after the GIS database was created with soil as a variable, that Bhagat began to internalize the connections with soil. Farmers talked so much about soil. A retired agriculturalist who consulted for Jalaa explained to me that crops can grow in this region with soil moisture – they do not need water. If one improves the soil organic content then one can increase the moisture retention capacity of soils. (The discussion under 'Limits to Agriculture' in this chapter addresses this debate) The watershed project fixation with water, and sending water underground is linked to

the construction of drought and land degradation in the country, and more importantly the aim to improve the agricultural productivity of dry lands through irrigation. Overall because of its rain fed nature, there was a pervasive non-intensive style of agriculture but it was has not characterized by wrong action, or inaction as assumed by projects. Rather the action had a different pace but it was active (which is why interventions want to change this area and make it productive). In all my five years on the field in this region, never once did I hear any farmer characterize their problem as land degradation. All they did is talk about constraints, such as erratic rainfall, lack of manure, and difficulties in fixing capital. How would they when most of them were actively working their landscape on a daily basis?

Jalaa's Universal Coverage and Trench cum Bund

In the final analysis, I argue that the universal coverage of Trench cum Bund through Jalaa's watershed project did make an impression on farmers who have to negotiate a serious set of structural constraints on a daily basis. Given their structural constraints to build bunds, they note that in the Jalaa program all lands were treated and also all drainage lines from upstream to downstream. Farm ponds were built in the course of big *naala*s. In farmer Basanna's words, “In those days not everyone had the opportunity to build bunds. Today people have the opportunity and 'comfort' - because Jalaa and the state program have come to the area and are executing work. In those days only those who had capacity (*taakat)*, those who could build from their own stone, and those whose plots were in the course of *naala*s, but not every one for every plot. Now with these programs every plot is getting covered. Then they only built bunds for areas that absolutely needed it, now every area is getting treated.”

In this context, I also argue that it is important to dwell on the journey of 'Trench cum Bund' – a situated practice has informed NGO practice, and is then taken by the NGO to package and then propagate, and when the package is delivered to the farmers within the framework of a funded development program, it is appreciated by the farmers for the manner in which it fills the gaps in their landscape. What is happening here, and what does it inform us about development/technology, and modernity, and the cultural specificity of both? Using the concept of how 'ideas travel' in development practice, I argue that modernity and development in this case do not erase a 'local' (Gupta A 2003; Klingensmith 2003). Instead the translations I followed using Latour's approach allow me to demonstrate that changes happens through a 'regional political idiom' (Subramaniam A 2003). Trench-cum-Bund is an idea / a practice/ a structure which stands the test of movement of soil, water, and social relationships of development.

Changing Ideas of Environmentalism

As I leave this landscape, it remains important to view farmers' bunding practices in the context of other changes they are making in agriculture. Better yields and more stable income are steadfast goals that all farmers articulated. Bunding needs to be viewed as part of their bundle. There are other ways that farmers are trying to make the land more productive within the different micro topographies of this region - hybrid seeds, fertilizers, bore wells and a small shift in crops such as onions, and garden vegetables. Moreover farmers are very connected to external economies through their seasonal migration which has been a feature of the landscape even in the

Asset creation: Jalaa's mud bund stabilized with grass

1930s (Iyengar 1931). State sponsored subsidies for certain social groups allows people such as Mukundappa to focus on income generating activities that are not directly related to tilling the land. In the face of these changes is bunding becoming a luxury, particularly the construction of stone bunds? Is soil and moisture (not water) conservation, becoming a luxury? Have all the new opportunities made it less attractive (less labor, less time, less interest) for farmers to continue the incremental practice of stone bunding which then yields soil and moisture slowly over the years, but in a very sustainable manner? What of the environmentalism of these farmers?

In attempting to answer this question, we must distinguish between stone bunds and mud bunds. Each comes with its own bundle. As the handiwork of farmers in this chapter has shown stone bunds are favored in stream courses where the gradient is steeper. Mud bunds are favored in medium and gentle slopes. The slow incremental process of bund building arises also out of the local geology – whether they want to or not, farmers while ploughing their fields remove stones that obstruct the plough and place them in stacks in one part of the field. Every time I asked a farmer with such a stack they would tell me that these were the stones that would eventually be used to repair their old bunds, or build new ones, or incrementally add to old ones. Even if they did not build stone bunds, some would also build a hybrid of stone and mud bunds before the rainy season to prevent soil erosion.

Attention to the materialities on the field does not provide a clear answer. Costs of bore wells are sometimes almost equivalent to building bunds. But then the kind of water they get from bore wells is different – and this is where the debates amongst farmers on the ground becomes useful – the debate between water and moisture - 'big' water and 'small' water as they call it. However, staunch supporters of 'small' water are passing away, such as seventy year old Mudukappa. Nevertheless, bore wells and stone bunds are not mutually exclusive options for most farmers.

Firstly, those who irrigate their fields typically have an interest to level their lands to ensure efficient irrigation. For this they will maintain their bunds, or construct bunds (although it might not be stone bunds)

But one piece of strong evidence which reveals the clustering of mutually exclusive relationship between bore wells and bunds is the micro topography which is again related to the geology – areas typically suited to bore wells are downstream and in stream valleys, where the soil is not as stony -hence you do see fewer stone bunds because of fewer stone, and less need. This is brought out clearly in the voices of farmers of Kaadugere, who say that there are only 1 or 2 bore wells in their village. However, people in the downstream village of Gulithota are very aware that the they are benefitting from successful bore wells in their village because of all the bunding that has happened upstream from them, and this is not just Jalaa's bunding. Arvind of Kaadugere said rather ruefully to me, "people in Gulithota get to benefit from generations of bunding in our upstream village."

Here is another hypothesis – if you have marginal land, can you buy better land to cultivate, with better sources of income? But when they buy better land do they think it helps them avoid bund building. My gut feeling is that the power of this semi-arid landscape and its attendant uncertainty is so huge that people do not think twice about the costs of bunding, particularly mud bunds. While stone bunds might not not be built as much as the past, I think the bunding technology is such a simple, part of the landscape and economy that it stays.

In very marginal lands, bunds still do represent a fundamental way of creating land, because there are only a handful of farmers who can afford to rent earth movers and tractors to level their lands, and / bring in soil. This reflects something about the environmentality of the farmer, or rather his relationship to his land which is more primal than the modern term environmentality. The point I want to make is that there is continuous working with the landscape for farmers, according to the situation, and even though they have borewells, etc., here one of the things they have to work with slope, and soil- and they are sensitive to soil erosion, even if they have bore wells. They do not view bunds as environmentalism, they view it as survival and increase in productivity. And even though they have a gradual role in productivity, bunds are remain a small, but significant part of their changing repertoire.[53]

53 Here, just as in the next chapter, it is important to note that most farmers I spoke to said that one thing they rely on is a broad set of traditional practices of farming without normalization of what must be done on their land. .

Chapter 8

Layered Landscapes of Knowledge Seeking, Sharing and Decision Making

In this chapter I will provide an analysis of practices of knowledge seeking, sharing and decision making of different actors in this agrarian landscape, with an emphasis on farmers' practices. What does such an analysis of practices contribute towards a critical understanding of the use of remote sensing and GIS in rural development? While Chapter 7 focuses on farmers' practices of soil and moisture conservation in order to contextualize the NGO's use of these technologies for planning watershed treatments, this chapter focuses on farmers' practices of knowledge seeking and sharing in order to contextualize the NGO's attempts to scale up their use of these technologies by framing them as participatory knowledge tools. This examination is required because applications of spatial technology applications are being ratcheted up as information interventions for the rural poor. Illustrative of this is the trend of Information and Communication Technologies for Development (ICT4D). Many such interventions exhibit an interventionist streak, where many interventions are planned, proposed and or implemented without due attention to existing processes of knowledge seeking and sharing. They are positioned to solve the 'information asymmetry problem' of the poor.

In this chapter I will show how farmers' processes of knowledge seeking and sharing are not an inherent cultural trait representative of a region characterized as backward, but are embedded in an active history of a semi-arid agrarian landscape, one of the main features of which has long been highly variable rainfall. An additional feature of this landscape post Independence is its marginality to the agricultural interventions that targeted the very fertile and better irrigated delta regions of India. I argue that it is important to understand that 'information asymmetry' and inequalities amongst various actors in this agrarian landscape do not simply exist as normal processes. Instead we have to notice that these inequalities and information asymmetries are being constantly reworked through very active processes. If we pay attention to these processes, then the manner in which we frame IT interventions could be more politically enabling for the intended beneficiaries.

Even amongst IT interventionists who conduct ethnographies, there is a tendency to understand people's practices only with a view to improve their designs by sitting squarely in their position. For example, when I attended an ICT4D workshop in Bangalore in 2009, I witnessed one of the programmers talking about his participant observations at a trial Information Kiosk established by the State to allow farmers apply for a ration card[54]. He was very amused by some farmers trying to beat the electronic system in order to apply for more than 1 ration card and went on to discuss how he and his fellow 'geeks' could better program the system to prevent such practices. I argue that this programmer's description of the culture of practice is still different from understanding practices as part of an active history. He never paused to ask the question – Why are farmers trying to beat the system?

54 A ration card allows households to purchase basic food commodities at a rate subsidized by the Government, as part of the nation wide Public Distribution System (PDS)

The question that I answer in this chapter is - What is the edge that this historicized understanding of practice gives us? At the outset, I have highlighted that when we speak of IT interventions in this area, we need to be aware that for decades or even a couple of centuries, this region has not been exposed to any processes that have facilitated capital formation for the small and medium farmers who comprise the majority of the agrarian population in this region. This explains, at least in some measure, the current practices of knowledge seeking and sharing and why 'adoption'[55] of IT does not happen in the manner imagined by interventionists. I illustrate through ethnographic data in this chapter that people in this semi-arid location relate to knowledge interventions in a different manner.

Information Intervention

I will summarize here details from my interviews with Ashok, Director of Jalaa on how and why these tools were being framed as 'knowledge' tools by Jalaa to help farmers in their practices of knowledge seeking and sharing. The first of these tools was the farmer card which Jalaa intended would be a record of land conditions, just as a *khata* is a record of land rights. In the prevailing landscape of subsidies and credit for farmers this record of land conditions was intended to be a comprehensive one stop record using which a farmer could first assess his eligibility for a subsidy or loan, and then also use the records to apply for the same. The assumption here is one of fine tuning the appropriateness or matching, and also basing the appropriateness on land conditions and socio-economic conditions of the applicant.

Based on his experience Ashok thought that farmers need to become managers in order to negotiate with the complex world they are part of, and in order to become managers a key input they would need is information. Ashok wanted to intervene through democratization of information. In the current context Ashok argued that information available to a farmer is biased and the farmer is 'locked into various situations with the money lender, with the agriculture extension office, and with a number of other people who are giving him information or inputs." For example if a farmer went to a moneylender to enquire about prevailing market rates for a crop, the moneylender would give the farmer biased information. Although Ashok agrees that all information comes with a bias, farmers in the study area do not have enough opportunity to crosscheck the information they receive from one source with that from other sources in order to make an informed choice. This is what he means by democratization of information for the farmer.

As a development interventionist he would like to promote a level playing field for all those involved in the transformation of the rural landscape. Farmers should be on par with money lenders, bank officials, development professionals such as himself, etc., Ashok particularly feels that the internet as a tool has a lot of potential to redress the situation as he sees it. At a fundamental level, the internet permits cross verification. Based on his experience in previous watershed projects Ashok proposed to sit down together with all the farmers and use a digital decision making system in a video game type format. One significant aspect of Ashok's

55 The reason I put adoption in quotations is because it is not really a term that adequately expresses what I want to say. It is a limiting term for farmers' practices of negotiating with the IT interventions.

arguments for democratization of information is the use of the digital realm, which is what differentiates Ashok's video game proposal with traditional participatory methods. Ashok's arguments for democratization of information are specific to the capabilities that are afforded by the digital realm. The key advantages afforded by the digital realm seem to be storage of large amounts of data (decision making criteria), integration of disparate sources of data, simultaneous recall or data referencing, transparency linked with legible traces of information, and uniqueness or legible definitions of data. I also note that while I have provided this summary of Ashok's ideas of information interventions, in the rest of the chapter I use this summary as a representative of a more general trend that is predominant in India. A detailed survey of the ICT4D trend is beyond the scope of my dissertation in its current framing.

Farmers' Practices of Knowledge Work

The ethnographic data in this chapter builds on Chapters 3 and 7 which demonstrate the vulnerability of agrarian livelihoods and farmers' active processes of working with the landscape and structural constraints. In order to develop a historicized understanding of farmer's practices of knowledge seeking, sharing and decision making, I used a combination of secondary data sources and ethnographic data collected during my field work. Finally I will tease out aspects of the actual practices of knowledge seeking and decision making and analyze the implications of such practices for information interventions.

Local Governance

I begin with the working of local governance in the study area, since after the introduction of legislative changes in the early 90s, institutions of local governance and distribution of state sponsored benefits have significantly mediated farmers practices of knowledge seeking and sharing, and access to benefits of the development State.

The 73rd Amendment was a landmark with respect to decentralized government in India. It paved the way for three tier- sub state level elected governance bodies at the district level (District *Panchayat*), *Taluka* level (*Taluk Panchayat*) and most importantly at the village level – the *Gram Panchayat* (GP). A *Gram Panchayat* is a body of elected representatives from the local population, by the local population. The number of elected officials / members is in proportion to the size of the population in the villages they govern. In Kamalapura *Gram Panchayat* there are 18 *Gram Panchayat* members. GP elections are to be conducted every five years. Karnataka is one of the first states to have made GP elections mandatory. The reservation policies for GP are - 33% reservation for women, and 33% reservation for other backward castes (OBCs), and reservation for schedule castes (SC) and schedule tribes (ST) in proportion to their population, and reservation for posts of the GP president and vice president (SC / ST for president position depending on the proportion of SC/ST in the state). To assist the members, there are two administrative non-elected positions – the GP Secretary and the GP Bill Collector. Final decision-making power is with the GP President. Reservation mandates that members cannot get elected for a second term.

Every year each GP gets tied and untied funds from the Central and State governments, which in 2002 totaled 10 lakhs. A significant part of these funds are meant for employment guarantee and food security programs. G.Ps have some limited taxation powers – about 10% of the revenue is raised through taxes (Besley et al 2007) The GP is responsible for maintaining civic amenities such as roads, drainage, sanitations, electricity and drinking water supply in the villages. Regular maintenance of civic amenities are to be paid for by taxes. The other important function is to distribute development schemes and subsidies of the Central Government and State governments, most of which are routed through the GP (Vijayalakshmi, 2005). Every year the GP has to make an annual plan which has to be discussed and approved by all the people in a village meeting called the *Gram sabha*. *Gram sabhas* have to be conducted four times a year. Discussion and approvals of scheme distribution comprises bulk of what happens in the *Gram sabhas*. The most popular scheme is the housing scheme called '*ashraye*' scheme where each year houses are allotted to beneficiaries below the poverty line.

Reservation and Representation in Local Government

Decentralization is not only distribution of development, but also about representation, the rules for which are laid down in the reservation policies of *Panchayati Raj*. India has had a long history of reservation which has been actively contested and upheld by various social groups and at various points in time even before Independence (Das 2000). While the country is populated by a Hindu majority, it is also home to many minority groups defined on the basis of religion, caste and gender, such as the Sikhs, Muslims, Christians, Anglo-Indians, Schedule Castes, and Schedule Tribes. Many of these groups like SC and ST are historically disadvantaged groups. Schedule Tribes (ST) are generally from tribal communities that have lived in isolated areas in the countries. Whereas Scheduled castes (SC) are found all over India and were the lowest rung in the caste system and economic system – their jobs were considered 'polluted' and hence they were the 'untouchables'. Post Independence, B.R.Ambedkar headed the committee to draft the country's constitution which contained specific reservation policies for economic and social upliftment of minority groups. Article 335 of the Constitution states reservation of jobs in administrative services, government positions and in parliament and state assemblies. There is also reservation for admission into schools and colleges. Besides reservation, Prevention of Atrocities Act was in enacted in 1989 to specifically prevent social discrimination of SC and ST. Reservation was mandated in the *Panchayati Raj* processes too in order to ensure that the weaker social groups are not kept out of the benefits of decentralized governance.

Besides reservation rules, the Central and State governments have instituted various funding measures for these communities. For example, the tenth Five Year Plan (2002-2007) earmarked funds for SC and ST development in proportion to the population and utilization of these funds was stipulated in sub-plans. These sub-plans “aim at facilitating convergence and pooling of resources from all the other development sectors in proportion to the population of SCs and STs, respectively for their overall development.” State plans should also earmark outlays for SC and ST development in proportion to their population (Planning Commission 2012a, 103). Many of these schemes are distributed through the GP. A news report by Rajeev Ranjan Roy in The Pioneer stated that many departments did not follow this mandate.

Because of this non-compliance “The Planning Commission has prepared detailed guidelines to ensure that they spend 22.5 per cent of resources for the welfare of scheduled castes and scheduled tribes during the 11th Plan.” (Planning Commission 2012b). Each of the State Governments have also set up Schedule Caste Corporations and Schedule Tribe Corporation which are public sector enterprises. The purpose of these Corporations is to provide economic support to these disadvantaged groups. However a study of the SC Corporations published in EPW in 1996 states that most of these Corporations are managed poorly and only serve to provide SC-s with marginal funds, and do not have programs that help them in any sustainable / productive manner. They are also not well coordinated with district administration (Mishra 1996, 2219)

80% of SC live in rural areas in India. Karnataka's has 16% SC which is the same as the country level figure. As per Census 2001 data, the villages that I researched have nearly the same percentage of SC and ST population as the entire State. Percentage figures of most of the villages hover around the district and state average - 15% roughly for SC, 7% roughly for ST. According to the Mandal Commission Report, by the mid 1970s in Karnataka state 48% of government jobs were reserved for OBCs[56] besides the 18% reserved for SC and ST (Wiener 2001, 198). Aiyar, and Ananthpur say that reservation policies in *Panchayati Raj* are working well (Aiyar 2007; Ananthpur 2007). In the timespan of 2 decades and 4 elections that have gone by, changes have taken place. In the beginning many of the members were unanimously elected. Traditionally powerful people in the villages would become members uncontested. But most people in the villages and Jalaa staff told me that by and by people in the villages are making sure that elections are compulsory. Bhagat said, “As the budgets allocated to GPs have increased significantly election culture has crept in because there is more competition amongst people for GP positions.”

Each village has its internal process of sharing of GP member seats according to the reservation policies and existing caste composition. Bhavani who is a woman G.P member in Gulithota talked about her experience of being a GP member. “There are only three caste groups in my village – Nayakar, Kurubar and Harijans. There is a fourth caste called Pinjar but it is clubbed with Nayakar. As per our population, our villages gets 3 GP member positions. So every election 1 member is elected from each caste. Since Nayakar and Pinjar are clubbed together we alternate our chances. I have been a G.P member for four years now, and one more to go. Of the 18 members we are 6 women. I am a farmer and had no interest in the G.P. People from my caste forced me to stand for elections because they thought that I am active in work and will be able to do some good things for our caste. I asked them to let go of me and choose one of the many 'wasters' who don't work. But they insisted. I stood as an independent candidate and got elected. G.P members are not good (sighs). They never hold meetings. The GP president has to take interest. He is related to me – my brother-in-law. The GP secretary also takes no interest. Both the president and GP have all the control and never answer any of the questions some of us raise. They always gang up with the aggressive members and pull the wool over the eyes of the

56 Other Backward Caste (OBC) is a category in which weaker social groups (other than SC and ST) are added and removed by the Government depending on the group's social and economic status.

quieter members. Sometimes they force us to sign blank papers. If a strong member opposes both of them, then they will begin to negotiate with him / her."

I was allowed to attend a meeting of GP members during the last stages of my field work. During this meeting members were discussing distribution of a specific government scheme and not a single woman member had anything to say. Shankaramma, another woman farmer pointed out to me that decisions regarding the composition of GP are not really taken at the village level, instead they are taken at the level of the Member of Legislative Assembly (MLA). This is substantiated in V. Vijayalakshmi's review of *Gram Panchayat* processes - "In Karnataka the *Gram Panchayat* elections are not contested on party basis (i.e., using party symbols). The political parties, however, are actively involved in the election process. Although not officially acknowledged, the president is elected from the party that had the maximum number of representatives" (Vijalakshmi 2005, 30).

Virupaksha, a male GP member from Neelapura also said to me, "When GPs were first instituted, funds allocated to GPs were less, and all the big schemes would be controlled by the *Taluka Panchayat*s and District *Panchayat*s. *Taluka Panchayat* officials would distribute schemes to whomever they wanted. But now GP members are from the local villages – here in Kamalapura GP we are 18 members elected from 7 villages – so we are able to distribute schemes to the constituents. 50% of the schemes that are routed through the GP are for SC and ST. There are often tiffs amongst caste groups for development schemes. When such tiffs happen, it is up to the members to solve the issues at hand. For example, in my village we do not have many SC/ST, so we exchange our SC/ST quota with the general quota of another village, which has higher % of SC/ST – so we make these sorts of internal arrangements. After *Panchayati Raj* things have definitely improved for us – schemes are coming directly to us now. It is also easier for people if they want documents – earlier we had to travel very far to the *Taluka* head quarters." What Virupaksha is acknowledging here is the decentralized distribution of state benefits.

Probably the biggest critique about *Panchayati Raj* or decentralized government is that while distribution of development is decentralized, but not planning. Reviewers have pointed out that legislative decentralization has not been accompanied by clear specification of functions at each level (district, *Taluka* and *Gram Panchayat* levels), and is not accompanied by financial decentralization, administrative decentralization, and most importantly as several people pointed out to me on the field, planning decentralization (Narayana 2005; Gorphade 2002). The second point to be made is that in the practice of decentralized distribution of development there is very little accountability and transparency. Before *Panchayati Raj*, decision making about the distribution of development schemes was in the hands of the bureaucracy, the MLAs and MP s – the latter two sets of actors continue to stake their claims through GP members. Also, prior to *Panchayati Raj*, Line Departments such as Agriculture, Horticulture, Power, Irrigation, etc., were under the purview of the District collectorate and made and executed development plans. These Line departments continue to operate from District *Panchayats* and decision making boundaries are fuzzy. Hence *Panchayat* officials are dependent on administrative officials for information about schemes (Vijayalakshmi, 2005). It is due to this that the GP Secretary is the most powerful member of the GP. He is the link between the ZP, Line Departments and the GP.

Bhagat made the following distinction between the civil service officers and the *Gram Panchayat* officials such as the Secretary - “People posted in the GP Secretary post are typically not capable for their job – they don't have long term vision. Take for example, the District CEO – he is an Indian Administrative Service (IAS) officer and he has vision. But if you go further down the hierarchy - the *Taluk* level CEO is a Class 1 Officer, most of the executive officers are deputed from other line department. For example Assistant Director of Agriculture is doing two jobs – line department job and *Panchayat* job, and Assistant Director of animal husbandry is doing both ABH and VO work, executive engineer of *Zilla Panchayat* engineering is doing both the works, so they are coming only on deputation from their respective Line departments because the state budget wants to combine both the positions and not pay two people in two positions. Based on what I have seen only Class 1 officers – the CEOs have vision.”

One outcome of these limitations is particular nature of daily practice of governance by the GP members. Development schemes that are distributed through the GP are limited in nature, i.e. everybody does not benefit. Either the schemes are based on a quota system, i.e. meant specifically for disadvantaged groups in village society, or are few in number. In the hands of GP members, schemes are then commodified on the basis of this 'scarcity'. Many farmers I spoke with said that some GP members viewed their positions as ways to accumulate money, and only some viewed their positions responsibly. When the GP received information about a forthcoming scheme, corrupt members would only inform people they wanted to give the scheme to. Also, in order to grant a scheme, corrupt members demanded bribes from beneficiaries. This is clearly what Ashok argues – that information provided to people is biased, just as is the case with the Extension Officer and *dalal* which was discussed in Chapter 3. However, I have tried to remain attentive to how farmers then negotiate the space between each of the actors.

In order to apply for schemes, potential beneficiaries have to prove eligibility in the application process which requires paperwork and signature from *Panchayat* officials. It has become normal practice for officials to demand bribes even for signatures. Farmers told me that for each scheme they are required to provide original caste certificates and landownership certificates. They need to travel to the GP office to request for originals of these documents and the GP Secretary demands a bribe each time. Even though bribes for such paperwork are the lowest (of the order of a few hundreds of rupees) the amounts are significant for rainfed farmers who have limited money in hand before harvests. Also their agricultural schedule gives them limited time to deal with government offices.

Jalaa, for its part also worked with farmers to motivate them to access schemes, and make government programs accountable. They would periodically arrange awareness and training programs for people in the project villages. These programs were sometimes conducted on the Jalaa campus in Kamalapura or farmers would be taken on a 2 day workshop / retreat to a nearby tourist destination. Initial training under this program comprised 'teaching' people how to monitor the day to day functioning of *Gram Panchayat* services were executed – check if the mid day meal is implemented properly in the schools in the villages, if the medical representative / nurse of the GP make regular visits to the village, and if the nurse

administered all the mandatory vaccinations for new borns. While I was on the field Jalaa had organized a workshop to disseminate information about the Central Government's most recent employment guarantee program that is routed through the GP. The annual budget of GP has gone up significantly because of this program which guarantees each household 100 person days of work. The idea is to provide employment in the agricultural lean season which is when farmers typically migrate for work.

Amrithamma, a woman farmer from Neelapura had attended the most recent Jalaa workshop. She talked about what she had learned of the new employment guarantee program. She said, "They told us that we need to get together and make sure all these things function, and that we ask for services that are due to us." I asked her, "Is it possible to do so?" She replied, "Its not possible with just one or two people. Its difficult." I asked, "did you tell Jalaa staff in the workshop that is difficult with one or two people?" to which she rephrased what she had earlier said, "it is not 'difficult'...but you know each one of us have our own work and issues, we are all into our own lives.... Each one says 'what is in it for me? what is there for you?', 'she won't come, I won't come' – in this way people don't come together. People do not want to go - they say they have to work, they have their homes, they do not want to spend their money to travel to the *Gram Panchayat* office or a bigger town if they need to follow up on things...they say they have to invest their money in the self help groups."

Krishnappa, a Jalaa staff who was coordinating some of the work for the public works program told me that many farmers had not yet completed the required documentation to open post office accounts into which the wage labor payments would be credited. The *Gram Panchayat* bill collector and some Jalaa staff had spent days trying to help people do the documentation and open their post office account. Devamma, a landless laborer from one of the villages who was sitting with Krishnappa and I interjected to say, "some of us don't want to spend Rs.60 to take a photograph that is required for the post office account. What is the point after doing all the documentation – the officials do not begin the work on time. It is always delayed." Even spending the small amounts without returns in a short period of time has significant impacts on people such as Devamma who is a landless laborer. Spending money in order to negotiate both process and corruption attached to a specific scheme is one big difficulty for cash strapped farmers.

Basanna, an old farmer who repeatedly referred to the GP as "the ghost/spirit (*bhoota*) that has been created to haunt us" said, "Jalaa tells us don't give bribes, don't talk to the GP members, talk to the officials and negotiate what is due to you. If you are eligible for a development scheme, get your documents, show the proof, and get the benefit. But Jalaa won't be there for us – we have to fend for ourselves. If we speak like Jalaa staff we will fall by the wayside!" Jalaa's assumption in terms of defining accountability is make things work as they are intended to be. Amrithamma's response is most often the response that people have to Jalaa's call. However, this does not mean that they do not find useful the information that Jalaa provides as part of their workshops. They also distinguish between the information given to them by GP members and by Jalaa. This addresses Ashok's point of cross-verification, and my ethnographic data reveals that they take the information, attach different meanings and negotiate in different ways.

Amrithamma said, “GP members are supposed to keep all of us informed of the schemes. But what can we do if they only inform who they like. They will give the benefits only to their contacts. Who can blame them since they have spent so much money to become GP members – so they want to recover the costs and make a profit.” GP members are able to use their office to accumulate funds, and with more funds, more are competing for office, not just the traditionally powerful. This is substantiated in other studies too. Despite these frustrations and despite the presence of corruption, the increase of funds in *Panchayati Raj* and democratic representation allow farmers the space for choice. Farmers say, even if you have four to five people to support you and you are not rich or powerful it is possible to become a GP member if you play the game. Farmers told me that they able to gauge what sort of person a GP member is – if s/he is a corrupt person or a sincere person. If they are wronged by a member, and even if that member spends Rs 50,000 or 1 lakh in campaigning they will not gravitate towards him/her during the next election. Even if that member's son or someone else from that family stands for elections they will boycott him/her. But if a member is corrupt, yet collects bribes and also delivers what s/he promises, then people do not mind, they will still support that member.

I ask if there are farmers who refuse to pay bribes and remind GP members' of their official responsibilities. I am told, “yes, there are such farmers. But for them their work will not get done promptly.” Lakshmanna and Lakhsmamma are one such couple. Even though they belong to ST category they have never benefitted from schemes in their lifetime. They are aware that there are a number of schemes for their caste category but they have never gone forward and asked that they be allotted, and neither have they been allotted. They say it is futile as every scheme comes with benefits for just two or three beneficiaries per village and everyone will be jostling for these benefits. So they are not interested. They have a very clear position about accessing government subsidies through the *Gram Panchayat* which throws light on whether the process around schemes make a difference towards capital formation for the farmers.

They say, “What these things from the government mean for us is that it is all about people who know how to play that game and get benefits. There are those who don’t do that, and that is the category we fall into, which is fine (laughs). There is not much difference between us and them. Some of them pay Rs 2000 as a bribe and sometimes they do not get the benefits also...so we don’t spend that much money and effort and do not get benefits, so not much difference! Someone will travel outside, and will hear something about a scheme, and will get tempted.....its like a worm in the head then. We have also heard stuff such as benefits for old people above 60... We find out, and we talk to people and they advise us to follow up... we follow up and then we realize that only 3 or 4 people in the village or *Gram Panchayat* can get the benefits...so what is the point?” Their critique of government schemes is that despite the principle, in terms of the actual material benefits it is limited and hence like a lottery. So why waste the time, money and effort when it is a lottery. Lottery is useless when there are no capital reserves. I will later return to the point of whether there are indeed subsidies that allow fixing of capital.

Prakashappa and his friend in Kaadugere say that the only scheme that has come so far to their village is the housing scheme. They have not heard of schemes to

do with agriculture that have been routed through the *Gram Panchayat*. Both of them say that they are not proactive about networking with *Gram Panchayat* members because it depends on one's contacts and how close you are to a *Panchayat* member. Since the *Panchayat* members decide who to give the benefits to, both of them think it is futile and a waste of time. “If we don't get benefits it's okay, we work on our own.” I ask, “then what about improvements to your land, to your agricultural practice?” They say, “our current situation is enough for us. We are able to get access to whatever we need.” I ask, “even if the rains are not adequate are you able to get a good yield, then?” They say, “no, no! That is certainly not the case because we have red soil, so we do suffer. Nevertheless we are not interested to go and pursue these members.”

Bhavani of Gulithota, says she is not interested to pay money and get benefits (bribes) – she would rather just wait and take it when it comes, or not at all. She does not have the interest to do that. She says it is not her lot to go and talk to the president of the GP and network. “My family has not cultivated that practice. Even the elders in my family did not do that. If you don't go and ask you don't get anything. My husband doesn't do that, neither does he work. He just hangs around town and drinks. He doesn't have the interest to get information, to talk to people, to go and get things done. So what do womenfolk like I do then! Is it possible for us to go and do all those things?! So I do what I can –work, make money and come back”. These are the public spheres she feels comfortable in. She is happy with her son though. She says he doesn't have her husband's habits. He comes to eat and goes to work, and he will do all the jobs on the field and he has enough experience and doesn't wait for instructions. Bhavani's story reveals a choice, and conscious cultivation of a culture of not paying bribes, which I think adds insight to my representation of people in this landscape.

Basanna, an older, experienced farmer in Gulithota said to me, “People in the government offices do a lot of wrong things - they take bribes and give schemes to non eligible people by changing criteria. Very little checking is done from above. They all seem to be hand in glove – the village accountant, the land records officers, the extension officer, the GP secretary. Why! If I set my mind on it I can also begin to indulge in this kind of dirty work. But the people we give money to, have to give us a guarantee. When I was young there were no schemes at all. Maybe 1 or 2 but I can't remember. We had no help or information from outside for farmers. Our lives consisted of going to the *dalal*s, taking loans, paying loans and if were a rich farmer in our village we would take loans from him and pay interest.” This quote emphasizes for me the meaning of money for most, if not all farmers in this landscape, and what they want the currency to do for them. This currency is scarce and when used they want to see productive changes – this is what dictates their practices and preferences in the space between all these different actors.

Has the *Gram Panchayat* delivered at all, and for whom? Decentralized distribution of state benefits has benefited the SC and ST communities since the early 1990s. Under the Tribal Sub Plan (TSP), different departments under the State government had to earmark 3% of their plan budget for ST development. Since some of the schemes under the TSP were not relevant, these earmarked funds from each department were pooled together starting 1991 and were used to fund housing, education and irrigation wells and pumpsets for ST households (Government of

Karnataka 2005b, 245). Mukundappa recalls the *Ganga Kalyani* scheme under which he was able to build a well and install a pumpset on his land. He also added, "General caste people can't talk that much now. There is the law that protects SC and ST against atrocities inflicted by general castes and we are aware of all the benefits and protection due to us as we travel about and get news." However, as my ethnographic data in this section also shows there is a certain degree of caste, class and gender entrenchment that continues in the practices of local governance. Along with this entrenchment there is corruption and this does weigh heavily on the pockets of rainfed farmers. Yet people did say that because of the structures of of decentralized governance - GP composition, membership, election, and funding – these forms of control were being contested by greater participation.

I end this section with three points – First, it is important to note here that change has been facilitated by governance structures, as opposed to an information intervention. The second point I would like to highlight at the end of this section is that the intended beneficiaries negotiate the situation at hand. Negotiation does not happen in the rational manner that Jalaa envisions but in a manner contextual to the daily practices of dry land farmers. Yet farmers do find useful the information and assistance provided by Jalaa, they take it as another source for cross-verification.I use Amrithamma's comment about understanding the compulsion for GP members to be corrupt to make my third and most important point that state sponsored development is reproduced in specific contexts, both in practice and in meaning. This is an argument that information interventions remain blind to. This is also substantiated by Mukundappa's agricultural practices. Mukundappa's farm plots are not known to be productive in his village even though, as an ST farmer he has benefitted from schemes. Mukundappa himself acknowledged this to me and gave me socio-psychological reasons for this behavior. While there are some who do make use of subsidies to increase productivity on their land, Mukundappa's family has used the subsidies to earn an income but not necessarily only from his land. For example, he and his brothers have invested in a tractor (bought on loan) which they rent to other farmers in the village. The point here is that access to subsidies does not necessarily translate to agricultural productivity, but does translate to capital formation and / or social meaning as the sections on information mediators and '*rajki*' (politics) will illustrate.

Barefoot Governance Outreach

As part of their Community Monitoring Program (CMP) to make the state accountable in local services, Jalaa had also appointed two women from the SC category in Kamalapura and trained them as barefoot governance outreach workers. I had noticed the two women Shivamamma and Kamalamma in many CMP meetings on the Jalaa campus. I met them in their one-room office in Kamalapura to talk about their work. They began by telling me that ten years ago they did not know where to go, and what to do but Jalaa taught them how to go about various processes of interacting with the government. They recalled several Jalaa staff who have given them a lot of 'improvement'. They did not know how to get benefits. After Jalaa taught them they say they now know how to take loans, how to pay interest, how to use money, how to save. "We now have the confidence to talk to officials up to the District level and Ministers also and argue our case, and get benefits."

Their outreach job involves conducting CMP activities only for the SC folk in all the 10 project villages of Kadambahalla GP. One of the activities they oversee is public health – they advise how pregnant mothers should look after themselves, how women should care for children's hygiene indoors and outdoors, and they bring medical help to the villages such as a nurse from the hospital if there is a need, etc., "If any government staff such as the school teacher, or public health nurse did not perform their routine jobs – we have to question them – ask them why they haven't performed their tasks. Jalaa staff give us information about why these immunizations are required and what the government schedules are so that they can follow up. We instruct people about birth control. Also the State gives money to SC families when a child is born – if a mother has a ceasarian operation the family is entitled to Rs 1500, if she gives birth at home she is entitled to..." They very animatedly rattled off an endless list of government development schemes for SC individuals and household.

I ask them how they keep abreast of new Government announcements and benefits. They say that they visit the GP and hospitals to find out new information. "People in our villages also read the newspapers and tell us, and we will go to the GP and follow it up. In general we do not encounter problems in hospitals when we go to ask for information. But if they do not give us information or do not accept our applications for schemes, we will not budge from there. Typically officials never flatly refuse, they will try to delay the process by saying this document is missing, this identity card is missing. That is the process of harassment. That is why if we know the procedure we will also be able to hold them accountable and question them. We will go complain in the GP. So we know how to follow the system. Also we keep track of what is happening in neighboring GPs. If one GP gives the benefits and the other doesn't then we know who to question since both GPs fall under the same *Taluka* HQ. With the schemes that get routed through the GP such as housing schemes, we have to be very alert – unless we press the members they will swallow what is entitled to us. We tell them it is not right to eat up the money due to others, so we talk to them nicely and request them, 'brother, please get this done.' Then they also put up their price and implicitly ask us for bribes but we just keep repeating the process and reminding them that we have followed all the requirements and have submitted all the necessary papers in the necessary offices. Then they will say, 'but what must I do, the tahsildar office hasn't yet forwarded the papers to me'. But we have also learned the paper trail, so we ask if the application of x has been forwarded, if they say forwarded then the paper should not be there. If they say not yet then the paper will be sitting in his/her office. Then we will ask, 'why have you not sent it? If its a problem for you, give it to us, we will go and submit it to the next office.' "

I ask them if they have ever feel threatened because the type of work that they do would impinge certain actors and their racquets. They say, "our job is to educate and inform farmers. So when we do that and farmers act on our advice they get questioned by people in power. In response farmers just say 'Shivamma and Kamalamma told us the procedure, and we are following it.' People should not cower when the officials try to intimidate them, because that is the manner in which officials try to collect bribes. And all of them want bribes to accept applications and push papers. Farmers should be a little patient and learn to negotiate these systems and manage the officials.

What I personally found fascinating is that Kamalamma and Shivamma never went to school and do not know how to read and write. Only after they associated with Jalaa did they learn to sign their names. I was rather surprised to hear this because I would see them at every staff meeting in Jalaa and would marvel at the manner in which they carried themselves. They would each walk in with such confidence holding a diary and pen. They said they are able to dispense their duties mainly by being persistent with information seeking. I thought to myself 'what confidence and trust'. It seemed so fundamental to me to able to read and write to get at information, but for these two women it seemed like they had been educated in the grammar without being taught to read and write, and keeping their faith in that grammar they carried on with their jobs and livelihoods. They told me, "If our people do not have election card or ration card we will urge them to get it – because these are two forms of basic identity. So we will send them to the *tahsildar* office in Lakshmipur and explain the process to them. So in all these basic issues we have to be very careful (*bathira*), everything must be correct, or else we people cannot survive." Since one of their methods of seeking information is through an informal network such as when standing in a bus stop or chai shop I asked them how they will confirm the news. They said that confirm it with someone they trust such as staff in Jalaa. They also save newspaper cuttings. They know how to ask for the list of released schemes, and list of beneficiaries in each scheme.

They find that despite their outreach work not all farmers show enough interest in making the state accountable and getting what is due to them. They also indicate that this is because some of the SCs still are not very proactive in garnering all these benefits – they still need more confidence to be pushed forward. Because of this both women believe that their social group is still backward. Based on their experience they find that some of the SCs want people like them to come and help them avail of these benefits. People express a need for assistance. They need to be forced a bit. They hesitate to spend money on bus fare and such. They do not want to spend a little money like Rs 50 or Rs 100 to go and do the necessary work to get these benefits. But these two women feel if they get them past this initial block then every year it will be easier for them to follow up. They believe that if you are not prepared to spend those few rupees then the Govt will not give you the subsidies, or in other words, you cannot access those subsidies. They also state that the expense is only for us to prove our identity, and to prove that we are eligible – so we have to bear the cost of that and then we will be able to access the subsidy. They both feel that there needs to be some sort of leadership amongst people in the villages – leaders who can motivate them - besides outreach people like themselves. But they also indicate that Jalaa supports them in terms of notifying them about new schemes. Jalaa is a big source of reliable information, from their perspective.

Both of them were paid through Jalaa project funds. Their salary included travel and food expenses since they needed to move around between all the villages and also travel to the *Taluka* and district head quarters some times. They present all their bus tickets and food expense receipts to Jalaa. They said that their main responsibility is in the initial period when the subsidies or schemes are announced. At that time they motivate people to apply, help them with their application and follow up in the initial stages. After that they feel the individuals should take interest. It is only because of this limited involvement at a certain stage that they are able to do

their job well. This job also allows them to give attention to their household duties and their children.

Ethnographic data in this section equips me to understand another aspect of farmers' context of knowledge seeking, sharing and decision making. The barefoot governance workers instituted by Jalaa work specifically for the development of SC and ST communities who have been historically disadvantaged. In constructing this program, Jalaa does make an assumption that rational, pro active behavior is required in order to interact with and access state sponsored benefits. Yet the choice of the governance workers and their open, fluid work model which works with their positionality does allow for a contextual interpretation of the rational assumption. This manner of barefoot governance outreach does benefit beneficiaries who want that extra bit of translation.

It is also compelling evidence that while Ashok never failed to profess his strong belief in the internet and digital technologies as tools that would level the playing field for farmers and help them cross verify biased information so that they could become managers, he had also instituted this barefoot governance outreach program. This barefoot outreach program integrated well within the daily rhythms of the intended beneficiaries, while the technological interventions all continue to be explorations that have thrown up more food for thought for people like Ashok and I, rather than achieve anything substantial on the ground.

In the following section I will move to exploring another idea that is associated with interventions.

Collective Action in Villages

Following my argument in the section on 'Local Governance', ethnographic data in this section also complicates the idea of development as external intervention. One of the questions I would keep returning to in my conversations with farmers was, “You know so much, yet why do you need Jalaa?” In this section I synthesis farmers' responses to this question to complicate the idea of development, and to understand the space between what I thought is political in development, and what some of the intended beneficiaries think is political in their development. One of the threads in response to my question was often “It is not possible for us to work together”. Amrithamma of Neelapura had said with reference to Jalaa's advice in the CMP meetings that people are too busy going about their daily work at home and in the fields that there is no time. This demonstrates that the grammar of collective action as visualized by interventionists is not part of the fabric of their daily life rhythms. A point that always followed this refrain was that they needed help from an outsider, a neutral person who can help them galvanize.

Amrithamma talked of 'Kumar Sir' of Jalaa who first came to their village about ten years ago. “He used to tell us that women should come forward and should not sit back in meetings. We did not know such an intervention before that....and now we hear that Jalaa is wrapping up its projects... (sigh)”. I asked her and other women sitting around, “So, you feel you need Jalaa...” They looked at me, and at each other and laugh and say, “No, we don't need Jalaa.....” but the reality hangs in the air between us and I realize the absurdity of my question which tried to unnecessarily

complicate a need they were trying to express. This happened to me a few times on the field - every time that I thought I was reminding them about what I thought is political, they would smile at me and shake their heads and say, “yes, we know what you are saying but we need help from outside.” This is when I began to think that they operate in a different political sphere where what is political has a different meaning and a different manifestation in practice. Their ideas of politics complicates ideas of 'self-help', 'community participation' and 'collective action' which are common tropes in development discourse, and also substantiates Akhil Gupta's critique of the view that the discourse of development is external to rural populations in India, as discussed in Chapter 3 (Gupta A 1999).

However, it is not that people have no history of having organized to make things happen. Mukundappa and Madhaviah of Bannigudi had some rich stories of collective action in their hamlet such as instituting a bus service to and from Kamalapura market town. Sudhakaragowda one of the few farmers who has adequate capital reserves, said “there are really no processes of co-operation in our village. Each one minds the matter of his/her house. If 5 people get together one will go stray. GP has improved the status of households through housing schemes and some improvements in the village. I have no real interest to become a member. If people like Jalaa come from outside...yes, it does help improve our lot. Within our village, only if there is a real need we get together. For example, when we wanted electricity for our hamlet so that we could install bore wells and motors in our fields, people stopped their farm work for 8 to 10 days and got that job done. They rented a vehicle and went to *Taluka* head quarters to transport electricity line poles. We then dug holes and put in the poles. This was possible because every one wanted it. But if it is not something that everyone needs for their livelihood then people do not care or cooperate.”

Kiran and Virupaksha explained that collective action took place in the past in the context of no intervention from the State. But today because there is intervention from the state, and it is bureaucratized, it has changed the nature of collective action, and also perceptions of the process of change and where change should come from. Virupaksha said, “When I was young there was *Mandal Panchayat*i, and the district *Panchayat*i took care of village facilities. If something needed to be done we managed within the village, or we would communicate to the M*andal Panchayat*i member who was in our village or nearby village.” Kiran added, “In those days, village people themselves took the initiative to do things. For example, if there was a problem with the village open well then people would themselves try to rectify it. No one would come from the *Mandal Panchayat*i.” Virupaksha interjects, “Today no one is like that. Even if there is a small problem, no one lifts a finger. In those days, if water in the well dried out, people would get together and dig a hole in the river course for water. It's not so good to depend on someone else. Today they say go tell the GP member if is there is a problem with the well. I am *Panchayat* member and it is my job to help people today. When we go to the *Taluka* or district *Panchayat*i we have to give an application for any request of ours and they give us a receipt, which we have to keep. If we lose that then we won't know the status of our complaint or request. If we give a complaint within the village, then the G.P secretary, bill collector and president will have to come and inspect it....the social process is such today.”

In another conversation when I mentioned to Adisesha in Gulithota that Jalaa

thinks people in the villages should come together and co-operate in order to improve their situation. He said, “Jalaa has come in and made us come together. Before that we did not know how to form women's groups, how to save in a credit group, how to take loans, how to repay. After Jalaa, women have learned how to go the bank and operate accounts. The thing with Jalaa is that they come directly to us and talk to us and motivate us. The government does not do such things. The government only says they have 'x' amount of money in their budget. So we have to be interested to get what the government is offering. But with this recent employment guarantee program, people are coming forward because they get a wage. If wages are offered then we do not need any motivation!” This quote again brings us back to the importance of money in this region, and which is why seasonal migration is of huge significance in this region.

Basanna said jokingly, “Today Jalaa is the landlord - they have done so much and given us so much information”. After more banter he added, “Jalaa's watershed program gave us all good work and wages for three years. Per couple we were able to earn Rs 500-600 per day. This government public works employment guarantee program is not as good. It pays only Rs 82 per day per person. Jalaa also brought us all together – had meetings, talked to us, gave us a lot of information and hung out on the field with us while work happened. We don’t believe in Jalaa, but we believe in the path they have shown us. In those days there was power and control in a village system and people were containable, they listened and did things together, not today. Even committees for temple festivals are fraught with some issues - each street group has to collect Rs 30 per household but some people don't give and still come to the festival and eat. If Jalaa staff such as Krishnappa gives us some advise, we should think about it and take it. Some people don’t. Instead they come back and realize they should have and say we made a mistake. Others don't even realize. We need to be open to new information and advice but change is slow. But as we gain more education and exposure here, people will change.”

One day during my conversation with Devamma, the landless laborer in Heggapur, Jalaa staff member Krishnappa and a couple of other men in the village ambled along to join us. When they heard that Devamma and I were talking about processes of co-operation in the village one of the men interjected, “no point discussing this madam...people are not all right in the villages. People do not trust and cooperate. If some people take up an initiative others do not respond with sincerity - so it makes it difficult to get anything done. In fact in the beginning this attitude among people was a hindrance when Jalaa began its activities in these villages. If there is any problem, or even if there is no paper or pen - they would say 'go ask Jalaa to bring it. If there is any problem or you ask people to pay their dues they will say, 'go get it from Jalaa'. Krishnappa also said there is a dependence on Jalaa.

Then Devamma turns to Krishnappa and asks him how much he gets paid in Jalaa. When he gives her an answer she says, “okay then we will give you that - you work for us, after Jalaa leaves this area.” He says,” what about the motorbike I ride and petrol?”, and she says, “yes we will give you that also and you have to be captive government secretary for us!” and we all laugh. Devamma then wonders how she might pay him and I suggest that all 48 households in Heggapur pay Rs 100 per month. She says that it is too expensive and I ask Krishnappa if he will reduce his rate, and he says, “actually I have to increase my rate!” and the whole group breaks

into laughter. critiques the view that the discourse of development is external to rural populations in India

Ethnographic data in this section demonstrates very clearly that while farmers practices of action and negotiation contest assumptions of inaction that are often implicit in information interventions or development interventions, they do harbor a genuine need for certain kinds of intervention and assistance. The next section explores in more detail the kind of intervention for which many farmers expressed a need.

The Need for Information Mediators

People do want help to understand the intricacies of the bureaucratic process. It is with regard to this that many people in Bannigudi referred to Madhaviah. Madhaviah is a male in his late twenties who had also worked as Jalaa staff for five to seven years. Towards the end of my field work he had quit Jalaa and immersed himself in implementing the public works employment guarantee program through the GP in an informal capacity as a mediator of sorts. I had a good rapport with Madhaviah as he was one among the Jalaa field staff who was generous with his time and ideas (Details of Madhaviah in chapter 4). I was particularly fascinated by this other side of Madhaviah which he never chose to hide when on the field.

Lakshmamma and Lakshmanna who lived in the same village talked of Madhaviah as one person they thought of going to when they were in need. They said he was approachable and unlike *Gram Panchayat* members or other government officials, with him they felt there was a strong potential to be helped. Similarly, Shankaramma a woman farmer in the village also mention Madhaviah was one person who gave her news of happenings in the *Gram Panchayat* and *Taluka Panchayat*. Madhaviah, while conversing with me about this self-adopted practice of his explained that what people want in a person who they think can help them - “it does not have as much to do with the official position of a person, than it has to do with the character of the person and his helpfulness and his interest in everyone in the village” Vijaya, one of the few women field staff in Jalaa said very evocatively, “People in the villages still need to be motivated, they need courage to interact with the State and access benefits due to them just as they go to the field and have courage to harvest their crops.” This statement particularly brought home to me the point that processes of knowledge seeking that are often recommended by interventionists are quite foreign to the daily grammar of capital formation in the villages.

Madhaviah says that today in a village, there are at least 10 people like him, each with their own 'constituency'. In the earlier days there were one or two landlords or large land owners who had social control. But over the past three to four decades access to the State, market and education have redrawn lines of social stratification in the villages. Madhaviah is proud of his abilities to 'influence' people and also substantiates how he puts to good use money that comes into his hands. He gave me an example of how he has helped people - “For example, there is a boy in my village who was interested to study B.Ed. He did not score very high marks in his high school examination. So he needed help for college admission. I took him to Kamalapura and I did not go directly to the teacher as nothing is in the hands of the teacher. I know two people in the Trust that runs the college. When the MLA elections were going on

those two people were among the few who asked me to speak on stage during the election campaigns. The practice is that someone in the village who has a standing and command of the people will do the talking and solicit votes. I did that in our village, and these guys paid attention to me. They made note of me. Even after the event, I used to influence people in my village to vote. I would take two to three men aside and chat with them and motivate them to vote. I will tell them that I will look after them, and if they need money for expenses for their kids for example, I will help them out and such. They wanted votes, they gave money for campaigning expenses, I took the money and spent it for that purpose, and also got them 100 votes – that is how they started to have confidence in me. So when I went to them to get my friend college admission, they called the MLA and recommended a seat for my friend." He gave me another example of how he sorted out a brawl in the village that had ended up at the door of the police station.

While most folks in the village only had good things to tell me about Madhaviah I also learned that some of them, if not all, were aware of the machinations involved in the mediating process. Lakshmamma the woman farmer who was averse to networking asked me in one of our meetings whether people like Madhaviah, who run around organizing a lot of activities, get paid or make money through the process. I agreed with her that there must be some form of remuneration involved in the process. Gowranna, a senior field staff in Jalaa told me that he thought such mediators, despite their working the system, brought in more accountability to State processes - "If there are people with so much knowledge, then it is not possible for others to push them aside. Corrupt officials have to keep them and do the work."

Mediating is Different from *Rajki*

I will mention briefly here, that farmer's distinguish between Madhaviah's style of functioning with another practice which they term '*rajki*' which loosely translates to 'politicking' and 'opportunistic networking'. This shows that farmers make a value distinction and this is also substantiated by the manner in which Madhaviah differentiated his work from *rajki* . In expressing a need for mediators, people are also acutely aware by whom they would like to be represented. This is the nuance in their conception of knowledge as power.

People did not hesitate to point out the '*rajki*' sort and sometimes also called them 'wasters'. In fact two of the women farmers I conducted in-depth interviews with did not hesitate to tell me that each of their husbands were '*rajki*' people and up to no good. When speaking to the two barefoot outreach workers – Shivamma and Kamalamma - I asked them who they think has most access to information? I wondered aloud if we can generalize across caste groups or landholding groups given the nature of government subsidies? They say typically those who are educated seem to have more access to information in their villages. The other social group that has information is the group that is political (*rajki*) and that has wide social networks – because they are constantly in touch with so many people they get information. As I had noticed that most often people in the villages pointed out to males and said to me that he is the '*rajki*' sort, I wondered out aloud with Shivamma and Kamalamma if '*rajki*' was a male practice? They said that while women also indulge in '*rajki*', it is mostly a male trait but immediately went on to add, "women are becoming GP members, TP members and even ZP members, and nowadays most reservation is for

women only. There are also lots of schemes targeted at women these days. Look also at this concept of micro credit groups – they are also aimed at women, and not men – so because so much access is aimed at women, women are also getting more information and knowledge, and thereby also engaging in '*rajki*'! The idea here is that information is power and breeds power. This is an idea that is often absent in the framing of information interventions where some technocratic people want to speak for the rural poor.

Madhaviah in his conversations, tried to distinguish his mediating with the practices of one specific '*rajki*' male farmer in Gulithota. He explained, "The State has been giving the SC category people many benefits. This particular guy does not know why the State is giving his group all these benefits, but he is making use of all of them. And he has developed an attitude of superiority – whereby he demands that all the govt officials must give him what he wants and that it is his due. That is his character. He functions by trying to find the weakness of officials. In the *hobli* and *taluka* level people like him have created an organization just for their caste. They will strike against a particular issue if the officials do not grant them what they want, exposing officials and their corruption to intimidate them. If the officials pay them something then they will keep quiet. So they make use of the SC atrocity case power that protects them. So all they need to do is file an atrocity case against an officer and that officer will get suspended. But if I go to file a case – no action will be taken. Their practices are not right. Why does the State give quotas? For people to use them, not misuse them. Under the SC quota – the people who have made full use of the schemes and in the right way are the Lambanis caste. But what I have explained can't apply to everyone 100% - I am just giving you a sense." While I find that this quote of Madhaviah also speaks about his casteist ideas, it does serve to illustrate a functional difference that many others pointed out to me between *rajki* and information mediating. It also demonstrates how people in different social positions attach and contest meaning of what is personally empowering for oneself and others.

Methods of Generating Capital amongst Farmers

While the previous four sections explored different spaces of farmers' knowledge seeking, sharing and decision making, in this section I shift the discussion to differences in farmers' methods of income generation and saving. The purpose of this discussion is to situate farmers practices of planning in their agricultural and livelihood practices. It is important to understand farmers planning practices in order to complicate assumptions implicitt in information interventions.

I begin with the classic question of what defines agricultural productivity. Sudhakaragowda, a rich and experienced farmers says, "there are no differences in practices because of size of landholding. People fall back more on tradition – what they have been following for years together. The people who have small landholdings are able to get good yields, provided they have an interest in agriculture. If it is a couple and 4-5 acres of land they can do well because they have adequate labor for their land, better than a 20 acre farmer. It is difficult to get labor these days because people migrate. They do not want to earn Rs 30-40 from local labor here when they can earn Rs 100-200 working in paddy fields and grain mills of irrigated farmers, or as construction labor in bigger cities. But when they migrate seasonally they do have to spend on travel and food expenses. So I think it is better to stay here, be with your

family, work your own lands and also work as agricultural labor here. Yes, if you have a big family it is possible to send 1 or 2 persons who can stay there for 6 months and save and come back while others work here. That is better. I believe it is more about interest and less about opportunity because today nobody hesitates to spend money on anything as you see!" Here I do not totally agree with Sudhakaragowda because in this quote he erases the fact that he is one of the few farmers in his village who has a financial cushion. So he has the luxury to play down the importance of income from seasonal migration.

Lakshmanna and Lakshmamma provide more details about Sudhakaragowda's context and his financial habits. Sudhakaragowda is the most experienced farmer in their village and they attribute that to his agricultural lineage. He is a Lingayat, which is traditionally an agricultural caste[57]. They say that they sometimes chat with him and he does give them suggestions. While both of them do acknowledge that they have knowledge and experience in agriculture which their families have built up over the last three generations, they maintain that Sudhakaragowda is much more knowledgeable than them. They also point out that compared to Sudhakaragowda both of them have greater possibility of receiving aid from the State, given their schedule caste status. Yet, they point out that if Gowda thinks of an idea and he has greater capacity to go ahead and make investments and develop his land with the hope to making greater returns.

Lakshmanna and Lakshmamma say they can't take the risk like Gowda. Gowda definitely has more capital. They further stress, "If 'our type of folk' (meaning people of the same caste) had as much capital as Gowda they would not use it like he does. Instead they would go to the town and spend it or buy country liquor. Gowda has different spending habits. On a regular basis 'our' folk spend Rs10-15 on snacks and tea in the village tea shop. Do you know what Gowda does? He buys 1 kg of puffed rice and makes those snacks at home. When he goes to Kamalapura on work and he is thirsty he just drinks a glass of water. He doesn't buy tea. He doesn't waste his money outside. All his relatives are like that too. Take for example his sister-in-law Shankaramma – she has a well stocked kitchen. Gowda advices us sometimes on our spending habits. People listen to him and then they walk off and forget about it." I asked them if these differences were apparent when they were young and growing up. They said, "Even in those days Lingayat farmers got good yields compared to us. Their lands itself are different and better. If you notice their lands you will see that it is all level black soil lands (*kari chet*) uphill, level lands... they had prime place in terms of land. We are the backward people, the uncivilized people, who just came in with our livestock and sheep and goat. We used to graze livestock – that was our traditional occupation. So our folks are different and their folk are different.... but we are slowly improving our land."

Based on cursory observations I found that there wasn't a strong correlations between caste and landholding. This is substantiated in V.M.Rao's research in another

57 Ludden in his 'Agrarian History of South Asia' traces the antecedents to caste identity such as the Lingayats who in the sixth to thirteenth century transformed from gentry to landowning and ruling classes, and who still wield considerable power in the agrarian landscape today (Ludden 1999, 52-3). In the face of several generations of power, the fact that scheduled caste farmers still articulate that things have changed and can change is telling of socio-political processes in this region.

semi-arid region of the state with low levels of agricultural productivity[58]. His data reveals that some members of elite agricultural castes are landless laborers, and some Scheduled Caste farmers have large landholdings (Rao, 1981). My data from chapter 7 also illustrates this point. However, ST caste farmers do make a distinction between themselves and traditional agricultural castes in terms of agricultural practice and economic practice. However, I noticed that labor is the biggest factor that differentiates farming households and their agricultural productivity or rather livelihood sustainability in this semi-arid context. Given the changes in traditional systems of inter-dependence amongst farmers, households have had to become self-dependent on labor (Vasavi, 1999). Hence the land:labor ratio that Sudhakaragowda raised is of importance. My data in Chapter 6 revealed how while Sudhakaragowda managed his 10 acres rather productively, his own sister-in-law struggled to reap harvests primarily because of labor issues.

I asked Sudhakaragowda about the history of saving in his community. He said, "What do you mean savings at that time? There was no concept of savings then! Then even if you had Rs 1000 you were considered a big, rich man. Today there is no meaning for money. Rs 1 lakh means nothing – they say 'oh, I can go to the city and earn that in 6 months'. But today the worries of a household are also many, and it is more difficult to save money – what comes goes soon. Take for example you and your husband – you got on a motorbike and came to my village – you have only Rs 100 – you would have spent Rs 60 for petrol and another Rs. 10 for tea, etc., ...so what do you save today? Not much. If you had Rs 200 maybe you could save a little more. We can't say that people do not get money, or do not have capital...but it is just that money gets spent quickly. So people have to spend and then take loans for one son's wedding and then another son's wedding...that's how life goes on here."

Basanna's insights push a little further Sudhakaragowda's description of change in the last 4 to 5 decades. "Difficulties then were that if there was a marriage, lots of money was required. If we had 5 children – it was difficult to feed all. Now there are some government schemes which weren't there before. Now there are incentives from the State to have just 1 or 2 children so today there is less burden of children. In those days each one had 10-12 children and had to get each one of them married. If one fell sick finding medical help was unheard of in those days. Now we can get employment and get Rs 100 as daily wage. All these things make a difference. We do have difficulties now too. But today there are some benefits for the families who send one or two to migrate for seasonal labor. Today youngsters go off to faraway places like Bangalore and Mangalore and come back with Rs 20,000." Gowranna, a Jalaa field staff also told me that today things are better and people go earn Rs 20000 when they migrate, and have at least have Rs 5000 in hand and are also able to pay bribes. Many of the points that Sudhakaragowda and Basanna mention of household finances resemble the situation Kesava Iyengar reported in his Economic Investigation of 1931. This reveals the historical continuity of low levels of saving, and the role played by inflation.

Many farmers and the agricultural extension officer pointed out to irrigated farming as source of change in this landscape of limited capital formation. With

58 Gidwani 2002 and A.R.Vasavi 1999 also point to socio-economic change in agrarian society in India typically known to be differentiated by traditional axes of difference such as caste.

irrigation farmers could make changes in their cropping pattern and perhaps benefit from better prices offered for other crops such as onion, and bengal gram. However, Bhavani a woman farmer who gave me the impression of having gone about her livelihood with a plan, pointed out the challenges of irrigated farming. Bhavani, despite having many markers of financial security (2 buffaloes, 2 goats, investment in life insurance policy, a secure steel cupboard, and curd/yogurt in her home) takes loan from the *dalal* and from the Jalaa administered SHG, of which she has been a member for over three years. She is also aware that she can get loans of up to Rs 25,000 from the State Bank in Kamalapura under a small farmer scheme. Recently she took a loan of Rs 6000 for household expenses from the SHG. She has already paid two installments – one of Rs 3000 and the second of Rs 1500. She plans to pay up the rest of the loan after her sale of irrigated onion. She take small loans of not more Rs 20,000 at the time of sowing which she splits between the SHG and the *dalal*. She harvests 10-15 tonnes and give back some yield to the *dalal* as repayment. She says with 5 acres of irrigated land there is no other way to survive because you need high level of inputs. The expenses are more with irrigated land – it costs at least about Rs 10,000 for fertilizers and manure. But she still makes a profit from her irrigated land.

The difference I noticed between Bhavani and many other farmers is that she said she invested her profits from agriculture every year. One year she bought a a cart, then she bought bullocks for Rs 35,000. The reason she has been able to make investments is because her households consists of just her husband, and her son, and daughter-in-law, all of whom but her husband provide labor, and she has no educational and marriage expenses. Bhavani's practices reveal two things – one, the fact that how you have to circulate your money in a specific manner in order to fix capital in this political-economy, and two, that a combination of reasons can only make this possible in irrigated agriculture. There have been cases, where mere shift to irrigated agriculture has resulted in losses and failure, and so many prefer to stay with dry land agriculture. Only if you have a certain combination of factors can you make the switch and successfully sustain it, and the combination of factors is not constant across households. The same goes for rain fed farmers, although in general rainfed farming means less risk and less profit.

Lakshmanna and Lakshmamma, a couple who own two rainfed plots, say that it is better to take loans from the SHG run by Jalaa than it is to take from the trader. Lakshmamma has been a member of the Jalaa SHG for about five years. If they do not have the money in hand at the time, she takes a loan to buy pearl millet and sunflower seeds when the first season rains begin. They also say that it has not always been necessary for them to depend on loans to practice agriculture – there are years when they have been able to manage with their income. Before Jalaa they did not have the opportunity to take loans and they have managed. If they can, they buy inputs and if they can't, they manage with whatever they can apply to their land. We do what we can for our land – this is the attitude of many rainfed farmers. They have two children who study in a residential school in a neighboring town. Their education expenses come to about Rs 5000-6000 per year. If they get a good yield they make Rs 20,000 – 30,000 in a year and so can manage to pay their children's fees. If they have a bad year with the crops then they have to take a loan but they are confident that they can pay it off within the next year or two.

When irrigated farmers are able to sustain their cycle of capital generation over a few years, typically they stop migrating because they do not need to migrate, and they would prefer to spend more time tending their farm plots as irrigated farming requires more labor and attention. Bhavani told me that she and her son have not migrated for work for the last three years. The two Lambani farmers say that they do not migrate for work during the off-season. When I asked them how then they manage when they need some extra cash they said that they cultivate vegetables since they have a borewell. They sell their produce in the nearby town shanties and make money. They pool in with other farmers who grow vegetables and hire a small truck in order to transport their produce to the shanty. They prefer this method to borrowing credit from banks or applying for state-sponsored subsidies because "its all in (their) hands. We go to the shanty if we want to. If we get a spot in the market we sit down and set up our stall. If we don't we start walking the streets of the town and sell our produce." They say this is easier for them - "no barriers and in their control" Another story which emphasizes the structural dependence of farmers on local markets.

However, in the case of rain fed farming, wage income from seasonal migration contributes significantly to a households' need for income. It is also in this regard, that Jalaa's watershed program implementation made an impact in many households for at least three consecutive years. In fact during the tail end of my field work when the Central Government had launched its public works employment guarantee program, several farmers were unhappy with the wage rates because it was lower than what Jalaa had paid. One farmer told me, " The State sponsored program is not beneficial for farmer because they get higher wages even when they migrate." Even though this program is supposed to offer an alternative to seasonal migration whereby families face a disruption in their household during the lean season, farmers felt it did not compare to a situation where one family member could migrate for work and return with Rs 15000 minimum. Amongst the rainfed farmers I noticed that those who were most successful at fixing capital were the households that sent different people off to do different things – one or two members would migrate and come back with money to invest in a borewell, or purchase livestock, one member would run a stall, or one member was adept at procuring government subsidies or sourcing useful information. It is this diversification and circulation in many small scale economies that allowed them to overcome the vagaries of the monsoon. The more experienced micro credit staff in Jalaa also made a similar observation.

Planning

In this section I dwell on practices of planning / decision making of different farmers in order to answer a question that is often central to many information interventions – if the farmer has more information at his disposal can he plan / manage his land better in order to earn more? If a farmer can plan, that means s/he is in a situation to take advantage of prevailing market rates for different crops, can choose where to buy their inputs, can plan for labor, and also strengthen soil nutrients and moisture to give good returns for the chosen crop and safeguard against the unpredictability of the monsoon regime. So, do farmers actually plan? Is it really important for them to have more information? Or better information about certain processes?

In Chapter 7, where I analyze farmers practices of soil and moisture conservation I make the point that their understanding of knowledge is as a process embedded in their dry land political economy. While they may know the details of bund building and understand very well the flow of soil and moisture their interventions are based on availability of capital, or availability of time – both of which have cycles very specific to this time-space geography. This finding then obviously recurs in discussions of farmers' practices of knowledge seeking, sharing and decision making. In the earlier sections of this chapter, this idea manifests in their articulations of how they negotiate their daily life, their view of knowledge as power, and in their acute awareness of whom they want to be represented by.

Here I would like to highlight a different point. In their conversations with me farmers constructed a dichotomy in the identities of farmers – those who work the land, and those who run around networking to be a part of the subsidy culture. In reality there are linkages between the two but I do not want to ignore the construction of this dichotomy because it arises from labor intensive agriculture that is practiced in this marginal landscape with strong structural constraints. For example, I was surprised to find out that the two Lambanis farmers' third brother is a person who served as the *Gram Panchayat* bill collector. I had interacted with him in the past and he played a very active role in the operationalization of the most recent state sponsored public works program. I was surprised that with a brother who is a bill collector these two farmers had no interest in working the system of subsidies. They laughed when I expressed my surprise. Mukundappa who was with us clarified for me, "yes, that is what *he* does, and *these two* work the land! The two brothers added, "Our brother does not know agriculture. He brings us seeds and tells us to sow. He went to school so he is like that from young. We never went to school so this is the route we took. As kids we used to graze livestock and now we work the land." Even if their third brother wanted to he could not work on the land now. They say he has no experience on the land whereas they rely on experience to practice agriculture. This dichotomy represents two lived modernities that exist – two trajectories so to speak.

The two Lambani brothers look at Mukundappa and say, "He also has a lot of information about the outside world, like our brother." to which Mukundappa says in defense, "but I am also a farmer!" They respond - "Yes, you are a farmer who has experience on the land but you also know a lot about the outside world – your head is sharp, unlike ours. You read the newspaper and gives us information." They distinguish between Mukundappa and their brother – while one does not know agriculture, the other knows agriculture and also has a lot of information about the outside world, yet they are the ones who actually work the land, not even Mukundappa. And they also seem to regret that they are not literate. These categories that they articulate reveal complex reproductions of modernity of which I argue information interventions must make note.

While Mukundappa's land reveals traces of government subsidies he himself and many others in his village told me that he did not realize maximum productivity because he is one of those who does not go to his field everyday. During my field research I encountered Sudhakaragowda - an upper caste farmer who without access to subsidies but with a comfortable capital reserves and adequate labor realized good productivity, Shankaramma – an upper caste farmer with low reserves of capital and little labor who struggled to get a decent harvest, Lakhmanna and Lakshmamma -

lower caste farmers who did not access subsidies but worked their lands day in and day out and realized good returns, and Yenkoba - a lower caste farmer who accessed subsidies and worked his land every day to realize good returns, and I still struggle to be specific if one asks me what the pattern is in terms of productivity and fixing capital. There is also no clear link between knowledge and productivity of land.

A certain formal education gives access to a job with a predictable salary that arrives at the beginning of every month. An agricultural job does not require formal education. But are people like Ashok trying to 'educate' farmers by providing an information intervention so that they too can enjoy predictability and stability in agriculture? In order to enjoy predictability and stability in agriculture Ashok says that each farmer should have access to much more information than they currently have access to, and also be able to cross-verify all the information in order to make decisions that allow him/her control over his/her situation – control over his/her soil, land, seeds, fertilizers, crops, prices, labor, money, etc., As per the current situation, Mukundappa says, “farmers cannot plan. Planning is *golaata* (gambling) for us farmers. We just keep going on.” The debate about information needs to be viewed in the context of the identity politics that is taking shape in the agrarian landscape on the basis of literacy and agricultural practice. Mukundappa explains the importance of education, “The government says we need to attend school and get educated. If we were educated then we would not be in a situation like this where we are dependent on untimely rainfall and where our agricultural livelihood is a gamble. Those who are educated can get jobs – their lives are simpler – they just have to go to work and thereby manage their lives. We, on the other hand do not know what to expect. We cannot make very long term plans. All we know for certain is that we have to go out everyday and work our lands.” The reason they say this is because the only thing under their control is their own labor and effort applied to the land. Here Mukundappa is looking at education as an alternative to his agricultural livelihood, not as providing a better way to cope with his agricultural livelihood. I think this is something we need to listen to! He values stability of income much more than the land-based livelihood. And there are other farmers who value their agricultural livelihood despite its uncertainty.

I ask the two Lambani brothers, “Even if you do not have access to the type of information that Mukundappa or your brother provide you with, given your experience with the land, could you still make improvements on your land and get good profits?” They laugh at me. Mukundappa explains, “It's not really possible – they are trapped quite tightly on all sides. Since they buy their seeds from the trader, when they get good yields they have to go back to the trader to sell their produce and settle their dues. If they want to experiment with something new they do not have the experience. They do not even know where to begin – what new seeds to buy and the package of practices. They do not even know how to go and collect compensation packages that are given out by the State as the time of drought or untimely rainfall. When there is crisis such as inadequate or untimely rainfall and crop loss they will migrate for work, make some money, go get a loan and sow during the next season. When they harvest they will go pay up the loans and thereby the cycle continues.” He also says that besides the *dalal*, they borrow sometimes from farmers in the village. These two farmers do not know any information about banks.

Basanna, an old farmer in Gulithota said, "Although life is better now in general, market rates have gone down especially in the last year – One quintal of bengal gram was Rs 2400 - 2500, and now its gone down to Rs 1900- 1950. From last year to this year we see this big difference. We don't have a market at all. The government has promoted palm oil, and such - so demand for the oilseeds that we grow has gone down. What do we do? What can we do? How to grow different crops when rain itself is a problem? Because of this rainfall regime we can't really change our cropping pattern. If the government protected us with a fixed price for every season then we can decide to try a new crop or even decide what crop to grow, but they don't do that. In this context, what is the importance of our decision making? There is no consequence attached to our decision making!"

According to Mukundappa his method of educating some of the farmers has been providing them information about new state-sponsored schemes. But he finds that if he tells some of the farmers (such as the Lambanis he has introduced me to) which officer to meet in which government office to ask about a particular agricultural scheme, they do not follow up on his advice. I met these Lambani farmers and asked them why they do not follow up on Mukundappa's advice. They said, "We prefer to do what we know. When the first rains come we plough, and then we sow and that's how we carry on with our lives." I interject, "But people like Mukundappa move around a lot and have lot of useful information about government benefits." to which they reply, "If we are to be like him we won't have time to work on the land." Why is it that when Mukundappa plays the role of a benefactor to farmers more disadvantaged than him, he feels they are not doing the right thing by following his information tips? And why is it that when Mukundappa is at the receiving end of information tips from others such as Jalaa staff that he disregards the information? Why is this contradiction embodied in the same person? Is there something about the process of providing information that is patronizing or rather, acontextual? In what situations do farmers take or accept information? When it fits into their context – for example, there is ample evidence that the mobile phone has revolutionized communication in rural areas in India. The work that information mediators such as Shivamma and Kamalamma do has helped farmers. So what I am trying to say is that low levels of capital is one problem, and in this context, information interventions make sense for farmers only if they fit into their daily practices.

I argue here that it is because of the strong structural constraints that we find farmers constructing this dichotomy, and at the same time view knowledge as power and actively negotiate situations. This critiques the representation of farmers in this region as backward. Hence just as I point out in the section on 'Local Governance' that structural factors in *Gram Panchayat*s have stimulated greater participation, here too I argue that it is more important for the State to improve the dry land economy of farmers, rather than speak of Information and Communication Technologies (ICT) as a panacea.

Discussion

One of the main examples that Ashok gives is of farmers having access to prices of agricultural commodities. This is a reason that is most often cited by IT interventionists in the rural development realm. In Ashok's words farmers "no longer grow only for themselves. If palm oil price is down, or *bajra* crop fails in Rajasthan

this year, then farmers here should have that information so that they make a decision on what to grow, to take advantage of the price situation. It is in this context that I say that farmers need to become managers.” But the ethnographic data in this chapter has demonstrated that there are structural constraints, and there are power structures which do influence the topography of information, and within those constraints farmers actively negotiate. So we must not assume that they do not cross verify or do not make opinions and exercise their opinions and judgements.

Ludden has highlighted how controlling the supply of short term credit, and the capacity to employ labor in these type of regions allow a few people to wield a lot of power (Ludden 1999, 98). However, I am not romanticizing this situation and saying they do not need to know more. But what I am arguing is that they do not articulate a need for packaged information or information without context. Whereas Ashok's strength in Jalaa is packaging concepts, as he himself once said to me. What the farmers are asking for is not more 'information' or an 'Information Kiosk' but for 'more fair terms', and for 'infrastructure' or mediators that will allow him/her to fix capital, using which then s/he can choose whether s/he wants to buy a laptop and get an internet connection to get information. S/he is not asking for a farmer card, or a farmer database or an Information Kiosk. Packaging in practice of science and in labs has a different social meaning, while packing in a landscape of material poverty has different implications. This is bringing in concerns Development Studies to extend the immanent potential of STS approaches. When we engage in this zone we do not engage with the separate fields, but we create a new ground in which to speak.

I do not intend to essentialize the rainfed practices of farmers and the concept of uncertainty that they work with constantly. There have been slow changes in this region and all actors in this landscape right from the farmers, to the traders and the extension officer acknowledge this. As the Extension Officer pointed out to me in 2009 that when the region received untimely rains during the lean season in April, people with black soil went ahead and sowed green gram. They did not hold on to their calender of practices and instead took took a risk. There are some limits which farmers are contesting and changing. There is scarcity in development schemes also, which is why there is so much active negotiation that is happening in this landscape. My ethnographic data serves to demonstrate that people of this landscape as not unaware, but energetic, and cross verification is happening. There are material constraints however which I do not want to ignore. So, just an information fix, and the assumption of the information fix is not enough or even not really required, but what is required is adequate capital formation for all.

Also, as the barefoot outreach workers made me realize that information is power and breeds power in this rural landscape. I think that people here understand this better than we do. While we do not understand it and try to 'level the playing field' – they understand it and negotiate it. So while they too commodify it, they do not commodify it in a decontextualized way as is the case with many ICT4D interventions. I think their way of dealing with information represents a level playing field because the message is clear – 'negotiate!' Whereas the level playing field that interventionists seem to want to create comes with erasures of a few wanting to speak for the rural poor.

The argument I would like to put forth is that, in this matrix then, the question we need to ask ourselves is – 'is it important to intervene through interventions that package 'information' as a separate commodity, or it is more meaningful through interventions where information is contextualized in infrastructure or structural interventions? I argue that contrary to assumptions, in the current political economy it is risky for farmers to rely on an information interventions as opposed to the assumptions that information interventions reduces risk for farmers. They can't afford to waste time. They can't afford to plan. The case of going to the *dalal* vs the credit group or bank for a loan is a simple case in point. This illustrates that for this class of peasants with barely any capital circulation, it is too much of a risk to rely on Information Systems. Most farmers I spoke to said that one thing they rely is a broad set of traditional practices of farming yet there was no normalization of what must be done on their land.

Chapter 9

Conclusion
Repoliticizing Technology / Development

I began with the ambiguities of the digital environment in a specific geographic location – the spatial technology sector in south India. Working in a research project that was investigating land use change over two decades, I realized that satellite images presented significant power to see - power to pinpoint change in the landscape at the level of a pixel, and power to overlay property boundaries and tell people of a particular region what changes they have wrought on their landscape. However, in the political economy of the Indian spatial technology sector of the late nineties, I personally found that this power was not easy to create. We ended up doing a lot of bootstrapping for each process in satellite image processing and GIS. Since there was no authority in this field, and no standards, everybody was more or less reinventing the wheel. While on the one hand there was an unproblematic celebration of the importance of geographic information, at the user level I saw little engagement with the content of data, measurement of data and history of geographic information. However, the point I want to highlight is not the practice of bootstrapping, but that the bootstrapping occurred in a specific environment of scarcity at the level of practice, and this scarcity was being negotiated against the backdrop of a heavy symbolism of the Indian satellites in the sky.

My motivation in this dissertation was to understand the meaning and content of these technologies and the trend of privileging them as planning tools in rural development. I reviewed a subset of GIS-Society literature that looked at natural resource management applications. The research of Paul Robbins and Steven Hoeschele, and Barrett, Sahay and Walsham left with me instrumental critiques of the technology (Barrett, Sahay & Walsham 2001; Hoeschele 2000; Robbins 2000; Robbins & Maddock 2000). While the works of Matthew Turner, Eugene Martin and Alexis Zubrow engaged with some of the ambiguity I perceived as a project staff (Martin 2000; Turner 2003; Zubrow 2003).

I used theories in Critical Development Geography and Science and Technology Studies to cast my research question in a broad manner and thereby move beyond the technology-society dichotomies in the above mentioned literature. I found that I was most compelled to study the ambiguities through a question of representation and robust spatiality and in this I am strongly influenced by Latour's framework of translation (Latour 1999), Gillian Hart's framework of relational ethnography and Sivaramakrishnan and Agrawal's concept of regional modernities (Hart 2001; Hart 2002; Hart 2004; Hart 2006; Sivaramakrishnan & Agrawal 2003). Inspired by these approaches I asked a broad research question - How is knowledge produced and rural development practiced using these spatial technologies? In order to answer this question I chose to conduct an ethnography in a semi-arid region in southern India where a NGO employed remote sensing and GIS to make watershed development plans in order to conserve soil and moisture and thereby improve the rather precarious livelihoods of small, dry land, farmers.

In order to follow the production of knowledge I conceptualized the space in which this spatial technology based plan for rural development took shape as a landscape layered with the articulations amongst many different actors. I did not separate the spatial technology plan from the landscape in which it takes shape and I also blurred the lines between different actors such as the NGO director, the NGO staff, and farmers. I remained attentive to the manner in which the practices of these actors, and their relationships unfolded on a daily basis. It is in these unfolding relationships that I have now made sense of the meaning and content of these technologies and the trend of privileging them as planning tools in rural development.

Findings from The Field

One of the findings from my many field traverses with farmers across the landscape is that farmers, in their daily practices, are actively involved in processes of place making. A terrain on which to farm has to literally be created in some instances. The landscape is being actively worked for soil and moisture conservation contrary to the assumptions in the reports of many watershed programs –which typically read as - low productivity of land is the cause for livelihood insecurity and hence seasonal migration, which in turn leads to lack of interest in land based activities. The absence of a rich natural resource base being understood as backwardness is a cross-cutting theme across multiple ideologies. The explanation that typically follows is that farmers tend to give up. However the work of farmers in creating and maintaining inter-generational assets in the stone bunds is a strong critique to such tendencies.

How is the landscape being worked by farmers? Key features in the landscape are stone bunds and mud bunds. Complete maintenance of these bunds was not the order of the landscape because of low levels of capital formation. So while some structures stood the test of more than one generation, and some were patched up in a temporary way, some were left damaged and some were built just to last one season of rainfall. Stone bunds such as these in the past were built with hard manual labor, and bullocks. Today they are built the same way but take much longer and cost more because of the changed political economy. Such bunds are more widespread in the marginal upstream locations and in farm plots that straddle the courses of streams – both locations where there is a dire need to create land and soil for cultivation. In the areas with medium to low slope, mud bunds, which are stabilised with grass are more adequate. In the mid to downstream locations, where streams widen, some rich farmers have been able to trap large quantities of alluvium with stone bunds.

My conversations with farmers revealed that they did not view bunding as a stand alone solution for soil and moisture conservation, but as entwined with a bundle of practices such as ploughing and manuring of soil, and also adequate drainage of soil, and crop rotation. How a farmer managed his/her bund depended on the interaction of run-off and type of soil. I found that they were constantly paying attention to this.

In following their history of spatial technology based planning spanning over a decade in the NGO one of the most significant findings for me is the movement in their planning models. I focus on two key moments in this NGO's movement or history of planning. It is these two key moments that position me to participate in larger theoretical debates about technology and development.

The first moment I wish to highlight arises in part from a deep, and finely grained spatial database that I argue is political in the face of the shallow spatial models that are propagated by the Indian State and other mainstream players in the spatial technology sector in the country – many that I was perplexed by when I was working as a project staff.

Ashok, the Director of Jalaa said to me that in his early years of working with agricultural livelihoods he found he wanted an overview, “If I had an overview of how water flows, if I had an overview of land, water, trees, then I could come up with an integrated plan for dry land farmers livelihoods. I did not know anything about GIS then but I always thought through the logic of the 'overview' – so that I could 'see'.” So, the agronomists' methods were not enough for Ashok in terms of technologies, he wanted 'visual' technologies that allow him to 'see' collate, aggregate, and database. His first point of contact with the Indian Space Research Organization – the producer and distributor of satellite images in India - was in the early nineties – he thought the satellite images would provide him the overview. But the images were of a scale too coarse. He was told by the Space Research Officials to walk the land instead. He was walking the land. He learned that many people who were end users of ISRO were people who did not walk the land!

By the time Ashok revisited satellite images a few years later, Jalaa, had already begun implementing watershed projects which whether state funded or donor funded were almost always worked through NGOs on the ground. By this time -1997 – the Indian Space Research Organization had increased the spatial resolution of multispectral data to 23.5m and had developed a panchromatic band of 5.8m. The combination of these two types of data turned things around for the NGO and rekindled their interest in spatial data and spatial planning. They developed a large scale, cadastral level, spatial database prototype which was used for watershed planning.

Bhagat, the watershed engineer and the main architect of the watershed plan in Jalaa had first explained to me about how he visualized spatiality in a watershed, “Water flows according to slope. Managing water is managing slope. So slope is the main reason one needs to be aware of catchment area. That is the scientific way.” As I mentioned just a little earlier, amongst farmers, bunding is viewed within the context of a bundle of practices such as ploughing, drainage, cropping pattern. Soil is a big concern for farmers given the aridity and local geology of this region. In fact most farmers, except those in stream courses, said that bunds were firstly built to trap soil. The next priority was to increase soil moisture, and only the third priority was to level slope.

In the project set up Bhagat was focused on slope, and this was tied to water, and the movement of water. 'Water' is different from 'soil moisture', the latter being the priority for farmers in this semi-arid region with highly variable rainfall and a cropping pattern of millets that has evolved over many centuries. Bhagat always articulated that he wanted the water to seep underground and not flow. Whereas farmers always told me that their intention in building bunds was to increase soil moisture, reduce soil erosion by reducing the velocity of water, and letting the water flow downstream.

This narrative would not be complete without looking at Bhagat's practice of watershed planning in a historicized manner. While Bhagat did begin with an initial strong focus on slope, he did not stick with it. He talks of how the GIS database gradually altered his planning. The detailed plots maps and soil surveys in the spatial database made him widen his focus from slope to include the interaction of soil and other 'social' variables. I also reiterate that it is not just the inclusion of variables that make a deep database, but the manner in which they are represented, i.e. the relationships in the database, the abstraction that comes from the representation, and the relationships between all actors in the NGO who work with the database and use it, of which Bhagat is one.

The second moment, which I call the Trench-cum-Bund model, comes towards the end of the many spatial planning models that the NGO experimented with over a decade. First I answer the question - Why many spatial models? Why not just one? Ashok, the Director of the NGO used these technologies and his long understanding of this landscape and its people to craft a techno-development package which he could propagate as a livelihood plan that would represent the people of the landscape – the farmers. However, I do not intend to reify the position and practice of Jalaa or Ashok, in moving from one model to another, attempting to best represent one good solution for farmers' livelihoods, Ashok was also weighed down by political economic difficulties that one encounters and struggles to control as a Director of a non-profit organization – limited access to funds, high turnover of staff, cost of technology, negotiating political alliances in the NGO-funding sector, and the marginal semi-arid environment he has chosen to set up his NGO.

The Trench-cum-Bund model is a very simple model which involves the construction of a trench-cum-Bund in every farmers' plot and does away with the designs in watershed models which come with a complex assemblage of different types of structures such as check dam, contour trenches, farm ponds, etc., Ashok says, “So our evolution is that from all those things we came down to one thing - the Trench cum Bund - and the reality of it is that watershed which was really the core business of all our GIS work, is now reduced to one thing for which we don’t really need GIS! But it is not a critique of GIS. First we tried it out as a watershed planning tool, then as a credit inventory tool, and we tried to look at it for so many of our own needs. Now with Trench-cum-Bund we don’t need the setup we created - how do we retain everybody in Jalaa? All we need is our civil engineer to give one training session to the farmers, people have to be convinced and then we bring in an earth excavating machine and make the Trench cum Bund - it will cost about Rs. 400 per acre - its been brought down to this level - so simple and strong and we think it is a good solution. The implications of this is that you can now implement an entire watershed program (for an area of 500 ha) for just Rs. 600,000. Interestingly, with a watershed project budgeted at Rs 600,000 it would not seem attractive to an NGO. It is not viable for us to exist in this region with this model!”

Theoretical Contributions

While the limitation of my work is that I look only at a specific case of spatial technology based planning and do not conduct a larger structural analysis of the spatial technology-based rural development sector in India, in Gillian Hart's words

“(P)articularities or specificities arise through *interrelations* between objects, events, places, and identities; and it is through clarifying how these relations are produced and changed in practice that close study of a particular part can generate broader claims and understandings.” (Hart 2006: 996) These findings position me to participate in debates in the three fields that I engaged with in my literature review of Chapter 2, and also make a few broad claims about spatial technology-based development in India.

In GIS-Society literature, I complicate Robbins and Maddock, and Hoeschele's arguments about the Indian Forest Department, or Turner's arguments about the elite environmental research community in Sub-Saharan Africa, all of whom dirty their hands in employing spatial technologies to represent landscape and its people (Hoeschele 2000; Robbins & Maddock 2000; Turner 2003). In the case of Jalaa, it becomes difficult to fix Ashok's instrumentality. Ashok's proximity to the actors and objects he wants to represent provides one revolutionary glimpse about the techno-social phenomenon I set out to understand in this dissertation. His proximity to these actors differentiates him as someone who does not unproblematically accept the models propagated by the Indian Space Research Organization (ISRO). While the heavy engineering to build and launch remote sensing satellites in ISRO combined with the shallow land use models they propagated left me perplexed as I describe in Chapter 1, Jalaa's work with a range of actors showed me how a landscape of scarcity can be represented in some complexity by giving agency to its many constituents. A deep database was created not out of heavy engineering or an obsession for accuracy, but out of proximity to its constituents and an understanding of spatial relationships as they are continuously produced in a landscape.

I also take this point about awareness of relationships a step further to address debates about participatory planning in GIS. While there are critiques of Participatory Rural Appraisal (PRA) techniques as disciplinary tools of development (Mosse 2005) my theoretical framework combined with the specificities of Jalaa's practice demonstrate that the socio-technical relationships that make possible a deep database are 'participatory' beyond the strategies typical of disciplinary participation, i.e. farmers sitting together in a circle with NGO staff and providing inputs about themselves to fit into a predetermined framework – traces of which I see in both Hoeschele's 'intimate sensing' and Robbins' and Maddock's 'local' classification of forests used to counter 'Forest Department's' classifications of forests (Hoeschele 2000; Robbins & Maddock 2000). In other words, I argue that representing others can be politically enabling even if the represented are not physically involved as in PRA processes, so long as the process of representation is dialectical, in the Latourian sense – that every stage in representation allows movement to be traced both ways. (Latour 1999, 69) Dialectical representation also cannot be reduced to the tool, or the user. It comes together and allows for participation in the particular assemblage and in the relationships, for example – in Bhagat and his gradual internalization of the Households-at-Risk model. I argue that in our eagerness to bring in 'local' people and their 'local' categories we must not be blind to the participatory possibilities of dialectical representation.

In Development Studies, my research sets up a response to the post structural critiques of development as exemplified in the works of Ferguson's 'Anti-politics Machine' and Tania Li's 'The Will to Improve'. Ferguson in his book 'Anti-politics

Machine' looks at how an international development project originating in the West constructs the conceptual apparatus where the region to be developed is defined as underdeveloped, and the institutional apparatus to develop the region. In this construction, the project was set up to provide technical solutions to "problems" which were not technical in nature. Tania Li, in the 'Will to Improve' demonstrates how development programs in Indonesia are focused on creating 'responsible subjects' and in the process depoliticize the political economic reasons for existence of inequality, and limited access to resources. This she terms the 'rendering technical' of issues 'political'. My research in a semi-arid location in India, informed by a theoretical framework of deep spatiality, demonstrates how people use technology to keep the complexity they see in the landscape in the database – to keep the political in the technical.

Part of Li's work in 'The Will to Improve' shows how development projects are focused on creating 'responsible subjects' and in the process depoliticize the political economic reasons for existence of inequality, and limited access to resources. This is the 'making technical' that Li talks of, with reference to the cases she studied in Indonesia. In Li's research she shows how much work of the development program is to align the subjects with the objectives of the development program (Li 2007). In my research I demonstrate that more energy and thought is put into working with the conditions as they exist on the ground – development planners are not fixated on planning, to the exclusion of everything else, and hence their prime focus is not to depoliticize. Instead they work with their tools, and their attention to conjoined relationships in the field is revolutionary.

In analyzing the materiality of the relationships that hold the GIS plan together, I make the argument that my focus on relationships, which in turn arise from my framing of deep spatiality, moves beyond the dichotomies of representation and reality, between the plan and implementation which permeate the post structural critiques of development (Ferguson 1994; Li 2007). The space between all the actors and objects in the process of planning and implementation, or in other words the relationships that hold them together, are being continuously produced and negotiated – and therein lies the political reproduction of development. When Jalaa field staff Sukumar says, "watershed work is not about doing magic, it is all based on process, and these structures that are built are really the product of a long range of social processes," he is acutely aware that development work arises out of negotiations and relationships. His hard work and his negotiation of the 'modern' and 'amodern' play a significant role in bolstering soil and moisture conservation efforts of farmers.

South Asian agrarian experts such Barbara Harriss-White and A.R.Vasavi, and Tania Li in her Antipode essay 'Make Live or Let Die' highlight how the agrarian poor are being dispossessed of their land and labor due to their increasing irrelevance to capital (Li 2009; Shah & Harriss-White 2011; Vasavi 1999). I would like to point out that the work of the trench cum bund in watershed projects such as the one I studied, are in some measure strengthening the land assets of small and marginal dry land farmers, and also providing them with seasonal labor in the construction of watershed structures – these are measures that the above mentioned theorists too argue for. Even though farmers have been actively working their landscape many of them in this region specifically told me that programs such as those implemented by Jalaa helped fill in the gaps in their land management because the programs provided

100% coverage of soil and moisture conservation structures – gaps that existed because of farmers' political economic constraints.

Also integral to the contributions I make to Development studies, are the insights from the position of Jalaa within the political economy of NGOs in the country. Unlike the big Development Agencies that have been the subject of Ferguson, Li and Mosse, Jalaa is a small NGO that operates within an uncertain funding environment (Ferguson 1994; Li 2007; Mosse 2005). Their size does effect their proximity to the landscape and its people. Another feature of their position of alterity is that their sustainability is bolstered by the relatively inexpensive development labor sourced from the region in which they work. Anthony Bebbington and Rajni Kothari argue respectively in two essays that are spatially and temporally distant, that NGOs make use of the unevenness of development to set up shop (Bebbington 2004; Kothari 1986). Since they are dependent on fund flows they are also not vested to make serious interventions in the regions that alter the political economic backwardness of the area, but are instead invested in constructing success. Jalaa, because of its position of alterity complicates this argument of NGOs, and does make some changes that serve to alter farmer's political economic constraints.

In Science and Technology Studies, my application of Bruno Latour's translation approach is a response to claims that it is apolitical (Casper 2000; Yearley 2002). My ethnographic research demonstrates how Latour's theory of translation can be productively used for political reasons if it is given its due place, read in a historicized manner and extended, through a robust reading. In tracing the translations in representation I use the concept of deep spatiality, which I interpret in both Hart's theory of articulations (following Gramsci) and Latour's theory of translation, in order to politicize my understanding of processes knowledge production in the case of diverse actors in my field location. I engage with the content of knowledge and the political implications in the same breath when I look at the translation between actors. This is evident in the conclusions I draw from the movement in Ashok's practice, and the movement in Bhagat's practice as highlighted above. In looking at the movements in field staff practices in Chapter 6, I argue that what is lost for field staff is their work mobility, and in looking at the movement in farmers in their daily spaces of knowledge seeking, sharing and decision making I set up a critique of their representation as 'backward.'

Donna Haraway, in her call for a 'feminist, multicultural, antiracist technoscience' which does not respect the boundaries of disciplines, institutions, nations, or genres' alludes to the politics of the academy and the closures it brings with disciplining fields (Haraway 1994: 60). She identifies the three fields of cultural studies, feminist multicultural and antiracist theory/projects, and science studies and argues that they are 'not preconstituted, nicely bounded scholarly practices or doctrines that confront each other in debate or exchange, pursuing wars of words or cashing in on academic markets, and at best hoping to form uneasy scholarly or political alliances and deals. Rather, the three names are place markers, emphases, or took kits—knots, if you will in-- in a constitutively interactive, collaborative process of trying to make sense of natural worlds we inhabit and that inhabit us; i.e. the worlds of technoscience. ...” (Haraway 1994, 66). Kavita Philip, also an energetic voice in extending and unwrapping the political possibilities of STS approaches argues, along with Irani and Dourish in her essay 'Postcolonial Computing' that we

must not be not be too rigid about the classic analytical concepts that come with any disciplinary project (Philip, Irani and Dourish 2010). I use Haraway's and Philip's calls to substantiate my reading and application of Latour's translation approach.

Critique of Remote Sensing Applications in India

While a significant part of my research was focused on the reproduction of spatial technology based development in one location in the country, and the work of several actors highlights the repoliticization of technology / development, it is still necessary to take a step back and make an argument about remote sensing technology developed and promoted by the Indian State. Towards the end of my field work I had the opportunity to interview two retired ISRO scientists, one of whom I would define as a technocrat because he had served in a administrative position. Both conversations threw more light on the ambiguities of remote sensing applications within the larger contexts of the Indian Space program, and the country at large. The retired technocrat explained to me in a rather animated fashion, reliving the excitement of his days in Thumba, how remote sensing application entered the picture in the midst of developing indigenous rockets and satellites. Once they had gained some footing in the design and manufacture of rockets and satellites, the question of applications was considered. While communication, education, and meteorology were foremost in the list of applications for a developing country, remote sensing also cropped up.

He explained how they fitted a Hasselblad multi spectral camera to a helicopter and captured images of parts of Kerala, Madhya Pradesh and Punjab. He talked of a set of significant images of coconut plantations in Kerala - tops of healthy coconut trees showed up as pink, and unhealthy coconut trees a lighter shade of pink. They were pleased to be able to differentiate this and shared this with Indira Gandhi, the then Prime Minister of India. Funding was difficult to procure, and it was an uphill task for ISRO to convince the government for funds for remote sensing applications. In the early seventies, ISRO also tried to garner support from users. For example, he mentioned that they invited M.S. Swaminathan, architect of the Indian Green Revolution, for user meetings so that they could garner support for remote sensing applications. This conversation illustrated to me the contingent history of Indian Space Research. While the Space program was in the interests of the newly independent Indian state in order to establish its scientific sovereignty, the nature and trajectory of developments including core rocket and satellite technologies and applications arose out of several considerations, and relationships.

Given that the second scientist had worked in a less powerful position than my previous interviewee, he provided a different perspective on space applications. In the sixties, most of the research in ISRO was focused on the core technologies of rockets and satellites and not the applications. Sounding rockets occupied centre stage in research, and there was barely any application value in sounding rockets given the short time they were in space. Only when the bigger satellites were developed did applications research come into vogue. The bigger satellites obviously had more time in space and more capacity to carry other equipment. From the late seventies onwards developing applications became the need of the hour in a developing country like India. Today, given the large scale development in the applications side and that fact that Indian satellites have a life span of five to ten years, he felt that it is now important to balance the emphasis on applications with more research on cost

effective core technologies of launch vehicles and satellites. His memories were also constantly referenced with the seven different men who headed ISRO in the last six decades, and their different approaches to scientific research, management, and technocracy.

Insights from the above two conversations together substantiate the conjunctural nature of scientific developments. Their conversations highlight that the remote sensing application, is one among the many different contested objects holding the Indian Space program together. The CAG audit report that I refer to in Chapter 1 serves to inflect the path of Space program's progress, and the story that I narrate in this dissertation from a particular semi-arid location in the country should also be counted, particularly through the articulations that I have traced in this semi-arid location. While the satellite images did give Ashok the overview he wanted, over time he and Jalaa field staff made redundant the main utility of the images which was creating the indicative plot map. Because of the costs involved in procuring satellite images, they developed their field method of walking the land, and drawing the plot boundaries on the cadastral map. This relegation of the satellite images also happened because over time, given all their 'movements', Ashok and Bhagat particularly realized the power of the deep database over the 'overview', and the power of the deep database was produced by the rich work of the farmers on their landscape and of all the actors in Jalaa. Thus, I argue that the rich articulations of all these actors present a strong critique to the utility of the remote sensing program as promoted by the Indian Space program. In STS vocabulary, this represents a failed alignment, where consensus is not reached for relationships to congeal and form the remote sensing applications 'black box.'[59]

The trend of Information and Communication Technologies for Development (ICT4D) represents another form of legitimation for spatial technology applications. Spatial technology applications are being ratcheted up to join the ICT4D bandwagon. Kavita Philip's recent work on 'Indian Informational Capitalism' is a call for interdisciplinary work and new analytics in order to make sense of the different configurations and contradictions we see playing out in the country today in the name of the rural poor (Philip 2009). While the contextual assemblage of a deep database and relationships amongst the many actors is able to provide a structural change to farmers in their landscape of uncertainty, the decontextual information infrastructures represents a rupture in the development landscape. Farmers' daily practices of negotiating the structural constraints they face in a dry land political economy present a critique to Ashok's ideas of creating an information infrastructure to set right the 'information asymmetries' he perceives in this landscape. The work that farmers have to try to fix capital in this dry land economy make a strong case instead for more concerted agrarian policy interventions in this region.

I began with the ambiguities of the digital environment, and with the ambiguities that I saw in the spatial technology sector in India. I wanted to understand the meaning and content of these technologies and why they were being privileged in rural development planning. My ethnographic work in one location in India has provided me with some openings about the meaning of spatial technologies and rural development. In conclusion, I argue that there is nothing inherently reductive about

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59 I acknowledge Geoffrey C. Bowker in helping me tease out this idea, which demands further analysis.

these technologies and their use in rural development paradigms, and that when we look at the relationships which tie up various objects and actors it is possible to catch glimpses of revolutionizing representations of the world we live in.

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