Rural Andean Bolivia: Needs and Potential Solutions

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Engineers Without Borders National - History

- Started April 2000
- Dr. Bernard Amadei and 8 students at CU Boulder
- First project San Pablo, Belize
  - water delivery system
- Completed May 2001 at a cost of ~ $14k

EWB mission

- Work with disadvantaged communities worldwide
  - To improve their quality of life
  - Implement environmentally / economically sustainable and socially equitable, engineering solutions to problems of
    - water storage and distribution/irrigation, safe drinking water,
    - water delivery and sanitation,
    - dormitories for schools,
    - electricity for light powered by solar energy (PV)

EWB motto

- Changing the world one community at a time
- Several local chapters
  - Puget Sound Professional Chapter
  - Seattle University Student Chapter
  - University of Washington Student Chapter

UW Student Chapter History

- Founded by UW students in Spring 2005
- First project Susudel, Ecuador
  - Irrigation project
  - Joint with Puget Sound Professional Chapter
- Second project Yanayo, Bolivia
  - Began as an irrigation project…

Bolivia

- One of the poorest South American countries
- ~ 65% of population below the poverty line
  - ~ 80% in rural areas
- ~ 23% of population is malnourished
- Illiteracy rate ~ 7% for males, ~ 20% for females
- ~ 40% of population without access to potable water
  - ~ 80% of rural population without access to potable water
- Many rural communities have NO sanitation system, not even latrines
- In key health indicators, only Haiti scores consistently lower than Bolivia in the Western Hemisphere


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BOLIVIA
LOW / HILLS / MOUNTAINS
200 mi
200 km
Abuna River
Cobija
Madre de Dios River
Beni River
Guapore River
Alto Madidi N.P.
Peru
Mamore River
Brazil
Lake Titicaca
Andes Mts.
Trinidad
Bolivia
N
Copacabana
La Paz
San Pablo River
Cochabamba
Oruro
Carrasco N.P.
Santa Cruz
San Jose de Chiquitos
Desaquadero River
ALTIPLANO
Lake Poopo
Sucre
Potosi
Pilaya River
Paraguay River
Pacific Ocean
Andes Mts.
Tarija
Chile
Pilcomayo River
Villazon
Paraguay
TROPIC OF CAPRICORN
Argentina

Assessment Trip

September 2006

Lodging in Santa Cruz Airport

Note music video television at high decibels

The Road to Yanayo

Yanayo Project

- Small community in the department of Potosi, Bilbao province (central Bolivia)
- Mountainous terrain, semi-arid climate
- About 20 families (~ 100 people)
- Subsistence farmers
  - Wheat
  - Potatoes
  - Goats
  - Small amounts of quinoa, corn, carrots

Yanayo Project

Community concerns

- Farming for 500 years
- 15 year drought
- Limited diet
- Youth moving away
- Lack of training
- Lack of access to outside world

Community involvement

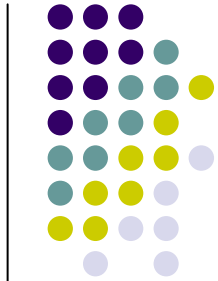
Community Project List

- More water for crops
- Improved road
- New bridge for transportation
- Improved seeds
- Technical training
  - Agriculture
  - Health
  - Animals
- Improved animals that give milk and don't die

What wasn't on the list?

- Potable water
  - Have a 1990 UNICEF system of community taps- possible contamination at household
- Sanitation
  - No household sanitation, one poorly utilized community latrine
- Electricity
  - Solar panel at school, no electricity elsewhere
- Better stoves
  - Women cooking with wood indoors with no chimneys
- Water for household gardens
  - Improved nutrition through wider variety of foods
- Better roofs
  - Decrease habitat for insects carrying Chagas disease

Project Assessments



- Looked at springs
  - Tested water quality
- Looked at road and potential bridge site
- Looked at households
  - Roofs and stoves

Springs and diversions

Community water system

UNICEF 1990

Five community water taps

Spring Diversion

- Options
  - Divert spring flow through canal to fields
  - Dig wells near town

- Concerns
  - Disruption of groundwater flow to drinking water source
  - Potential water quality issues
  - Equitable distribution of irrigation water

Bridge

Road and bridge

Villagers must walk 4-5 hours to get a bus to Cochabamba

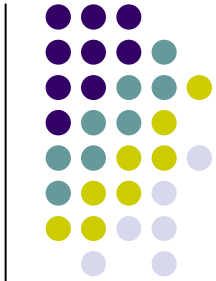
Bus runs twice a week

Costs 1.5 times avg. daily wage

Road and Bridge

- Options
  - Improve water diversion along road
  - Stabilize cut and fill slopes
  - Locate new area for car bridge
- Concerns
  - Maintenance of water diversions
  - Longevity of slope stabilization
  - Stability of bridge abutments

Agricultural improvements



- Options
  - Training on composting, organic fertilizers, mulching, and green manures
    - Penned goats- ready source of manure
    - Other NGOs in Bolivia working on these issues
  - Partnering with others for training on new seeds and livestock handling
    - Community actively interested and eager for information and training
    - Partner with other NGOs

Stove Project

Household survey showed poor ventilation and low efficiency stoves

Stove Project

Household survey showed poor ventilation and low efficiency stoves

Constraints

- Safety (sparks on thatch roofs)
- Health risk (smoke exposure)
- Stove size
- Building material (adobe clay)
- Efficiency
- Culture
- Skill level of community (building the stove)

Potential Solutions

- Move current stove design outside.
- Use existing stoves as templates for new stove.
- Build entirely new design (Rocket-type)
- Official ME 495 design project
  - Matt Simon is working with Dr. Gao

Rain Water Catchment

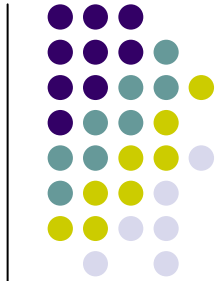
Provide water for household gardens

Need area, slope, drain, storage

Rainwater harvesting

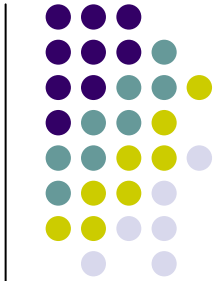
- Ancient techniques- used for millennia
- Area, slope, drain, storage
- Can use roofs, rocky areas, compacted areas

Constraints in Yanayo



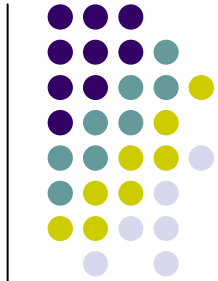
- Thatch roofs- can’t support gutter from above
- Material for drain
- Material for storage

Water, Infrastructure and Health



- Chagas disease (carrier lives in thatch)
- Pulmonary disease (smoke from indoor cooking with wood)
- Nutrition (insufficient water, low crop diversity)
- Sanitation (potential contamination)
- It’s all related…

Where do we start?



- Need short and long-term projects
- Early projects need to be easy to implement and have a high rate of success
- Need to meet community needs
- Need to have community participation

Short term:
Roofs, stoves, water, health

Replace thatch with tin

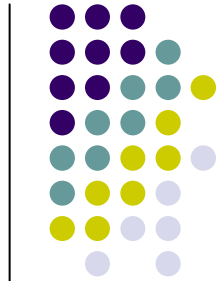
Benefits

Decrease habitat for reduviid insect that carries Chagas disease

Facilitate new stove design with chimney (tin not flammable)

Facilitate rainwater catchment design (can attach gutters easily)

Longer term



- Work on stabilizing roads and bridge design
- Develop workshops on health
- Develop workshops on agriculture and livestock
- Investigate feasibility of introducing composting toilets

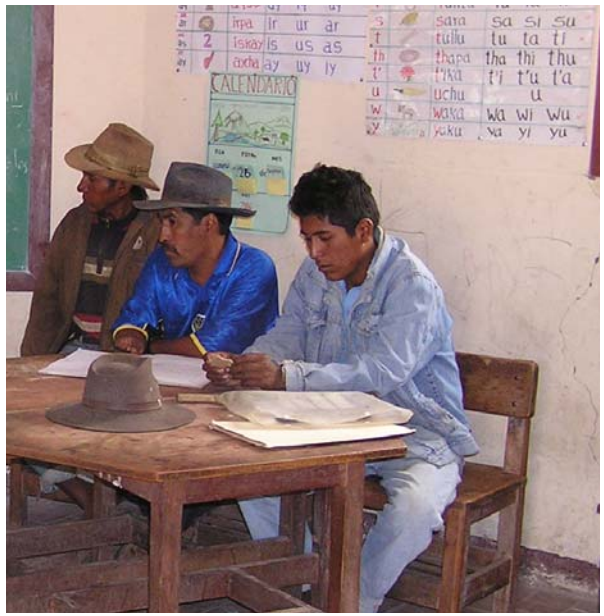
Agricultural Training

Small ruminants play a major role in the survival of households during droughts. These animals impact the welfare of women, children and the elderly, who are segments of the population at greater risk during droughts and famine.

Community assets

- Energetic community leaders

Guido Ibañes
School teacher



German Condori
Florentino Ticona
Corregidores (mayors)

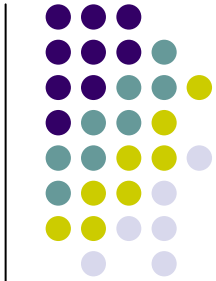
Jesusa Condori
Leader, women's group

Community assets

- Skill building with adobe and clay
- Adobe and clay locally available
- Strong desire to improve their community
- Good community organization and dialog
- Strong belief in education

The next generation

What can you do?



- We are offering classes on project design and implementation
- Volunteer your time, expertise, or money to help design and implement projects
- Get active in your area of interest to improve the world

Student Chapter
Engineers Without Borders

Meeting Wednesday, January 10th at 6pm

- Where: Research and Technology Bldg.
  3rd floor entrance by Burke Gilman Trail

Contact Jonathan Miller for more information
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Visit our website for more information:
http://www.nimret.org/ewbuw/space/start