Carolina Balazs
University of California-Berkeley, Berkeley, California

2006 EPA Graduate Fellowship Conference *From Discovery to Solutions: Generation Y Scientists Lead The Way*

Towards Incorporating Social Equity into a Water Management Model

Figure 1. SF Basin, Brazil

Overview

In many parts of the world, the rural poor are likely to be the most negatively impacted by changes in water supply due to both climatic and management decisions[1]. Therefore, the need to consider the impact of water management scenarios on the rural poor is of great importance. One way to address this issue is to consider the impacts of future water management policies on social equity through the field of Integrated Water Resource Management (IWRM). For this to happen, concrete tools—that explore the interface of water policy, equity and poverty—must be inserted into IWRM models.

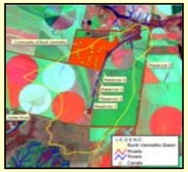

Figure 2. Aerial view of BV catchment (<500 hectares), outlined in yellow. Includes large (n=2) and small-scale producers (n=17).

Focusing on Buriti Vermelho (BV), a sub-catchment of Brazil's Sao Francisco Basin (Figures 1 and 2), my doctoral research has two objectives: 1) Incorporate social equity into an IWRM-based catchment model; 2) Analyze the implications of water policies and scenarios on equity.

Using the Water Evaluation and Planning (WEAP) model, I developed a catchment-based water management model (Figure 3). Results from this model provide an initial framework to consider the effects of water management scenarios, and their implications for distribution of the water supply. The results also offer an opportunity to conceptualize how to convert water delivery results into indicators of socioeconomic equity.

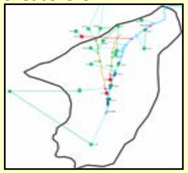

Figure 3. Schematic of BV model.

Results

1. Current farmers irrigate 58 hectares. When new farmers enter, an additional 115 hectares are irrigated.
2. Compared to BAU, BAU with drip results in ~270,850 m3 more *met* water demand, or 7% greater met demand (coverage) (Figure 4).
3. Compared to additional and current users with drip, current users with drip and additional users with furrow scenario results in an additional ~878,360 m3 in unmet water demand, and 1% less total coverage.
4. Using initial results, initial equity indices (Table 1) can be developed to indicate how to measure equity or livelihood gains across scenarios

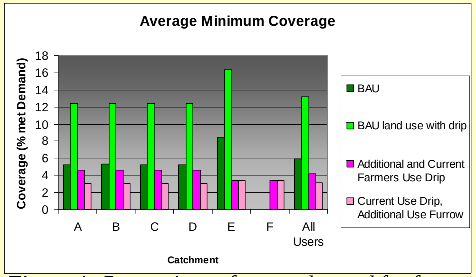

Figure 4. Comparison of unmet demand for four scenarios.

Table 1. Equity indices under four scenarios.

Preliminary Equity Indices	BAU	BAU with Drip	New and Current w/Drip	Current w/Drip, New w/Furrow
Total # Irrigators	17	17	30	30
Total Ha Irrigated	58	58	108	108
Water conserved/ha	845 m³/ha		107 m³/ha	
Profit/farm, or Profit/ha	$tbd	$tbd	$tbd	$tbd

Methods

- Built an initial catchment-based hydrology model using WEAP
- Collected socioeconomic and land use data for all thirty households located within BV
- Incorporated land use and irrigation technology results into WEAP
- Estimated crop water demand
- Developed *four preliminary scenarios*: 1) Current-day land use and irrigation practices (BAU), 2) BAU land use, but current irrigators shift to drip irrigation, 3) New farmers irrigate, and alongside current farmers use 100% drip, 4) New farmers irrigate with 100% furrow irrigation, current farmers use 100% drip.

Next Steps and Impact of Research

- Calibrate and refine model and indicators
- With final model, research will contribute methodologically to the integration of social equity into water management modeling
- Research will be used by policy makers in Brazil's River Basin Committees

Acknowledgements: Dr. David Purkey, Dr. Lineu Rodrigues, Dr. Annette Huber-Lee, SRP Project team and CGIAR Water for Food Program
1 Gleick, P. 2000. "The Changing Water Paradigm," *Water International*, 25(1): 127-38

This fellow is sponsored by EPA's STAR or Greater Research Opportunities (GRO) Program.