

ANNUAL PROGRESS REPORT

Climate Variability and Household Welfare in the Andes: Farmer adaptation and use of weather forecasts in decision making

Year 1 of 3: August 1 1999 through April 30, 2000
NOAA Award No. NA96GP0239

Principal and Co-Principal Investigators:

Corinne Valdivia and Jere L. Gilles
University of Missouri-Columbia

Co-Principal Investigators in the region:

Roberto Quiroz, International Potato Center
Christian Jetté, United Nations Development Program-Bolivia
PROINPA, Promotion and Research on Andean Crops-Bolivia
CIRNMA, Center for Research in Natural Resources and the
Environment, Peru

Co-Investigators in the region:

Walter Bowen, International Potato Center
Bruno Condori, Javier Aguilera and Ramiro Carrillo PROINPA-Bolivia
Walter

Graduate Students:

Susan Materer, M Sc Agricultural Economics
Fernando Galindo, PhD Rural Sociology

Undergraduate:

Justina Condori, Agronomy, Bolivia

Climatic variation and the risk that it entails is a key feature of agriculture in the Andes. Producers are faced with droughts, frosts and El Niño events. This project aims to answer three research questions: 1) What have farmers developed as successful strategies to cope with climatic variation in the Andean region; 2) How do farmers currently use information from forecasts and local sources to make production and consumption decisions; and 3) What mechanisms and institutions facilitate or constrain the utilization of information about climatic risk. The project spans three years.

SUMMARY OF ACTIVITIES YEAR 1

The following activities were planned and carried out the first year: 1. Convene an advisory committee to catalyze the interdisciplinary research process and advise on the development of the data collection instruments; 2. Conduct a household survey to understand household economic

strategies and corresponding economic portfolios; 3. Conduct focus group interviews to incorporate information about production decisions and predictions, the impact of drought and frost on production, the outcomes of 98-99, and the impact of El Niño on households in San José Llanga Bolivia, first study site; 4. Work with the non governmental organization PROINPA to extend information on technologies that may reduce vulnerability to droughts and frost, with a focus on potatoes, to determine if there are alternative technologies that farmers can rely on when delayed rains and droughts are expected. 5. Convene a meeting of the expert panel and research group in July of this year to present position papers on Climate Prediction and Agriculture in the Andes, Local Knowledge Systems, Poverty and Vulnerability, and Rural Livelihood Strategies in the Andes, and integrate the findings from year 1. These positions papers address the state of knowledge on forecasting in the Andes, biological models and their calibration for potatoes, quinoa, forages, and livestock (sheep, cattle and camelids), a review of local knowledge systems in the Andean region, the role of economic and social factors in vulnerable groups to understand the effect of climate in interaction with poverty (in response to reviewers comments), and the theoretical model of the household economic portfolio being evaluated to measure vulnerability.

ACTIVITIES IN YEAR 1

1. Convene an advisory committee to catalyze the interdisciplinary research process and advise on the development of the data collection instruments

Our original plan of work considered the advisory panel a first and necessary research activity. As funds were not available in August of 1999 (see implementation issues), an advisory group was convened in Bolivia to discuss the research approach, objectives and activities for year one, with our collaborators from PROINPA, UNDP and CIP. The PI and CoPI from MU met with the advisory group to develop the plan of work for Bolivia. An electronic discussion list AndesClima-L was created to allow researchers from Peru to provide input in the discussions of this advisory group. The full advisory panel will be convened in Puno Peru, in July of this year, to present the commissioned position papers identified by the advisory group.

2. Conduct a household survey to understand household economic strategies and corresponding economic portfolios in San José Llanga, Bolivia.

Agreement with the Community San Jose Llanga: Colleagues from UNPD and PROINPA visited San José Llanga Community leaders to explain the purpose of the project and activities proposed in September 1999. The community leaders, and the general assembly agreed to participate in the research project.

The following activities were completed in order to test the household economic portfolio approach in Bolivia, and prepare for the second phase of the study:

- The questionnaire was developed with the advisory group, and finalized by the principal investigators. It was field tested and applied (September and October). A data base format was developed at CIP in November. Data entry by PROINPA was completed in February in Bolivia, while carrying out monitoring potato varieties (see activity 4). The data based was cleaned.
- The income variables for the economic portfolios are being constructed from this data

base for analysis during May through July. Results from the economic portfolios identified will be presented at the Advisory and Expert Panel meeting the first week of July. Some preliminary findings were presented at the IRI conference April 26-28.

- The Role of Potatoes Production in Diversified Household Economic Portfolios: Study of San José Llanga. A graduate research assistant in agricultural economics was identified to conduct her graduate research on climate variability and potatoes in Bolivia. She is supported by the Agricultural Economics Department at MU. A research proposal submitted to the Brown Fellowship was successful and will cover her field research on The Role of Potatoes in Andean Household Portfolios: Analysis of Interaction Between Local and Introduced Knowledge, Potato Production and Household Economic Activities (\$3,600). The household portfolio approach will be used and a panel study conducted looking at current coping strategies in San José Llanga. Case studies will be used to determine the role of potatoes and the vulnerable groups to climate variability, and their characteristics. Field work starts on May 18, through August of this year. To identify potential groups that may benefit from climate forecasts in the context of potato production.
- Detailed information on potato production varieties strategies and yields under drought and frost gathered will be used in the biological models by PROINPA and CIP.

3. Local knowledge systems and use of forecasts

Two activities were conducted, a literature review and focus group interviews about information on production decisions and climate predictions, the impact of drought and frost, and perceptions of El Niño by San José Llanga producers.

- Review of the literature in three areas (Materer and Valdivia). This included definition and characteristics of indigenous knowledge, role of local knowledge systems in development projects and local climate knowledge.
- Focus group interviews on current forecast methods (Valdivia, J. Condori and F. Mamani) with producers pursuing different production strategies (November 1999). Sources of information for production decisions were elicited from dairy farmers, potato farmers, women farmers and the elderly. A participatory approach was agreed to with PROINPA researchers (Condori and Carrillo) to gather information on the production and climate prediction calendar, and tested during the focus group interviews in November (Valdivia, Condori and Carrillo). The purpose is to identify the timing of production decisions in the agricultural calendar and information needs. A first agricultural calendar was completed that captures a climate and crops calendar. This activity is on going.

4. Potential Beneficiaries of Climate Forecasts

Two activities were undertaken, the first to evaluate available technological alternatives; the second, related to second year activities, identify mechanisms that constraint and facilitate access to information.

1) The project is working with PROINPA to extend information on technologies that may reduce vulnerability to droughts and frost, with a focus on potatoes. Materer' thesis will also identify potential beneficiaries of climate forecasts in potato production.

- Possible alternative technologies in potato as well as management technologies were shared with the community (see outputs below). PROINPA provided information and training on land management practices for interested community members.
- Demonstration of drought and frost resistant varieties: In a General Assembly 12 farmers were chosen at random through a lottery they developed, to participate in potato production trials carried out by them with assistance from PROINPA. Two families from each neighborhood were selected through the lottery. The seed was provided by PROINPA with the understanding that farmers successful in production would return seed at the end of the production year to be shared with other interested community members. The research purpose is to evaluate the benefits of potential technological alternatives. Yields and performance will be measured in comparison to local varieties at the end of the current production year 1999-2000, a year not affected by La Niña nor El Niño. An agronomist from PROINPA is monitoring this activity.

2) Research on potential beneficiaries of climate forecasting (Gilles and Galindo).

Using two types of data, published literature in the climate and social sciences areas, and data from Bolivia case studies, potential beneficiaries of and barriers that might exist to the use of climate forecasts will be identified. The use of climate forecasts is examined at three levels: a) the level of the technology; b) the challenges to current state of knowledge and skills; and c) the institutional and social barriers to the use of climate forecasts. The first two levels are analyzed with published research reports, and the third level is addressed through field research that will be conducted in July and August by Gilles. The objective is to examine the disconnect between macro-level nature of climate forecasts and the interests of persons in specific localities (micro level).

5. Convene the expert panel and research group to a meeting in July 2000 to catalyze the interdisciplinary research process, integrate findings from year 1, and plan year 2 activities.

Expert panel meeting to link research results into the portfolio approach to understand livelihood strategies in 1998-9 and during El Niño. Members of the expert panel include representatives from the climate forecasting community, and officers from institutions involved with early warning and disaster prevention. In Bolivia we are inviting a representative from the Early Warning and Food Security Systems (Sistema Nacional de Seguimiento de la Seguridad Alimentaria y Alerta Temprana). Position papers will be presented at the expert panel meeting, where researchers and other stakeholders will discuss the research findings and review the plan of work for networks research in Bolivia in year two, and household economic portfolio research activities in Peru. The position papers include: State of Climate Forecasting in the Andes; Climate variation and its impact on agriculture (see Annex 1); Poverty and Vulnerability in the Altiplano; Local Knowledge Systems and Forecasting in the Altiplano (Peru and Bolivia); and Rural Livelihood Strategies in the highlands.

PRELIMINARY FINDINGS

Research on household rural livelihoods in San José Llanga in 1999-2000, focusing on the production of food crops, shows that this activity has grown between 1993 and 1999. This is especially the case for a group of producers identified as productive and resource poor, relying mostly on native animals and grazing areas. Other groups of producers identified through cluster analysis, as the innovators that have been able to adopt new technologies such as dairy production, and elderly families, have also increased the area destined to potatoes. Market prices may be driving this change, but further analysis with the data collected will shed more information. Analysis has also shown that local knowledge systems are the main source of information used by all types of producers. This includes interpreting natural phenomena, as well as biological indicators. A small segment of the population used networks in the community, and information from their older relatives to make planting decisions in the case of potato. A very small part, 4%, indicate use of the media as one of the sources of information.

Several methods to deal with the uncertainty of their own forecasts include staggered planting, plot diversification and use of various potato varieties. Preliminary results from some of the survey questions indicated that 73% of the sampled population was aware of El Niño, with younger household being more aware. In terms of acting on this information 46% of the innovators changed the area produced, while only 13% of the low resource producers did. This result is puzzling when contrasted with the sources of information normally used to make decisions about the coming production year. Media plays a minor role, networks such as neighbors are accessed by 16 percent of the sample. The analysis of networks and access to information during the months of July and August this year is targeting this research question.

We are finding that the typology, or profiles of potential users of information is providing some consistent results. Refinement of this model will take place during the meeting in July. The profile was used to identify potential users of information, and also to evaluate the impacts of El Niño on production decision in 1998-99. Availability of seed was a constraint to increased production in all groups, but lack of access to cash and other resources, such as land were important constraints for extensive, low resource producers and the elderly farmers. These are only preliminary results, as we are currently constructing the income variables, and will be identifying the impacts of climatic risk per each activity.

In terms of scale of the forecast, discussions with officers of the food security and early warning system in Bolivia, indicated that they have only provided general information about El Niño as the microregional variability in the Andean Region makes it difficult to provide forecasts. We will be networking with them during year two.

IMPLEMENTATION ISSUES

Research is constrained by the agricultural calendar, and funding coming later than expected forced us to combine activities to be in the field at the appropriate time. The production cycle for crops in the Andean region starts at the end of September/October and ends around

May/June. Livestock production is a year round activity. The project started four months later than originally proposed. Resources did not flow until November to the region because the contracts took time to be finalized. Our subcontractor CIP was unable to provide advances until the contract NOAA - University of Missouri and International Potato Center was signed. We had some problems with the flow of funds, because of the late start without appropriate contractual arrangements. This has been solved.

The questionnaire was applied when we needed to thanks to travel funds facilitated by UCAR. This had to take place before the new production year started, as we were asking farmers to remember the recent and 97-98 production cycles. Other, such as the interdisciplinary meeting by the Expert Panel could not take place. This was postponed to the end of the first year. As a result a large amount of the budget anticipated expenses will take place in the months on June and July of this year.

OUTPUTS YEAR 1

Presentations, and Working Papers

- Valdivia, C. 1999. Climate Variability and Household Welfare in the Andes: Farmer adaptation and use of weather forecasts in decision making.” The Human Dimensions Meeting of the National Oceanic and Atmospheric Administration, April 26-28, Tucson, AZ.
- Valdivia, C 1999. Climate Variability, Household Strategies and Technology in the Andes. National Oceanic and Atmospheric Administration, Office of Global Programs. Seminar, September 15. Washington DC.
- Valdivia, C. 1999. Discussant. “Differences in the Environmental Justice Discourses of Brazil and Peru”. Workshop on Public Philosophy, Environment and Social Justice.” Environmental Justice Discourses. *Carnegie Council on Ethics and International Affairs*, Merrill House, New York. October 21-22.
- Quiroz, R. 1999. Methodologies for Interdisciplinary Multiple Scale Perspectives. SAAD III (Symposium on Systems Approaches for Agricultural Development) Universidad Nacional Agraria, La Molina, Lima. November, 8 - 10. 1999
- Gilles J. and C. Valdivia, 1999. “San Jose Llanga Producers and NOAA Climate Variability Project.” Presentation Environmental Sociology Group, December 10, Sociology, MU.
- Quiroz, R. 2000. Second International Conference Geospatial Information in Agriculture and Forestry. Coronado Springs Resort, Lake Buena Vista, Florida . January, 10 - 12.
- Valdivia, C. 2000. Climate Variability and Household Welfare in the Andes. Seminar Series, Department of Agricultural Economics, MU. March 3rd.
- C. Valdivia, J. L. Gilles and Susan Materer. 2000. Climate variability, a producer typology and the use of forecasts: Experience from Andean semiarid small holder producers. IRI conference, Palisades, April 26-28, 2000.
- Valdivia, C. and J. L. Gilles (Forthcoming) Gender and Resource Management: Households, Groups, Strategies and Transitions. *Ag and Human Values*, December 2000.

- Valdivia, C. 2000. Climate variability and household welfare in the Andes at session : Climate & Agriculture Studies in Uruguay, Bolivia, and SE USA Aplicación de Pronósticos Climáticos en Agricultura: Métodos, Experiencias y Oportunidades en América Latina. IAI - CIP conference: May 16-17.
- Materer, S. Household Production Strategies in a Climatic Variable Zone. Working Paper on the use panel data with 1993 and 1995 data sets.
- Valdivia, C., R. Quiroz, C. Jette, J. Gilles and S. Materer. 2000. Peasant Household Strategies in the Andes and Potential Users of Climate Forecasts: El Niño of 1997-1998. Accepted Selected Paper Sessions. American Agricultural Economics Association (July 30-August 2). Tampa Florida.
- Gilles, J. and F. Galindo. 2000. Knowing the future. Paper will be presented at the Rural Sociology Meetings. Washington DC, August 2000
- Panel review member, Human and Economic Dimensions of NOAA, 2000. February 17-19.

Training Courses

- Condori, B., J. Aguilera and R. Carrillo. Training Course in San José Llanga, Advantages in the use of certified potato seed. September 1999.
- Carrillo, R., B. Condori and J. Aguilera. Use and Management of Pesticides. In San Jose Llanga. May 1 2000.

LINKAGES

Institution in Bolivia in the area of climate prediction and use: Sistema Nacional de Seguimiento de la Seguridad y Alimentaria y Alerta Temprana (National system of food security and early warning), with Javier Choquevilca, to coordinate efforts and to participate in the expert/advisory panel meeting. November, 1999.

Linking to projects on climate forecasting and use in the Andean Region: Through Walter Bowen and Roberto Quiroz (International Potato Center) with Jim Jones (University of Florida) IAI project to discuss Climate Prediction Applications in Agriculture. May 2000.

Projects on Natural Hazards: David Preston, Senior Fellow, School of Geography. University of Leeds, UK, working in Tarija Bolivia.

Participation in the IRI Forum on Climate Prediction Agriculture and Development. Palisades, New York.

Workshop in Zimbabwe with Jennifer Phillips, IRI. (Postponed)

SUMMARY OF ACTIVITIES IN YEAR 2

During the second year we will develop the analysis of networks and institutions in Bolivia, and a similar plan of work to year 1 in the site selected in Peru. During the meeting in July the specific sites will be selected, and an assessment of available information will be conducted. We anticipate the activities to be those listed in the plan of work. One activity that we need to include in year 2 if we can identify the funds for this, is monitoring in the community of San Jose Llanga for a second year. We believe this is necessary, as many on the years we have data for have been impacted by drought, or the effects of the drought on production in the following year. We need to identify 10,000 dollars. If there are any funds left over from year one, we will apply this to that activity.