

**Management Responses to Seasonal Climate Forecasts  
In Cropping Systems of South Asia's Semi-Arid Tropics  
(APN 2000-17)**

**Project Leader:**

Holger MEINKE  
DPI

Agricultural Production Systems Research Unit (APSRU)  
P.O. Box 102, Toowoomba, QLD 4350  
AUSTRALIA

Tel: +61-7-4688-1378

Fax: +61-7-4688-1193

Email: [meinkeh@dpi.qld.gov.au](mailto:meinkeh@dpi.qld.gov.au)

# **Management Responses to Seasonal Climate Forecasts In Cropping Systems of South Asia's Semi-Arid Tropics (APN 2000-17)**

## **APN Funding**

US \$75,000

## **Participants were funded from the following countries**

Australia, India, Pakistan, USA

## **Introduction/Background**

The demand for secure and sustainable food production in developing countries continues to increase. The challenge is particularly great in rain fed production systems in the Semi-Arid Tropics (SAT) of India and Africa, where Green Revolution technologies have had relatively little impact. Much of the challenge relates to the inability of farmers or policy makers to anticipate and make proactive adjustments to climate variability. Experiences in Australia, the USA and South America have shown that the emerging capacity to forecast future rainfall and temperature distributions can substantially contribute to increased agricultural productivity and farmer livelihood, underpinned by more appropriate natural resource management. APN support was granted to initiate a multidisciplinary program that can eventually be used to deliver an internationally recognised framework for effective delivery of seasonal climate forecasts in rain fed systems of SAT.

In addition to the aforementioned APN funding, additional support came from the International START Secretariat. The Department of Primary Industries, Queensland, Australia (DPI), the International Research Institute for Climate Prediction (IRI, USA), Tamil Nadu Agricultural University (India), the Indian Institute of Science, the Indian Institute of Tropical Meteorology and the Pakistan Agricultural Research Council all provided substantial in-kind contributions of scientific staff time and training materials. The project is also known as a 'CLIMAG demonstration project'.

The project is designed as a scoping study and constitutes a stepping-stone towards a well-integrated research and delivery program that will address more comprehensively those aspects of climate risk that currently impede agricultural production in developing countries. Using locations in Southern Asia as case studies, this project demonstrates the utility and feasibility of combining seasonal climate forecasting with a structured, agricultural systems research approach based on simulation modelling. The project provides the means to assess the potential value of seasonal climate forecasting to agricultural producers in the Asia-Pacific region.

The specific objectives of the project are:

- Document the current skill of predictability of relevant climate variables as a basis for understanding biological cropping system response to predictable components of climate;

- Demonstrate via systems analysis how this predictability could alter management decisions to improve crop yields, stabilise livelihood, and enhanced sustainability of resources;
- Identify other partners throughout the Asia-Pacific region and gain support for this initiative. The partners will include scientific institutions and existing farmer networks, and provide the scientific linkages necessary to ensure a successful end-to-end delivery program across national boundaries. This process will identify other potential regional sites and researchers where CLIMAG-related activities could be fostered in future years; and
- Design and gain additional funding for the comprehensive program.

### **Outline of activities conducted**

- Project visits by Drs Meinke and Hansen to project sites in India and Pakistan (detailed report available on request);
- A two-week training workshop on agricultural systems analysis and applied seasonal climate forecasting was conducted in Toowoomba, Australia (6-17 November 2000, CD available on request); and
- The CLIMAG project team conducted the third week of the Training Institute on Climate Variability and Society in the Asia-Pacific Region held at the East-West Center facilities in Honolulu, Hawaii, USA from 5-23 February 2001.

### **Outcomes/Products**

In addition to a range of publications currently either in press (eg. H. Meinke, W. Baethgen, P.S. Carberry, M. Donatelli, G.L. Hammer, R. Selvaraju, and C. Stöckle, 2001. Increasing profits and reducing risks in crop production using participatory systems simulation approaches. Ag Systems) or in preparation, the following outcomes resulted directly from project activities:

- 1) Visits by Drs Meinke and Hansen to project sites in India and Pakistan

#### Pakistan

The purpose of this meeting was to bring Dr. Aslam up-to-date on project objectives, approaches and the tasks required to achieve the objectives of the project. A PhD student is conducting research on wheat/mungbean rotations (Ms. Raazia Durrani). Ms. Durrani has been collecting field data that appears to be well suited to test simulation model performance under Pakistan conditions.

It was agreed that Dr. Aslam would participate at the workshop in Toowoomba (6 to 17 November 2000). In preparation for this workshop we agreed to conduct an analysis of cropping options along a transect through a higher rainfall cropping region of Pakistan (Peschawar, Islamabad, Lahore); conduct climatic analysis of the long term rainfall data along this transect; obtain the necessary missing climate data for the 3 locations and prepare them in APSIM ready format; and develop a clear and concise outline of current cropping systems, including key management decisions and possible management intervention based on climate information.

## India

At the progress review meeting (attended by Drs Gadgil, Selvaraju, Hansen, Meinke, K.N. Rao and Mr. P.R.S. Rao) a detailed work plan was developed. This was followed by field visits to collect the necessary background information and data needed for the systems analysis (Toowoomba workshop). A study area was selected about 150km north of Bangalore on the border between Karnataka and Andhra Pradesh. It stretches for about 50km and covers dry land and irrigated production as well as a range of soil types (marginal to fertile). Peanuts grown in the kharif season dominate the cropping system. With the help of Mr. P.R.S. Rao, meetings and field walks were conducted with two different farmer groups ('marginal farmers' and 'progressive farmers'). During these meetings a clear picture emerged about possible applications of seasonal forecasting under these conditions. Details have been recorded and will form the basis for the systems analyses that will be conducted during the Toowoomba workshop.

This was followed by meetings at Tamil Nadu Agricultural University (TNAU), Coimbatore. Dr. Selvaraju organised several field trips that provided a wealth of information suitable for the scenario analyses. Based on the information gathered and the contacts made with local farmers, the project team selected 2 sites (villages) that differ in climate patterns, cropping systems and infrastructure development, namely Tiruchengodu and Naduvacheri. Important decision points such as crop choice in relation to duration and severity of dry spell between seasons were identified for analysis at the workshop.

### 2) Toowoomba workshop (6 – 17 November 2000)

In addition to many Australian scientist who were invited as guest lectures, the project sponsored participants were R. Selvaraju, Suluchana Gadgil, K.N. Rao, P.R.S. Rao, Krishna Kumar (India), Muhammad Aslam (Pakistan), Rizaldi Boer (Indonesia) and Jim Hansen (USA). A CD was produced and distributed to all participants containing important resource material.

Based on the information collected at the project sites, simulation analyses were conducted that demonstrate the value of using seasonal forecasts for decision-making. Issues addressed ranged from the value of soil conservation practices to conserve soil moisture in Pakistan to the quantification of management responses of the peanut based cropping system to ENSO-derived climatic variability (including the economic value of the forecast based management practices over the traditional practices). The work is currently being collated and several manuscripts are in preparation.

### 3) Participation at the Training Institute on Climate Variability and Society in the Asia-Pacific Region (third week)

This activity took place in mid February. It was an opportunity to showcase the results from this project and to discuss and decide on the future direction of the initiated work. Dr. Eileen L. Shea ([shea@ewc.hawaii.edu](mailto:shea@ewc.hawaii.edu)) is the leader of this APN

funded sister project. This portion of the Training Institute will provide an opportunity to develop a collaborative regional research project, involving national case studies and a common protocol, dealing with climate forecasts, their transmission and use in the context of different farming systems and cultural settings.

### **Future directions/Follow-up work**

The project has clearly demonstrated the potential value of seasonal climate forecasting and agricultural systems analysis in developing countries. It is a stated objective of the project to develop - and obtain funding for - a comprehensive demonstration program that will:

- Quantify and communicate the value of agricultural management responses to climate and seasonal forecast information in sensitive regions around the globe;
- Develop appropriate methods to connect dynamic climate models and seasonal climate forecasts with agricultural systems analysis and decision making at the farm or policy level; and
- Develop well-focused, regional partnerships across national boundaries.

At a two-day project meeting following the Training Institute strategies to achieve these goals will be discussed.

### **Project Leader**

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DPI

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AUSTRALIA

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