Building socio-biophysical resilience: learning from smallholder farming community for adaptation

CLIMATE VARIABILITY AND AGRICULTURE

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AIM

To utilize the local coping strategies (including indigenous knowledge) and modern technologies (climate prediction, system analysis and participatory methods) to improve decision making for climatic risk management in agriculture

To utilize the ability to predict climate variability and change on range of scales to improve decision making using climatic risk management strategies in agriculture

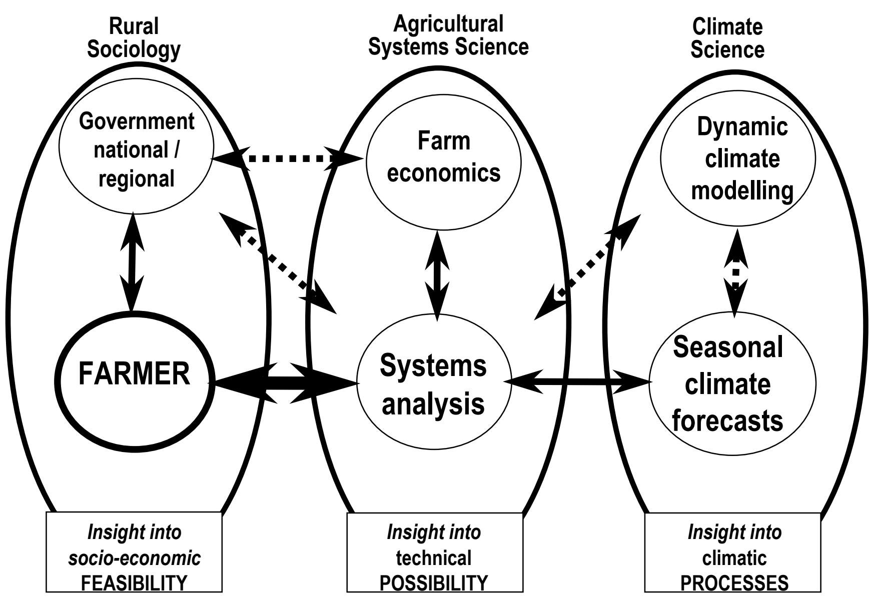
Targeted Agricultural Systems

- Shifting cultivation – slash and burn (4 - 25 years cycle)
- Fallow systems (3 – 4 years cycle)
- Ley systems (grain – grass/legume long term rotations)

Dominant systems in SAT

- **Rainfed upland cultivation (drylands)**
- **Arable upland irrigated farming (garden land)**
- **Arable intensive irrigated systems (wet lands)**

Program Concept : True *end-to-end* applications



Methods and Tools

- **Seasonal Climate Forecasting**: Probabilistic, ENSO indices, analogues
- **Agricultural Systems**: Management responses, Mechanistic Cropping System models, Simple Crop Water Balance, Whole Farm Economic Modelling etc.,
- **Socio-economics** : Physical description, User needs, Farm economics, Market price, Participatory Decision Making, Discussion Support Tools and Farmer's risk perception

Finding Options: Link with local coping strategies

Crop Diversification

- Multiple cropping systems (eg. Cotton, peanut-sorghum)
- Different maturity group varieties
- Intercropping
- Multi-storied cropping

Enterprise mixing

- Crop-animal-tree interactions
- Off farm employment
- Indigenous Methods of Pest and Disease management
- Soil and moisture conservation practices at farm and catchments scale
- Price scenario and variability
- Methods also evolved to link financial institutions with the management strategies based on the past experiences

Traditional Climate Prediction Methods

- Only 10% of the traditional knowledge are related to seasonal rainfall prediction (n = 90)

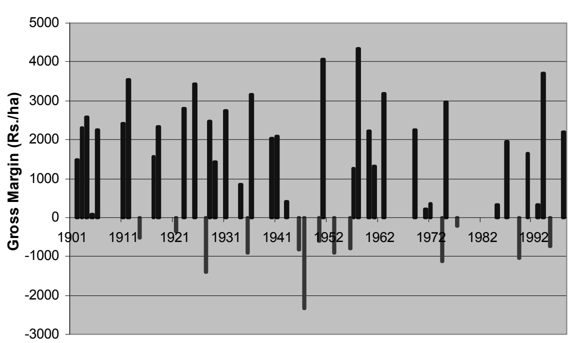
- Rainfall on Sep.17-18 : Above average rainfall during Oct-Dec
- Lightning and thunder during April-May: Less chance of normal monsoon
- Heavy and steady wind during May lead to good rainfall in Oct-Nov.
- Rainbow over south east direction in June: Good monsoon
- Moon's crescent – equal on both side during January – Good rainfall during the year
- Termite fly appears in the evening: Heavy rainfall
- **Many local knowledge on seasonal climate has the recreational value than the potential value**

Tactical crop management

Crop management options based on the climate information would make the system resilient

Use of seasonal climate forecasts reduces the risk and captures the opportunity

Value of risk reduction is greater than capturing the opportunity in smallholder farms



Tactical (forecast responsive) Vs fixed (non-responsive) peanut plant population

Value of climate application and Management Level

The Information **Value** increases with the level of management

Cropping Systems has **greater resilience** at low level of management, enabling sustainability

Conflicting objectives – a core issue affecting the systems' ability to maintain the resilience due to over exploitation

Profit Maximization Vs Sustainability

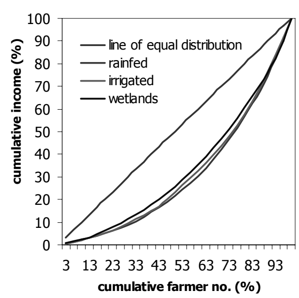
Adaptation Options Changes with Farmers' Risk Preference
Crop diversification increases with risk averseness making the system more resilient

For a highly risk averse farmer climate knowledge has no meaning; always he will diversify the enterprises

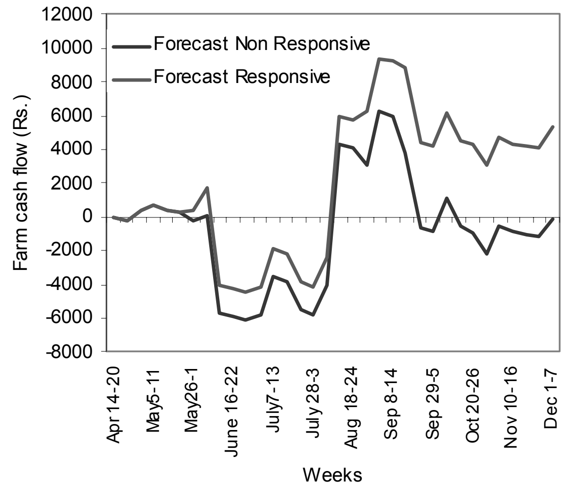
Adaptation options (eg.input application) may create greater inequality due to varied level of management by the farmers irrespective of the agricultural systems

Rich farmer gains marginally; poor farmer is affected greatly

Intensive systems offers little scope for adaptation with respect to management practices – requires genetic manipulations

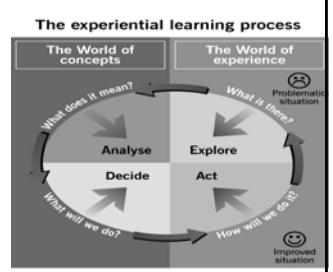


Adaptations reduces the vulnerability of the system to climatic risks
Cashflow analysis (2002)



Participatory Farm Decision Making - Use of Iterative techniques

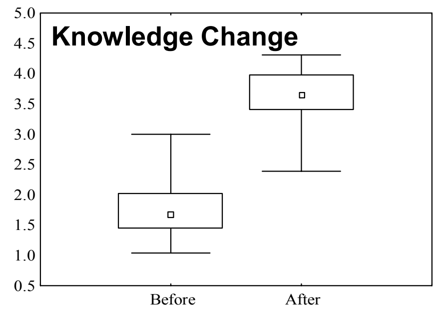
- **Use of Iterative techniques ensures combining scientific and indigenous knowledge of farmers**
- **When indigenous knowledge confirms with scientific understanding entire participatory risk management process will be successful**
- **Strong continuous south Westerly wind during may – sign of good rainfall during Oct-Dec**
- **SST and SOI patterns confirms this understanding and farmers changed their crop choice**



CLIMATE EDUCATION:

Building Knowledge and Skill for Climate Risk/ Opportunity Management

- **Awareness is the first step for successful implementation of climate and agriculture programmes**
- **Skill of climatic risk management can be improved through climate education and awareness**
- **About 90 workshops conducted**
- **Need of the farmers – participative methods**
- **24% of the farmers acted based on forecasts and 16% were successful and improved the productivity**
- **Village level observatories helps to improve the understanding of the local climate eg. Seasonal cycles**
- **Rain gauges, Stevenson screen with thermometers and anemometers**



Capacity Building

- Developing self sustaining groups to manage climate variability at different agricultural systems
- Five training workshops conducted for researchers (3 international; 2 National)
- Training to the 1400 regional extension staff (linked to ongoing efforts on hi-tech Ag.training programmes)
- Awareness meetings to the water managers and public works department
- Directly working with farmers in a participative mode in the context of development as well as learning

The Challenge

- Probabilistic forecasting is a good option to go ahead understanding greater uncertainty in climate prediction – understanding
- Spatial variability in rainfall is a greater issue that also needs attention
- Climate knowledge is only the information – not technology that farmers require – but greatly affect the performance of technology
- How to combine and evaluate the local indigenous knowledge with the scientific technologies?
- Climate communication – aware and having ownership of problems and solutions
- MESSAGE DISTARTION – distorted information is worst than no forecast

Summary

- Climate forecasting is one of many instruments that aims to reduce production uncertainty.
- It is one of many risk management tools that sometimes plays an important role in decision-making in different scales.
- to understand when to use this tool where and how is a complex and multi-dimensional problem (disciplines, scales, decision types etc).
- Participatory systems analysis needs to establish the role of climate forecasting in relation to other tools.