

Complex agricultural problems and innovative approaches to their solutions

Iddo Dror

SEARCA Forum-workshop on Platforms, Rural Advisory Services, and Knowledge Management: Towards Inclusive and Sustainable Agricultural and Rural Development, Los Banos, 17-19 May 2016



S E A M E O
SEARCA

Southeast Asian Regional Center for Graduate Study
and Research in Agriculture
Science and Education for Agriculture and Development



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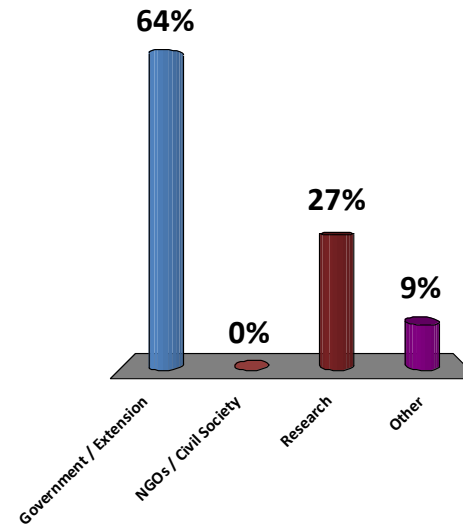
FARA
Forum for Agricultural Research in Africa



Who is in the room?

Please pick the category that best describes your primary affiliation

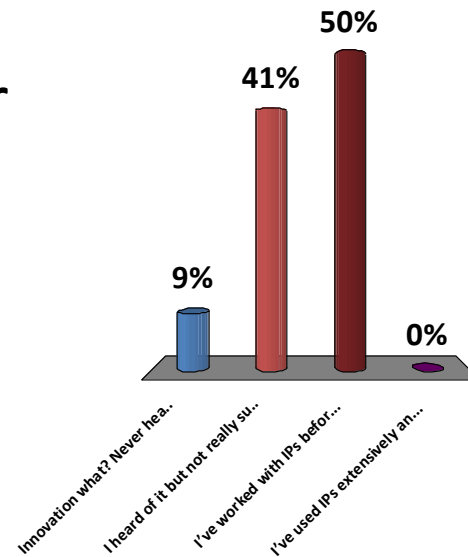
- A. Government / Extension
- B. NGOs / Civil Society
- C. Research
- D. Other



Who is in the room?

Please describe your exposure to innovation platforms (IPs)

- A. Innovation what? Never heard of it...
- B. I heard of it but not really sure what they are
- C. I've worked with IPs before and have a basic understanding of the concept
- D. I've used IPs extensively and have a strong grasp of the topic



Objectives of the module

The core objectives of the module include:

- To identify and examine the main features and characteristics of complex agricultural problems
- To explore innovative solutions to address complex agricultural problems
- To examine the circumstances under which innovative solutions emerge



Complex agricultural problems defined

- In one way or another, agriculture is integral to the physical and economic survival of every human being.
- Agricultural problems are multidimensional and multilevel involving many actors.
- The causes of agricultural problems are also complex



Complex agricultural problems

- Agricultural sustainability is a must if we want to be able to produce food for the generations ahead
- Agricultural sustainability is complex and needs to cover the whole food chain, from production to consumption
- Contemporary agriculture = managing land in ways that conflict with the healthy functioning of ecosystems (level fields, reductions of biodiversity, no rest period, use of toxic chemicals, etc.) Yet agriculture depends on the healthy functioning of ecosystems (Hollander,2004)



Complex agricultural problems

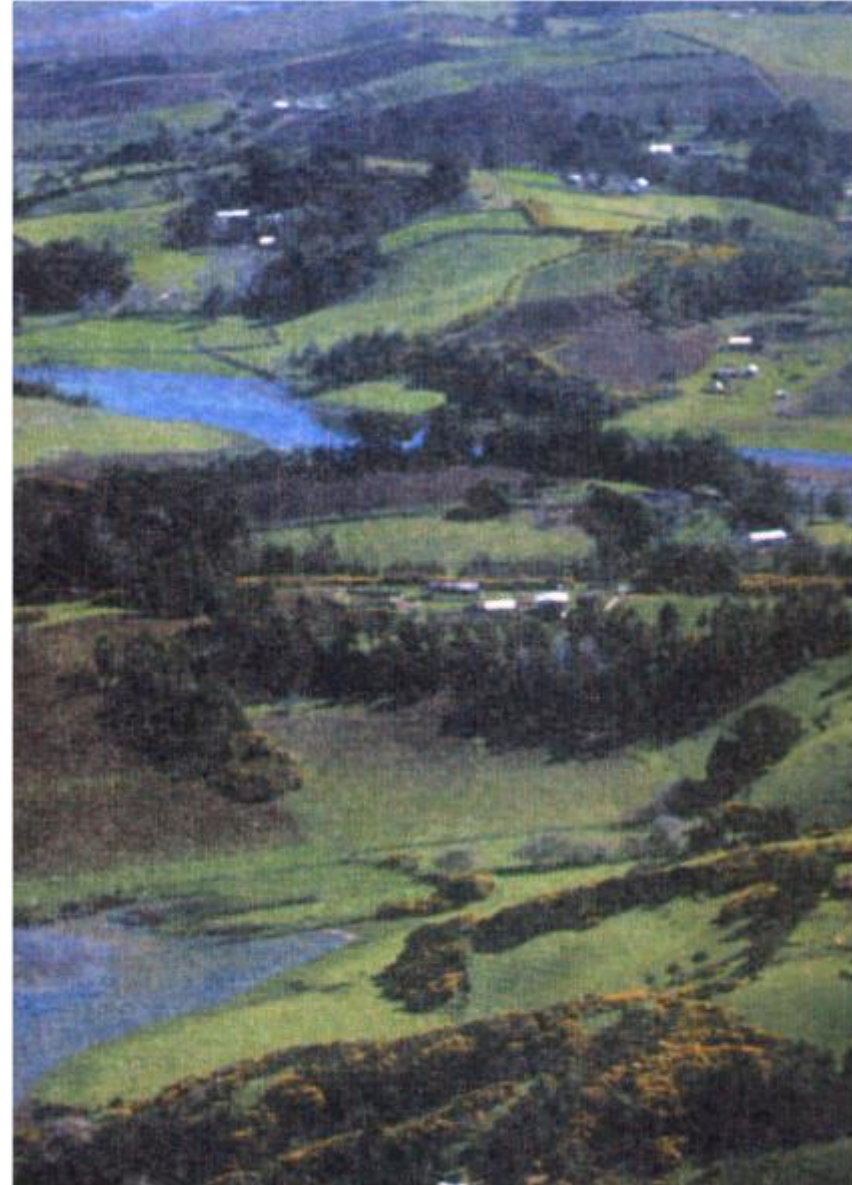
The Status of the Agricultural Production Base; characterized by disconnects, both the in developed and developing world:

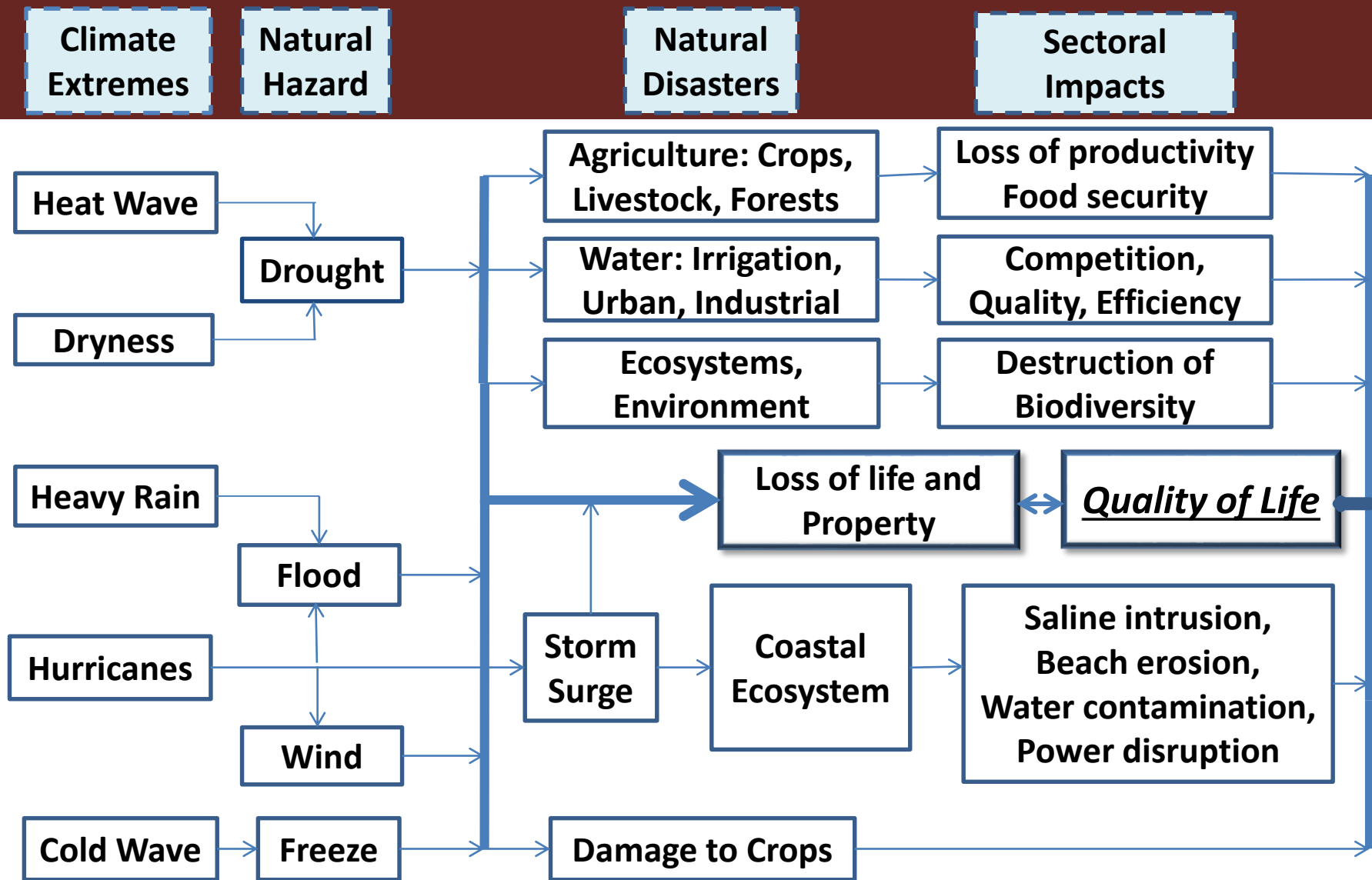
- Disconnects between agriculture and the environment;
- Disconnects between producers and consumers or land and cities;
- Disconnects between policies and expectations.(Peter, 2012)



Disconnects between agriculture and the environment

- Human activities have significantly disturbed water, carbon and nitrogen cycles and so are impacting global climate change, which in turn is and will impact agricultural productivity and challenge sustainability
- Contemporary farming methods have degraded soil leading to massive fertilizer use. (Peter .2012)







The Challenge: Sustainable Agriculture in a Changing Climate

Disconnects between producers and consumers

- Perpetual low prices that consumers are generally willing to pay for food (making farming a precarious business), is now compounded by a crisis of trust amongst consumers, fueled by food scares (Mad Cow, Bird Flu) and a sense that many supermarket foods are low on nutritional value, high on price. (Peter, 2012)



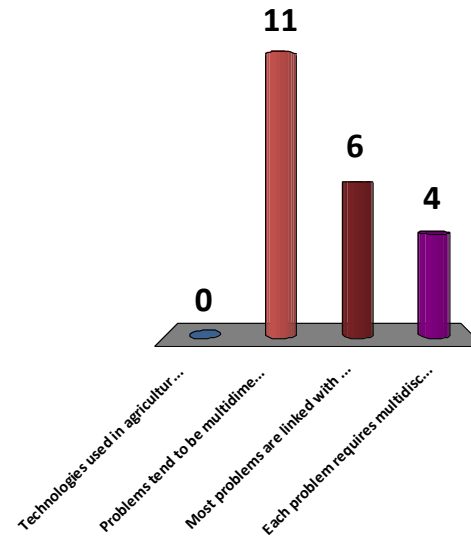
Disconnects between policies and expectations.

- Almost every country in the world cherishes its agricultural roots, in song, picture and mythology.
 - But this valuation is rarely translated into policy to support the family farms that are central to an agricultural community.
- .(Peter .2012)



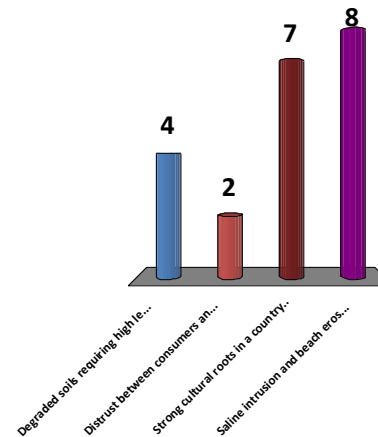
What makes agricultural problems so complex?

- A. Technologies used in agriculture are more sophisticated than ever before
- B. Problems tend to be multidimensional, multilevel and involve multiple actors
- C. Most problems are linked with climate change which has brought about complex changes in agricultural ecosystems
- D. Each problem requires multidisciplinary research to discover a solution



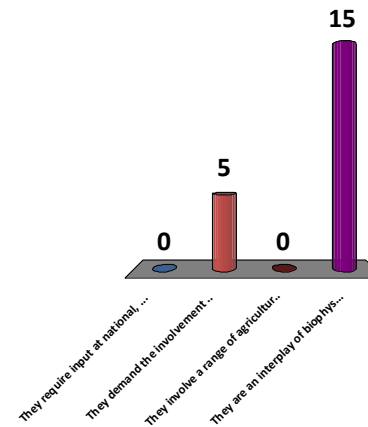
Which of these situations do NOT represent a 'disconnect' in the Agricultural Production Base?

- A. Degraded soils requiring high levels of fertilizer inputs
- B. Distrust between consumers and producers of agricultural produce
- C. Strong cultural roots in a country's agricultural heritage
- D. Saline intrusion and beach erosion resulting from unprecedented frequencies of storm surges



When we say that complex agricultural problems are 'multidimensional' do we mean...

- A. They require input at national, regional, local and sometime global level.
- B. They demand the involvement of multiple actors to achieve resolution
- C. They involve a range of agricultural products.
- D. They are an interplay of biophysical, technical, socio-cultural, economic and political factors



Complex agricultural problems defined



- Explaining complex agricultural problems, and examining and designing and applying remedies will not be fruitful if these dimensions, levels and stakeholder needs and interests are examined and addressed separately.

Factors Behind complexity

- The principal reasons that make agricultural problems complex can be grouped under four main categories.
 1. Complex agricultural problems are an interplay of biophysical, technical, socio-cultural, economic, institutional and political factors.
 2. They have different implications across different levels and they are intertwined in interactions across different levels (for instance global, national, subnational).
 3. They are characterized by the involvement of a multitude of actors and stakeholders. For instance, farmers, politicians, private sector, NGO and academicians may all be involved in identifying remedies to such problems.
 4. The development of the problem and the efficiency and effectiveness of different types of proposed solutions is uncertain and unpredictable.

Factors Behind complexity



Multi-dimensional

- Interaction of biophysical, technological, socio-cultural, economic, institutional and political dimensions.
- For instance leaving import taxes on steel without putting taxation on imported agricultural equipment and machines (institutional dimension) will hurt producers of locally adapted agricultural equipment such as no-till planters. This has implications for effective soil conservation for sustainable crop management (biophysical dimension).

Climate change and food security



Rainfall patterns
Temperature



Reduced yield/
income



Drought resistant
varieties



Kyoto protocol
Carbon credits



Cropping
calendar



Who is responsible?
Who pays?

Factors Behind complexity

Multi-stakeholder

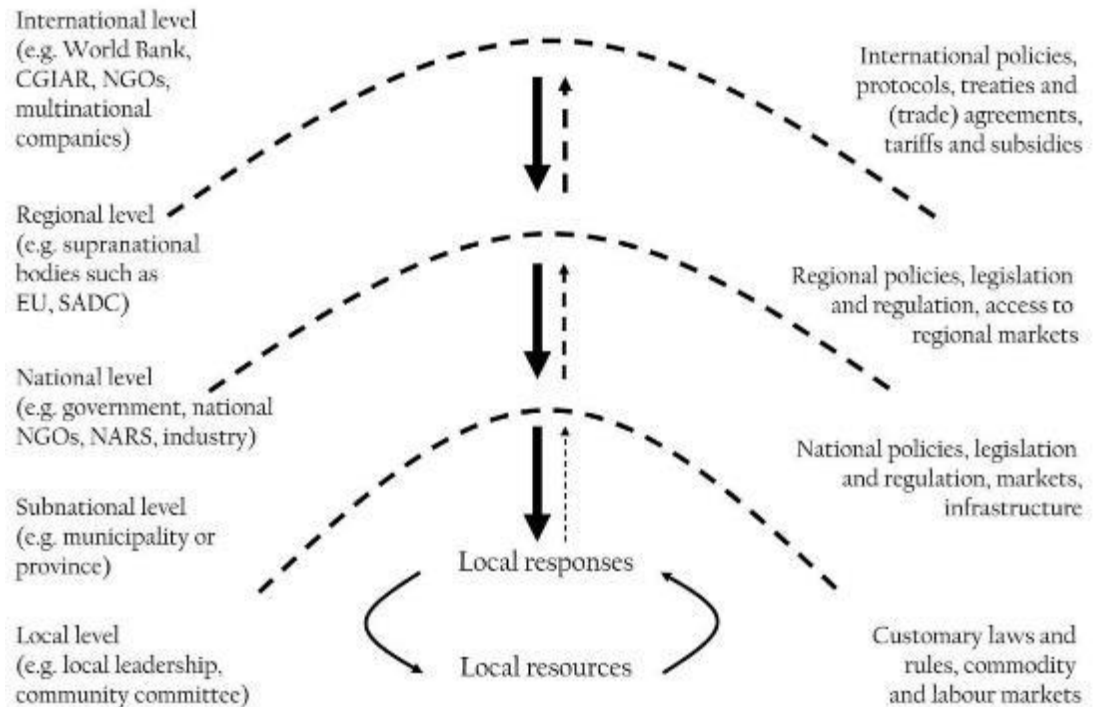
- Actors comprise anybody who is associated directly or indirectly with a problem, or with the possible remedies to a problem.
- Stakeholders are those actors that can affect or be affected by actions, policies and objectives and have a vested interest in addressing the problem and whose participation in finding solutions is seen as a major success factor
- Stakeholder involvement can provide understanding of the various dimensions of the problem and the kinds of solutions that are both technically feasible and socio-culturally and economically acceptable.



Complex agricultural problems

Multi-level interactions

- International
- Regional
- National
- Subnational
- Community
- Farm
- Plot



Exploring solutions requires interventions across different levels

Climate change and food security

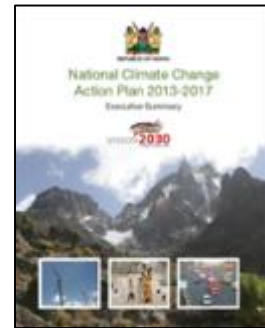
Intergovernmental Panel on Climate Change (IPCC) – awareness of and structural allocation of resources to CC



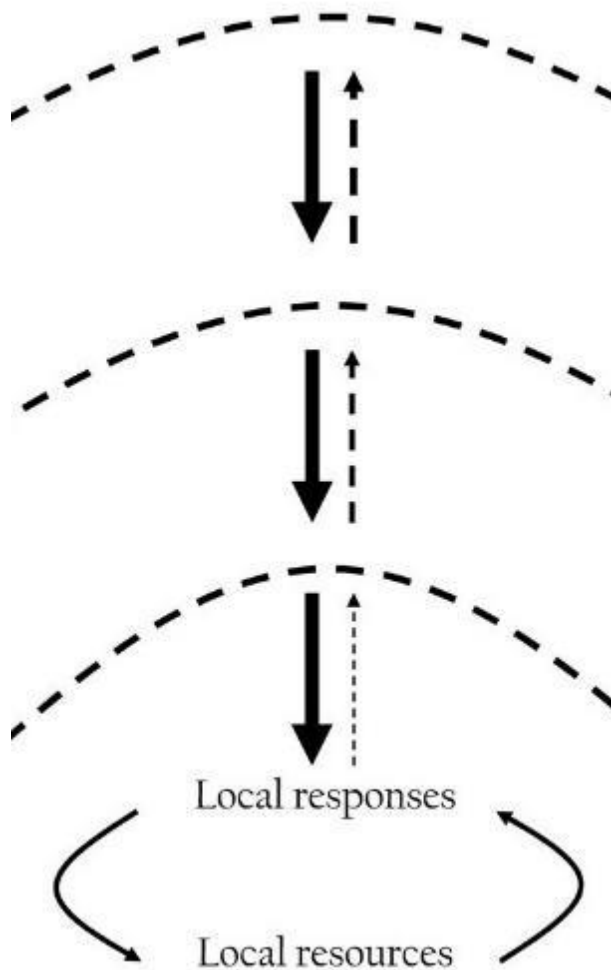
SADC Climate Change Adaptation Strategy – impact of CC on water availability for amongst others agriculture



Kenya National Climate Change Response Strategy – urban pollution/ clean energy/ deforestation/ desertification



Farmer climate change mitigation and adaptation strategies (e.g. rain water harvesting)



Factors Behind complexity

Multi-stakeholder partnerships do not only bring key stakeholders together to discuss policy issues, build consensus and implement solutions. They also:

- Foster the sharing of skills and innovation.
- Promote inclusivity and equity
- Promote grassroots mobilization and participation.
- Help to develop trust among groups that are usually suspicious and hostile towards each other.

Source APC,2007

Complex agricultural problems

Multi-stakeholder

- Policymakers
- Civil society
- Development
- Donors
- Farmers
- Private sector
- Consultants
- Researchers

None of these stakeholders can solve the complex problem on their own.



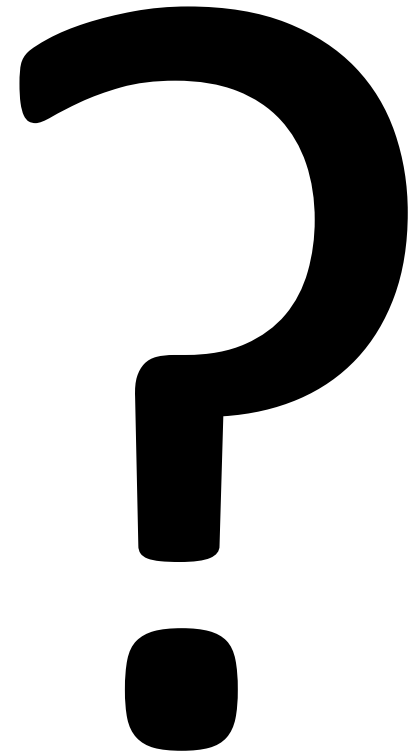
Factors Behind complexity

Efficacy of solutions Uncertain and Unpredictable

- The development of the problem through time
- Type of solutions and their (undesired) impacts
- Stakeholder interactions
- Phases in e.g. policy processes
- Disorder and catastrophes

Climate change and food security

- How will climate change develop over time?
- What type of climate change adaptation and mitigation strategies will be effective?
- Will different types of stakeholder continue to work together?



Need for agricultural innovations

Solution strategies with attention for:

- Integrated analysis of problem dimensions, design integrated solutions
- Interactions between multiple levels
- Needs and interest of different stakeholder groups (including gender, age, ethnic groups)
- Flexibility and adaptive capacity to respond to uncertain and unpredictable context

How innovations emerge?



http://www.youtube.com/watch?feature=player_detailpage&v=NugRZGDbPF

How innovations emerge?

- Spaces for creativity
- Where ideas of different people can mingle
- Connectivity, borrow from each other, combine perspectives
- Finding the missing piece
- Such processes take time
- “The whole is bigger than the sum of its parts”

Define agricultural innovation



Agricultural Innovation system

Agricultural innovation system

- An Agricultural Innovation System (AIS) is a network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into economic use, together with the institutions and policies that affect their behavior and performance.' (World Bank, 2009)
- It is a cooperative arrangement putting together several organizations working toward technological, managerial, organizational, and institutional change in agriculture.



Source World Bank ,2009

Define agricultural innovation

- Technology, practice or product handling that will bring increased yield and income to the farmer
- Modern/ improved or superior production technique used to improve production or quality and quantity required at a given time.
- Novel idea, process, tool, or solution to facilitate healthy and sustainable agriculture that is tailored to a specific context.

Define agricultural innovation

- Combined hardware (technologies – e.g. seeds) and software (social-organisational – e.g. seed systems) to enhance development and business objectives, change for the better
- Tool that can guide analysis of complex agricultural problems, and the identification of entry points that enhance the innovation capacity of the agricultural system in which the complex agricultural problem is embedded.

Emergence of agricultural innovation

- No detailed blueprint exists for making agricultural innovation happen at a given time, in a given place, for a given result.
- Actors in an agricultural innovation system (AIS) innovate not in isolation, but through interacting with other actors
- Valuable insights are gained from working with all kinds of groups to develop and achieve shared objectives

Source (World bank,2006)



Agricultural Innovation Systems

Purpose	National agricultural research systems (NARSs)	Agricultural knowledge and information systems (AKISs)	Agricultural innovation systems (AISs)	
Roles of farmers	Planning capacity for agricultural research, technology development, and technology transfer	<ul style="list-style-type: none"> Strengthening communication and knowledge delivery services 	Strengthening the capacity to innovate	
Actors	Agriculture research organizations, universities, extension services, and farmers	Agriculture research organizations, universities, extension services, farmers, NGOs, etc	Potentially all actors in the public and private sectors involved in the creation, diffusion, adaptation, and use of all types of knowledge	
(Source ASTI,2011)				

Agricultural Innovation Systems

Purpose	National agricultural research systems (NARSs)	Agricultural knowledge and information systems (AKISs)	Agricultural innovation systems (AISs)
Outcome	Technology invention and technology transfer	<ul style="list-style-type: none"> Technology adoption and innovation in agricultural production 	<ul style="list-style-type: none"> Combinations of technical and institutional innovations
Organizing principle	Use of science to create inventions	Accessing agricultural knowledge	New uses of knowledge for social and economic change

(Source ASTI,2011)

Agricultural Innovation Systems

	Technology Transfer (TT)	Farming Systems Analysis (FSR)	Agricultural Knowledge and Information Systems (AKIS)	Agricultural Innovation Systems (AIS)
Intended outcomes	Technology adoption and uptake	Adapt technologies to farming systems	Joint development of technologies	Capacities to co-innovate, learn and change
Key intervention approach	Technology dissemination through extension and mass media	Surveys, typologies, modelling of impact	Participatory research, Farmer Field Schools	Establish, implement and support multi-stakeholder platforms
Weaknesses	Disregards farmer involvement and adoption context	Focus on field and farm level	Local orientation, costly, scaling up and scaling out	Lacks empirical evidence, system's boundaries are difficult to define

Barriers to Agricultural innovation

Barriers include:-

- Adverse market conditions
- Culture
- Knowledge deficiencies and Capacity
- Policy and Bureaucracy
- Linkages
- Attitude and behavior
- Infrastructure
- Lack of incentives



Farmers do not need a package of practices but a basket of choices!

- Farmers have always been innovative – innovation is not something external actors ‘bring’ to communities.
- From the 70s until now there is a steady move in the way researchers work with farmers from
 - Production system approach to farming system
 - From farming system to farmers first and participatory approaches
 - From participatory to a broader knowledge system (Agricultural knowledge and information system - AKIS) approach
 - From AKIS to innovation

Each step acknowledged the complexity and non linear nature of the attempted change and introduced new factors (socio economic, cultural, institutional and political) to understanding the drivers of change.

More information

This module is associated with an elearning module on 'Understanding, Facilitating and Monitoring Agricultural Innovation Platforms' available at:
<http://learning.ilri.org/course/detail/24>

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ILRI is a member of the CGIAR Consortium

Box 30709, Nairobi 00100 Kenya
Phone +254 20 422 3000
Fax +254 20 4223001
Email ilri-kenya@cgiar.org

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