


# Enhancing the contribution of research-based knowledge to the pursuit of sustainability



Co-organizers: Louis Lebel , William Clark

12 Oct, 1400-1530

at the 6th Open Meeting of the Human Dimensions of  
Global Environmental Change, 9-13 October 2005 at the  
University of Bonn in Bonn, Germany

# Rationale

- Many believe that science & technology are important to and could play a larger role in the pursuit of sustainability
- But there is not much understanding about how could this capacity be enhanced
- What are the characteristics of effective knowledge systems?

# Knowledge Systems

- A “knowledge system” is a network of actors connected by social relationships, either formal or informal, who are involved in bringing about specific actions for sustainable development.
- KS Analysis is therefore concerned with organizations, institutions and objects that shape and inform those social relationships and actions.
- Knowledge may be explicit or tacit, embedded within formal procedures or informal observation.

# The Knowledge Systems for Sustainable Development Study

- Carrying out individual and comparative studies in several sectors with shared overarching questions but a lot of case-specific detail
- Collaboration among researchers at Harvard University, Stanford University, Arizona Universities, UN-ECLAC, Chiang Mai University
- Key financial support: NOAA +

# The Panel

0-10 minutes	Introduction	Louis Lebel
10-25 minutes	Knowledge flows and cash flows: investigating financing mechanisms as knowledge systems	<b>Nicole Szlezak</b>
25-40 minutes	Know your shrimp, trust your friends: sustainability and the knowledge system surrounding shrimp aquaculture in Thailand and Mexico	<b>Po Garden</b>
40-55 minutes	Knowledge Systems for Agricultural Transformation in the Yaqui Valley, Mexico: Producers, Risk, and Resource Use	Ellen McCullough
55-70 minutes	Knowledge systems and sustainable agriculture in the Argentine Pampas	<b>David Manuel</b>
70-85 minutes	General discussion	<i>Facilitator</i>
85-90 minutes	Conclusion	Louis Lebel

# The Global Fund to Fight Aids, Tuberculosis and Malaria



Nicole Szlezak, Lorrae van Kerkhoff

# The Problem

- The Global Fund aims to make a dent into three devastating diseases – Aids, Tb, Malaria
- Action program: applying existing knowledge
- New governance arrangements to foster scientifically sound, yet country-owned projects

**What are the effects of these new governance arrangements on the knowledge system?**

# The Knowledge System

- Focus: the Application Process to the Global Fund as the main site where science, funding and politics intersect
- Who creates the applications?  
Decentralized ‘Country Coordinating Mechanisms’
- Who decides who gets the money?  
Centralized, independent technical review

# Findings I: decentralized application processes

- There are no simple distinctions between ‘local’ and ‘scientific’ knowledge
  - ‘local’ practitioners may also be scientists
  - ‘scientific’ knowledge often based on localized studies
    - ➔ BUT countries depend on external advisors to write applications
- Fund creates great demand for research by countries
  - Need reliable data on diseases, evidence-base, pilot studies
  - Need new technologies, intervention models
    - ➔ BUT research community is not well engaged in ‘operational’ issues

# Findings II: centralized technical review

- Technical review plays an important political function—‘independent’ decision-making
  - Core feature of the Fund’s appeal to donors
- But, when grants are allocated on the basis of scientific review, science and politics are intimately intertwined
  - Perceptions of political motivation
  - Risks for credibility?

# Findings III: research and system-wide issues

- Most problems that practitioners face are involve complexity, uncertainty, dynamicism, risk
- Research is focused on biomedical ‘magic bullets’, and on operational ‘magic guns’
- Seeking global solutions to essentially local—place based, culturally specific—challenges
- Lessons and opportunities for innovation are being lost

# Improving the Knowledge System

- Need institutional designs that balance national interest and scientific review where they conflict
- Need institutional designs that allow practitioners to deal with risk, uncertainty, dynamicism
- Interdisciplinary research is paramount
- Science needs to be part of a process rather than a ‘solution-producer’

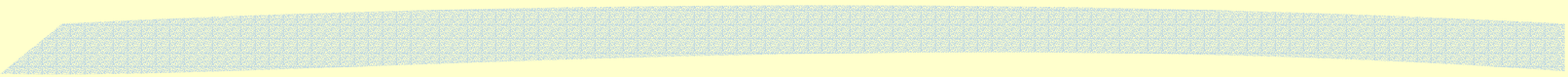
# Outlook, Policy Implications

- Central level: need to expand the concept of a **learning organisation** to a **learning system**
  - the GF can use it's influence to foster the development of the knowledge system, and actively contribute by analysing their own data on 'what works'
- Country level: countries need to invest in their **knowledge capacity** as a **core enabling component** of health care
  - Reducing dependence on external 'experts' should be a core target of all project

# Outlook, Policy Implications

- Research: **Partnerships** between northern and southern **institutions** for research and education
- Research based on **partnerships with practitioners**
  - e.g through collaborative centres, policy laboratories, adaptive management methodologies, etc.
- Research focus on **helping practitioners deal with** uncertainty, complexity, risk, dynamicism
  - E.g. interdisciplinary modelling, forecasting and other techniques

# Know your shrimp, trust your friends: sustainability and the knowledge system surrounding shrimp aquaculture production in Thailand and Mexico



Po Garden, Louis Lebel, Amy Leurs

# Problems

- Ponds have been built in Mangrove
- Physical disturbance of hydrological regimes: sediments and waste water
- High level use of antibiotics; increasing resistance in natural environment
- Shrimp are reared on fishmeal & oil from ocean caught fish (contributing to over fishing)

# Knowledge System Issues

*Places- Ponds on the coasts (ecological know-how)*

- Site selection
- Post-larvae inputs
- Role of state and private R&D
- Learning in network and association of farmers

*Chains- Commodity chains across the globe (market know-how)*

- Growing for profit (not yield)
- Mechanism to control disease and chemical residues (CoC, standards, competitiveness)

# Findings I- Places

- Site selection- Thailand- government plays little role- farmers rarely open up new areas in mangroves after learning that costs are high
- Farmers are getting better at moving upstream and rearing shrimp in low salinity water
- Sonora, Mexico- Patterns of land ownership and investment rules had a much more important impact
- 1992 Ejido sector of Yaqui region held control over most coastal resources → Today, renting out to private managers

# Findings II Pond water and waste management

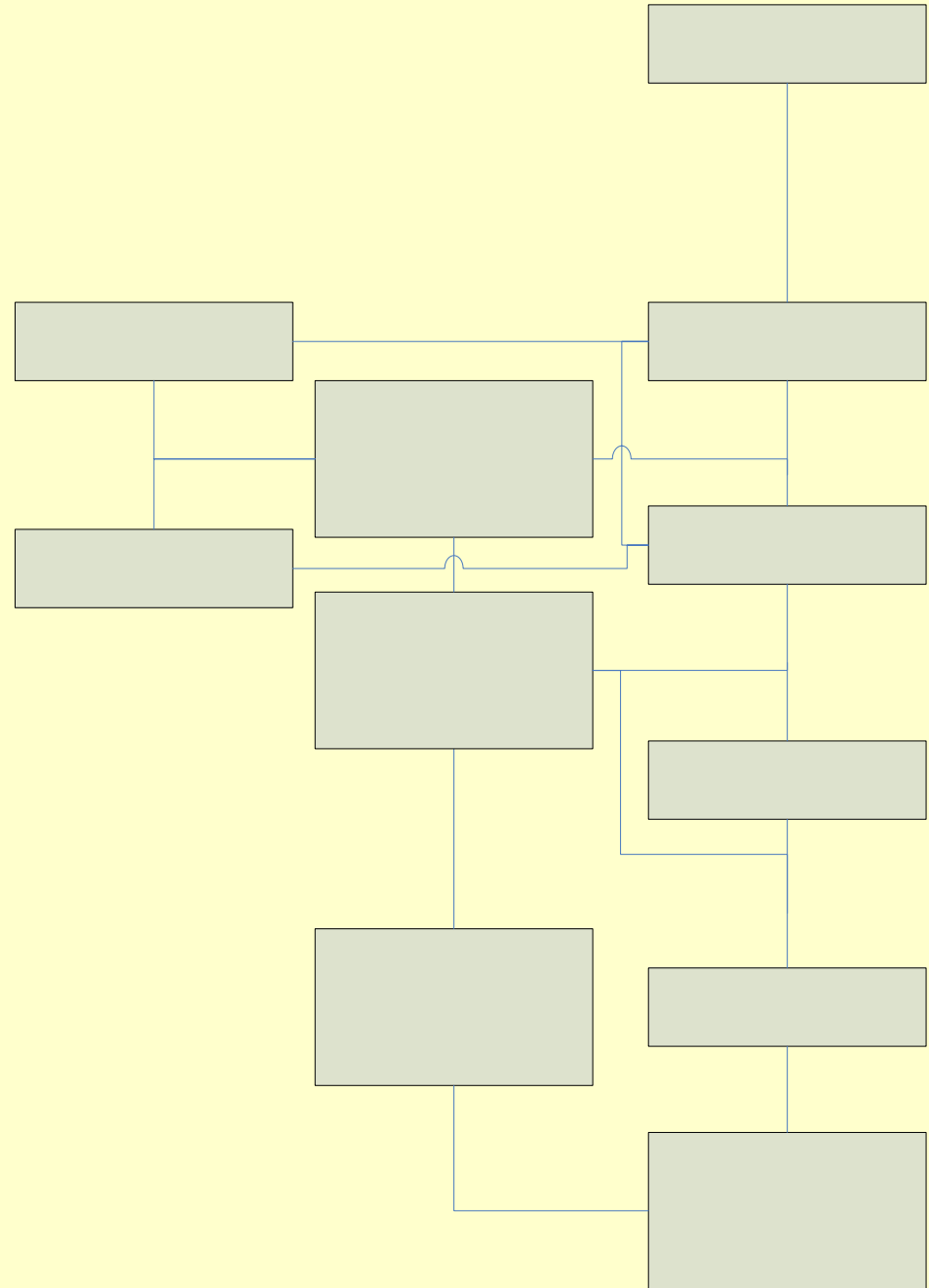
- Farmers have strong incentive to manage the quality of intake, maintain quality during growing cycle, but not waste water
- Changes in technology and numerous management variables and challenges requires experience, technical know-how, and social skills
- Success = close monitoring, fine scale experimentation, timing, and capacity to mobilize knowledge of others at time of crisis

# Findings III

- Post-larvae inputs- Responding to diseases:  
Thailand is switching from Black Tiger to White;  
Mexico from *Stilirostres* (blue shrimp) to White  
*Panearius vannemei* due to TSV
- State research lagging behind changes in private sector
- State asked for genetically improved pathogen free shrimp; farmers ask what it is in nature that gives black tiger shrimp resilience

# Findings IV Learning in Chains

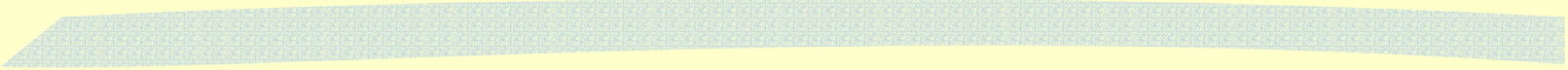
- Cutting across trade associations
- Strategic use of knowledge uncertainties in price negotiations
- Private firms, consultants, and media
- Sifting facts from fictions



# Suggestions

- Dense networks of social relations with diverse set of actors enable access to wider set of expertise and filtering misinformation- **associations and organized groups are important**
- Bureaucracy and private-state organization focused on narrow technical solution while farmers ask for more integrative solutions (**focus on shrimp farmers- not just the shrimp**)
- Centralize research institutes increases distance between scientists and farmers- **tacit and formal knowledge better integrated in more distributed system**

# Knowledge systems for agricultural management in the Yaqui Valley, Sonora, Mexico



Ellen McCullough & Pamela Matson

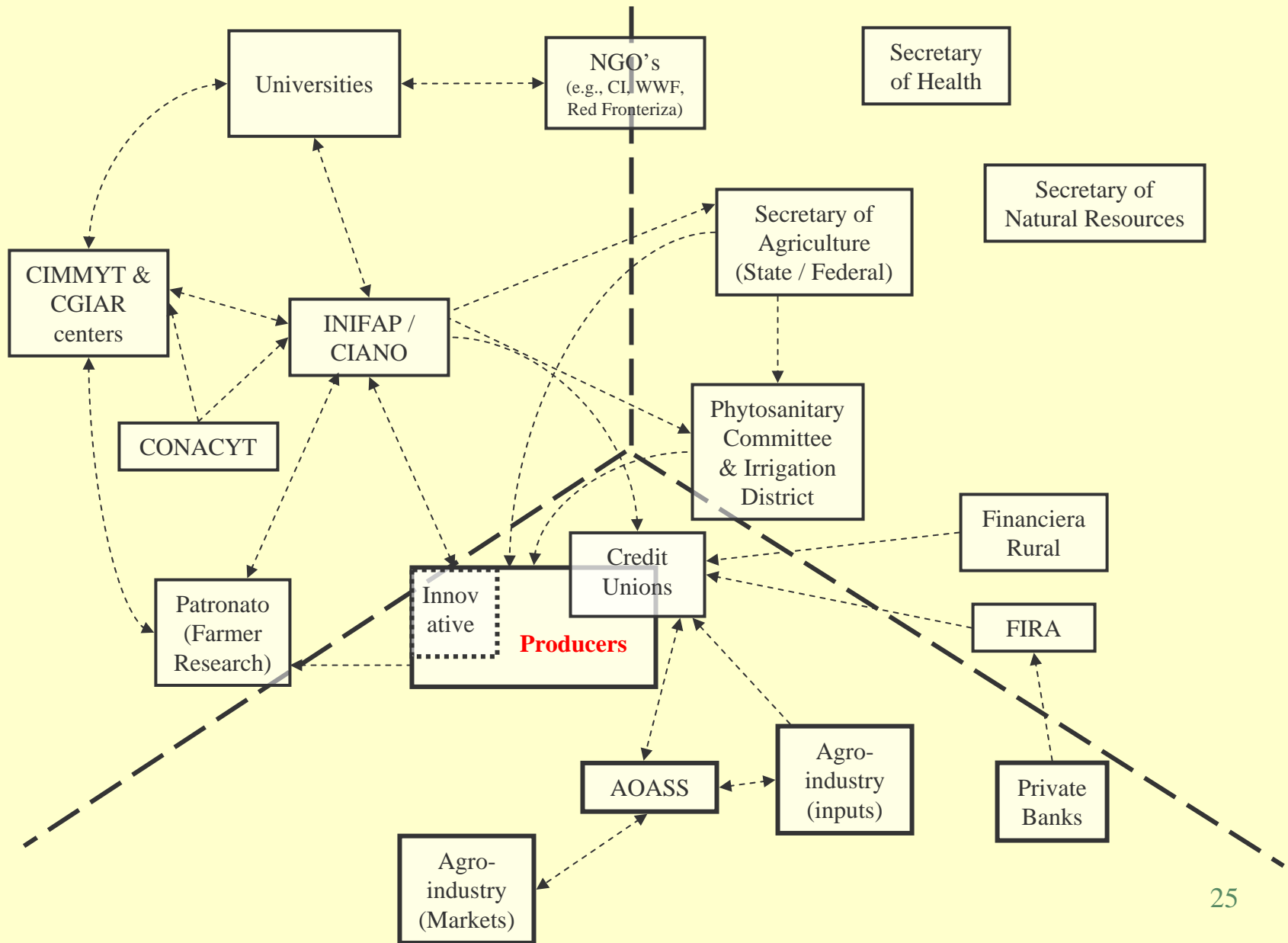
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# Problems

- Economic:
  - Increased market exposure coinciding with the dissolution of the state's agricultural support system.
- Environmental:
  - Intensive agricultural production has off-site impacts, including...
  - Diversion of water resources from alternative uses, runoff of nitrogen fertilizer into freshwater and coastal ecosystems, heavy use of agrochemicals, and poor air quality from burning of residues.
- Social:
  - Public health impacts
  - Egress of small farmers from agriculture.
  - Land tenure reform

# The Yaqui Valley Knowledge system



# Findings (I): Credit Organizations

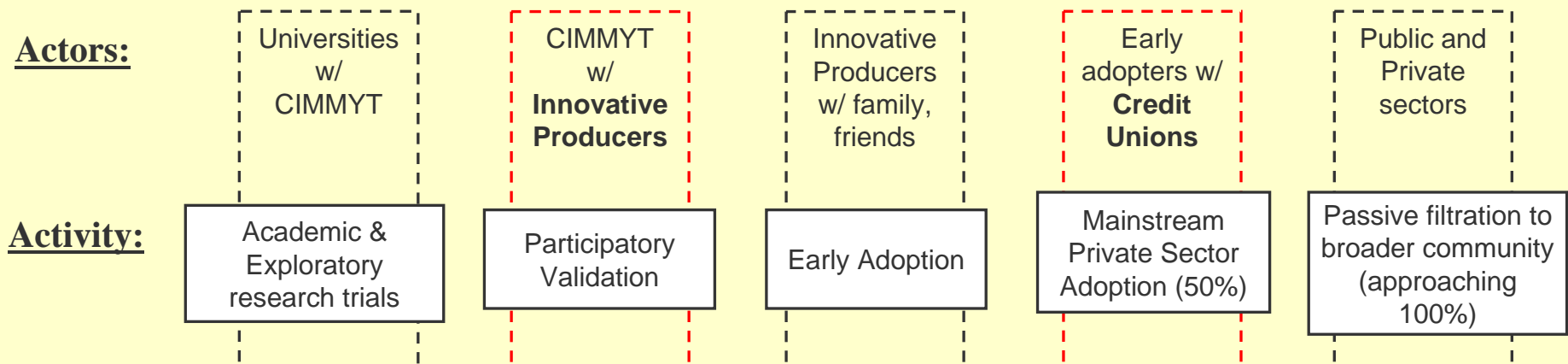
- Roughly 8 major credit organizations with differing institutional arrangements and clientele.
  - They broadly dictate regional agenda setting for agricultural research and policy
- They offer many services to their clients (and influence their behavior):
  - credit services, insurance, technical assistance, input provision, marketing outlets, storage, and processing
- Crucial “boundary organization”
  - They have grown to replace the functions of other actors who have been lost from the knowledge system (e.g. technology transfer)
  - They play a major role in processing information on behalf of their members and in influencing their production management decisions

# Findings (II): The Risk Challenge

- The Risk Challenge:
  - Yaqui Valley farmers have always operated in the presence of risk.
    - In the past, policy has been a source of risk (e.g. land reform).
  - Now farmers must take on a new set of risks surrounding market exposure
- Fertilizer management
  - Credit unions have resisted technologies that reduce fertilizer use (by changing the timing or amounts applied based on plant demand and residual storage)
  - Researchers are now directly engaging credit union leaders in the research validation process, and preliminary results look promising
- Diversification
  - Valley cropping systems remain wheat-dominated although it is not socially profitable.
  - Farmers and organizations have not made the marketing innovations necessary to facilitate diversification to higher value crops.

# Findings (III): The Stepwise Innovation Function

- New agricultural management approaches are co-developed, tested, validated and distributed through a multi-step process with two key stages:
  1. Collaboration between innovative (risk-tolerant) producers and researchers
  2. Acceptance of innovations by credit union leadership (facilitating their spread to the mainstream)
- Results:
  - Process lends credibility, legitimacy, and salience to the innovations that are successful
  - Credit unions are more risk averse than their members, which can suppress the spread of innovations



# Conclusions

- Knowledge for Sustainable Development
  - Knowledge system reflects Green Revolution goals and ideals
  - Power concentration among agricultural leaders leads to exclusion of other actors (e.g. public health, environmental)
  - New “sustainability” challenges require broader agenda-setting as well as the production and utilization of new types of information
  
- Fostering a more effective knowledge system in the Yaqui Valley:
  - Set research priorities and frame research questions with risk in mind
  - Pursue research collaborations (e.g. with credit unions) to ease the risk constraint

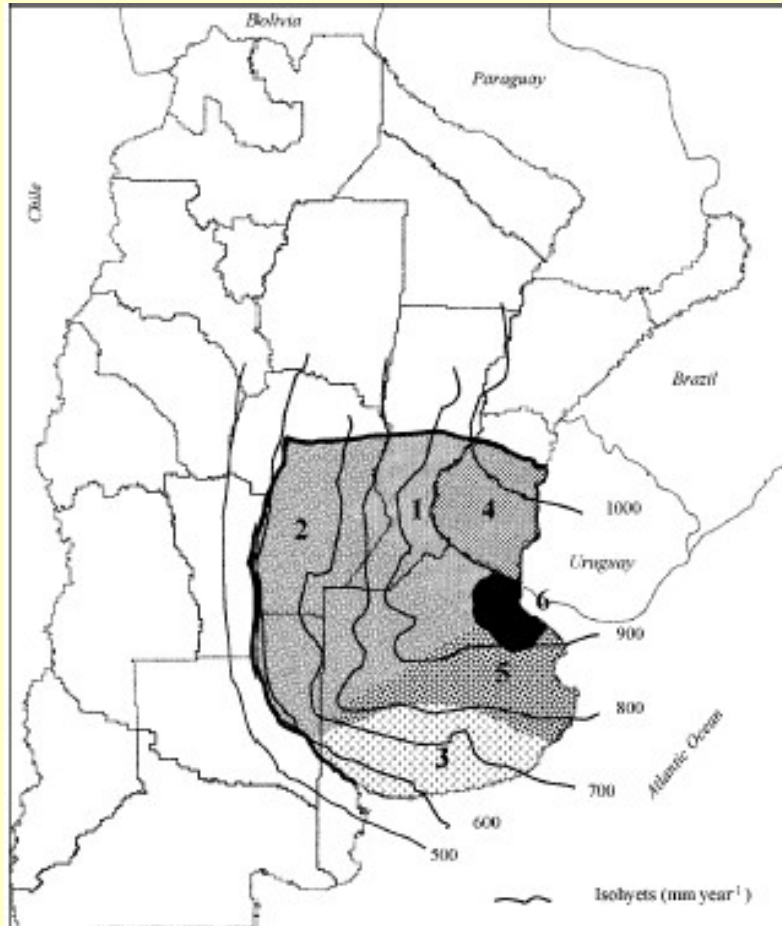
# **Knowledge systems and sustainable agriculture in the Argentine Pampas**

**David Manuel-Navarrete**



**Presented at the 6th Open Meeting of the Human Dimensions of  
Global Environmental Change, 9-13 October 2005 at the  
University of Bonn in Bonn, Germany.**

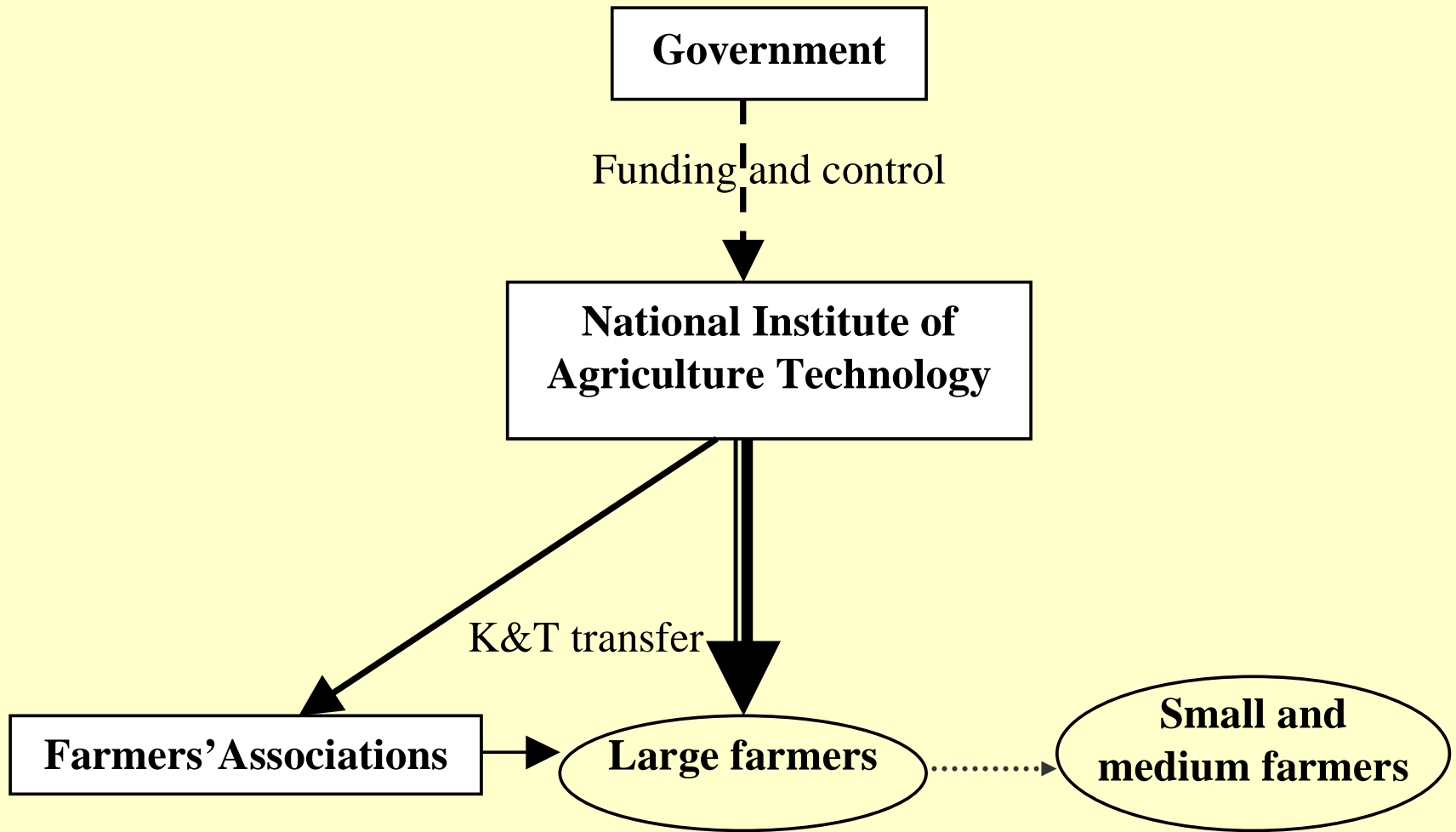
# The Pampas region



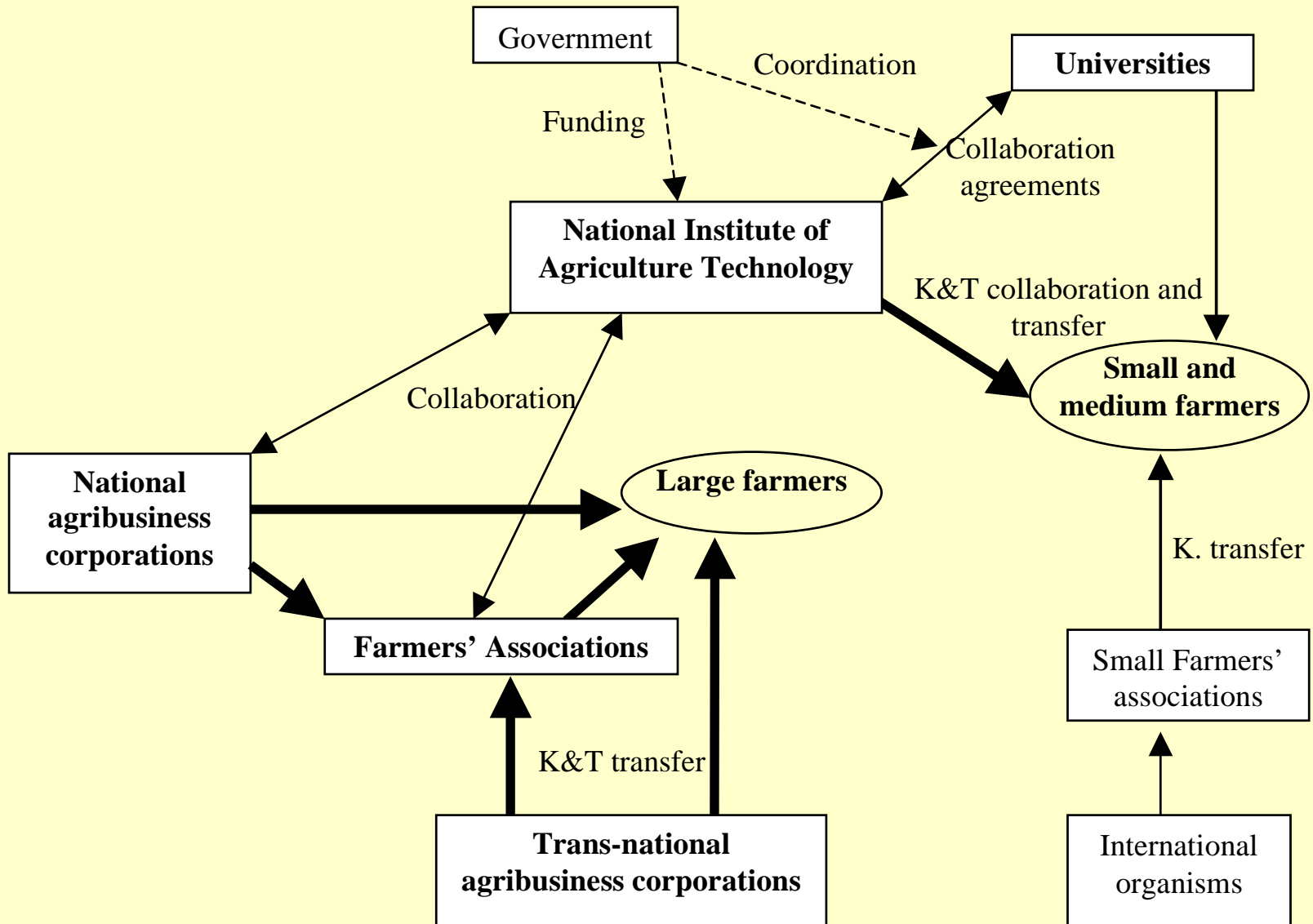
# Problem

- Argentine Pampas region (1990s): **public extension services are in decline and the agriculture research agenda begins to be dominated by the private sector**
  - **What does this change in the knowledge system's governance arrangements mean in terms of sustainability knowledge generation and use in this region?**

# Knowledge system description (1970s-1980s)



# Knowledge system description (1990s-)



# Findings (I): KS effectiveness

- The 1990s' new KS governance arrangements, including major private sector protagonism, improved the rate of knowledge use, particularly by large producers
  - (e.g. no-till agriculture, GMOs)
- Farmers' organizations, acting as boundary organizations between corporations and large farmers, were crucial for private KS effectiveness

# Findings (II): K. for sustainability

- Private-dominated KSs are effective for the adoption of K&T leading to sustainability, even in the absence of government regulations, when:
  - There are win-win opportunities
  - Land tenure and market relative prices leave enough room for long-term innovative strategies
  
- It is also crucial that:
  - Farmers are well organized and prone to innovation
  - Sustainability is incorporated into farmers' development culture and discourse

## Findings (III): KS reforms

- Private sector relevance in K&T production and transfer forced public sector KS reforms with several positive consequences:
  - Smallest farmers' knowledge needs are receiving further attention from the public sector KS
  - Public-private partnerships are more frequent
  - Public sector is, in general, more receptive to farmers' demands

# Findings (IV): sustainability K.

- Private sector does not fulfill:
  - Integrated and systemic analyses leading to territorial planning
  - Assessment and monitoring of impacts at the regional, ecosystem, and species levels
  - Social sciences knowledge (not related with economics and finances)
  - Critical analyses of K&T suitability to particular places (contextualization of K&T)
  - Critical, independent scrutiny of certain technological packets which are strategic to agribusiness corporations

# Conclusions for KS improvement

**KSSD effectiveness is fostered by governance arrangements in which:**

1. Well-organized private sector deals with sustainability K&T at the scale of the farming unit
2. The public sector KS focuses on:
  1. the needs of the least powerful actors
  2. Integrated and regional scale assessments
  3. non-human systems and species
  4. non-economic social knowledge
  5. adaptation of K&T packets to contextual conditions
3. Sustainability is a common goal and public-private collaboration/partnerships becomes the norm

# Panel Synthesis



Louis Lebel

# Challenge I: Epistemologies

- The challenge of effectively combining research-based with other ways of knowing is difficult
- Effective knowledge systems acknowledge and engage local and practice-based knowledge in participatory & deliberative settings
- Validation, however, is thru experience, new tests and consistency with other knowledge (beliefs)
- Knowledge most relevant for addressing key problems in sustainability often is about behavior of and action in “complex adaptive systems”

# Challenge II: Governance

- The performance of knowledge systems is strongly influenced by their governance arrangements. For example:
  - How are agendas set ?
    - Allocation of financial and human resources
  - How are actors held accountable?
    - Monitoring and evaluation procedures
  - How does mobilization occur?
    - Negotiating coalitions among science and practise
  - Who speaks for the marginalized? And, nature?

# Challenge III: Linking knowledge with action

- Linking knowledge with action is a critical to the effectiveness of knowledge systems and can be difficult even when actors are “close”.
- Several institutional forms have been tried or emerged. Boundary organizations are one example. Sometimes mediation, translation and “editing” functions are more distributed in networks of relationships.
- Effective systems have the capacity not only learn at the actor-level but through re-organization of linkages and roles at the system level. Most learning is by doing.
- Gaps are analytically a good starting point: Is what is known used; is what is needed available?

# IHDP

- What contributions have IHDP projects and activities made to knowledge systems for sustainability of the earth system?
- Have some interactions been more fruitful than others? Why?
- How could the contributions to action be enhanced?

# Take home I

- Knowledge systems for sustainable development are not pipelines from researchers to policy and practice
- Indeed effective systems have linkages that result in co-produced actionable knowledge and enhanced sharing of “interpretation contexts”

# Take Home II

- Knowledge systems are usually not the outcome of omniscient design, but they can be partially understood and influenced
- A knowledge system perspective is humbling one for scientists as it frequently underlines formal research as one contribution among many.