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*«Libérer la Science, la Technologie et l'innovation pour promouvoir la sécurité alimentaire et  
nutritionnelle*

*Avec, comme axe prioritaire, l'Afrique, Les Caraïbes et le Pacifique »*

### **Élaborer une feuille de route**

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# Innovation Systems: Towards Effective Strategies that Benefit Smallholder Farmers: The CoS-SIS Experience

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# Overview

1. Brief description of CoS-SIS
2. Background: The Business Model of Agronomy (BMA) and its dominance
3. The BMA in Africa
4. Back to CoS-SIS: what it tried to do and what it achieved

# 1. CoS-SIS: CONVERGENCE OF SCIENCES- Strengthening Agricultural Innovation Systems

## Partners:

- Benin: Université d'Abomey-Calavi
- Ghana: University of Ghana, Legon
- Mali: l'Institut Polytechnique Rural de Formation et de Recherche Appliquée, Katibougou (IPR/IFRA)
- The Netherlands (WU and KIT)

## National programme management teams

(Directors R&D, Ministries, FBOs, NGOs, private enterprise)

## Funding and time

2008-2014, DGIS/BUZA

# THE TEAM





# Some Key Ingredients

- Disappointing impact of agricultural science
- Focus on creating enabling institutional contexts for innovation by smallholders
- Experiments with institutional innovation in nine agricultural domains
- In each domain: platforms of selected key actors
  - Facilitated by trained post-docs
  - Fed with results of scoping and diagnostic studies
  - Focusing on key entry points selected on the basis of these studies

Country	CoS-SIS domains
Benin	<ol style="list-style-type: none"> <li>1. <i>Cotton</i></li> <li>2. <i>Oil palm production</i></li> <li>3. <i>Water management</i></li> </ol>
Ghana	<ol style="list-style-type: none"> <li>1. <i>Cocoa</i></li> <li>2. <i>Food security (cowpea, millet, sorghum and livestock)</i></li> <li>3. <i>Oil palm production</i></li> </ol>
Mali	<ol style="list-style-type: none"> <li>1. <i>Agricultural surface water management</i></li> <li>2. <i>Non-woody forest products: karité</i></li> <li>3. <i>Integrated livestock and fodder management</i></li> </ol>

## 2. Background: The Business Model of Agronomy (BMA) and its dominance



# Diffusion of Innovations

- In 1943, Ryan & Gross studied the spread of hybrid maize among farmers in Iowa and described an amazing autonomous process: the diffusion of innovations, a magic multiplier of agric. research and extension effort...
- Which underpinned a period of phenomenal productivity growth and of capturing economies of scale
- I did my PhD (1970) with Everett Rogers, the father of diffusion research (first edition 1962): S-shaped curve, adoption, early adopters. 'Dominant paradigm'

# The Agricultural Treadmill

- In 1958, Wilbur Cochrane described the agricultural treadmill....
- The economic mechanism behind diffusion of technology in agriculture
- The treadmill influenced mainstream thinking as much as the diffusion of innovations paradigm. It works as follows:

- Farms are small firms, which all produce the same commodities.
- Each is too small to affect the price: they are price takers who produce as much as possible against the going price....
- Leading to a constant downward pressure on overall prices
- Since overall prices are dictated by the prevailing state of the art, early adopters of a productivity-enhancing innovation capture a windfall profit

- Soon diffusion leads to over-production and further price squeeze. Adoption becomes necessary to stay in the marketplace
- Farmers who cannot keep up drop out. The survivors absorb their resources and capture economies of scale

Farmers in industrial countries who have survived to this day have internalised the treadmill: to stay in business you have to surf the waves of innovation and keep growing

# Macro Effects

- drives intensification and productivity growth
- reduces food prices
- eliminates uncompetitive farms and releases agricultural labour for industry
- increases industry efficiency, and improves the nation's competitive position

Exporters, banks, consumers, politicians, agribusinesses, agronomists and farmer unions...  
everybody loves the treadmill!

# Business Model

- In 1979, a *Science* article, based on the diffusion of a.o. hybrid maize, showed that investment in ag. research and extension has a high Internal Rate of Return (IRR)
- The *Science* article is the third ingredient in what I call the business model of agronomy (BMA):

Investment in agricultural science drives the growth of farm productivity



# BMA dominates mainstream thinking about ag. development

- The EU's CAP is based on it
- The Green Revolution in Asia provided further proof and reinforcement
- The CGIAR (IITA, AfricaRice, ....) is based on it
- FARA, Regional Agric. Research organisations (ASARECA, CORAF/WE CARD....) and NARS composed of ARIs all live by it

# Is that dominance a problem?

- Externalisation of costs: pollution; GHG emissions; loss of biodiversity and other ecosystem services; food safety & health; social exclusion
- BMA runs out of steam, as actual yields catch up with potential ones (yield gaps close)
- Farmers in treadmill: race to the bottom
- Pre-empts smallholder development (e.g., impact of NAFTA on Mexican maize producers)

Hypothesis: BMA cannot support a sustainable global food system

- International Assessment of Agric. Knowledge, Science and Technology for Development (IAASTD, 2009) signed by 59 Governments:
  - Business as usual is not an option
  - The market fails when it comes to food security, sovereignty and safety, poverty, and sustainability
  - Sustainable intensification - an oxymoron (no win-win but trade-offs)

### 3. The BMA in Africa

- So far, BMA did not work in Africa: failure of Green Revolution, collapse of T&V system of extension, persistent low productivity, (very) disappointing uptake of science-based technologies
- Lack of enabling institutional context
  - CoS: ‘small windows of opportunity for adoption’
  - ‘Persistent (institutional) bias against smallholder sector on the sub-content’
  - Smallholders overwhelmingly report institutional constraints

# African experience reveals major conceptual flaw in BMA

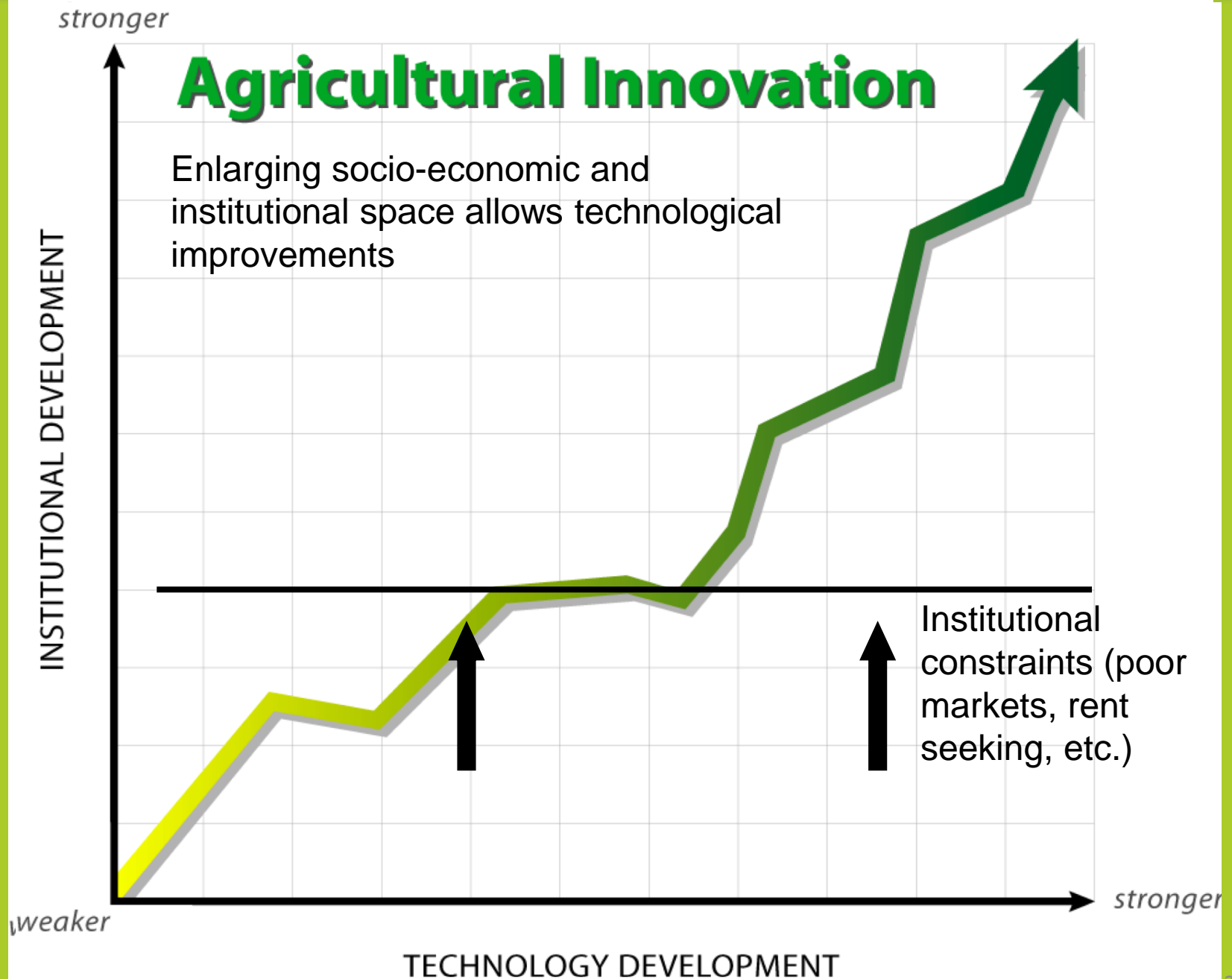
- In industrial countries, diffusion, treadmill, high IRRs kicked in 50 to 100 years *after* major institutional change
- In the US, by 1940: Land Grant College system (MSU 1854), strong political representation of farmer unions in legislatures, infrastructure, agribusiness, value chains in place
- In Holland by 1960: tenure law 1917, water boards, farm women's education (1890s), ICRE (1951).



BMA is blind to the institutions that make it work. We think about agricultural development in terms of science, technology and the (free) market, but have great difficulty in thinking about, analysing, and working with, institutions.

BMA is a frame that blinds us to history and to major mechanisms that shape society.

BMA is not appropriate for Africa (yet?). It is predicated on major institutional innovation



# Getting around inst. constraints

- By-pass smallholder development: Foreign Direct Investment ('land grab')
- Kenya's SRDP in Tetu (1970s): diffusion of hybrid maize among smallholders by creating non-replicable farmer training, seed and fertiliser distribution and credit
- In 2014, AGRA's \$180 million (Gates) 5-year programme enrolls 1.75 million smallholders; set up 9000 dealers to supply fertilisers and seeds; appointed 2800 inspectors of soil health, harvest is bought by WFP

- Integrated Agric. Research for Development (IAR4D): packages of inputs for diffusion of HYVs, managed by platforms of actors who can ensure necessary conditions

Focus on ag. research and creation of unsustainable institutional conditions to ensure diffusion of pre-selected technologies

## 4. Back to CoS-SIS: what it tried to do and what it achieved



Convergence  
des sciences :  
Renforcement  
des systèmes  
d'innovation  
agricole  
au Bénin, au  
Ghana et  
au Mali (CoS-SIS)

# Nouvelles pistes d'innovation :

Créer aux petits exploitants  
agricoles de l'Afrique de l'Ouest les  
conditions nécessaires pour saisir  
les opportunités



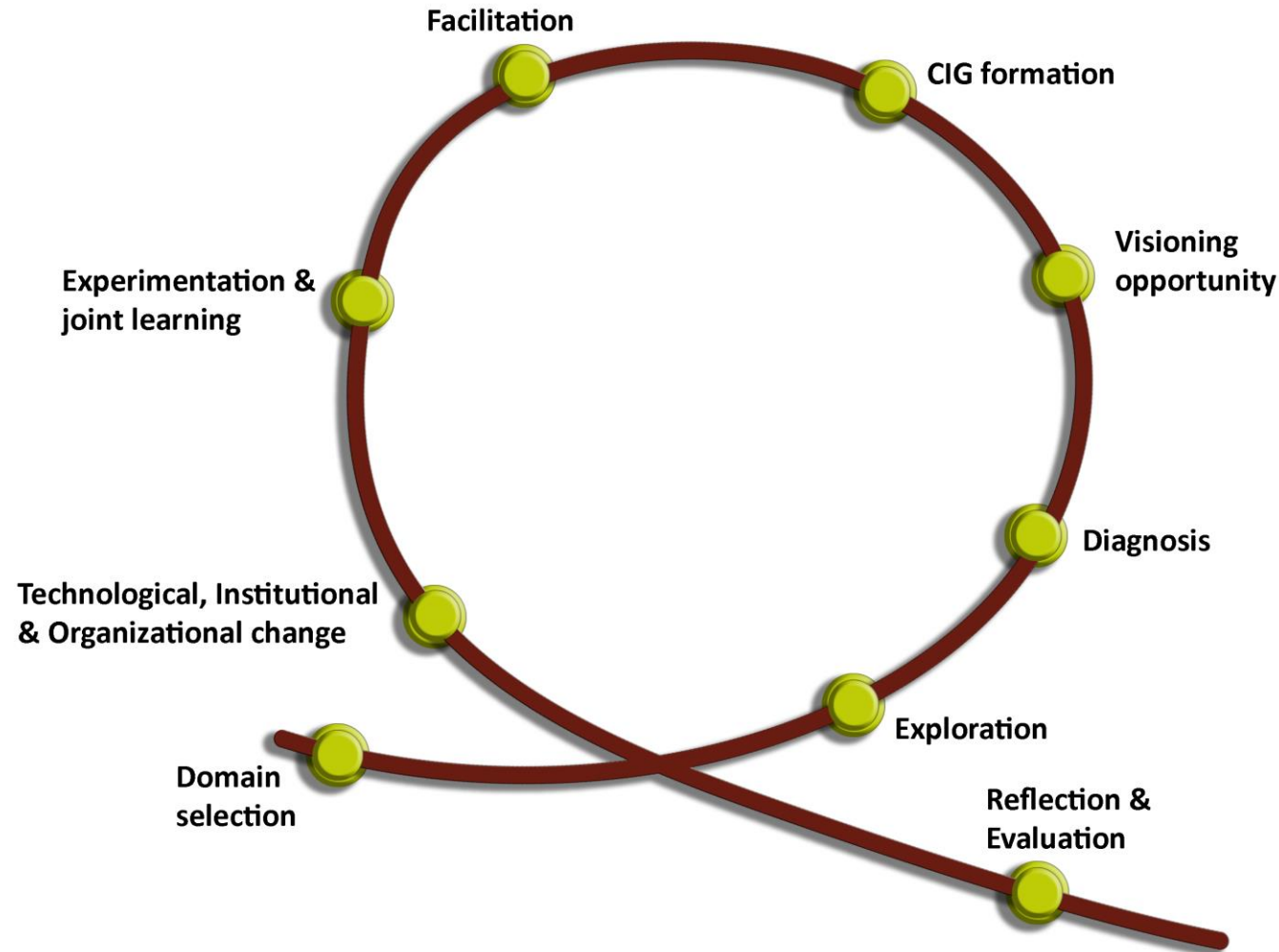


- CoS-SIS is based on analysis of BMA in Africa (Hounkonnou et al. 2012)
- Focus on domains: not recommendation domains, but arenas for interaction → potential coalitions of interest
- Domain entry point: not diffusion of preconceived technologies, but scoping and diagnostic studies to identify entry point that reflects priority constraints/opportunities of smallholders (very often institutional issue)

- Participatory entry point identification based on information about domain
- Analysis of actors and networks to identify key stakeholders who could make a difference (and avoid wreckers)
- Facilitation of Innovation Platforms to take concerted action on institutional change

Not investment in R&D and technology diffusion, but investment in facilitation, interaction, learning and concerted action

# The Cos-SIS cycle



# Examples

- Cocoa Ghana: price formation
- Oil Palm Benin: seed system
- Crop/Livestock integration in ON, Mali:  
conflicts between herders and rice growers

# Some outcomes

- CoS-SIS is an action research programme: RAST, RAs, PhDs (see publication list)
- Significant change in 8 out of 9 domains....
- Qualitatively different from pushing technologies: change in rules, procedures, governance practices, national plans, etc.
- In Ghana: 3 research institutes adopted CoS-SIS cycle (science for impact)
- CORAF/WECARD is adopting CoS-SIS approach for 'rolling out' IAR4D

# Thank You

