IFSA 2016 Symposium
WS 5.7 There are other options: boundary issues and innovation system governance

Institutional change: challenge for agricultural extension and the science that supports it. Evidence from West Africa

Keywords: smallholder farming, innovation platforms, enabling conditions, diagnostics, power, Benin, Ghana, Mali

Abstract

Even in this age of small government, agricultural extension provided by public, private, and civil society actors still is the profession of thousands of 'front line staff', managers, policy makers, consultants and other change agents. It continues to be a crucial interface between science and agencies of collective action, on the one hand, and the rural communities and industries that use land, on the other. Extension usually is seen as an instrument to help farmers adopt technology, i.e. ride the treadmill of technological innovation and capture the economies of scale that, at macro level, ensure food security at minimal costs in terms of human resources and consumer spending. Though not a discipline, the body of knowledge that informs extension professionals and the actors that deploy extension as a policy instrument, extension studies, is an applied social science with researchers, academic departments, conferences, and a journal or two, that usually is part of an agricultural faculty, college or research organisation. This paper is based on twelve years of innovation system research in West Africa that was instigated by the question whether the body of knowledge that underpins agricultural extension imposes severe limitations on the impact of the resources invested in it, and leads to high opportunity costs in terms of what could have been achieved. The paper presents evidence that institutions provide a crucial but neglected context for innovation on smallholder farms, that they can be changed, and that innovation platforms can be effective in initiating such change. This evidence raises important issues for extension professionals and the social science that informs them.

1. Introduction[1]

Agricultural extension here is defined as a policy instrument that is used by government, business and civil society to intervene in land use practices usually with the aim to improve productivity and sustainability of resource use. It specifically targets voluntary behaviour of land users, based on perceived self- or collective interest, understanding, persuasion, change of norms and rules, empowerment, etc. As such, extension usually is combined with more compulsory instruments, such as market forces, regulation, credit, access to research, inputs and services, and fiscal instruments, such as subsidies. Its thousands of professional field workers, managers, consultants, trainers and evaluators are guided by a body of applied social science, usually referred to as 'extension studies', which in turn is informed by such disciplines as anthropology, rural sociology, communication science and agricultural economics, and by research traditions such as diffusion of innovations, farming systems research, social marketing, science and technology studies, soft systems methodology, and more recently innovation systems research (e.g., Leeuwis with Van den Ban, 2004; Rivera & Sulaiman 2009).

Extension studies strictly cannot be called a 'science': there is not much accumulation of knowledge. Instead, -and this is based on my many years of involvement- it is more usually marked by (politically) contested paradigms, shifting perspectives, re-invention of arguments, and persistence of 'theories of yesteryear'. All this makes it a fascinating field, be it that expertise does not lead to much credibility, authority or impact. Any banker, donor, businessman, feminist or agronomist can claim it. One of the seductions of extension studies is paradigm bashing, e.g., of the linear model. I try to avoid it in the present paper. Some explanation of my critical view is in order.

My earlier work on Agricultural Knowledge Systems (AKIS) (e.g., Röling & Engel, 1991), which was explicitly based on Checkland's (Checkland & Scholes 1990) Soft Systems Methodology, was picked up by the World Bank. It soon became a hard systems notion with given goals (productivity per hectare), given boundaries (the national agricultural research 'system') and given components (research, extension, farmer), truncating the very elements that could have made a difference. FAO's pioneering Farmer Field School

[1] The paper is based on a research programme (www.cos-sis.org) that has been productive in terms of publications. Therefore, the author has refrained from providing references for all his assertions. Two key publications that provide documented background documentation are Hounkonnou *et al.* 2012 and Hounkonnou *et al.* in press 2016.

programme in Indonesia (Röling & Van de Fliert 1998) convincingly demonstrated the effectiveness of this approach in combating pesticide-induced Brown Plant Hopper outbreaks in rice. Currently the Brown Plant Hopper is as much of a threat to Java's food security as in the early 1980s (Fox 2014). Vested interests, including pesticide companies, thwarted best practice. Andy Hall's (e.g., Hall *et al.* 2003) influential work on Innovation Systems has been massaged into e.g., 'Integrated Agricultural Research for Development' (IAR4D), and most programmes that use innovation systems assume that agricultural science is the driver of agricultural development and hence seek to enhance science impact or 'valorisation'. Innovation system has come to mean the National Agricultural Research System. Meanwhile, the potential of Innovation Systems thinking for prioritising institutional bottlenecks is ignored because they are a blind spot in agricultural science. Innovation platforms (e.g., Röling 1994), again based on soft systems ideas about stakeholder interaction are usually translated into programmes to strengthen the value chains that, often with substantial subsidy element, support the adoption of packages of high yielding varieties, fertilisers and pesticides.

A final example refers to the very argument of the current paper, which was raised eloquently by Clark (2002) 15 years ago: 'Contrast is made with more conventional approaches that take institutional structures as given and focus more on factors such as price regimes, policy weaknesses and political will. The paper argues that so great now are the problems in this area (particularly in Sub-Saharan Africa) that there is a clear need for institutional reform to accompany relevant technological changes. In the absence of such reform innovative (and hence economic) potential is likely to be compromised'.

West Africa (WA) has a rapidly growing population, a labour force largely engaged in agriculture, growing cities that import most of their food, and stagnant or slowly growing agricultural productivity. Yet in terms of potential, the region has an eager rural population and vast under-utilised land, water and genetic resources, albeit that climate change and resource degradation pose disproportionate threats. Given that yield gaps in industrial agriculture, e.g., in the US and Europe, are rapidly catching up with the potential 10 tonnes/ha or so grain equivalent, WA with its one or two tonnes/ha is one of the world's regions with potential to help feed the expected additional billions in a sustainable manner. Yet the policy instruments thrown at this challenge have singularly

failed to deliver impact. The Green Revolution has not taken hold (e.g., Djurfeldt *et al*. 2005). Investment in agricultural research and technology development over fifty years has not led to spectacular change in practices (except for outgrower export industries). Yet, when it comes to farm innovation, the initiative at the national, regional and international levels remains with agricultural research, as if technology development were the bottleneck. The key argument of the current paper is that this focus is too limited, if not mistaken, to the point where it has held up agricultural development in WA and elsewhere.

This paper is based on the experience of a 12-year (2002-2014) multi-disciplinary WA research programme called 'Convergence of Sciences' (CoS), in which the author has had the privilege of participating as 'science adviser'. Its first phase (2002-2006) operated on the hypothesis that the disappointing impact of science was due to the inappropriateness of the technology promoted. Hence that phase focused on Participatory Technology Development (PTD) with farmers. It led to the conclusion that, however appropriate the technology, smallholders' windows of opportunity, in terms of e.g., markets, access to resources and rule of law are too small to capture its benefits (Van Huis *et al.* 2007; Sterk *et al.* 2013). The second phase CoS-Strengthening Innovation Systems (CoS-SIS 2008-2014) was based on this experience as well as on a painstaking review of the literature on agricultural development in Sub-Saharan Africa (Hounkonnou *et al*. 2012) and, therefore, worked on the premise that, in the current historical context in WA, it is not so much technological innovation that drives farm development, but the institutional context that sets disabling or enabling conditions for such development.

This view is supported by our realisation (Hounkonnou *et al*. 2012) that in industrial agricultures such as those of the US and The Netherlands, major institutional changes *preceded* the phenomenal rise in productivity by at least 50 years. They included tenure laws, the emergence of farmer cooperatives and organisations, regulatory frameworks, education for farm men and women, land improvement, research support, market organisation, integration of value chains, access to credit, domain governance, control of corruption and product adulteration, and fiscal policies. When I was a student in Wageningen in the fifties, the introduction to agricultural economics still focused on the enabling institutions that had been created since the 1880s. Later the focus shifted to farm management.

Where current agricultural development practice tends to focus on productivity per hectare and/or livelihoods of *individual* farm families, and uses *aggregated* data on individual productivity or livelihoods as indicators of success (i.e. methodological individualism), in this paper we shall focus on institutions as attributes of collectivities, and therefore look for mechanisms for *systemic* change that explain the emergence of shared rules and practices that underpin concerted and distributed action to achieve collective goals.

Now that the CoS-SIS has ended and its results have been and are being published, the present paper seeks to pull together its lessons for extension studies.

2. Nature of the evidence

CoS-SIS operated across three countries, Benin, Ghana and Mali, in nine agricultural domains, which were short-listed by teams of national experts as being national priorities. The programme management committee (PMC) made the final selection. Table 1 presents them and the specific entry point each eventually worked on.

Table 1: Countries, domains, and entry points

Country	*Domain*	*Entry Point and RA*
Benin	1. Oil palm	Integrity of system for distributing hybrid (*Tenera*) oil palm seedlings
	2. Cotton	Access to affordable less harmful plant protection (Integrated Pest Management)
	3. Water Management	Rice production in inland valley bottoms. Helping rice producers capture expanding national market*
Ghana	4. Palm Oil	Artisanal processing. Helping women processors improve quality of crude palm oil (CPO) and access domestic and export markets for quality CPO
	5. Cocoa	Formation of prices that farmers receive for their cocoa beans
	6. Food Security	Marketing of small ruminants in Northern Ghana*
Mali	7. Shea Nut/Karité	Improving the inclusiveness of women's cooperatives involved in buying and refining Shea butter
	8. Crop/Livestock integration	Conflict resolution; breakdown of discipline following devolution of the *Office du Niger***
	9. Water management	Maintenance of tertiary canals by Water Users' Groups; breakdown of discipline after devolution of the *Office du Niger***.

* For various reasons, this domain could not be used to assess the influence of Innovation Platforms on institutional change.

** A large irrigation scheme in Mali

The question can be raised why the entry points mentioned in Table 1 can be called 'institutional'. I take the oil palm domain in Benin as an example. For farmers, the hybrid *Tenera* oil palm has real advantages: it bears fruit early and is much more productive in that its oil bearing fruit flesh is much thicker than in traditional varieties. Small farmers increasingly started planting the hybrids, leading to rapid diffusion and accelerated demand for seedlings. This demand was not met by official sources and soon the system for supplying seedlings was corrupted, aided by the fact that it is visually impossible to distinguish hybrid seedlings from those of traditional varieties or from sterile offspring of hybrids. The CoS-SIS PhD student had established that the younger the plantation, the higher the percentage of non-hybrid planting material that the farmer had used. Thus the system for distributing seedlings was increasingly becoming corrupted as unofficial nurseries, often in cahoots with corrupt extension workers, jumped into the opportunity that had opened up. There is no technical solution to this problem. It requires institutional mechanisms, such as regulation, certification, inspection, licensing and training.

Bold *et al.* (2015) describe similar outcomes for hybrid maize seed and chemical inputs in Uganda: urea fertilisers contain 33% less nitrogen than what is on the label, and 'hybrid maize seed' contains only 50% genuine hybrids. The authors conclude that, with this quality of inputs, it is entirely rational for farmers not to adopt HYV technology.

CoS-SIS was a partnership of the Université d'Abomey Calavi in Cotonou, Benin, the University of Ghana in Legon, Accra; and the Institut Polytechnique Rural de Formation et de Recherche Appliquée (IPR/IFRA) at Katibougou in Mali, and in The Netherlands, Wageningen University (WU) and the Royal Tropical Institute, Amsterdam. In each domain, the Programme installed a PhD student, who was supervised by a team composed of natural and social scientists. The PhD students played a special role: although their doctoral trajectories were between them and their academic supervisors, two of their dissertation chapters served the Programme as a whole: a diagnostic study of the constraints and opportunities of smallholders in the domain (Jiggins *et al.*, 2012) and an assessment of institutional change in the domain (Struik & Klerkx, 2014). The annual meeting of all PhD supervisors played an important role in deciding the course of the whole Programme.

In each domain, a post-doctoral Research Associate (RA) was appointed with three tasks: (a) to carry out a scoping study of the domain to identify suitable entry points for

programme intervention (synthesised in Adjei-Nsiah *et al.*, 2013); (b) to facilitate the Innovation Platforms (IPs) of which more below (see Nederlof & Pyburn 2012 for their facilitation); and (c) systematically to track main events concerning the IPs so as to be able to link institutional effects (if any) to the interventions of the IPs. This third task was supervised by a team of social scientists from the four countries, the RA Support Team or RAST, which, from early 2012 to early 2014 met three times a year at a workshop attended by all RAs. The third task was crucial for testing the hypothesis of the second phase of the programme. The results are published as Jiggins & Jamin (2016 in press) and are the basis for the conclusions reached in the present paper. A comparative overview of the empirical outcomes of the programme has been published in Houkonnou *et al.* (2016 in press).

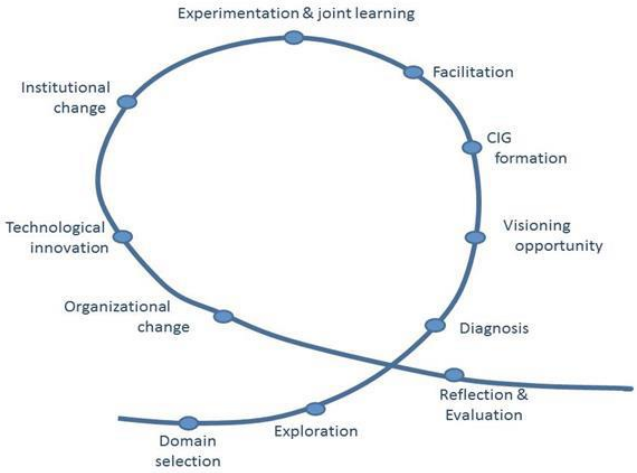

Figure 1: The CoS-SIS process (Source: CoS-SIS 2013)

Figure 1 presents the (idealised) process of the CoS-SIS Programme. Domain selection, exploration, diagnostic studies, visioning and agreeing on entry points for intervention took a year after the appointment of PhD students and RAs, setting up Programme Management Teams (PMTs) in each country, etc. The key vehicle for affecting institutional change was an innovation platform (IP), a group of key stakeholders in the domain (called Concertation and Innovation Group (CIG) in figure 1), convened on the basis of an actor analysis in each domain. IPs became quite independent in their decision-making. Even when at first convened at the municipality, commune or district level, in most cases they eventually incorporated key actors from the national level,

including banks, government authorities, research institutes and parastatals. In the initial budget of the Programme, considerable outlays had been allocated to each IP to finance experimental interventions (in addition to operational costs for meetings, travel, board and lodging, facilitation, etc.). As it turned out, none of the IPs used these experimental funds and the Programme used them for mounting the research capacity represented by the RAST and its workshops with RAs and National Coordinators, without which the *comparative* conclusions about institutional change would have been impossible.

In all, the CoS-SIS focused on creating space for farm innovation in specific agricultural domains. Its main hypothesis was that the institutional context is the key bottleneck in creating opportunity and enabling conditions. Specifically, the Programme tested the idea that innovation platforms (IPs), informed by careful scoping and diagnostic studies, can lead to institutional change. As such it experimented with a quite radical departure from the normal focus of extension interventions in that it deliberately focused on institutional entry points that emerged from scoping and diagnosis (Table 2). Platform initiatives that represented conventional extension activities, such as introducing parboiling of rice, were discouraged. It is this deliberate focus on institutional change that makes the Programme interesting for extension studies.

Table 2: Comparison of Innovation Platforms that promote adoption of High Yielding Varieties (HYVs) and those convened by CoS-SIS (Hounkonnou *et al*. 2016 (in press).

	IPs that promote adoption of HYVs	**CoS-SIS IPs promoting institutional change**
Entry point	Preconceived: adoption of science-based technologies	Semi-open: depends on scoping, diagnostic studies and system analysis but focus on institutional context
Actors	Pre-determined: scientists, input suppliers, credit and marketing organisations create conditions to make adoption possible	Open: depends on scoping, actor analysis, strategic selection of champion stakeholders in domain, and entry point
Subsidy element	(Usually) free package of seeds, subsidised fertiliser, facilitated access to credit and markets	Investment in exploratory research, convening and facilitating of IPs and interaction on IPs, but no development funding
Target unit of change	(Selected) farmers in selected rural communities	Agricultural domain as unit of concerted action
Criterion variables	Farm-level adoption, yields, and incomes	Domain-level changes in laws, rules, norms, governance, organisation, power that enable farm innovation

The study had a comparative case study design across the nine independent domains. In two domains, the Programme failed to establish an IP. In one, the agency employing the intended RA did not assign him part-time to the Programme and later transferred him out of the area; in the other the PhD student started a year late so that the diagnostic study was not available for entry point selection and specification. For each of the seven remaining domains, its RA over two years regularly recorded the events relating to IP activity and process. These were presented, compared and compiled in regular workshops of all RAs with the RAST. The outcomes of the event recordings were assessed against two declared alternative theoretical explanations: (a) the events can be explained by use of power by some individual or group, and (b) the events can be explained by the intervention of the IP. Jiggins *et al.* (in press) explains this Theory-Guided Process Tracing (TGPT) in detail.

3. Results

The results are presented as short vignettes, which describe the context and main outcomes for each domain, as well as the transformations that the IPs wrought during their two years of operation. Programme funding stopped at end of 2014 and some of the IPs no longer meet. Information on impact on productivity or farm incomes, or on persistence of effects beyond 2014 is not available.

Oil Palm Benin. The entry point has been described above: the seed system had become corrupted, frustrating the country's aim to revitalise the industry. As a result of the CoS-SIS programme, the following occurred: two IPs were formed at the Commune level. They trained five new nurserymen and ensured a limited number of hybrid seedlings for them. Some took out loans to buy more. Through the work of the IPs, but also because of the involvement of *Centre de Recherche de Plantes Pérenness* (CRA-PP), micro-finance organisations and members of the PMT, nation-wide attention was drawn to the problem. CRA-PP was made responsible for supplying hybrid seeds to official nurseries and for annually inspecting and certifying them. Seed system integrity was incorporated into the 5-year agricultural plan.

Cotton Benin. Structural Adjustment led to devolution of the parastatal organising annual cotton campaigns to an 'Interprofession' composed of farmers, pesticide and fertiliser

providers, ginners, transporters, supervised credit providers, and researchers. It became monopolised by a businessman who acquired control of pesticide supply, transport and most ginneries. He refused to sell ingredients for an officially propagated integrated pest management approach, which were cheaper and less toxic than conventional pesticides.

The PhD student, who established this in his experiments with farmers, started testing alternative methods, focusing on Neem oil, which is readily available in the production zone. Meanwhile, the businessman fell out with the authorities, had to flee the country, stopped pesticide delivery and cotton transport, and left the industry in chaos.

A district-level IP was started with empowered experimental farmers, district authorities and researchers, which focused on by-passing the official system by training women's groups in producing Neem oil, helping a local entrepreneur to distribute it and working with national research to (a) get Neem officially recognised for cotton, and (b) test and release a variety preferred by farmers.

Palm Oil Ghana. The RA had established that artisanal women's groups processed the bulk of the palm fruits produced in the country but could not access remunerative markets because of the low quality of their oil. Experimenting with local women and millers, the PhD student proved that artisanal processors could produce good quality oil by manipulating fruit storage times.

An IP, initially at the District level, soon incorporated representatives from the Quality Control Board, Export Promotion Authority and Research Institute. The IP prioritised termination of the use of discarded lorry tyres as fuel for boiling nuts. Apart from poisoning the processors, the fumes also affected the quality of oil. The IP's lobbying of the District Assembly and the Chiefs led to a ban on using tyres. The processors' representative in the IP had established that pressed cake, a waste product, was an excellent alternative fuel. The IP is promoting contracts between artisanal processors and exporters. Meanwhile, the Ministry started forming processors into cooperatives that could access government funds for improved processing equipment. The experience drew the attention of Government and the Research Institute to the potential of artisanal processing, where policy had earlier favoured large-scale factories.

Cocoa, Ghana. Cocoa is a major export crop. Farmers used to be paid as little as 30% of the Free On Board price. This led to decreasing production and smuggling to Ivory Coast.

Under pressure form international financial institutions, the percentage was increased to 70%, doubling national production. Farmers receive the fixed price, whatever the quality of their beans. The PhD student examined these relationships between price formation and smallholder response. The IP, convened from among stakeholders at the national level, started with a 'member sourcing' examination of the price formation process. It was not transparent. It was not based on actual costs. The time of announcing the producer price did not fit farmers' production decisions. A public programme of mass spraying paid out of deductions from the farmer price was not transparent and effective. Members of the IP subsequently influenced government decisions to pay farmers higher prices, to announce them at a different time, and to publish in local newspapers the exact amounts of pesticides and fertilisers that were to be delivered to a District. Mass spraying is on its way out.

Shea Butter, Mali. Shea butter, or Karité, is produced from the nuts of a tree that covers vast swathes of the Sahel as a result of selective weeding. It is the main source of cooking oil and cosmetics and a major cash crop. The nuts are collected and processed by women. Their butter is sold to itinerant merchants, and increasingly to cooperatives, for refinement and export. The PhD student analysed one cooperative and concluded that foreign support had led to inequity in terms of access to the benefits of the cooperative. The IP initially was composed of the management of the Coop, a representative of the Ministry of Women's Affairs and the RA. The IP helped the Coop to access official credit, so far unheard of for local women's groups. It allowed the Coop to buy a lorry and take institutional measures, which greatly expanded access of local women to the lucrative markets for the Coop's products. As a result, the IP took on more official members and assisted eight other cooperatives to access credit, and shifted the focus from exclusive exports to satisfying national demand for improved Shea butter.

Crop/Livestock integration, Office du Niger (ON), Mali. Climate change is forcing pastoralists to move south into arable farming areas. The ON, officially dedicated to rice production, is affected: many plot-holders own flocks of cattle, which graze outside the scheme during cropping, and keep dairy cows. Structural adjustment enforced devolution. Rice is now commercially marketed but scheme discipline broke down, leading to conflict, (official) court cases and (local court) litigation that paralyse tenant communities. An IP was started with two objectives: to explore the feasibility of stall-feeding and fodder production instead of rice, and to reduce conflict. Experiments with

farmers proved stall-feeding to be attractive. The IP invested in meetings to explain in local language the provisions of the 'Contrat Plan', the official agreement between plot holders and ON management, to the tenants and herders. The meetings brought to light required adjustments of the Plan. Agreement on common rules reached in these meetings, and their publication in local language on billboards in the communities led to an end of court cases and vast reduction of litigation. The results led to ON-wide demand for the same approach to be used in other 'Cercles'.

Mali, tertiary canal maintenance. The devolution of the ON also led to breakdown of tertiary canal cleaning by farmers. The water user groups became dysfunctional, absentee plot holders did not contribute, and general resentment of the neglect of secondary canals by ON management and the high fees demanded for it added to the implosion of irrigation, already weakened by continued plot fragmentation. The IP initiated a tertiary canal cleaning demonstration. It promoted understanding of the rules in the 'Contrat Plan' dealing with responsibilities of respectively water users and ON management. It renegotiated the fees plot holders had to pay the Scheme, and stimulated revival of the associations.

Conclusion. Across a wide variety of contexts and issues, the seven independent cases show remarkable institutional change in support of smallholder entrepreneurship that seems entirely attributable to the IPs. Some of the changes seem irreversible: irrevocable processes have been set in motion. The main instrument for intervention was a platform for concerted action among key stakeholders in the domain with an entry-point based on scoping and diagnosis.

4. Implications for extension studies

Institutions matter[2]*.* The overriding implication is the need to recognise the importance of institutional, as separate from on-farm technological innovation. While thousands of agricultural scientists the world over promote technological change, institutional innovation has few champions apart from institutional economists. Yet farming everywhere is embedded in dense networks of institutions, which can be enabling or

[2] This was the title of the Medium-Term Plan published by The International Service for National Agricultural Research (ISNAR 2000) shortly before CGIAR's decision to abolish ISNAR as an independent institute. It is now part of IFPRI. This publication is another example of the persistence of the dominant paradigm for agricultural development.

353 inimical to farmer entrepreneurship. Industrial countries have developed such networks
354 to support the ever-smaller number of farmers to compete with each other on the
355 treadmill of technology adoption and increasing economies of scale ('the race to the
356 bottom') and are now struggling to develop institutions that support ecologically
357 'sustainable intensification'. In WA, equally dense networks of institutions exist that are
358 usually designed to cream off the wealth that farmers generate, be it through parastatals,
359 police roadblocks, corrupt politicians, profiteering in the absence of farmer countervailing
360 power, policies that favour transfer of rural wealth to urban and industrial development,
361 or other mechanisms (e.g., Blundo & Olivier de Sardan 2006). They all stifle
362 entrepreneurship and impede the realisation of the tremendous productive potential of
363 WA agriculture. The exploitative networks are short-sighted in that all stakeholders,
364 including urban consumers, would be much better off if the institutions enabled farm
365 innovation. The experience of CoS-SIS suggests that, in the current phase of WA
366 agricultural development, institutional innovation is essential, much as it was in industrial
367 countries prior to the phenomenal rise of productivity enabled by it.

368 Institutions are difficult to talk about and many people find it hard to 'see' them. We tend
369 to think of traits of the collective as aggregations of individual traits. As a consequence
370 we are blind and inarticulate when it comes to traits of collectivities that affect the
371 behaviour of individuals. The CoS-SIS experience is that WA agricultural professionals,
372 usually born on smallholder farms, do not have that problem; every day they are involved
373 or implicated in institutional dynamics that are inimical to farmers' interest. Yet this
374 understanding tends to remain within the realm of informal discussion and separate from
375 their professional behaviour. In CoS-SIS we found that a two-day training in value chain
376 management can surface this understanding and bring to life the institutional dimension.
377 For example, such training emphasises the need to create synergy among key
378 complementary actors, their commonality of interest, the vulnerability to rogue or corrupt
379 actors, and the notion of emergent properties that emerges when things gel. Of course,
380 institutions embrace much more than value chains, but they are a good start.

381 *Domains*. A key condition for institutional innovation is the focus on agricultural domains,
382 such as specific industries, cropping systems, value chains, water catchments or other
383 entities that (potentially) have stakeholders interested in their development (Röling 2014).
384 Such intervention domains are, therefore, very different from 'recommendation domains',
385 categories of potential adopters who are similar in that a given technology can be

assumed relevant for them. A domain has given (i.e. not natural or 'hard') boundaries, which might change as one begins to understand it. It has a diversity of actors, not only along the value chain but also in policy making, regulatory, juridical, educational, consuming and other positions. One important function of scoping a domain is to map the key stakeholders, and among those the ones that can be considered potential champions and the ones that can be considered 'wreckers'. In the case of domains for institutional innovation, stakeholders not only include primary producers, but all actors whose positive or negative contribution can make a difference. These actors change as the intervention progresses. Diversity of stakeholders is essential for building synergy, self-organisation and concerted action, but can lead to conflict. Institutional change always has a 'political' dimension involving such issues as access and allocation. Interactive processes might lead to rule of law, transparency and voice for smallholders, but can also lead to consolidation of exploitative situations.

Scoping and diagnostics. Most WA agricultural development programmes, including many that deploy IPs, assume that the restraining factor is technology and focus on inputs, credit and markets to make its adoption possible. CoS-SIS found that consultants engaged to carry out exploratory studies of such domains as cocoa or cotton regurgitate 30-year old issues. In WA very little current information exists on the state of agriculture. Farmers have no voice or political clout. In such a vacuum of information on which to base interventions, it is essential to invest in broad (i.e., agronomic, economic, sociological) scoping studies of domains, in diagnosis of specific issues from the perspective of specific categories of smallholders, such as artisanal palm oil processors, and in analysis of actor networks. Such studies throw up entry points that replace pre-conceived problem identifications based on myths, private or professional interests, or selective perception. The field of extension studies needs to embrace practical methods for domain scoping, diagnosis and network analysis that go beyond Participatory Rapid Appraisal (PRA), or rich pictures created by stakeholders.

Innovation Platforms. The main instrument for institutional change is the IP. It brings together key domain actors for interaction, negotiation and concerted action. This is very different from the conventional focus of extension on individual or organised primary producers or processors. It is also much broader than the value chain approach. Instead of following pre-conceived entry points, IPs that effectively foment institutional change make their own decisions based on information provided by scoping, diagnostic, or their

own studies. In CoS-SIS' experience, guidance is required to prevent IPs from taking 'the easy way out' by choosing some technical issue to increase yields/ha, instead of focusing on domain governance. IPs involve actors from different levels. In this respect, CoS-SIS has used the distinction between niche, regime and landscape (Geels 2005). IPs are niches in which experimentation is possible. Regimes are more stable institutional conditions, while landscapes provide the rather unchangeable context provided by climate, world markets, national politics, etc. A key issue is to ensure that niche experimentation affects institutional regimes. In CoS-SIS, even when experimentation started at a local level, it proved necessary to incorporate or create linkages with regime actors who could take issues to national forums. It is clear that IP facilitators need a good understanding of domain networks based on actor analysis.

Facilitation. The extension workers who can facilitate IPs are quite different from 'front line' staff who have been trained in some agronomic specialism to demonstrate technologies for increasing productivity/ha on individual farms. IP facilitators must be strategic operators whose criteria for success include evidence of learning, enthusiasm, synergy, empowerment, self-organisation, initiative and concertation. Facilitation is a process of identifying, convening, and guiding groups towards negotiated agreement, synergy and concerted action, through providing networks analysis, information, social learning, monitoring and evaluation, etc. The experience of CoS-SIS was that post-doc researchers, officials and lecturers in national organisations, usually with an agronomic background, with guidance and training were perfectly able to facilitate IPs in promoting institutional change.

Establishment. An extension service with a capacity to facilitate such IPs would need to establish a cadre of trained staff who could be deployed from time to time to operate special projects or programmes of institutional change. Budgets would need to allow investment in scoping, diagnosis and network analysis in collaboration with national universities and research institutes, effectively using requirements that students and researchers engage in field research as part of their training and career planning. Open-ended investment in interaction without pre-conceived technical goals would be a necessary condition for effectively fostering institutional change. An advantage of institutional change, e.g., a tenure law, is that it is fairly irreversible and affects all those concerned in one fell swoop, i.e. without having to inform, educate, convince, or train each individual agricultural enterprise.

5. Conclusions

WA's farmers been the recipients of a deluge of well-meant but ill-conceived development interventions based on the experience of industrial countries after the take-off of the incredible growth of their farm productivity just before or after World War 2, and codified in such iconic studies as Evenson *et al*. (1979) on the high internal rates of return to investment in agricultural science in the US. As a result, the inimical institutional contexts in which African smallholder farming has been embedded since colonial times have been ignored (e.g., Clark 2002). For example, CoS-SIS researchers found that the deregulation, devolution, and privatisation that were imposed by Structural Adjustment programmes in the 1990s have strongly affected institutional contexts for farm development in the cases of the governance of the cotton industry in Benin, access to veterinary services in Northern Ghana and the discipline in irrigation schemes in Mali. Twenty years later, private enterprise had not stepped in to replace the services and supports and the public sector had not developed new roles.

In WA a host of enlightened individuals and organisations seems ready for radical change and is beginning to develop African responses to agricultural stagnation. For example, as a result of participating in CoS-SIS, three Ghanaian agricultural research institutes decided to adopt the programme's approach to improve their science impact. Universities in Benin and Ghana developed MSc/PhD course curricula for training professionals in the approach. CORAF/WECARD, the WA regional agricultural research organisation, adopted the approach as the basis for its second Strategic Plan.

The bad news is that institutional change continues to remain a blind spot. Changing this would be the task of a science of agricultural research and extension (R&E) that learns from the poor impact of R&E on the productivity of smallholder agriculture. Yet it is that very R&E that, on the one hand has an interest in promoting cutting edge (natural) science as the driver of farm development, and on the other, in most countries also is expected to take initiative and give direction to farm innovation. It is this (institutional) context that explains the persistence of more-of-the-same and failure to learn from feedback.

But there is also good news. The recognition of the poor track record of the current approach is affecting where it hurts most, R&E funding. The focus of conventional

agricultural economics on methodological individualism, internal rates of return to investment in R&E, and on technology development as the engine of development has been challenged by institutional economics ever since North (1990). The increasing tendency to see agriculture as part of a food system forces rethinking of narrow productivist perspectives in favour of wider concerns with food security and sovereignty and food safety (e.g., Tansey and Worsley 2008). There is increasing attention to the counter-strategies of small farmers to create styles and livelihood niches, irrespective of the dominant market forces that neoliberal policies and the food industry have put in place (e.g., Van der Ploeg 2012, Hazareesingh & Maat 2016). Finally, in many fields of agricultural science, such as plant protection, plant breeding, animal health, impact is so closely interwoven with institutional issues that they cannot be ignored by the discipline itself. For example, the conventions governing breeders' rights and access to genetic diversity, as well as the methodologies governing participatory plant breeding have been legitimate subjects for research.

The field of Extension Studies has a key role in a much-needed transformation towards recognition of the key role of institutional reform in agricultural development, not only in WA but also in industrial countries that are struggling to put in place a post-productivist agriculture. This transformation means engaging with the fundamental mechanisms of agricultural innovation beyond technology. Once that engagement is there, a whole set of consequences would emerge for institutional innovation within extension itself. Of course, the author has no expectation whatsoever that this piece will affect the dominant paradigm that determines thinking about R&E.

6. Matters arising

- Is institutional the same as systemic?
- How can innovation system thinking incorporate institutions?
- What are the entry points for institutional innovation of R&E and what IPs would it require?

7. Acknowledgements

The support of the Directorate General for International Collaboration (DGIS) of the Dutch Ministry of Foreign Affairs is gratefully acknowledged, as is the contribution of the post-doc RAs to the learning that the programme was able to generate: Samuel Adjei-Nsiah; Richard Adu-Acheampong; Fadjala Dembele; Barra Ouologuem; Aliou Saïdou; Lassine Soumano; Pierre Vissoh and Elisabeth Zannou. In addition, I would like to thank the National Programme Coordinators, Professors Dansou Kossou, (the late) Owuraku Sakyi-Dawson and Mamoudou Traoré, my other colleagues on the Programme Coordinating Committee, Prof. Arnold van Huis, and Dr Dominique Hounkonnou, and finally Prof. Janice Jiggins, who gave leadership in building the knowledge about the programme's outcomes. The author gratefully acknowledges helpful comments by two anonymous reviewers of an earlier draft.

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