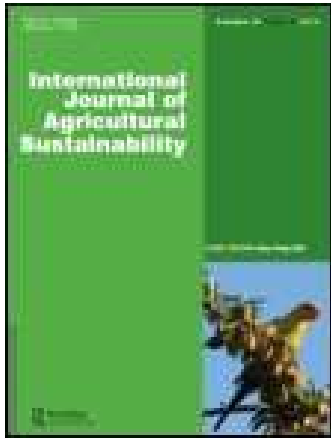


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Unravelling institutional determinants affecting change in agriculture in West Africa

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Unravelling institutional determinants affecting change in agriculture in West Africa

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This paper compares lessons learned from nine studies that explored institutional determinants of innovation towards sustainable intensification of West African agriculture. The studies investigated issues relating to crop, animal, and resources management in Benin, Ghana, and Mali. The constraints addressed were agronomic or economic (e.g. low production, yield, quality, prices) and institutional (e.g. poor access to resources and constraining regulations) and were analysed using an array of research approaches. The studies showed that political ambitions to foster institutional change were often high (restoring the Beninese cotton sector and protecting Ghanaian farmers against fluctuating cocoa prices) and that the institutional change achieved was often remarkable. However, flexibility of institutions, co-evolution of technical and institutional change, and increased transparency are needed to make institutional change successful. The programme Convergence of Sciences – Strengthening Agricultural Innovation Systems encouraged interventions where needed and enabled researchers and stakeholders to acquire the *change capacities* required to identify the need and potential for change and to make change happen. More research is needed to design pathways towards sustainable intensification based on social and technological innovation. Policy-makers should create space for institutional experimentation and empower smallholder farmers in West Africa to create resilient, local food systems to feed burgeoning urban populations.

Keywords: action research; agricultural innovation; impact assessment; institutional change; smallholders; sustainable intensification; West Africa

1. Introduction

This special issue of the *International Journal of Agricultural Sustainability* presents nine studies investigating institutional issues that affect smallholder farmers in West Africa. They were contextualized in the general introduction to this special issue (Struik *et al.* 2014).

All nine studies were carried out within the framework of the programme Convergence of Sciences – Strengthening Agricultural Innovation Systems in Benin, Ghana, and Mali (CoS-SIS). This programme assumed that institutions explain a large portion of the variance in the quantity or quality of agricultural output, or in the added value realized by farmers (Hounkonnou *et al.* 2012). Within the CoS-SIS framework, institutions are defined as *the rules of the game* that reduce uncertainty in human interaction; institutions include diverse aspects such as gender relations, markets, standards, income distribution, land titling, and systems of governance. These institutional determinants were examined in the papers in this special issue.

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The programme involved action research that sought to catalyse change through multi-stakeholder innovation platforms. It was surmised that, for all constraints identified, the technologies to address them were available. It was also assumed that the human and natural resources required to apply those technologies were present as well. The programme was hence built on the premise that it requires an institutional reform to make those necessary changes happen. Therefore, this special issue elucidates both the institutional constraints that prevent progress and the potential and opportunities that novel institutional settings may hold.

The nine projects had in common that they investigated institutional issues affecting innovations relevant to smallholder farmers. They aimed to achieve a social benefit and to sustainably intensify smallholder farming systems (see Pretty *et al.* 2011 for an elaboration of sustainable intensification). The focus was on aggregation levels higher than the individual household or farm. The nine studies investigated different cases, relating to different domains (Struik *et al.* 2014). Five of the papers deal with crop issues: two on oil palm/palm oil, in Benin and Ghana, one on cocoa in Ghana, one on shea butter in Mali, and one on cotton in Benin. Two studies deal with animal issues: one on small ruminants in Ghana and one on crocodiles in Benin. Two studies were on resource management: one on mismanagement of irrigation systems for rice production in Benin and one on land use in Benin. The topics were identified through a participatory process involving local stakeholders.

Table 2 in the introduction to this special issue (Struik *et al.* 2014) summarizes the major constraints diagnosed and the main causal relationships underlying the identified constraints. In some studies, the constraints were poor institutions to properly manage resources; examples include the lack of a properly functioning oil-palm seed and seedling distribution system (Akpo *et al.* 2014) and the lack of proper land tenure arrangements (Yemadje *et al.* 2014). In other cases, constraints consisted of a lack of incentives, for example in the commercial production systems for small ruminants (Amankwah *et al.* 2014), to produce high-quality oil (Osei-Amponsah *et al.* 2014) or cocoa beans (Quarminé *et al.* 2014) or to invest in managing a value chain (Sidibé *et al.* 2014). Some of the studies highlight the need to negotiate competing claims, for example in the management of water from agro-pastoral dams (Kpéra *et al.* 2014). Others revealed that constraints were caused by a lack of opportunities to engage in integrated pest management (Togbé *et al.* 2014) or in self-organization (Totin *et al.* 2014).

To guide the comparative analysis across the nine studies, the following questions were addressed:

1. Which constraints impeded sustainable intensification and what was their relation to agricultural development towards this end?
2. Which research approaches were followed and on which institutional determinants did they focus?
3. What were the ultimate objectives of the institutional innovation processes catalysed?
4. What were the main findings regarding institutional change and the implications for sustainable intensification?

These questions reflect the main elements of all nine studies, i.e. the problem diagnosis, the research approach and specific research questions, the aims of the research and of the institutional change, and the results and implications. Although perhaps rather descriptive, the questions do permit the diversity of constraints to be highlighted. They also permit the identification of the institutional changes required to alleviate these constraints, and of the possible mechanisms and strategies to enhance change. In addition, the differences in the backdrops to the studies are briefly outlined. We close this reflexive paper with implications for future research and policy, and options to further build on the achievements of CoS-SIS.

First, however, we briefly summarize the highlights of the individual papers.

2. Synopses of studies

Table 1 provides an overview of the different studies.

Akpo *et al.* examine the complaints from farmers in Benin about non-hybrid palms in plots allegedly planted to 100% hybrids. The authors claim that the supply of oil-palm seedlings has become less reliable, due to flaws in the seed system and the lack of oversight. They use an event ecology approach to identify causal mechanisms accounting for observed variations in oil-palm types in smallholder plantations. The proportion of hybrid palms appeared to vary with seedling supply source, farmers' geographic position, seedling purchase price, and year of planting. Older palm stands were of better quality. The variation in the quality of smallholder plantations over time proved to be associated with institutional aspects, including national policy change, local arrangements for seedling supply to smallholder farmers, and smallholder farmers' personal characteristics.

Osei-Amponsah *et al.* explore the problem that the crude palm oil produced by artisanal female processors often has too high a free fatty acid content for it to be acceptable in high-value markets. They claim that one of the reasons for this is that the artisanal processors leave harvested fruits unprocessed for up to three weeks in order to improve the oil extraction rate. Processors also use old lorry tyres as fuel for boiling the fruits during the extraction process. The authors describe the impact of a joint experimentation and learning approach with the processors and of creating a local stakeholder platform. They also stress the importance of organized arrangements and of information flows. Emerging institutional changes have been observed, resulting in the women learning to improve oil quality.

Quarmin *et al.* investigate how the producer price of cocoa has developed over time and the extent and speed with which the producer price in Ghana responded to changes in world market prices. The objective was to assess whether the multi-stakeholder institution that sets the producer price of cocoa changed its behaviour as a consequence of institutional change that gave cocoa farmers more clout in determining the price. The authors find that higher prices resulted in more cocoa bean production and that indeed farmers received a better price. On the other hand, producer prices also became more unstable. The authors claim that there is a need for policies that can stabilize the price in order to protect farmers against international price fluctuations.

Using a case study approach, Sidibé *et al.* discuss the impact of access to working capital in a women's shea butter-processing cooperative. Their case analyses the changes in the cooperative's practices and inclusiveness before and after accessing working capital. The capital allowed the cooperative to diversify in terms of improving the sourcing of shea kernels, while increasing the number of women who benefitted from the cooperative by delivering their harvests or crude butter. These outcomes are early signs of institutional change originating in the interaction between the management of the cooperative, an exclusive and specialized group within the wider social fabric, and the new opportunities provided by working capital. The paper explores how such tracing of institutional change in local practice can support the creation of an enabling environment for development.

Togbé *et al.* assess the immediate impact on smallholder producers of the 2009 reform of the cotton sector in Benin. The authors use a policy arrangements approach to analyse what farmers felt about the transformations brought about by the reform and how these influenced their day-to-day activities. Farmers trusted the new cooperatives established by the reform. The number of cotton growers increased, but the yields per hectare remained low. Probably, the reform addressed mainly institutional constraints, such as the lack of trust in organizations and the management of financial flows. At the same time, however, technical constraints in cotton production were neglected, such as problems regarding the cotton variety supplied and the usage of appropriate pest management for the crop. The policy arrangements emerging from the reform still generate

Table 1. Overview of the nine case studies in the order in which they appear in this paper and in this special issue.

Focus, first author and country	QUESTION 1		QUESTION 2		QUESTION 3	QUESTION 4	
	Main constraint(s) identified	Relation to agricultural development	Research approach	Institutional determinants affecting change researched	Ultimate goal(s) of change	Main findings of study	Implications of findings for sustainable intensification
<i>Crops</i>							
Akpo (Benin)	Poorly functioning oil palm seed system	Oil palm stands with non-hybrid plants give poor yields	Event ecology approach	Arrangements between buyers and sellers of seedlings	Reliable seed system	Formal seed system sometimes fails, informal seed system sometimes successful	Viable seed systems must engage formal and informal distribution networks
Osei-Amponsah (Ghana)	High levels of free fatty acids in artisanal palm oil	Obtaining access to high-value markets by improved processing	Participatory action research	Storage duration and fuel type	Organized arrangements and information flow	Processors start to experiment; Use of lorry tyres as fuel halted	Simple adjustments to processing techniques can increase palm oil quality and improve workers' health
Quarminé (Ghana)	Poor producer price stability for cocoa bean	Income, production, and market stability	Economic analysis	Installation of producer price review committees	Protection against fluctuating world market price	Producer price review committees improved prices	Flexible institutions can stabilize producer prices
Sidibé (Mali)	Lack of capital and solid institutions in shea chain	Income of local producers; Women's empowerment	Analysis of institutionalization	Institutionalization of new rules and practices	Management of sourcing and stocking	Obtaining working capital changed rules of the game	Working capital can enhance institutional innovation in value chains
Togbé (Benin)	Decline in cotton production	Revival of cotton sector	Policy arrangements approach	Reform of cotton sector	Trustworthy farmer cooperatives	Farmers returned to growing cotton and production increased	Mix of technological and institutional changes is needed for sustainable intensification

(Continued)

Table 1. Continued.

Focus, first author and country	QUESTION 1		QUESTION 2		QUESTION 3	QUESTION 4	
	Main constraint(s) identified	Relation to agricultural development	Research approach	Institutional determinants affecting change researched	Ultimate goal(s) of change	Main findings of study	Implications of findings for sustainable intensification
<i>Animals</i>							
Amankwah (Ghana)	Veterinary services not equally distributed	Decentralization and privatization of veterinary services	Qualitative survey; Focus group discussion; In-depth interviews	Monitoring of impact of reforms; Self-organization in response to reforms	Monitoring effects of decentralization and privatization	Irregular vaccinations; Unequal service delivery; Decline in control of drugs; Increase in moonlighting	Reduction of public services requires promotion of self-organization
Kpéra (Benin)	Competing claims on agro-pastoral dams	Optimizing ecological services	Comparative case studies using a framing perspective	Different framing and strategies	Developing institutional rules	Communication among stakeholders necessary to exchange experiences	Sharing strategies helps to cope with wildlife
<i>Resources</i>							
Totin (Benin)	Ineffective maintenance of irrigation system	Collaborative water management	Analysis based on social dilemma perspective	Improved maintenance of irrigation systems	Efficient institutional arrangements for water use	Diversity among producers enhances institutional change	Effective institutional arrangements allow better use of irrigation potential
Yemadje (Benin)	Uncertain land titling and rental agreements	Sustainable land management	Analysis of law court archives; Field plot surveys	Experimental land tenure programmes	Improved land tenure; Sustainable intensification	Land owners and tenants invest in soil fertility	Changing land tenure arrangements improves soil fertility management

discussion, and the reform's top-down approach limits problem-solving capacity, especially where actors' interests are conflictive. A mix of technological and institutional reforms might offer a better option for the future.

Amankwah *et al.* evaluate the recent policy of decentralization and privatization whereby authority and resources are transferred to local entities. They apply this analysis to the effect of policy reforms on the delivery and smallholders' use of veterinary services in two districts in northern Ghana. In these districts, settlements are scattered and animal husbandry is extensive. The authors use a framework that distinguishes allocative, cognitive, and normative institutions to analyse the effects on prevention of animal diseases, clinical services, provision of drugs, vaccines and other products, and human health protection. They show that the reforms entailed substantial cuts in financial and human resources. These cuts resulted in fragmentation of service supply, preferential service to some farmers, and non-adherence to the international protocol for livestock health reporting. The results also show self-organization to provide effective veterinary services delivery in a few communities; this suggests that the system might tend to a new equilibrium.

Kpéra *et al.* study how users of agro-pastoral dams in northern Benin frame the presence of crocodiles, the formal and informal rules for dealing with crocodiles, and the way institutional change could improve the peaceful co-existence of humans and crocodiles. They use a comparative case study design and adopt an interactional framing perspective. In some villages, dam users are discontent because they are hampered by crocodiles. Formal rules protecting crocodiles are framed as being incomplete because they ignore human livelihoods. Therefore, these formal rules were translated into informal rules that were more in line with the interests of humans. Stakeholders in another village were equally bothered by crocodiles but co-constructed informal rules that helped them to accept the crocodiles. These rules were based on the cultural belief that crocodiles are holy and thus should be respected. The authors suggest different ways of creating space for sustainable dam management allowing crocodiles and humans to live peacefully together.

Totin *et al.* investigate how farmers try to respond to rising rice prices while struggling with the degradation of collective irrigation infrastructures for rice production in inland valleys in Southern Benin. The devolution of responsibility for maintaining tertiary canals created an opportunity to study the factors that affect cooperation in canal maintenance. Using focus group interviews, surveys, and archival research, the authors employ a social dilemma perspective to compare three rice production areas that differed in their extent of cooperation. Crucial factors appeared to be (i) the balance between water demand and availability, (ii) the existence of inequities and privileged positions within the group, and (iii) the strength of group organization and the ability to sanction uncooperative behaviour. The existence of alternative sources of livelihood also influenced cooperation. Controversially, the largest and most diverse group of producers appeared best organized and equipped to engage in cooperation.

Yemadje *et al.* analyse land titling in the oil-palm-based cropping system on the Adja Plateau. A land-titling programme in this area (another 'natural experiment') provided the opportunity to analyse the relationships between titling and soil fertility management. *Titling* increased land security for landowners, whereas the introduction of *witnessed paper-based contracts* enhanced tenants' access to land and improved their security of tenure. Improved titling and more secure tenure reduced conflicts over land and opened opportunities for agricultural intensification. This change was associated with a shift from long-term oil-palm fallow to shorter-term land management practices. Tenants and landowners increasingly used crop rotations and mineral fertilizer to improve their land. The authors suggest that sustainable agricultural intensification requires institutional changes in both land ownership and rental agreements to access land, based on a mixture of customary and formal rules.

3. A comparative analysis

3.1. Study comparison

The focus of the studies was determined by a participatory process of defining the most relevant domains of study at the onset of the CoS-SIS programme (Struik *et al.* 2014) and the diagnostic studies carried out during the early phases of the nine PhD projects (Jiggins 2012). Below, Table 1 is discussed on the basis of the four questions posed in the introduction to this paper.

Question 1: Which constraints impeded sustainable intensification and what was their relation to agricultural development towards this end?

The studies deepened the analysis of issues impeding development towards sustainable intensification identified in the diagnostic studies (Röling *et al.* 2012). The individual diagnostic studies have been published in Jiggins (2012) and were based on a common methodology developed in the first Convergence of Sciences programme (Houkonnou *et al.* 2004). All crop studies included elements of institutional constraints, such as poor functioning of the oil-palm seed system or farmers' organizations, lack of information flow in the artisanal palm oil chain, lack of access to resources, and so forth. Most studies were inspired by constraints relating to either production, yield, quality, or commodity price. Two studies (the shea butter study in Mali and the palm oil study in Ghana) focused on the entire value chain, including sourcing, storage, processing, and marketing. The animal studies focused directly on institutions, i.e. how farmers handled the decentralization and privatization of veterinary services, or how they handled the presence of crocodiles in the multi-purpose agro-pastoral dams. The resource management studies are related to ineffective maintenance of irrigation systems or obstructing aspects of land-titling and rental agreements.

As the constraints identified were (at least partly) institutional, the relation to agricultural development was associated with mitigating the institutional obstructions, for example by developing profitable and sustainable markets (see studies on shea butter, cocoa, and palm oil), functional agricultural sectors (study on the cotton sector), functional systems to supply inputs (studies on oil-palm seedling production and maintenance of rice irrigation systems) and services (veterinary support to commercial small ruminant husbandry), or solving conflicts with regard to resources (competing claims on agro-pastoral dams and land titling). Other factors deemed to support sustainable agricultural intensification include the creation of: a more conducive environment to support agricultural development, such as the empowerment of women farmers or processors (the shea butter and palm oil studies); more diverse product chains (shea butter); market stability (cocoa); or collaboration in resource management (irrigation system management).

Question 2: Which research approaches were followed and on which institutional determinants did they focus?

The research approaches followed varied considerably because of the diversity of constraints investigated. This diversity allowed a broad and enriching array of research methodologies to be designed and developed to study the equally diverse mechanisms of institutional change.

The nine studies, however, all had in common that the methodology followed was, usually, a (comparative) case study methodology with a mix of qualitative and quantitative data collection methods, but with a direct linkage between the constraint identified and the research method developed. A clear example of the case study approach is the analysis of the competing claims on the agro-pastoral dams carried out in different villages in Benin (Kpéra *et al.* 2014). This example is also illustrative of the complexity of linking quantitative data (e.g. on crocodile numbers and damage per crocodile) with qualitative data (the perceptions of the village people on the danger the crocodiles caused).

Because of the diversity of the constraints however, the research approaches focused on an array of institutional determinants as well. Therefore, some approaches required intensive interaction with stakeholders, through joint learning exercises, interviews, or participation, such as the oil-palm cases in Ghana (Osei-Amponsah *et al.* 2014) and Benin (Akpo *et al.* 2014).

Five studies investigated the impact of institutional changes implemented by the different governments in the past, and how these affect the current space for innovation. These examples included the installation of producer price review committees in the cocoa sector, reform of the cotton sector, veterinary services reforms, experimental land tenure programmes, and the protection of crocodiles that threatened the use of agro-pastoral dams. Four studies explored options for new rules or arrangements, such as those regarding sourcing, stocking, and marketing shea butter, or more efficient institutional arrangements for water use, or better arrangements between buyers and sellers of oil-palm seedlings, and different processing procedures for palm oil.

Question 3: What were the ultimate objectives of the institutional innovation processes catalysed?

The changes required to alleviate the diagnosed institutional constraints were often very concrete, and some of the changes were already implemented before or during the course of the CoS-SIS programme. In several studies, the constraints were framed in such a way that the institutional experimentation that Van Huis *et al.* (2007) showed to be feasible actually became part of the research approach. This was possible through close collaboration with innovation platforms, known as *Concertation and Innovation Groups* (CIGs), which were facilitated by Research Associates (Nederlof and Pyburn 2012). Informative examples include the establishment of improved and efficient oversight of nurseries producing oil-palm seedlings, thus creating more reliable seed systems for a perennial crop, and a better organized flow of information within the palm oil chain. The nine studies often found that new institutions were needed to realize positive change: for example, the institutionalization of new rules and practices to make the sourcing, stocking, and trading of shea butter more efficient, and new workable institutions to improve the management of agro-pastoral dams or the maintenance of irrigation systems. These new institutions had in common that they needed to be transparent, suitable for the context, consistently interpreted, and reliably enforced. The health of labourers and processors was improved by using existing and traditional institutions successfully to create change: the moral authority of local chiefs was called upon to stop the use of lorry tyres as a fuel in artisanal palm oil processing. Changes also relate to abandoning some of the current rules of the game that were perceived to have a negative impact on the livelihoods of specific groups in society: there was a desire to abandon customary privileges, uncontrolled protection of crocodiles, current rules regarding land rental agreements, and so forth.

Question 4. What were the main findings regarding institutional change and the implications for sustainable intensification?

The Convergence of Sciences programme had already proved that it is possible to experiment purposefully with institutional conditions so as to remove smallholders' constraints and stretch their windows of opportunity (Van Huis *et al.* 2007, Struik *et al.* 2014). All nine studies in the CoS-SIS programme confirmed the CoS-SIS hypothesis that institutions are important determinants of change, and hence an enabling institutional context is necessary to achieve increases in agricultural production and improvements in the livelihoods of smallholder farmers in West Africa. The studies showed that it is important to consider current institutional arrangements and how these can be made more enabling, but also to assess how earlier institutional changes have worked out.

Some institutional changes assessed in the nine studies appeared to result in positive outcomes: cocoa prices were improved, although further stabilization measures were still needed; farmers did return to growing cotton; there was increased investment in soil fertility by

landowners and tenants when land tenure arrangements improved; and obtaining working capital changed the rules of the game in sourcing, stocking, and marketing shea butter, whereby not only the cooperative members profited, but also non-members and traders. Other studies clearly showed a negative impact of earlier institutional change: for example, cutting the veterinary services' budget caused mass vaccinations to become irregular, the service to be distributed unequally, the quality control of drugs to become poor, and moonlighting to increase.

The last column of [Table 1](#) provides for each study the main implications for sustainable intensification. In some studies, the implications for sustainable intensification were reflected in opportunities for improved seed system institutions and the formal arrangements within those systems, and in room for more flexible institutions to stabilize cocoa prices. In other studies, it became clear that a mix of institutional and technological changes was required, for example in the processing of palm oil and in the revival of the cotton sector. Further impact potential from supervised learning (in the sense used by [Richards et al. 2009](#)) and institutional change to improve the management of resources was proved in the studies on the management of rice irrigation systems and on land tenure arrangements. The value chain could be further optimized in the shea butter study in Mali. However, the veterinary services study showed that self-organization was required to cope with the cuts to the public services, and the agro-pastoral dams study showed that communication among communities with different approaches to the same problem might help to develop better coping strategies.

3.2. Country comparison

As the nine studies showed, the institutional context is strongly influenced and permanently re-shaped by environmental, socio-political, cultural, and historical backdrops. These backdrops have developed over time in the agrarian, rural societies of the three countries involved, Benin, Ghana, and Mali, and are, therefore, very diverse. The three countries are situated in different agro-ecological zones, i.e. they differ in soil, landform, agro-ecosystems, climatic conditions, and their vulnerability to global change. Moreover, the specific social, cultural, and historical characteristics of these countries have shaped their policies and, therefore, also the institutional changes described in these nine studies as, inevitably, these changes are context dependent.

[Pardey et al. \(1995, p. 5\)](#), for example, stated that the 'africanisation of agricultural research occurred more slowly in Francophone Africa than in Anglophone Africa'. This difference is associated with the differences in policies of the former colonizing powers: the UK ceded the research institutes in their colonies to the local governments; France, on the contrary, kept control over its research stations in Africa much longer and therefore dictated the research agenda much longer ([Nederlof 2006](#)). The institutes conduct the lion's share of agricultural, applied research. Therefore, these policies had a long-term impact on the development of knowledge institutions in the young countries, for example by affecting the extent to which the research system stayed focused on large-scale agriculture.

In Benin, the policy style relating to the institutional changes researched was very much top down, as illustrated in the efforts to stimulate the oil-palm industry ([Akpo et al. 2014](#)), to reform the cotton sector ([Togbé et al. 2014](#)), and to re-organize the management of rice irrigation systems ([Totin et al. 2014](#)). These political and institutional changes were embedded in the centralized and planned economy of the social regime that lasted until 1990 and in the Gallic culture of this former French colony. For example, the farmers' platforms in the Convergence of Sciences programme and the CIGs were much more rigidly and formally organized in Benin than in Ghana (authors' personal observations).

In Ghana, however, the institutional context was determined by the political wish to establish institutional price-setting mechanisms for export products ([Quarminé et al. 2014](#)), to create

structural reforms in agriculture through decentralization and privatization of services (Amankwah *et al.* 2014), and to enhance access to market segments by demanding improved quality (Osei-Amponsah *et al.* 2014), i.e. the context was economic libertarianism. These changes occurred in a relatively open society, characterized by a strong impact of religion on daily life, and shaped by its past as a British colony. For example, the diagnostic studies in the different phases of the programme were less strongly orchestrated by the local supervisors, with more space for individual approaches, in Ghana than in Benin (see also Nederlof 2006).

In Mali, a country with a very young academic tradition and only recently involved in the Convergence of Sciences programme with a relatively small team, the programme was not yet as firmly anchored in the academic institutional reality and in farmer networks as was the case in Benin and Ghana. The institutional change investigated was very much influenced by the efforts of the Ministry of Rural Development to diversify income sources by enhancing opportunities in a well-defined sector: the shea butter industry, dominated by women. The impact of creating credit opportunities was large: it changed the rules of the game, not only for the women processors but also for the traders.

4. Implications for future research and policy

We can identify some main theoretical and practical implications derived from the set of findings reported on in the studies in this special issue. First of all, unravelling the institutional determinants that hinder agricultural innovation (following Hall *et al.* 2001, Hounkonnou *et al.* 2012) can help identify and diagnose institutional constraints. These can then provide clear entry points for reforming those institutions and for uncovering the specific stakeholder interfaces at which work is needed (in line with earlier work of, e.g. Roep *et al.* 2003, Klerkx *et al.* 2010). This can help to change different unfavourable aspects of the agricultural systems which hinder progress from being made by the diverse stakeholders involved, including the smallholder farmers. Moreover, it can help identify key actors who can advance and enhance change, such as the chiefs in Ghana using their moral authority to ban tyres as fuel for processing palm oil (Osei-Amponsah *et al.* 2014). The studies have shown that there is value in unravelling institutional issues with an immediate, short-term effect on the innovation challenge at hand locally. However, it is also very worthwhile to look at historical institutional changes over the past decades and their desired and undesired effects. Historical changes, in particular, can offer valuable lessons for future interventions and help avoid past errors. Moreover, global changes in the institutional environment will become increasingly important. Hence, more research is needed into the role of institutional change in agricultural development and into systems approaches to facilitate change and ensure a positive impact.

In the CoS-SIS programme, it was found that carrying out such research is not a simple task: it requires a diverse set of skills and is demanding on the researchers and on the stakeholders involved in the research process. Moreover, trajectories of institutional change are – almost by default – complex, non-linear and case-specific, certainly in Africa where agro-ecosystems are so diverse and where socio-technical and socio-cultural factors are so dominant in innovation processes (Teeken *et al.* 2012, Nuijten *et al.* 2013, Triomphe *et al.* 2013). We, therefore, need to continue to invest in trans-disciplinary forms of action research, with the researcher in the role of knowledge broker (Kristjanson *et al.* 2009, Turnhout *et al.* 2013, Schut *et al.* 2014). Such research should aim at designing practical pathways towards sustainable intensification of agriculture based on coherent social and technological innovation (Röling *et al.* 2012, Stür *et al.* 2013). Sustainable intensification will be successful when it has created strong local food systems, able not only to feed the rapidly growing urban masses, independent of food imports, or food aid, but also

to provide a reasonable income to the rural populations, independent of fluctuating world market prices of food products.

In order to reach that stage, there is still a lot of ground to cover. The agricultural research community needs to find practical answers to several complex questions, such as:

1. How can lasting change be catalysed in an agro-ecological setting and an institutional environment that is highly complex?
2. How can we use the lessons learned about institutional innovation to make local agro-ecosystems resilient and suitable for sustainable intensification?
3. How can sustainable agricultural intensification be orchestrated in such a way that it improves the livelihoods of all the rural poor?
4. How can we design and implement agricultural policies that protect smallholder farmers against the threats and uncertainties associated with globalization of markets?

The existing variation in institutional context calls for tailor-made approaches along the practical pathway towards sustainable intensification of agriculture and self-supportive local food systems. An important lesson for policy-makers is thus that a good understanding of these variations in institutional context must be acquired in order to inform the appropriate interventions, instead of focusing on ‘one-size-fits-all’ solutions. Policy-makers should allow space for different ways of institutional experimentation. Action research (and related to that, innovation platforms – see Kilelu *et al.* 2013) needs a degree of flexibility to be able to respond to specific situations and uncertainties, emergent outcomes, and windows of opportunity in innovation processes. These cannot be fully planned *ex ante*.

5. Widening the circle by building on the achievements of CoS-SIS

The authors hope that CoS-SIS has inspired researchers and farmers involved in the programme, case stakeholders, and readers of this special issue by showing that it is possible – through the appropriate research approach and the link with the CIGs – to engage actors, administrators, policy-makers, and decision-makers who are in the position to influence policies and change institutions. CoS-SIS did so in well-defined domains, and this helped to strengthen the ability of the PhD candidates and the Research Associates involved in the programme to suggest clear avenues for policy change or progress. On the basis of the findings of the PhD projects reported in this special issue, as well as through the work of the Research Associates who acted as CIG facilitators, CoS-SIS also tried to initiate policy and practice changes. The CIGs are briefly outlined in the introductory paper (Struik *et al.* 2014). They were closely linked to the PhD studies, but were not part of the activities of the PhD students and therefore their activities are not reported in detail in this special issue. Through these CIGs, CoS-SIS tried to engage *change agents* acting as institutional entrepreneurs (Farla *et al.* 2012) or champions of innovation (Klerkx *et al.* 2013). At the same time, CoS-SIS encouraged *interventions* where needed, for example by bringing together the different sub-systems of actors in the complex systems that characterize African smallholder agriculture (Hall and Clark 2010). CoS-SIS has experimented with and trained academics in such approaches. However, more work is needed to be able to ascertain reliably for each institutional change what is needed in terms of pre-requisites, conditions, and incentives to make change happen. The cross-country comparison has already suggested that change is context-specific.

A general challenge for the CoS-SIS programme (and similar programmes) is that institutional changes take time. Experimenting with such changes – let alone the implementation of these changes and the evaluation of their impact – is usually difficult within the time horizon of a PhD study or of the programme as a whole. This is also the reason why the CoS-SIS Research

Associates set up the CIGs. If farmers and other stakeholders realize their added value, these groups might persist beyond the duration of the programme, but at the time of writing it is too early to tell whether or not that will be the case. Thus, perhaps most importantly in terms of enduring *innovation capacity* (cf., Hall 2005), the PhDs who have now graduated, and the Research Associates who facilitated the CIGs, have acquired relevant *change capacities*, i.e. have developed the skills needed to identify the need and potential for change and make continuous change happen by creating the necessary institutional space.

Creating the required impact of change through institutional innovation and sustained innovation capacity requires widening the circle: the community that is actively involved in (learning about) creating institutional change should contain not only researchers and farmers, but also extensionists, administrators, decision- and policy-makers, and even scientists and professionals active in cognate fields, all of whom also require some sort of innovation capacity. The set of examples provided in this special issue is also meant to encourage donors to re-think the strategies of their aid programmes and reconsider the way they manage these programmes. Diversity in innovation strategies is a strength, experimentation with change processes is needed. Similarly, we encourage government departments in their corresponding work to continue experimenting with institutional change.

The set of examples may also be useful as teaching material for students in various disciplines, including development and business studies. We thus hope that some of the approaches developed in CoS-SIS can support behavioural change, speed up progress towards the sustainability of African agriculture, and be institutionalized and further elaborated in teaching programmes of secondary and tertiary education institutions.

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