NJAS - Wageningen Journal of Life Sciences 60–63 (2012) 115–121

Contents lists available at SciVerse ScienceDirect

NJAS - Wageningen Journal of Life Sciences

journal homepage: www.elsevier.com/locate/njas

Diagnostic research in support of innovation

J. Jiggins

Communication and Innovation Studies Group, Wageningen University, P.O. Box 8130, NL-6700 EW Wageningen, The Netherlands

ARTICLE INFO

Article history:
Received 30 September 2011
Accepted 23 June 2012
Available online 27 July 2012

Keywords:
Action research
Diagnostic study
Socio-technical novelty
Institutional change

ABSTRACT

This paper analyses the diagnostic studies of this special issue to underline their function in probing the opportunity for transformational change and the potential of socio-technical novelties in such processes of change. The studies document the ability of poor, illiterate farmers to create novelties, and, sometimes, to develop the institutional and informational capacities needed to support and disseminate the novelties. The studies also show that it is not easy for farmers to *change* 'the rules of the game' that are encoded in routine practices, the relationships amongst organizations, normative behaviours, informal or formal regulations, bylaws and so on. The general methodologies of the studies documented in this special issue are discussed and their potential, strengths and weaknesses are indicated. The studies might not have yielded significant policy lessons but they have provided well-grounded insights into processes of sense-making, contextually relevant criteria for and processes of assessment, and into the initiation of change. They have developed sufficient initial understanding for building and informing institutional innovation. How successful (or not) that process has been will be analysed in later reports from the CoS-SIS programme.

1. Introduction: the diagnostic metaphor in innovation in practice and research

Diagnosis refers to the ancient practice of determining the nature of a disease, malfunction or disorder; the identification of symptoms is the key process in the analysis, from which causation is inferred. The emphasis in medical practice is placed on 'what is wrong'. The diagnosis of systemic failures has been common in development studies, giving rise to a wide variety of prescriptive remedies. Where the treatment has appeared to produce improvement or cure, success has been claimed for the treatment, although the pathways between intervention and outcome often were left un-described in such studies. The 'diagnostic study' as an approach to probing the opportunity for transformational change, and of the potential of socio-technical novelties in such processes, is of more recent origin and derives from diverse fields of knowledge. These include studies of entrepreneurship, and policy discussion of whether entrepreneurial ability can be developed through appropriate interventions.

The work of researchers such as Anil Gupta or Robert Chambers have documented the ability of even poor, illiterate farmers to create novelty, and sometimes also to develop the institutional and informational capacities needed to support and spread their novelties at and beyond local level. In this set of papers, too, farmer-developed novelties are recorded. However, what is noteworthy is that in the process of revealing such novelties, the studies come to probe deeper questions. Yemadje et al., for instance, report farmers' role in developing a system of oil palm fallow on the Adja plateau, Benin, under population pressure. The study raises the question of whether the system has become an arena for resolving or intensifying competing claims on land. Tenure issues are involved and the issue of the balance of power between those who own land (in a practical and not necessarily legal sense) and those who borrow land cannot be avoided. This leads to the realization that an analysis based on the social category 'farmers' may be unhelpful because the category bundles together heterogeneous interests that are better disentangled. Other authors in this issue make similar efforts to disaggregate who in fact is doing what in the situation examined. Amankwah et al., for instance, distinguish the novelties developed by 'positive deviants' in the small ruminant sector in northern Ghana; Doumbia et al. analyse the development of dairying by particular farmers and an entrepreneur, in defiance of the prevailing 'rules of the game' set by the Office du Niger, Mali.

However, evidence is much scarcer that farmers alone are able to *change* 'the rules of the game' that are encoded in routine practices, the relationships amongst organizations, normative behaviours, informal or formal regulations, bylaws and so on. The dominant 'rules of the game' tend to be set and maintained at other levels of governance than the local, and by other actors, who may overtly

E-mail address: janice.jiggins@inter.nl.net

1573-5214/$ – see front matter © 2012 Royal Netherlands Society for Agricultural Sciences. Published by Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.njas.2012.06.008

act in their own rather than farmers' interests. Moreover, in any one locality the assemblage of institutions may be made up of discordant elements that are the outcome of the accidents of history rather than design, an assemblage that no single actor commands or understands in its entirety. This set of diagnostic studies represents a first step in building an analysis and shared understanding of 'what is wrong' in the assemblage. CoS-SIS' intention is that the diagnoses help to identify novel products, technologies, and practices but also behaviours, relationships, rules, norms and other features of the institutional landscape, that would offer stakeholders a potential for positive change. In framing the studies in this fashion, a number of methodological issues arise that we consider further below.

The studies in addition offer empirical information related to mid-range theories about innovation processes. They thereby contribute to three strands of practice and research. For practitioners, they offer insights into how an appropriate institutional understanding can be developed of a given socio-technical problem in a specific context [1]. Secondly, they address preliminary 'what' and 'how' questions that arise in relation to the development of novelties in local processes of system innovation [2]. Thirdly, they contribute to the stream of studies that are feeding the 'new analytics' [3] of governance. This paper reflects further towards the end of this paper on these three substantive issues.

The issues addressed are not, strictly speaking, new. They were articulated in the 1970s as fundamental and pressing agricultural development concerns by, amongst others, Uma Lele and her team at John Hopkins University, Baltimore, USA, and later in the World Bank [4], ORSTOM, Paris, and its colleagues throughout francophone Africa [5], and by the Agricultural Administration Unit's worldwide network of university- and field-based researchers, development administrators, policy-makers and practitioners (based at the Overseas Development Institute, London) [6–8]. The expertise and understanding vested in the then dominant centres of power to command the development discourse, of how governance, technologies and institutions actually work in specific contexts and in fine detail, have faded with the passing of the first generations of those intimately involved in the late colonial and post-colonial development experiences. More recent discourses, based on assumptions of market-led or market-mediated economic growth and development trajectories, have focused attention on aggregated economic prescriptions for the development of agriculture and food systems and agro-ecosystem management. Local and national institutions' functions and their actual functioning in a particular context, in these narratives are occluded because they are assumed to converge over time under compelling market imperatives. Furthermore, because in competitive markets it is often technical and product innovation that give enterprises an edge, over the last decade the discourse has narrowed consideration of managed change and induced innovation still further, to a focus on issues of profit-driven technology and product development, promotion and market share, and associated organizational changes. Innovation, in this perspective, is the outcome of entrepreneurial creativity, drawing on the purposeful organization of systems of support and information flows within and between private commercial, business and public actors.

However, countervailing processes, such as (the growing) consumer preference for products with traceable non-market qualities (such as health benefits, food safety, the social well-being of producers, environmental sustainability), as well as persistent poverty, increasing malnutrition, observed and forecast climate change impacts on agro-ecosystems, adverse natural resource trends and intensifying competition for these resources, are challenging numerous communities of research and practice to question again the inter-relations amongst institutions and their context [9]. By examining once more the potential for system innovation by means of purposeful institutional innovation in particular socio-technical contexts, a wider range of stakeholders is brought into view. The study of innovation as constituted in multi-dimensional relational processes reveals the possibility of multiple viable entry points and pathways for purposeful change. In particular, the institutions in which existing relationships are encoded and normalized, present themselves as gaps, constraints to and opportunities for change.

2. Methodological issues

2.1. Boundary decisions

The scope and focus of the diagnostic studies were derived from pre-analytic choices made at national level and through priority-setting by local stakeholders (Introduction, this issue). Those interested in studying processes of change, and in intervening in those processes through the way in which research is conducted, acknowledge the importance of positioning 'boundary-setting' as a conscious choice that helps to make a 'messy problem' tractable [10]. There is no objective way to judge if the choices made are 'right' or 'wrong'; what is important is that key stakeholders are brought together in a process in which they themselves assume joint responsibility for the choices made. Diagnosis of a situation of interest can itself serve as a step in the process of bringing diverse actors together to consider and deal with the set of inter-relationships constituted in multi-layered institutions encoded and embedded for instance in the political rules of the game, local practices and also biophysical states and flows. Osei-Amponsah's diagnosis focusing on the quality of palm oil produced by local processors and Quarmine's diagnosis of the cocoa sector, or Akpo's of the oil palm seed system, bring these constitutive arrangements clearly into focus as the actors seek to develop novelties in products, bylaws, regulatory norms, practices and local organizational arrangements, and thereby to find or create the institutional spaces for change across their respective domains.

What binds such elements together is people's experience of the situation, around which interactions are organized in a social space or, following Foucault [11], a *dispositif*. Yemadje's diagnosis of the socio-technical *dispositif* constituted by tenure arrangements, or Totin's analysis of the inter-relationships between socio-technical novelties and institutions in water management, suggest that the drawing together of the actors in order to improve a situation that is perceived by the stakeholders themselves as problematic is not necessarily a process that spontaneously arises. This observation in the past has led to the characterization of rural societies as locked into tradition, inert, fatalistic or resistant to change. The evidence and analysis of CoS I, and numerous other studies over the last five or more decades, is that rural societies, and individuals within them, are as alert and eager for change as anyone else when opportunities are accessible, profitable, and realizable. What makes the difference, then? It is the hypothesis of CoS-SIS that purposeful effort is needed to change in particular the institutional constraints that restrain opportunity for small scale producers, a hypothesis that we pursue in the next paragraph.

Sidibé's paper suggests that the techno-organizational interventions described – that were designed to promote innovation in the sheanut sector of Mali – can be said to be 'successful' only if diagnostic and practice boundaries are narrowly drawn. The innovations that occurred may be said to have created longer term and higher scale difficulties in so far as they appear to have locked the innovation and innovators into export-oriented market niches that offer only limited prospects of wide access to the opportunity, or for effective co-ordination along the value chain, or for buoyant market growth. Togbé et al., with respect to the cotton sector in Benin, and Totin et al., with respect to the inter-relation between

arrangements for managing rice and water in Benin, similarly provide evidence of 'institutional traps' that limit the power of proven novelties to effect wider change, institutions that are held in place by the prevailing pattern of interactions at and between multiple levels. The weight of the evidence in the papers in this issue indicate that, without a change in relationships among key actors, socio-technical innovation at the farm level will continue to be constrained. The contribution by Osei-Amponsah et al. explicitly draws attention to the fact that key actors have not been included in the dominant socio-technical arrangements impacting palm oil quality in Ghana. In consequence of their diagnosis, in this study the design of their innovation pathway has begun with the creation of more effective relationships amongst a wider set of stakeholders.

By widening the boundaries of analysis to include institutions and the interactions among socio-technical and organizational arrangements at and between multiple levels, this set of papers demonstrates that there exist in each context several viable pathways for innovation, even – as Amankwah et al. insist – under homogeneous farming system conditions. The (potential) existence of 'multiple pathways' raises the issue of whom, then, has power to govern the choices that are actually made among pathways, an issue to which we return towards the end of this paper.

We further see evidence in these papers of the effort it has taken each of the researchers, most of whom were trained in the agricultural sciences, to widen their disciplinary boundaries, to encompass and interpret 'the social', and specifically 'the institutional' into their thinking about technology, and into their researching practice. The initial scoping studies [12] led by the post-doc research associates provided for most of the research team the first indications of the difficulties this poses, as the researcher moves from the laboratory and experimental field, a world that the researcher more or less controls, into a world full of surprises. This is the first indication that 'purposeful change' is not a matter of social engineering but of design of processes that allow for learning, adaptation, and experiment.

There is, moreover, another balancing act to perform. The 'field of study' here presents itself as constructed by others' experience of reality. At the same time, the 'research object' – such as an enterprise, value chain or commodity sector examined in each of these diagnostic studies – becomes naturalized within the frame of reference of the researcher, thus once again, to an extent isolating the researcher from the totality of others' experience. The identification and characterization of 'research objects' that cannot be manipulated or measured under the disciplines of experiment, places great weight on the accuracy of observation, in a richly described context. A diagnostic study thus is a compromise; it preserves a separation between the researcher and the researched but the boundary acquires what Hatchuel has called a 'degree of porosity' [13], a boundary that the researcher has to negotiate continually.

The challenges are compounded as the researcher positions him- or herself in the position of someone who, through their researching practice, 'intervenes' in the processes that are observed, thereby helping to transform the context or the processes observed. This raises profound questions of knowledge production, to which we return below.

2.2. Cases as evidence of what?

Current interest in the gold standard of policy research has tended to displace former interest in case studies that, by means of cross-case comparison through time or space, might serve to test policy, practical interventions, or theory. The gold standard has two (sometimes merged) design features: before/after, with/without analysis of matching cases; randomized assignment of 'treatments' (where the designed intervention is regarded as a treatment) and, where sufficient numbers of such studies allow, meta-analysis of the entire data set. CoS-SIS has chosen not to construct a research pathway based on matching cross-case comparisons but also not on statistical analysis of randomized treatments. The programme argues for a middle way appropriate to the study of 'situated experiences embedded in specific histories and responding to the particularities of framing conditions that were themselves evolving throughout the period of research' [14]. It follows that the notion that a set of diagnostic studies such as these are merely anecdotes without collective explanatory power is rejected a priori. Of what, though, might they claim to provide evidence?

There are two dimensions of innovation for which these studies provide explanatory evidence. One has to do with innovation as a 'process', the other with intervention research as a form of knowledge management and learning that is constitutive of action [13]; we address the latter in Section 2.3. Innovation in our view is not an event but a process and as such requires a research methodology that can track the process over time and space. In this perspective the diagnostic studies are but a step along a methodological pathway (further elaborated in [1]). Hoholm and Araujo [15] review the promises and challenges of research that seek to understand the mechanisms and dynamics of how innovations emerge, unfold and become institutionalized. They argue for concentration on observable practices and actions in actual rather than assumed contexts while cautioning that analysis of multi-actor perspectives need to be informed by observation of the interplay among perspectives in situated actions and practices. Togbé, Doumbia and Kpéra provide evidence of the power of such a focus.

Hoholm and Araujo [15] also warn that a presumption that system innovation is necessarily a multi-level affair settles too many issues in advance of observation. All the papers in this issue attempt a preliminary sorting of the level or scale of inter-relationships that either open the space for or constrain the novelties they describe. In each paper's construction of institutional hierarchies, where the determining influences on or drivers of change might lie is revealed as highly diverse – an important insight for those who seek simplifying and universalizing prescriptions that ignore the bricolage of institutions described in Yemadje's paper, or who see innovation as an isomorphic process in a rationally ordered world.

2.3. Intervention research as a knowledge production model

Hatchuel [13], speaking of collective action, makes an important distinction: 'intervention research is not a means of producing knowledge for action but is rather a constitutive process of action'. This set of studies straddles this distinction, with Doumbia et al.'s and Amankwah et al.'s contributions lying more towards the 'production of knowledge for action' end of the spectrum, and Osei-Amponsah et al.'s and Quarmine et al.'s contributions being more clearly a 'constitutive process of action'.

This set of papers does not aim to develop a theory of collective action but numerous instances of collective actions are described. The study of collective action (amongst other points of interest) directs attention to how, specifically, in the instance observed, a technique is coupled to efficiency, under criteria of efficiency that make sense to those using, or proposing to use that technique. The studies in this issue provide rich insight into the experiences by which such efficiency criteria are formed. Quarmine et al. point for instance to the specific issues that arise in this regard when access to information is asymmetrical, and suggest how such asymmetry might be overcome by bringing about changes in the relationships among the stakeholders. The papers also highlight the challenges involved in bringing diverse actors' appreciation of the efficiency criteria that matter into a common frame that can be used both to design innovation processes and assess progress.

The preliminary diagnoses (that are intended by the CoS-SIS programme to feed into innovation processes) taken as a whole

further reveal the beginnings of collective effort to construct and reconstruct knowledge and relations that both organize and represent the actors' positions and interdependency [14]. Kpéra's 'rich description' of stakeholders' perceptions of their own and others' interests open up to a perceptive analysis of existing 'pathological' inter-dependencies but also of the potential for the collective design of arrangements that might offer greater mutual satisfaction, based on the co-construction of knowledge. We refer here also to Snowden [16] and to Blackmore et al. [17], who suggest that the link between diagnosis, action, and knowledge management is a matter of 'probing the space' for purposeful change through systematic enquiry in a researching process that involves the practitioners in shared reflection. The CoS-SIS researchers were engaged to a varying degree, at the time the work reported here was undertaken, as stakeholders in this kind of process. For instance, Akpo et al., as a matter of building stakeholders' trust in the researchers' practice, report the organization of 'shared reflection' as one of the very first steps taken. Others, too, have sought to involve the stakeholders in the co-production of knowledge and shared reflection, at varying points in the processes described. Overall, the diagnostic studies reveal that while the sciences are a necessary component in knowledge production they are not a sufficient social practice if the purpose is socio-technical innovation.

3. What we learn from the content and the issues that arise

We now attempt to draw out what might be learned from the content, organized under the three themes outlined in the introduction, that lie close to the heart of innovation practices and studies.

The concept of innovation directs attention to the purpose for which change is desired and towards the actions taken to bring this about i.e., toward sense-making among the actors involved. Sense-making can take many forms, including building shared conceptual frameworks, developing or enforcing norms of behaviour, jointly analysing the messy situation or problem at stake, and determining purposeful actions for change. Attention is directed also towards the criteria by which technical, managerial or organizational novelties are assessed, and how these are assessed 'in action' (rather than 'in the abstract' against disciplinary criteria). A related question in the complex social situations described (which are quite distinct from the bounded enterprises in which innovation studies frequently are conducted), where the actors bring to bear long historical memories and fine socio-cultural sensitivities, is who initiates the process of purposeful change, for which reasons.

3.1. Sense-making

The issues analysed in the diagnostic studies are not new and, as in the oil palm seed system analysed by Akpo et al., they have been recognized both by researchers and the stakeholders for a long time. However, the diagnostic studies not only document the issues: they draw the contours of the institutional arrangements that allow the problem or mess to persist, provide evidence to the stakeholders of the seriousness of the effects and consequences and, importantly, indicate ways forward that are grounded in the stakeholders' own perceptions, interests and, in most of the cases presented here, also in their willingness to engage in effort to transform the situation for mutual benefit. We note in addition that although the emphasis in most of the studies is on opening the institutional space for novelties to break out of their niche to effect larger scale change in the institutional regime, Amankwah et al. raise the question of when and where 'copying' the discoveries of positive deviants, based on building capacity and incentives for farmer-to-farmer learning, might be the more effective strategy.

The analyses explicitly build on the perspectives of the smallholder farmers, processors or pastoralists involved. They point to the lack of effective organizations to represent and defend the interests of local users of social, technical and natural resources *vis-a-vis* others in a hierarchy of institutionalized relationships. Bannerjee and Duflo [18] are among the many scholars who provide evidence of how assumptions about the opinions and preferences of smallholders cause aid programmes to fail. Conventional wisdom, formed and circulated among those far from the field, is shown to be a bad advisor. However, we do not conclude therefore that smallholders are right or that their views and experiences necessarily must prevail above all others'. We do insist that by revealing that they, as all other actors, have reasons for doing what they are doing, smallholders must be taken seriously as knowledgeable agents of innovation.

Two related issues can be considered. The first is that many complex issues cannot be 'solved' on the basis of expertise alone but will be resolved (if at all) by the stakeholders – who enter into multi-stakeholder processes with partial and divergent views on the issues that concern them. In such situations, the development of mutual understanding of the diversity of views and interests and of the inter-dependency amongst interests, is of crucial importance, and a necessary concomitant of any decision by the stakeholders to act in concert to bring about change. The second is that 'diversity trumps expertise every time' [19] when messy situations are the focus of concern. Laboratory experiments show that groups composed of diverse actors take better decisions with respect to such situations than those homogeneously composed of experts. Agricultural scientists concerned by the lack of uptake of technological solutions to problems around which neat boundaries have been drawn, need to consider if they have not, in fact, made a categorical error in the classification of 'the nature of the problem'. No technology will 'solve' the competing claims, and the conflicts that arise from these, documented by Kpéra et al., although, as the authors point out, rigorously grounded technologies and scientific information will be needed to inform the collective processes of conflict resolution and change on which the stakeholders may have embarked.

3.2. Criteria for and processes of assessment

The development of criteria for the assessment of novelty, and their application, are identified in these studies as crucial elements in the opening up the space for innovation. Sidibé et al., Osei-Amponsah et al., Totin et al., and Quarmine et al., for instance, describe in detail how product quality (respectively, shea butter, crude palm oil, rice and cocoa beans) determines access to markets and how improvement of quality drives the opportunity for innovation. The papers to this issue further show how quality is related to the nature of institutions, and that technical improvements in quality are dependent upon concomitant institutional changes.

It is not enough to develop quality criteria that match the perceptions and uses of the stakeholders (including here experts and researchers as stakeholders). The criteria need to be applied in assessment procedures that are considered fair and that can be applied and (formally or informally) regulated. These are primarily institutional issues. Sidibé, Doumbia, Akpo, Totin, Quarmine, Yemadje and Togbé (and their co-authors) in particular draw attention to the issues of trustworthiness that arise if, for instance, the (formal or informal) criteria and norms are unclear, or are arbitrarily enforced. They document the destructive consequences, both for smallholders and the sector as a whole, where misappropriation and cheating by one or more key actor is not constrained by the existing institutional provisions. The papers taken together offer a range of institutional options for building trust and

transparency in quality criteria along emergent value chains, including formal certification, changing the regulatory agent, and peer pressure.

3.3. The initiation of change

It is one thing to desire change, or to have an idea that might prove transformative, it is quite another thing to develop a novelty – whether in technique, organization, or management – and even more, to sustain a proven novelty within a 'niche' (where niche is defined as a localized and only partly stabilized institutional space in which the novelty is practised). By re-defining the boundaries of a messy situation, developing detailed knowledge of the situation, mapping the networks of stakeholders involved and identifying constraints and opportunities, a researcher becomes implicated in the process of developing the novelty and the institutional niche in which it has been developed. In so far as the diagnostic studies have provided essential knowledge to the actors, rendered manageable what has appeared intractable, and increased the salience of the issues at stake, they may be said to have become co-producers of knowledge for innovation.

The studies are not a collection of scholarly exercises conducted in isolation from each other and the programme's espoused purpose. Nor are they the definitive 'last word' on the situations described – contexts are always in a state of flux in the interaction of endogenous and exogenous forces of change. However, because the diagnostic studies were carried out early in the life-cycle of the programme it is not possible to point here to the impact they might have had in terms of fostering innovation. We can report that in all cases, in a variety of forums, the studies have been shared with, discussed and used by the stakeholders in each domain, have informed the subsequent action taken by the PhD and the post-doc researchers and, notably, by the Concertation and Innovation Groups (CIGs) (multi-stakeholder innovation platforms) – the main institutional innovation offered through the programme itself. This process of 'research into use' points to a feature of the studies that requires further brief mention i.e., that they have been conceived and executed as part of the action research activity of the CIGs.

4. The 'new analytics' and issues of governance

This set of studies strengthens the view that the universalizing trend of recent decades in terms of economic policy prescriptions for 'development' is unrealistic (leading in practice to frustration and real harm) and ahistorical (leading to inconclusive debate about unrealizable policy measures and ill-considered allocation of blame for failure). Grindle [3] identifies a countervailing trend in the governance of development towards a 'common theme of situationally determined responses to specific problems'. Knowledge of the context in this view is central to the purpose of designing interventions appropriate 'to time, place, historical experience, and local capacity'. Grindle emphasizes that, from this perspective, 'informal institutions are as important as formal rules of the game in figuring out where to go next and how to get there'. The body of scholarship she draws upon has been labelled 'the new analytics' – precisely the kind of diagnostic studies presented in this issue that aim to arrive at 'localized and informed solutions to specific constraints and needs'.

The work of Grindle and others point to the need to critically assess the extent to which this body of work indeed leads to such solutions, identifies which constraints can be released through innovation and which not, highlights persistent and common institutional barriers and the opportunities for transforming these through local, national or international policy, and the role of situated knowledge production constituted in action in effectuating change. She poses the following questions for programmes such as CoS-SIS:

- If the lessons of specific cases cannot be transferred as universal best practice, what can be learned from the individual cases?
- Does the diagnostic study, and subsequent multi-actor learning processes set in train by CoS-SIS help reduce the information requirements needed to effectuate the kinds of reforms demanded under universalized policy prescriptions?
- Is the researching practice developed through studies such as these 'user-friendly' enough to be more widely taught and adopted?
- Can the researching practice and findings be appropriated into the development of theory (such as theories of action and of knowledge production)?
- Can we identify the analytic processes that matter in innovation?

As the CoS-SIS programme matures, the answers to these and related questions are beginning to emerge and will be published over the next three years; this issue provides snapshots of the 'state of the art' at the very beginning of the critical scholarship needed. The members of the CIGs currently are facilitated by the post-doc researchers to negotiate, commission or undertake institutional experiments that are enabling them to learn how to remove institutional blockages and create opportunity for innovation through institutional change, and thereby sustain or advance their co-dependent interests.

We here add one further point. When it comes to diagnosis of opportunity for innovation it is necessary to consider criteria other than the rigour or representativeness of the studies. Zellick et al. [20] look at a range of sources of risk around evidence in these kinds of study and offer eight attributes of analytic rigour: hypothesis exploration (exploring multiple explanations of the data), information search (depth and breadth), information validation (checking and corroborating), stance analysis (source of data, positioned within a richly described context), sensitivity analysis (authors understanding their own assumptions and limitations of their analysis), specialist collaboration (inclusion of perspectives of domain experts), information synthesis (beyond listing data), and explanation critique (collaboration to incorporate different perspectives on the primary hypotheses). We suggest that more explicit attention to these criteria would help build confidence in the research pathway adopted by the CoS-SIS programme.

5. Additional work to be done

In the CoS-SIS programme vision, diagnostic studies are intended to develop sufficient initial understanding for building and informing the creation of institutional innovation i.e., the platforms of stakeholders, inserted at varying levels in each domain of interest. The neat sequencing of this logic is called into question by the timing of activity that actually occurred in each domain [21] and merits further examination when the CoS-SIS trajectory is completed at end-2013.

The major constraints and causal relationships identified in the diagnostic studies are summarized in Table 1. Based on the evidence of CoS I, the CoS-SIS programme took as its starting point that 'institutions' have the power to open or constrain the space for innovation and the kinds of innovation processes and pathways that can be pursued. Table 1 indicates that the assumption is well-founded. We must await publication of the results of the institutional experimentation that has flowed from the diagnostic studies as the programme matures, to test this proposition further.

Table 1
Summary of the major institutional constraints diagnosed, and causal relationships sustaining these.

Name of main researcher	Major constraints diagnosed	Main causal relationships sustaining the constraints
Akpo	Poorly organized and regulated access to the improved planting material (hybrids) Impossibility of distinguishing origin of seedlings by visual inspection (issues of trust between seedling sellers and buyers)	Seed distribution system
Amankwah	Socio-technical disincentives to producing small ruminants for the market	Incentive structures, relationships and rules governing access to veterinary services and to supplementary feeding and water
Doumbia	Socio-technical disincentives to uptake of improved dairy production practices and development of dairy value chain	Lack of support for dairy keeping in ON regime; lack of incentives for technical development of fodder crops; relationships and rules governing seasonal grazing rights among rice farmers and pastoralists
Kpéra	Competing claims on multi-purpose agro-pastoral dams	Lack of procedures for and incentives to negotiate agreement among multiple users
Osei-Amponsah	Poor quality of locally processed crude palm oil; storage practices for fresh fruits; harmful use of spent lorry tyres as fuel	Some key stakeholders not included in existing socio-technical arrangements; lack of organized arrangements among local processors for processing and sales; price relationships among types of fuel; absence of organized flow of information on effects of storage practices on oil quality, and of tyre burning on human health and the environment
Quarmine	Quality of cocoa beans that farmers deliver to buying agents	The incentive structure in which quality and quantity of beans are embedded; role of Licensed Buying Agent
Sidibé	Incorporation of small producers and processors in export-oriented value chain	Emphasis on export markets; structure & conditions of access to trade- and working-capital; value chain development and strategic choices are in the hands of intermediary organizations and elite entrepreneurs
Togbé	Non-adoption of LEC pest management strategy	Farmer access to pesticides essential for practice of LEC blocked by a key power holder in the value chain; investment and incentive structure does not support extension agents to work with farmers on LEC; biased farmer representation on official cotton industry platform
Totin	Organization and management of access to finance, markets, and irrigation water for rice; mismatch between pattern of farmer varietal preferences along the valley and the varieties available; ineffective farmer organizations	Structure of incentives does not support collective action and self-organization by farmers, nor collective development of the rice sector by stakeholders along the value chain
Yemadje	Competing claims on land; access to and management of land	Land tenure arrangements

Our final observation is that although the evidence in support of this claim belongs to another publication our preliminary observation is that the diagnostic effort has offered a spectrum of opportunity for the positioning of the platforms and for the types of institutional experiments conducted by the CIGs:

Positioning

- *mediating* amongst existing institutionalized interests;
- bridging disconnects between niche-regime levels, by building new cross-level networked relationships;
- surfacing and reviewing the implications of tensions.

Experiments

- *removing* or by-passing blockages and constraints;
- re-structuring incentives and rewards;
- regulatory reforms;
- mobilizing normative pressures for enforcing accountability.

Curriculum development

- *challenging* assumptions and theory by providing grounded, empirical data and information;
- widening professional and scientific understanding of what is necessary to take into account;
- legitimating the value and importance of such studies by the evidence of stakeholder willingness to become involved;
- building skills and capacity in researching and learning practices that catalyse the uptake of scientific information and technologies.

References

[1] D. Hounkonnou, D. Kossou, T.W. Kuyper, C. Leeuwis, E.S. Nederlof, N. Röling, O. Sakyi-Dawson, M. Traoré, A. van Huis, An innovation systems approach to institutional change: smallholder development in West Africa, Agricultural Systems 108 (1) (2012) 74–83.
[2] F.W. Geels, From sectoral systems of innovation to socio-technical systems: insights about dynamics and change from sociology and institutional theory, Research Policy 33 (6) (2004) 415–418.
[3] M.S. Grindle, Governance reform: the new analytics of next steps, Governance: An International Journal of Policy, Administration and Institutions 24 (3) (2011) 415–418.
[4] U. Lele, The Design of Rural Development, John Hopkins for the World Bank, Washington, DC, 1975.
[5] ORSTOM-CVRS, Land-use and development in Africa South of the Sahara, in: Smallholders' Logic and Technical Rationality. Report of a Conference, Ouagadougou, December 1978, ORSTOM, Paris, 1979.
[6] Overseas Development Institute, Stimulating Local Development. Agricultural Administration Unit Occasional Paper 1, ODI, London, 1976.
[7] Overseas Development Institute, Extension, Planning and the Poor. Agricultural Administration Unit Occasional Paper 2, ODI, London, 1977.
[8] Overseas Development Institute, Institutions, Management and Agricultural Development. Agricultural Administration Unit Occasional Paper 3, ODI, London, 1979.
[9] L. Klerkx, N. Aarts, C. Leeuwis, Adaptive management in agricultural innovation systems: the interactions between innovation networks and their environment, Agricultural Systems 103 (2010) 390–400.
[10] R. Ison, Systems Practice: How to Act in a Climate-Change World, Springer, London, 2011.
[11] M. Foucault, Surveiller et Punir, Gallimard, Paris, 1975.
[12] S. Adjei-Nsiah, R. Adu-Acheampong, K. Debrah, F. Dembélé, S. Lassine, B. Ouologuem, A. Saïdou, P. Vissoh, E. Zannou, Overcoming the bias against the small farm sector in Sub-Saharan Africa: scoping entry points for innovation platforms, Development in Practice, submitted for publication.
[13] A. Hatchuel, Intervention research and the production of knowledge, in: M. Cerf, D. Gibbon, B. Hubert, R. Ison, J. Jiggins, M. Paine, J. Proost, N. Röling (Eds.), Cow Up a Tree. Knowing and Learning for Change in Agriculture. Case Studies from Industrialised Countries, INRA Editions, Paris, 2000.
[14] P. Steyaert, J. Jiggins, Governance of complex environmental situations through social learning: a synthesis of SLIM's lessons for research, policy and practice, Environmental Science & Policy 10 (2007) 575–586.
[15] T. Hoholm, L. Araujo, Studying innovation processes in real-time: the promises and challenges of ethnography, Industrial Marketing Management 40 (2011) 933–939.
[16] D. Snowden, Complex acts of knowing – paradox and descriptive self-awareness, Journal of Knowledge Management 6 (2) (2002) 100–111.

[17] C. Blackmore, R. Ison, J. Jiggins (Eds.), Social learning: an alternative policy instrument for managing in the context of Europe's water, Environmental Science & Policy 10 (6) (2007) 493–586 (special issue).
[18] A. Bannerjee, E. Duflo, Poor Economics: A Radical Rethinking of the Way to Fight Global Poverty, Public Affairs, New York, 2011.
[19] L. Hong, F.S.E. Page, Groups of diverse problem-solvers can outperform groups of high-ability problem-solvers, Proceedings of the National Academy of Sciences of the United States of America 101 (46) (2004) 16385–16389.
[20] D.J. Zellick, E.S. Patterson, D.D. Woods, Measuring attributes of rigour in information analysis, in: E.S. Patterson, J. Miller (Eds.), Macrocognition Metrics and Scenarios: Design and Evaluation for Real-world Teams, Ashgate, Aldershot, UK, 2009.
[21] S. Nederlof, R. Pyburn, One Finger Cannot Lift a Rock. Facilitating Innovation Platforms to Trigger Institutional Change in West Africa, KIT Publishers, Amsterdam, 2012.