



Research paper

An institutional diagnostics of agricultural innovation; public-private partnerships and smallholder production in Uganda

Diana Akullo^a, Harro Maat^{b,*}, Arjen E.J. Wals^c

^a Department of Rural Economy and Agriculture, African Union Commission, Addis Abeba, Ethiopia, Ethiopia

^b Knowledge, Technology and Innovation, Wageningen University, The Netherlands

^c Education and Learning Sciences, Wageningen University, The Netherlands



ARTICLE INFO

Keywords:

Institutional diagnostics
Performance
Public-private partnership
Sorghum production
Innovation
Smallholder farming

ABSTRACT

This paper presents and discusses a diagnostic framework to identify institutional processes in the creation of public-private partnerships (PPPs) for agricultural innovation. The diagnostic framework proposed here combines a conceptualisation of institutions with a conceptualisation of technology. We argue that a performative notion of institutions provides a better tool for institutional diagnostics than the common understanding of institutions as ‘rules of the game’. The paper furthermore proposes to conceptualise technology as affordance, in contrast to a more common understanding of technology as an input. We explore the value of our diagnostic framework by analysing the literature on PPPs for agricultural innovation and unpublished data from a PPP initiative for smallholder sorghum production, based on an agreement between Uganda’s National Agricultural Research Organisation (NARO) and Nile Breweries Limited (NBL). In the discussion and conclusion section we evaluate the benefits of our diagnostic framework and discuss how the empirical issues it brings forward create important lessons for analysis of innovation for African smallholder farming and institutional diagnostics more generally.

1. Introduction

There is no single best way to turn research results into useful products. In the agricultural sector the task is typically taken up by governments. Agricultural education and extension provide farmers with research-based information and demonstrate and support the uptake of new technologies. In recent decades many governments have reduced these services and increasingly rely on private companies for the implementation and distribution of innovations (Klerkx and Nettle, 2014). Rather than fully privatized services, involvement of the private sector in agricultural extension is often established through Public-Private Partnerships (PPPs). Such partnerships change the rules and procedures among the parties developing and introducing agricultural innovations (Spielman et al., 2010). This paper presents and discusses a diagnostic framework for understanding institutional change related to agricultural innovation. In particular we focus on initiatives and discussions about agriculture in sub-Saharan Africa. An important motivation of PPPs for agricultural innovation is to enhance market integration of smallholder farming and therewith increase food security and reduce rural poverty.

Institutional factors have been central in recent studies focusing on

agricultural innovation. By and large these studies address institutions as the organisational arrangements, rules and routines that guide the behaviour of the actors involved in the innovation process. In fact, changing the organisational arrangements is considered a core element of innovation in agriculture, as a condition for successful introduction of new agricultural technologies and improved production (Hall, 2004; Hounkonnou et al., 2017). As this paper will argue, conceptualising institutions as sets of rules and related normative guidelines for behaviour provides a useful but limited understanding for institutional change. As we will argue, a performative notion of institutions, focusing on patterned operational practices of a particular society or group in society, provides a more useful understanding of institutions. A performative understanding of institutions helps to trace different responses to introduced innovations. Such an approach to institutions also helps policy makers and development agencies to deal with local responses more adequately, in particular when facing seemingly misplaced and dismissive responses from smallholder farmers.

A second component of our diagnostic tool for institutional change related to agricultural innovation is technology. In most literature on agricultural innovation, technology is considered an input. Agricultural technologies typically consist of a package of technical objects,

* Corresponding author at: Wageningen University, Knowledge, Technology and Innovation, Wageningen, 6706KN, The Netherlands.

E-mail address: harro.maat@wur.nl (H. Maat).

guidelines and instructions for (improved) farm-management practices. This understanding of technology tallies with a rule-based understanding of institutions. As elaborated in the next section, this is problematic as it assumes a single best way of technology use. A proper institutional diagnostics requires a perception of technology as an affordance, anticipating unforeseen adjustments and (partial) rejections of introduced technology, affecting the change process (Glover et al., 2017). Conceptualising technology as an affordance opens up questions about multiple groups benefitting in different ways from an introduced technology. Technology as an affordance complements a performative understanding of institutions.

In the next section we further underpin our diagnostic framework for understanding institutional change related to agricultural innovation. We will illustrate the usefulness of the framework by analysing cases of Public-Private Partnerships in the context of smallholder agriculture in Africa. After explaining our methods we present results from a brief literature analysis for, firstly, PPPs aimed at smallholder farming more generally and, secondly, PPPs for agricultural innovation. In a following section we further zoom in on a PPP initiative in Uganda that connected smallholder sorghum production to the beer industry. Our exploration is based on a review of literature on PPPs for smallholder production and agricultural innovation. The sorghum beer case is primarily based on unpublished data collected by the first author. In the discussion and conclusion section we will evaluate the benefits of our diagnostic framework and discuss how the empirical issues it brings forward, create important lessons for analysis of innovation for African smallholder farming and institutional diagnostics more generally.

2. A diagnostic framework for institutions and innovation

Inviting private sector partners to help realize development goals for the agricultural sector has a background in the policy changes known as the Washington Consensus. Private sector partners can increase effectiveness, it is argued, for the delivery of public goods and services to the rural poor (Kydd and Dorward, 2001). For all ministries and government services, including the agricultural sector, the main problem the Washington consensus was supposed to address is institutional failure. PPPs and similar solutions are typically presented as prepackaged solutions rather than sorting out what institutional problems have to be addressed for the issue at hand (Rodrik, 2010).

Part of the problem is the use of the term institutions. A rather common interpretation is to equate institutions with organisational arrangements, in particular arrangements set up and maintained by governing bodies. From this interpretation institutional analysis would primarily address the effectiveness of political institutions and the organisational capacity of government services or other organisations, such as farmers' organisations and NGOs. Clearly these organisations, although important, are not the only actors involved in market transactions and other forms of social interaction (Scott, 1995; Schouten et al., this issue). A more comprehensive definition is to consider institutions as 'the rules of the game in a society'. This notion is derived from the work of the economist Douglass North (1990). He makes a distinction between 'formal' rules, as stipulated in laws, contracts and similar arrangements, and 'informal' rules, referring to 'codes of conduct, norms of behaviour, and conventions'. For North, the combination of formal and informal rules provides an explanation of particular forms of behaviour. Rules, therefore, enable or constrain change and (economic) development. Although rules are created by a society or groups in practice, they act like an external factor upon the behaviour of people and the development of new technology (see Fig. 1). From a rule-based notion of institutions, agricultural innovation is about change in the 'rules of the game' that directs technology designers, and technology users, mainly farmers, to turn natural resources into food and other goods.

The Northian definition is sometimes explicitly referred to in analyses of institutional change related to agricultural innovation

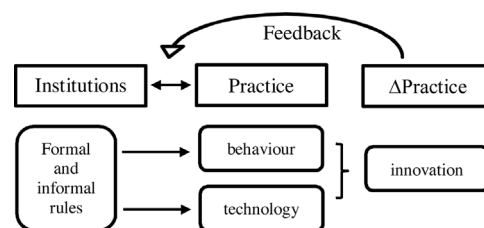


Fig. 1. Institutions as 'rules of the game'.

(Spielman, 2005; Hounkonnou et al., 2016; Hermans et al., 2017). As a rather broad and inclusive understanding of institutions, North's definition seems to offer enough analytical scope to understand the way particular rules and routines enable or constrain innovation. However, the rules-of-the-game definition has several problematic features. First of all, where formal rules can be traced from documents and stated agreements, informal rules are less easily grasped, in particular when it comes to locally-specific 'rules of the game' (Hollingsworth, 2000). Because hard to pin down, informal rules, as a concept, becomes a residual explanatory category for a wide variety of behavioural phenomena. As Greif and Kingston (2011: 24) put it: "if behavior does not conform to formal rules, by default it is attributed to – and assumed to be governed by – unobserved informal rules." Moreover, deviating behaviour, and therewith informal rules, tend to be portrayed negatively. Informality requires personal ties and trust and therefore is assumed to be functional only within small groups and close communities. This easily leads to a patronizing position towards informal rules, seen as a barrier to economic expansion and scaling up innovations that are assumed to work only in larger organisational settings (Douglas, 2004). Development in this way means the replacement of inferior informal rules by superior formal agreements, contracts and legislation.

For these reasons it makes sense to exchange a rule-based perception for a performance-based notion of institutions. A performance-based notion shifts the attention to collective activities. Rather than following rules, people act upon 'expected behaviour' by their group peers (Greif and Kingston, 2011). Such behavioural patterns or 'behavioural equilibria' emerge from the society itself, doing things in a way considered meaningful and adequate. Within and between societies, different groups may have developed different patterns. The multiple patterns function as interpretive filters for how to deal with particular situations and events. Proposed changes, for example by introducing new agricultural technologies or new production guidelines, thus can lead to different outcomes (Fig. 2). Rules are not unimportant but institutions act upon rules, they are not made by rules. For example, the overall behavioural pattern of drivers is to slow down in response to speed limits whereas teenagers may do the opposite because their age group may have a different idea about authority and risk.

What constitutes an institution is a recurrent theme in the work of the anthropologist Mary Douglas. Central in her work is to understand why, within a society, there exist multiple collective notions about how society should be organised and how to act in it (Douglas, 1986). In a recent overview work, Douglas' notion of an institution is defined as 'a

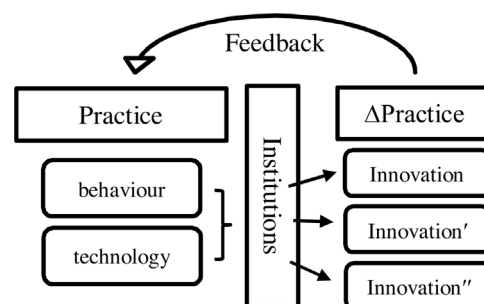


Fig. 2. Institutions as 'patterns of performing operations'.

pattern of performing operations exhibiting a common style' (6 and Richards, 2017: 113). What patterns emerge and how many is not random and unlimited. Crucial are the capacities of a society or group 'to execute certain kinds of patterned operational practices'. This emphasis on capacities and operations narrows down the variety of institutional styles that may emerge. Available organisational formats, modes of communication and environmental conditions are examples of the capacities at hand and what can be done with it. An institutional diagnostics thus implies tracing back how 'patterned operational practices' lead to particular outcomes. This perspective offers a different outlook towards development. Because multiple operational practices are presumed, change processes should focus on improving and widening the set of capacities that enable groups to develop particular innovation pathways rather than striving for one, optimised, outcome. Likewise, agricultural innovation is about change in the capacities of a society and particular groups, for example smallholder farmers, to establish a particular innovation in producing food and other items.

As most forms of agricultural innovation involve some form of technology, a diagnostic framework for institutional analysis should pay explicit attention to the question how technology interferes with institutional change. Two relevant perceptions are technology as input, and technology as affordance. The first perception is an instrumental view and resonates with a standard, everyday notions of tools and devices (Pfaffengerger, 1992). Technology consists of those technical aids that make human action easier, quicker or cheaper, preferably all at the same time. The producers of technology have to make sure the tool has the right design to do all that. The users of technology merely have to learn how to operate it in the most beneficial way.

The instrumental view assumes that the non-technical components of technology are externalities. Design, production, distribution and instructing users are organised by specialised units that insert knowledge and technology into a society. However, these 'insertions' come with built-in ideas about what users are, where to locate them and how they are supposed to respond to an introduced technology in order to realize the desired effect. This process, known as inscription, pre-configures the user and the wider effect of the technology-in-use (Latour, 1992). The human component becomes visible once users start interacting with the object.

Especially when users do not follow the predefined script or when wider goals are not reached, the preconfigured optimal use and objectives are discussed, typically resulting in comments to users not responding appropriately or pointing out unforeseen factors that are the cause of disappointing results. To avoid a 'design bias', technology is better perceived as an affordance, i.e. a suggested use (Pfaffengerger, 1992). Implementation of technology, introduced as part of an innovation process, initiates interactions between users and the engineered objects out of which a particular configuration emerges (Glover et al., 2017). Just as user groups may vary, outcomes may vary. This may imply smaller or more significant adjustments and other variations in operationalising a technology. The notion of technology as affordance thus highlights that there is no single best way to use a technology. Understanding this variation and looking for ways to support various forms of uses increases the overall impact of a technology. For example, for the case presented in this paper, the introduced sorghum variety affords sale to the beer company as well as sale to other buyers or home consumption.

The above components together create our diagnostics framework for understanding institutions in relation to agricultural innovation. What follows, after an explanation of our methods, is an illustration of the value of our diagnostic framework for understanding agricultural innovation. In particular we will show that a rule-based understanding of institutions and a perception of technology as an input inserts some of the problems and biases, as discussed above, into an understanding of PPPs for agricultural innovation. Our proposed diagnostic framework, a performance-based notion of institutions and technology as affordance, raises new questions for the PPP for sorghum beer and puts

the responses of smallholder farmers to the introduced arrangements for producing sorghum in a different perspective.

3. Methods

This paper is based on literature study and unpublished fieldwork data (Akullo, forthcoming). The literature is selected by using several search strings in Google Scholar, each containing ["public private partnerships" AND "innovation systems"]. That string itself results in 680 hits. Adding 'Africa' in the search bar reduces the set to 311 and it is further reduced by adding 'smallholders' (92 hits) or 'small farmers' (41 hits). The fast majority of these papers uses the term institutions (the 311 sample is reduced only to 307 when adding 'institutions' as a search term). Another search string used was ["public private partnerships" AND "sorghum beer"] resulting in 50 hits. Adding the terms 'innovation' and 'innovation systems' reduced it to 41 and 4 results respectively. These sets of papers were used as a starting point, not a definitive set. Sometimes papers within the set addressed the search terms very marginally or coincidentally (for example in the list of references). Sometimes papers referenced to other papers not in the set but useful for the analysis. The ultimate selection criteria was recognition of the issues addressed in our diagnostic framework.

The unpublished data results from field work carried out by the first author in 2007 on a project introducing a PPP for sorghum beer in Uganda. Interviews were held with researcher of the National Semi Arid Resources Research Institute (NaSARRI), an institute of the Uganda National Agricultural Research Organisation (NARO) located in Soroti, eastern Uganda. Individual interviews were also conducted in Soroti District with 40 randomly selected sorghum farmers. Focus group discussions were held with eleven key informants, two from the National Agricultural Advisory Services (NAADS), one from the private seed company AfroKai Ltd., four from Soroti District Farmers' Association (SODIFA) and four local councillors from the communities to which the interviewed farmers belonged. Research reports, news articles and bulletins complemented responses obtained from the different categories of respondents.

The literature and data are analysed on argumentative congruence with the diagnostic framework developed above. The analysis is exploratory in nature, meaning that the aim is not to provide a definitive conclusion about the case as such but to explore the analytical potential of the diagnostic framework for the case at hand and similar cases. Collection of field data was not set up on the basis of the conceptual framework presented here.

4. Public-private developments in agriculture

From the turn of the century, an increasing number of PPPs have been established in agricultural development. Definitions of what constitutes a PPP differ mostly in describing in greater or lesser detail the two key elements: joint development of products or services and risk sharing (Poulton and Macartney, 2012; Spielman et al., 2010). In their review of such initiatives, Poulton and Macartney (2012) observed that the private sector is typically involved in output marketing of traditional export crops. Few partnerships focus on pre-harvest service provision or food crops. Most PPPs for agricultural development thus aim for an increased market participation. Food security and poverty alleviation, the prime development goals, are thus considered to be achieved through increased income and, therewith, better access to food and other consumer goods.

Innovation is an important focus of PPPs. Governments of developing countries, prompted by international donors, initiated PPPs on the assumption of increased cost efficiency in achieving their principal objectives of introducing innovations to enhance food security and reduce poverty among smallholder farmers. In other words, the assumption is that PPPs are more cost-efficient in disseminating technological change at the bottom of the pyramid. Private-sector partners

bring in a market-oriented form of organisation to help overcome excessive rule following, the main shortcoming attributed to bureaucratic government organisations (Spielman et al., 2010). Another important feature of PPPs for agricultural development is the objective to include smallholder farmers. For this reason such partnerships are sometimes labelled as ‘public-private-producer partnerships’.

Most of these studies use a rather general notion of institutions that can either be seen as an organisation or as an organisational arrangement. These are sometimes specified, referring to financial institutions or research institutions (Ion et al., 2014). A PPP is supposed to combine or reshuffle such arrangements. Partnerships “are time-limited interventions to establish new markets, institutional or systemic arrangements that address underlying constraints” (Thorpe and Maestre, 2015: 43). All actors will have to get used to the new arrangements and how to deal with it. Thorpe and Maestre (2015), evaluating several partnerships across Africa, highlight the role of trust and argue for open dialogue and transparent procedures for all partners throughout the entire process. They also point out the key role of brokers in facilitating information exchange and ensuring a constructive dialogue about the new arrangements.

5. Public-private innovation

PPPs for agricultural innovation have received attention from a number of scholars, raising important issues with respect to relative benefits of such partnerships. Pray and Umali-Deininger (1998) and Hall (2004) show that commercial interests of companies create expectations that investments in innovation should pay back in the form of cost reduction in the production process, an increase of overall sales or higher profit margins. Moreover, companies usually cannot afford to wait for economic returns on the long run which puts a certain time pressure on the innovation process. When marketable products appear difficult to develop or when other financial benefits do not appear on the balance sheet, a company may decide to withdraw from the partnership. Moreover, commercial companies typically try to get financial gains from the innovation process itself, most prominently through patenting and intellectual property rights.

Overall, the literature on PPPs for agricultural innovation addresses the partnership side and predominantly uses rather common definitions of institutions and technology. Definitions or analytical frameworks of what counts as an institution are often implicit from the given examples, for example referring to ‘research institutions’ or ‘financial institutions’. A financial institution thus may imply credit arrangements and organisations supporting such facilities when talking about financial institutions, or channels for knowledge dissemination and organisations arranging that, in the case of research institutions. This fits the overall rule-based understanding of institutions as presented in our diagnostic framework. Definitions are more explicit and nuanced in papers that address the topics on a more conceptual level. For example, in a volume on value chains Trienekens (2012) discusses institutions extensively and follows the work of Richard Scott (1995) who distinguishes cultural-cognitive and normative elements of institutions in addition to rules. However, his insightful discussion of concepts and how to apply them are not taken up in any of the case studies presented in the same volume.

Few studies on PPPs for agricultural innovation contain a further conceptualisation of technology. Technology is primarily seen as an input, referring to specific products and packages of products and guidelines. For example packages may contain seeds, pesticide and instructions how to use them. Packages may also contain items combined with a set of technical procedures that can result in a range of new or improved products, for example the use of post-harvest technologies or biotechnologies. For the type of literature analysed here, a notion of technology as input seems rather unproblematic. After all, the main focus of this type of literature is to evaluate PPP for innovation on its positive effect on market inclusion in general and development

perspectives for smallholder farmers in particular. However, for exactly those reasons the question what kind of knowledge the innovation process is supposed to develop and what kind of technologies that leads to, are questions worth asking. An evaluation of PPPs involving members of the Consultative Group on International Agricultural Research (CGIAR), mentions that “[f]ew PPPs in the CGIAR are specifically designed to facilitate joint innovation processes with the private sector or diversify the avenues through which centers can collaborate with the private sector. These findings suggest that (...) they are not addressing many of the wider systemic constraints associated with knowledge exchanges” (Spielman et al., 2010: 273). In other words, technology or, in the more abstract form, knowledge, is not neutral towards the organisational arrangements in which it is produced and implemented. We will pick up on that in the discussion section, after having dived deeper in the case of sorghum beer

6. Public-private sorghum beer

In 2000, Uganda’s National Agricultural Research Organisation (NARO) (NARO, 2000) and Nile Breweries Limited (NBL), a subsidiary of the multinational brewing company SABMiller, agreed to cooperate in producing sorghum for brewing pale lager beer. The innovation process set in motion was to introduce a new sorghum variety to smallholder farmers. This variety, when grown under the right conditions, resulted in a harvest of sufficient quality to include it in the brewery process. Attached to the distribution of the sorghum variety was a series of activities to help sorghum farmers to improve growth conditions, control the quality and arrange collection and payment at the farm before transport to the brewery.

At the background of the PPP initiative were the reforms of NARO, as part of the country’s national development agenda. In 1998, Uganda developed the Poverty Eradication Action Plan (PEAP), which was re-framed in 2002 and later subsumed within the 5-year National Development Plan (NDP), launched in 2010. A key goal of the plan is to raise the income levels of smallholder farmers, in particular through better linkages to national and international markets. The Ugandan agricultural policies since the early 2000s have stimulated the involvement of private-sector companies in the development of agricultural technologies. A particular policy instrument used by the government of Uganda was to offer a tax rebate of 10–15% to industries using local products as opposed to imported products. Since then, there was a rise in the number of private seed companies and agro-processing industries (Mubangizi et al., 2012; Kabeere and Wulff, 2008; Nangoti et al., 2004).

On average sorghum occupies 265,000 ha of arable land in Uganda, a production area slightly smaller than those for maize and millet (NARO, 2003). It is an important food crop in the country, grown mainly as a subsistence crop by resource-poor farmers. The cropping area stretches out over the semi-arid regions of the country and cultivation typically involves low use of external inputs. In these conditions, sorghum yields are not very high and over the years government services have tried to improve the productivity through development of new varieties, recommendations on cultivation practices, crop protection, post-harvest handling and marketing. The innovation trajectory set in motion by the PPP basically tried to establish a fast-track marketing structure for a special type of sorghum, a type that was suitable for the production of lager beer.

7. Sorghum technology

The NARO entered the partnership through the involvement of the National Semi Arid Resources Research Institute (NaSARRI), responsible for research on semi-arid cereal crops in Uganda, including sorghum. Other parties involved were the private seed company AfroKai and the public-sector extension service (NAADS). The partnership programme envisaged the distribution of seed of an improved

sorghum variety called Epuripur. Epuripur was developed by NaSARRI researchers and released in 1995 by the National Variety Release Committee. Interestingly, the documents and interviews with researchers reveal that Epuripur emerged out of a breeding programme aimed at quality improvement for food production. It was selected for the PPP project in 2001 following a series of trials and technical tests with different sorghum varieties.

For a first cropping season in 2002, NBL contracted NaSARRI to start multiplying seed of Epuripur on 27.5 acres. The contract farming scheme was launched in Soroti District, which has remained the stronghold for the programme up to the present. Farmers were offered a contract which committed them to produce Epuripur sorghum. Provided certain quality standards were met, the contract guaranteed that NBL would buy the harvest. In the initial years contracts could be terminated at thirty days' notice. After 2004 this was extended to sixty days. NBL processed the sorghum and launched a new alcoholic beverage, Eagle Lager, which was launched on the Ugandan market in December 2001. Eagle Lager was marketed as a cheap beer made from locally produced sorghum.

The roles and responsibilities of the actors involved in the PPP were determined in stakeholder meetings and workshops. Various memoranda of understanding and contracts were drawn up to bind the actors to their specific roles. The activities included mobilizing farmers, arranging contracts with farmers, seed supply, monitoring of farming operations, price setting, quality control and delivery of the harvest. NaSARRI was involved in on-farm demonstrations, formulation of agronomic and quality guidelines and trainings for trial management. Much of the direct interaction with farmers was done by district and field officers of the extension service (NAADS), who were responsible for selecting farmers and supporting them to meet quality standards. Locally active NGOs (CARITAS-Uganda, SELFHELP International and ADRA Kotido) were involved in similar activities. The commercial-sector organisation most active at farm level is the seed company AfroKai, arranging the multiplication and distribution of sorghum seed and collecting the harvest from contract farmers for delivery at the brewery.

So far, the sorghum beer case is perfectly understandable from a rule-based perspective on institutions and an understanding of technology as inputs. Clearly, the contract arrangements and other agreements implied the introduction of many rules, defining what farmers and other parties have to do and the consequences of not following such rules. Moreover, various actors were involved in clarifying the rules and their implications to farmers and setting up support activities. These activities helped farmers to grow the Epuripur variety in the appropriate manner. Epuripur and the support activities formed the technological package distributed by the various actors.

8. Hiccups in the production

The public-sector organisations took the lead in the dissemination phase. Besides producing Epuripur, NaSARRI researchers set up demonstration gardens at the research station to train selected contract farmers on commercial production of the crop. The private-sector partners were hardly involved in these activities, with the exception of lab tests about the brewing quality of the sorghum. Researchers from NaSARRI worked with farmers in order to find out the optimal growing conditions for Epuripur. The researchers recalled that farmers suggested indigenous sorghum management technologies. However, farmers were trained to use the recommended ('integrated') crop management packages. A list of recommended agronomic practices was appended to the growers' contracts. The seed company AfroKai was not contracted by NBL until 2003 when the company was put in charge of setting up new contracts with farmers and collecting the harvest.

By far the most complicated element of the innovation process was to realize improved growing conditions in order to meet the quality standards set by the brewery. Breeders, seed producers and farmers

equally suffered from pests, in particular the sorghum midge, stem borers, birds and the parasitic weed *Striga*. Also, few farmers have adequate irrigation facilities, so erratic rainfall patterns had an immediate impact on the quality of the crop. In order to meet the agreed quantity and quality standards, farmers had to increase the labour input into the crop. More than half of the interviewed farmers considered labour supply and the lack of mechanization as major bottlenecks.

Environmental factors are non-negotiable and staff of the NAADS and AfroKai had few means to support farmers to overcome them. Overall, there was much more to control than these officers could handle. Their main activities involved selecting farmers and farmer groups to match with expected acreage, distributing seeds, regular inspections and record keeping for all the farms involved, and providing advice on cultivation methods, harvesting, and handling the harvested grain. The interviewed researchers and extension officers said they had insufficient resources to monitor all these field activities.

Nearly all the interviewed farmers complained about seed distribution and quality. Complaints included late delivery of seed, contamination of seed with seeds from other varieties or weeds, and low germination rates. Farmers also grumbled that AfroKai restricted the supply of seeds to farmers in order to regulate the volumes of grain produced for NBL. Farmers said they did not understand why there was a price difference between seeds and harvested grain from their fields. Interviewed researchers from NaSARRI said they did not have enough funding to produce basic seed. The release of funds from the central NARO office was erratic, which negatively affected the implementation of planned activities. Researchers also mentioned that control over seed multiplication and trade was weak, resulting in frequent adulteration of Epuripur seeds. Staff from Afrokai and SODIFA reported that it was hard to mobilize farmers for contract farming. The farmers appeared to be sceptical about the benefits of contract farming and the importance of adhering to the contract details.

9. Different farming practices

Based on the information provided above, the sorghum case poses some questions that are more difficult to answer from a rule-based understanding of institutions. Various parties seemed to have different interpretations of the contracts and how to deal with it. This may be attributed to informal rules but given the variation of ways actors dealt with the contract arrangement, it is unlikely farmers or other actors all followed some set of informal rules. Moreover, the sorghum beer project did not fail because of the difficulties described. In other words, the project can be considered and indeed is portrayed as a success despite ambiguities, inconsistencies and conflicts over contracts and other arrangements. Although we do not have a multi-year comparative data set, recent conversations with some of the actors involved confirm that the complications in settling contracts never really disappeared but that sorghum is delivered to NBL nevertheless.

A performative notion of institutions brings in another explanation. A focus on patterned operational practices raises the question about the institutional structures of smallholder farming and what patterns can be detected. The literature provides a start. An important feature of smallholder farming in Africa and other parts of the world is its embeddedness in community structures (Richards, 1985; Richards, 2004). For example, a contract is likely to be interpreted as a patron-client relationship, similar as between chiefs and commoners, or local traders and farmers (Kudadjie-Freeman et al., 2008). Trust and reciprocity are more important than what is written on paper. The quick expansion of the project likely thwarted the establishment of trust-based relationships. Contracts can be a substitute for trust but in the fairly complex set of organisations and actors involved, and the varying agro-ecological conditions, the contract hardly provide any concrete suggestions about what to do in particular events and circumstances. Instead, the existing institutions, understood as patterned operational practices, provided a way of dealing with the offered contract arrangement, resulting in the

rather diverse and seemingly unruly way the contracts were implemented.

The reluctance to engage with the offered contract arrangements cannot be merely interpreted as a lack of knowledge about or rejection of market arrangements. Stereotypical notions of smallholder farming as narrowly focused on subsistence, not knowing how to produce for markets, hardly ever apply (Netting et al., 1989). The introduction of contract farming and related arrangements to produce sorghum for the NBL brewery, introduced a new form of market-oriented production. From a performative understanding of institutions this is not the same as introducing a market institution. At best they are incentives to make the ‘patterned operational practices’ of farmers more market-oriented. But there are various ways of making contract farming work (Vellema, 1994). Interpretations over the best way how to do this as well as important factors such as trust and settling disputes, are operated through the local institutions.

The positive production figures in combination with the poor implementation of contracts, may have to do with the fact that sorghum can be used for different purposes. As explained, the Epuripur variety was originally developed for food production and developed in consultation with the farmers. Farmers thus may be more willing to grow the variety. Since AfroKai was obliged to supply the tonnage agreed with NBL, a situation emerged in which AfroKai had no reason to be very strict on compliance issues, which in turn allowed farmers to ignore contract details as long as their harvest, or even only part of it, was accepted and bought up. And even if AfroKai does not buy, the sorghum can be sold or used for other (consumption) purposes. In conceptual terms, the technology of improved seeds was not just an input but an affordance that enabled diverse usage within the diverse operational practices. An understanding of technology as affordance further explains the success of the sorghum beer production. It also shows that PPPs for agricultural innovation not merely should focus on the best available technology in combination with optimal organisational arrangements but look into an understanding of how particular technologies contribute to the repertoire of capacities that allow certain groups to produce food and other products at acceptable levels.

10. Discussion and conclusion

The overall objectives of PPPs for agricultural innovation are in line with ‘classic’ agricultural extension: to introduce science-based technologies to the agricultural community, most prominently smallholder farmers. A major assumption of such arrangements is that bringing in private-sector partners results in more effective development and implementation of agricultural technologies, with smallholder farmers as the main beneficiaries. The diagnostic framework that we introduced to analyse such partnerships aims to provide a better insight in the institutional changes such partnerships bring about and the role of technology in such arrangements.

Our analysis of the literature on PPPs for agricultural innovation and the case of sorghum production for the NBL beer company in Uganda show that institutions are predominantly understood as organisational arrangements, largely in line with Douglass North’s definition of institutions as ‘rules of the game’. This notion seems adequate at first. PPPs for agricultural innovation are indeed very much about new arrangements and how different organisations can improve service delivery to farmers. However, we argued that this notion falls short in explaining inconsistencies and wide variation in application and interpretation of rules. These are better captured by a performance-based notion of institutions. Our diagnostic framework also highlights the importance of considering technology as an affordance. In most studies on PPPs for agricultural innovation, technology is perceived as an input. Institutions ‘work upon’ technology and therewith change their meaning and functioning within a particular context.

Our diagnostic framework is not unique for Uganda or PPPs for agricultural innovation. Similar insights emerged from historical

studies on local responses to introduced commercial production by colonial regimes (Hazareesingh and Maat, 2016). Likewise, a study by Stone and Glover (2016) on different forms of rice production in the Philippines uses the notion of ‘rice worlds’ to highlight different positions of groups of rice farmers based on the extent to which ‘output is prioritized over other agricultural virtues’ and the extent in which farming is embedded in the ‘local agro-ecological context.’ A strong commercial focus on agriculture stresses productivism and is dis-embedded where for smallholders farming systems the opposite often applies. The diagnostic framework presented in this paper helps to understand the variation in responses in different societies, and between groups in a society, to agricultural innovation triggered by governments and international donors.

An important development goal of the PPPs for agricultural innovation is to enhance market integration of smallholders. Evaluations of PPPs typically focus on the effectiveness of the partnership, in terms of organisational benefits and economic returns for partners, providing mixed results that defy clear-cut conclusions (Poulton and Macartney, 2012; Spielman et al., 2010). Regarding benefits for smallholder farmers, an important observation is that effects on the longer run are rather unclear, in particular with respect to credit schemes and prize fluctuations (Thorpe and Maestre, 2015). A study on PPPs for sorghum beer in different African countries, including the Ugandan case, notes that ‘functional upgrading’, i.e. efficiency gains for particular operations, are found among ‘the better equipped chain actors’ (Van Wijk and Kwakkenbos, 2012: 83). Apparently, smallholders do not have the overall capacities to fully engage in a market economy and achieve similar gains.

Our diagnostic framework provides a wider set of options for policy makers to deal with institutional issues in relation to agricultural innovation. A first step is to set up a proper diagnosis of existing operational practices, including available technological options. Where from a rule-based understanding ‘strengthening institutions’ typically implies the creation of organisational arrangements to accommodate one particular, optimised outcome of the innovation process, a performance-based notion of institutions would opt for a more basic support that improves the overall capacities available to groups to develop their version of an optimal outcome. An example for the case presented here could be the creation of alternative arrangements for mediating between farmers, NBL and other marketing options. Certain farmers may be able to employ capacities in such a way that contracts can work well, for other farmers brokerage by village leaders or other intermediaries might work better. Institutional strength thus can be gained not by installing a blueprint solution but providing the support needed to allow for different ways to improve agricultural production.

Several studies confirm this. For example Hall (2004: 273) argues that PPPs for agricultural innovation could do more on ‘ways of building the social capital of local innovation systems.’ Indeed, conducting experiments and testing technologies is not confined to research stations and laboratories (Maat and Glover, 2012). Likewise, Spielman et al. (2010: 273) conclude that PPPs for agricultural innovation within international agricultural research centres should explore ‘modalities such as learning by doing or learning through face-to-face interaction, hands-on collaboration, and scientific exchange programs between the public and private sectors.’ Our diagnostic framework suggest that such forms of research should aim at developing technologies that ‘afford’ multiple usage.

The diagnostic tool presented in this paper provides a richer set of questions and better options for improvements to institutional processes in relation to agricultural innovation, in particular those partnerships aimed at market inclusion of smallholder farmers. Although we developed our diagnostic framework for institutional change in relation to agricultural innovation, we think that the value of our diagnostic tool is not restricted to innovation in agriculture. Policies and projects that include institutional support should identify and develop basic capacities that accommodate different groups and create a better balance

between different institutional styles in the implementation of development goals. Improving the capacities to support institutional change can mean basic things as creating meeting places, organize events where people can voice discontent and finding ways in which conflicts can be resolved. Development projects tend to focus too much on the technical side of innovation and shy away from some of the basic social processes that require equal attention.

Acknowledgements

This paper emerged out of the PhD study of Diana Akullo at Wageningen University, the Netherlands from 2004 to 2008, on the reforms of the National Agricultural Research organisation (NARO) of Uganda. The study was funded by a fellowship from the Rockefeller Foundation. We are grateful to farmers and project partners in Uganda for the information provided. We thank Paul Richards for enduring support and Dominic Glover for his profound comments on dissertation chapters out of which this paper emerged.

References

- 6, P., Richards, P., 2017. *Mary Douglas, Understanding Social Thought and Conflict*. Berghahn books, New York, Oxford.
- Akullo, D. (forthcoming), *Transformation of Agricultural Research in Uganda: Past, Present and Future*. PhD Thesis Wageningen University, Wageningen.
- Douglas, M., 1986. *How Institutions Think*. Routledge and Kegan Paul, London.
- Douglas, M., 2004. Traditional Culture: let's hear no more about it. In: Rao, V., Walton, M. (Eds.), *Culture and Public Action*. Stanford University Press, Stanford, CA, pp. 85–108.
- Glover, D., Venot, J.-P., Maat, H., 2017. On the movement of agricultural technologies: packaging, unpacking and situated reconfiguration. In: Sumberg, James (Ed.), *Agronomy for Development; The Politics of Knowledge in Agricultural Research*. Routledge, pp. 14–30.
- Greif, A., Kingston, C., 2011. Institutions: rules or equilibria? In: Schofield, N., Caballero, G. (Eds.), *Political Economy of Institutions, Democracy and Voting*. Springer, Springer Heidelberg Dordrecht London New York, pp. 13–43.
- Hall, A.J., 2004. Public Private Sector Partnerships in an Agricultural System of Innovation: Concepts and Challenges. *UNI-MERIT Working Papers Series 2006-2*. United nations University, Maastricht.
- Hazareesingh, S., Maat, H., 2016. *Local Subversions of Colonial Cultures*. Cambridge Imperial and Post-Colonial Studies Series. Palgrave Macmillan, London.
- Hermans, F., Sartas, M., van Schagen, B., van Asten, P., Schut, M., 2017. Social network analysis of multi-stakeholder platforms in agricultural research for development: opportunities and constraints for innovation and scaling. *PLoS One* 12 (2), e0169634. <http://dx.doi.org/10.1371/journal.pone.0169634>.
- Hollingsworth, R.J., 2000. Doing institutional analysis: implications for the study of innovations. *Rev. Int. Polit. Econ.* 7 (4), 595–644. <http://dx.doi.org/10.1080/096922900750034563>.
- Hounkonnou, D., Brouwers, J., van Huis, A., Jiggins, J., Kossou, D., Röling, N., Sakyi-Dawson, O., Traoré, M., 2017. Triggering regime change: a comparative analysis of the performance of innovation platforms that attempted to change the institutional context for nine agricultural domains in West Africa. *Agric. Syst.* (online first). <http://dx.doi.org/10.1016/j.agsy.2016.08.009>. (in press).
- Ion, A., Beyard, K., Sedaca, S., 2014. Synthesis of Trends in Public-Private Partnerships (PPPs) for Improving Food Security and Rural Development Through Agriculture. Report prepared by Carana Corporation for the Food Systems Innovation Initiative.
- Kabeere, F., Wulff, E., 2008. Seed sector country profile: uganda volume I: overview of the seed supply systems and seed health issues. Danish Seed Health Center of Developing Countries. Department of Plant Biology, Faculty of Life Sciences, University of Copenhagen, Denmark.
- Klerkx, L., Nettle, R., 2014. Achievements and challenges of innovation co-production support initiatives in the Australian and Dutch dairy sectors: a comparative study. *Food Policy* 40, 74–89.
- Kudadjie-Freeman, C., Richards, P., Struik, P.C., 2008. Unlocking the Potential of Contract Farming: Lessons from Ghana. *International Institute for Environment and Development (IIED)*, London (Gatekeeper series 139).
- Kydd, J., Dorward, A., 2001. The washington consensus on poor country agriculture: analysis, prescription and institutional gaps. *Dev. Policy Rev.* 19 (4), 467–478.
- Latour, B., 1992. Where are the missing masses? The sociology of a few mundane artifacts'. In: Bijker, W.E., Law, J. (Eds.), *Shaping Technology/Building Society: Studies in Sociotechnical Change*. Mass, MIT Press, Cambridge, pp. 225–258.
- Maat, H., Glover, D., 2012. Alternative configurations of agricultural experimentation. In: Sumberg, J., Thompson, J. (Eds.), *Contested Agronomy: Agricultural Research in a Changing World*. Routledge, London, UK, pp. 131–145.
- Mubangizi, E., Ntamu, D.N., Thambo, W.M., Thijssen, M., 2012. *ISSD Briefing Note – September 2012*. (Uganda Seed Sector Assessment).
- NARO, 2000. *Agricultural Research and Training Programme (ARTP) Phase I Completion Report*. NARO, Entebbe.
- NARO, 2003. *Annual Report, 2003*. NARO, Entebbe.
- Nangoti, N., Kayobyo, G., Rees, D.J., 2004. Seed demand and supply in eastern and northern Uganda – implications for government and non-government interventions. *Uganda J. Agric. Sci.* 9, 778–784.
- Netting, R.M., Stone, M.P., Stone, G.D., 1989. Kofyar cash-cropping: choice and change in indigenous agricultural development. *Hum. Ecol.* 17, 299–319. <http://dx.doi.org/10.1007/BF00889021>.
- North, D.C., 1990. *Institutions, Institutional Change and Economic Performance*. Cambridge University Press, Cambridge.
- Paffenberger, B., 1992. Social anthropology of technology. *Ann. Rev. Anthropol.* 21, 491–516.
- Poulton, C., Macartney, J., 2012. Can public-private partnerships leverage private investment in agricultural value chains in africa? a preliminary review. *World Dev.* 40 (1), 96–109.
- Pray, C.E., Umali-Deininger, D., 1998. The private sector in agricultural research systems: will it fill the gap? *World Dev.* 26 (6), 1127–1148.
- Richards, P., 1985. *Indigenous Agricultural Revolution*. Unwin Hyman, London.
- Richards, P., 2004. Private versus public? Agenda-setting in international agrotechnologies. In: Jansen, K., Vellema, S. (Eds.), *Agribusiness and Society. Corporate Responses to Environmentalism, Market Opportunities and Public Regulation*. Zed Books, London, pp. 261–287.
- Rodrik, D., 2010. Diagnostics before prescription. *J. Econ. Perspect.* 24 (3), 33–44.
- Schouten, G., Vink, M.J., Vellema, S., 2017. Institutional diagnostics for African food security: approaches, methods and implications. *NJAS-Wageningen J. Life Sci* (In this issue).
- Scott, W.R., 1995. *Institutions and Organizations*. Sage, London.
- Spielman, D.J., Hartwich, F., Grebmer, K., 2010. Public-privates partnerships and developing-country agriculture: evidence from the international agricultural research system. *Public Admin. Dev.* 30, 261–276.
- Spielman, D.J., 2005. *Innovation Systems Perspectives on Developing-Country Agriculture: A Critical Review*. ISNAR Discussion Paper 2. International Food Policy Research Institute, Washington DC.
- Stone, G.D., Glover, D., 2016. Disembedding grain: golden Rice, the Green Revolution, and heirloom seeds in the Philippines. *Agric. Hum. Values* 34 (1), 87–102. <http://dx.doi.org/10.1007/s10460-016-9696-1>. (Online first).
- Thorpe, J., Maestre, M., 2015. *Brokering Development: Enabling Factors for Public-Private-Producer Partnerships in Agricultural Value Chains*. International Fund for Agricultural Development of the United Nations and Institute for Development Studies, Sussex.
- Trienekens, J.H., 2012. Value chains in developing countries; a framework for analysis. In: van Dijk, M.P., Trienekens, J.H. (Eds.), *Global Value Chains Linking Local Producers from Developing Countries to International Markets*. Amsterdam University Press, Amsterdam, pp. 43–68.
- Van Wijk, J., Kwakkenbos, H., 2012. Beer multinationals supporting africa's development? how partnerships include smallholders into sorghum-beer supply chains. In: van Dijk, M.P., Trienekens, J.H. (Eds.), *Global Value Chains Linking Local Producers from Developing Countries to International Markets*. Amsterdam University Press, Amsterdam, pp. 71–88.
- Vellema, S., 1994. *Making Contract Farming Work? Society and Technology in Philippine Transnational Agribusiness*. Wageningen University, Wageningen (PhD thesis).