

## Chapter 16

# INNOVATION SYSTEMS, DOUGLAS, DOUGLASS AND BEYOND: USING CULTURAL THEORY TO UNDERSTAND APPROACHES TO SMALLHOLDER DEVELOPMENT IN SUB-SAHARAN AFRICA

**Niels Röling**

Emeritus Professor, Wageningen University and Research, The Netherlands.

Email: [n.roling@inter.nl.net](mailto:n.roling@inter.nl.net)

### Abstract

Innovation systems (IS) are taken to be coherent and consistent narratives or discourses. This chapter uses the *Group/Grid* or *Cultural Theory* (CT) to distinguish four competing IS narratives, each with their own theory of change, criterion variables, strategies, pathways of innovation and designs for innovation platforms (IP):

1. The business model of agronomy (BMA), based on the methodological individualism of the diffusion of innovations and ‘agricultural treadmill’ paradigms and focusing on technology development to raise yields.
2. Package and value chain approaches that seek to enable individual entrepreneurship through access to services, inputs, credit and markets and other institutions that reduce transaction costs.
3. Promotion of rules and regulations (hierarchical institutions) to constrain the pursuit of individual interests for some public goods (governance, control of corruption, sustainable use of natural resources).
4. Egalitarian approaches that seek to empower, emancipate, strengthen civil society and enhance social capital.

This framework proves useful for analysing the history of agricultural development in industrial countries and sub-Saharan Africa (SSA) to point to ways forward for inclusive approaches to mobilize the vast productive resources under smallholder management in Africa.

**Keywords: Agricultural treadmill, Individualism, Innovation platforms, Inclusive, Institutions, Empower, Social capital**

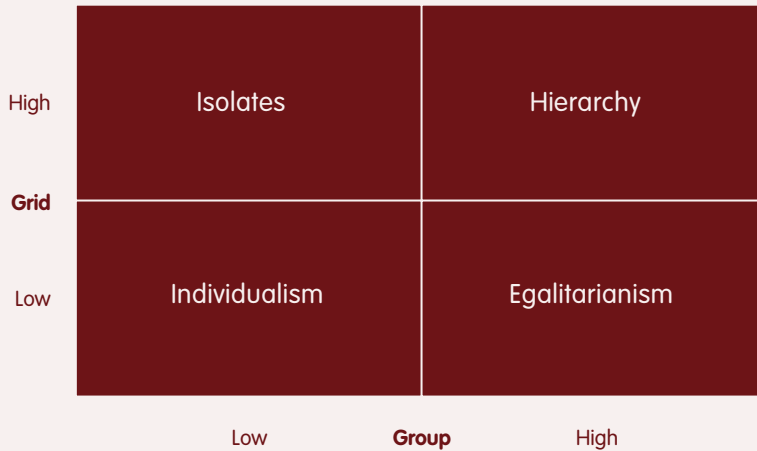
## Introduction

This chapter attempts to understand the incompatibility of ideas that agricultural IS practitioners encounter when they ply their trade. Why do such different views of research and innovation continue to persist especially in the context of the agricultural sector in SSA? And why, after decades of effort, is there so little concrete achievement on the ground in terms of mobilizing the vast productive resources under African smallholder management for food security and food sovereignty at levels beyond the extended family or local town? Why is there so little agreement on ways forward given the expected impact of climate change and the growth of its population from 1 billion now to 4 billion by 2100 (Gerland et al., 2014)?

In order to answer such questions and contextualize the contributions to the current volume, let us suppose that agricultural innovation systems (AIS) are narratives or discourses with consequences in the real world in that they inform professional practice, decisions about investment, definitions of criterion variables for assessing success, and intervention strategies. Mytelka (2016) sees IS as conceptual tools and frameworks “that are particularly useful since they do not regard ‘research to the market’ as a linear track, nor do they limit innovations to those at the frontier of knowledge.” Focus is given to the interactions among and behaviour of various actors which are shaped by the policy and institutional context. There have been attempts to define the AIS but in my view there is not one ‘true’ definition of AIS, not one concrete phenomenon that one could call an innovation system. It is more accurate to say that AIS narratives engage on a ‘battlefield of knowledge’ (Long and Long, 1992). Sumberg and Thompson (2012) speak of ‘contested agronomy’ and Struik et al. (2014) write about ‘scientific controversies in intensification and sustainability’ and about trade-offs. AIS narratives are dynamic, contested and never finished. Formulating a definition is a strategic manoeuvre.

## Cultural Theory

Contestation, controversy, trade-offs and battlefields suggest that this chapter would benefit from CT formulated by Mary Douglas (2007) and Aaron Wildawsky (Thompson et al., 1990). CT considers human collectivities as pushed and pulled among four competing views on optimal ways of exerting social control and coordinating human affairs (Figure 1). Each ‘cultural bias’ or ‘type of rationality’ reflects preferred kinds of social organization and the values and institutions that uphold them. Each defines itself in contrast to the others. What is rational is defined *a priori* by the premises that uphold each view. This means that the conflicts between them cannot be resolved by argument, and that compromise is at best a temporary and shaky truce based on the relative power of competing views. Societies are healthy to the extent that all four views are given space to express themselves. Domination by any one is detrimental to the health of the collectivity as a whole (Douglas, 2007). The choice for CT in the present chapter is based on the expectation that it can ‘deconstruct irreconcilable differences by identifying the particular type of civilization which the culture (read AIS narrative) upholds’ (Douglas, 2007).



**Figure 1.** The grid/group diagram used in CT

Source: Based on Douglas (2007)

Four perspectives emerge from two control dimensions: the extent to which people are perceived to be constrained by rules (institutions; formal and informal) (Grid); and the extent to which they are perceived as embedded in stable social networks (Group). Mary Douglas grew up in a Catholic convent school, where she experienced the safety, regularity and predictability of strict *hierarchy*, which stood in sharp contrast to the economy of the England of her time, imbued with neo-liberal values that extolled *individualism*, such as entrepreneurship, freedom, competition, wealth, power and market. The archetype of hierarchical culture is the bureaucrat, for individualism it is the businessman.

*Egalitarianism* refers to an enclave of people not bound by rules but by strong ties, equality and shared ideals and values. The sect, non-governmental organization (NGO), people's organisation (e.g. a women's cooperative), or sub-political movements (Sherwood et al., 2013) are examples. *Isolates* are more difficult to place. Douglas speaks of prisoners or the Queen as people who are strongly bound by rules but not embedded in groups. We could perhaps think here of unorganized, exploited and alienated peasant communities at the receiving end of globalization, such as those studied by Van Haften and Van de Vijver (1996) in Burkina Faso. In Latin America, one could think of the 'culture of poverty' (Lewis, 1969) with its fatalism, although critics have emphasized that the self-perpetuating nature of poverty is a 'convenient truth' for the dominant classes and that fatalism is the 'best adaptation to impossible circumstances' and does not persist once they change (Niehoff, 1966). On the other hand, Acemoglu and Robinson (2013) and Tabellini (2008) have argued that institutional backwardness can persist over centuries, although they give different reasons. The former emphasizes the role of elites in maintaining such patterns, while the latter focuses on the 'diffusion of adverse cultural traits', which make citizens 'tolerant of ineffective government'.

I will use three of the four perspectives, *individualism*, *hierarchy*, and *egalitarianism*, as most relevant for analysing AIS narratives in SSA and for contextualizing some of the contributions to the current volume.

### Individualism

In Douglas' scheme, individualism looks at society as the outcome of individual pursuits that are neither constrained by membership in groups, nor by societal rules and norms. Keywords linked to innovation in this perspective are freedom, entrepreneurship, growth and competition. Its corollary, *methodological individualism*, is the expectation that desirable societal outcomes emerge from individual pursuits to optimize personal/private utility. Societal attributes are seen as aggregated individual actions. This idea is reflected in the expectation that the decisions of thousands of farmers to adopt agricultural technologies leads to agricultural development and lower food prices. It usually ignores collective externalized costs, such as lowering of water tables when farmers adopt pump irrigation. Such costs are themselves an emergent property of individual action (S. Biggs, pers. commun. 2015).

Douglas' individualism raises a theoretical issue where it comes to the role of rules or institutions. She defines individualism in terms of low group and low grid, i.e. in terms of *absence* of control mechanisms, be they group pressure or institutional controls through constitution, regulation, informal norms, policies, governance, or accepted practice (Williamson, 2000). And, as we have seen, methodological individualism looks at society purely as an emergent property of aggregating individual behaviours. In that view, institutions, apart from property rights and their observation, do not feature very strongly. Enter Douglass North (1990).

The contribution of New Institutional Economics (North, 1990) is to have demonstrated that markets, rather than being the autonomous emergent outcome of the aggregation of individual supply and demand, exist only in evolved webs of rule-based institutions that are embedded in a society's political process. Laws protecting private property, agreement to accept an intrinsically worthless piece of paper as money, and companies that insure trade risks are examples of such institutions. Organizations and entrepreneurs initiate and shape the direction of institutional change, which in turn affects the behaviour of the market (R. Haagsma, pers. commun. 2015). Market and institutions mutually influence each other, in line with Giddens' (1984) structuration hypothesis.



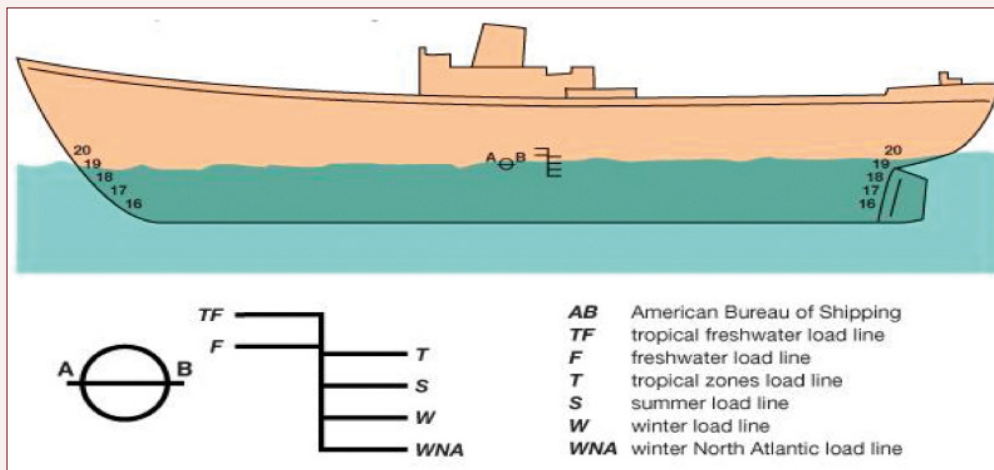
**Figure 2.** Level playing field  
Source: McIntyre et al. (2009):66

In North's perspective, institutions play a crucial role by reducing uncertainty in human interaction and thereby the transaction costs of doing business. Institutions *enable* individuals to pursue personal utility. In other words, and contrary to Douglas' condition of 'low grid', the expression of individualism is facilitated by an elaborate supportive institutional context that ensures fair competition ('level playing fields', Figure 2) and upholds other agreements that are of mutual benefit.

### Institutions

Institutionalism is a view of society that accepts that the individual actor is governed by collective rules, norms, systems of governance, and shared knowledge that both supports and constrains the actor's agency. Emile Durkheim (Durkheim and Traugott, 1994) defined institutions as 'social facts' that are collective and social in nature and external and constraining to individual choice. Institutions are "supra-individual units of analysis that cannot be reduced to aggregation or direct consequences of individuals' attributes or motives" (Di Maggio and Powell, 1991).

A good example of an institution is the Plimsoll Line marked on the hull of a ship, that indicates the maximum depth to which the ship can be loaded (Figure 3) (Jones, 2006). It is named after Samuel Plimsoll, a British politician who was instrumental in drafting in 1875 a law that enforced the use of the line to stop unscrupulous ship owners from overloading their ships without regard to the safety of their crews. The Board of Trade was charged with enforcing compliance with the new law. The Plimsoll Line has all the hallmarks of an institution, in this case a hierarchical one: it is a negotiated, accepted and enforceable collective rule that constrains individual action within technical limits in conformity with the public good.



**Figure 3.** The plimsoll line

Source: <http://www.marine-knowledge.com/plimsoll-lines-significance-meaning/>

The difference between methodological individualism and an institutional perspective is famously exemplified by the contrast between Hardin's (1969) 'tragedy of the commons' and Ostrom's (1992) observation of sustainable 'governance of the commons' by traditional communities. In his classic article, Hardin, from the tenets of neo-classical economics, inferred that each herdsman (on common grazing land) is locked into a system that compels him to increase his herd without limit in a world that is limited. In other words, common grazing land will inevitably be degraded as each individual tries to take as much from the commons as possible before others can do so. Ostrom, on the other hand, documented how traditional communities had preserved common property resources, sometimes for centuries, through rules limiting the number of people having access to the commons as well as the off-take per member, and measures to monitor and sanction compliance. Ostrom opened up a rich vein of research and policymaking by examining how institutions (in this case hierarchical ones) can reconcile collective resource conservation and the pursuit of individual interest. Tabellini (2008) discusses the conditions under which such institutions emerge and observes that in societies in which group membership is not well defined and individuals interact across groups, enforcement is achieved through formal and specialized means such as courts. Ostrom did not reach beyond local informal rules to such generalized rule of law and Biggs (Pers. comun. 2015) warns against romantic enthusiasm about local rules that ensure sustainability of resource use, by pointing out that local rules can easily be used by local elites to serve their own interests.

Institutions play different roles in Douglas's scheme (Figure 1). As we have seen, she defines *individualism* in terms of an absence of institutions, which applies to methodological individualism. North (1990) convincingly showed that by reducing transaction costs institutions enable the individual pursuit of personal utility. In North's perspective, individualism thus requires institutions to function. In *hierarchy*, institutions constrain individual behaviour for the public good. In both cases, institutions define individual behaviours; the difference is the objective. In North's case, the objective is to *create enabling conditions for the expression of individualism*, while hierarchy emphasizes *constraining it for the realization of some public good*. As we shall see, this distinction is crucial for the analysis of AIS, especially given the calls for agricultural intensification and global food security, on the one hand, and for equity and sustainability of finite resources and ecosystem services, on the other.

It is helpful at this stage to summarize the theoretical toolkit I will use for analysing AIS narratives and related vested interests and ideologies by distinguishing four 'cultural biases' or 'types of rationality' (Box 1).

I shall not deal with isolates. The remainder of the chapter uses these four positions to analyse AIS narratives, as well as their manifestation in the IS projects and programmes described in the current volume.

**Box 1. Four types of rationality**

- The methodological individualism of neo-liberal economics that predicts desirable outcomes from the aggregation of individual behaviours and mostly ignores institutions (except for the assumption of property rights).
- The web of institutions that enable pursuit of individual (or corporate) freedom and utility by reducing transaction costs.
- The hierarchical institutions that constrain individuals in the interest of some public good, such as sustainability of resource use.
- Egalitarian institutions with their focus on social capital, values and equality as dynamic forces for change.

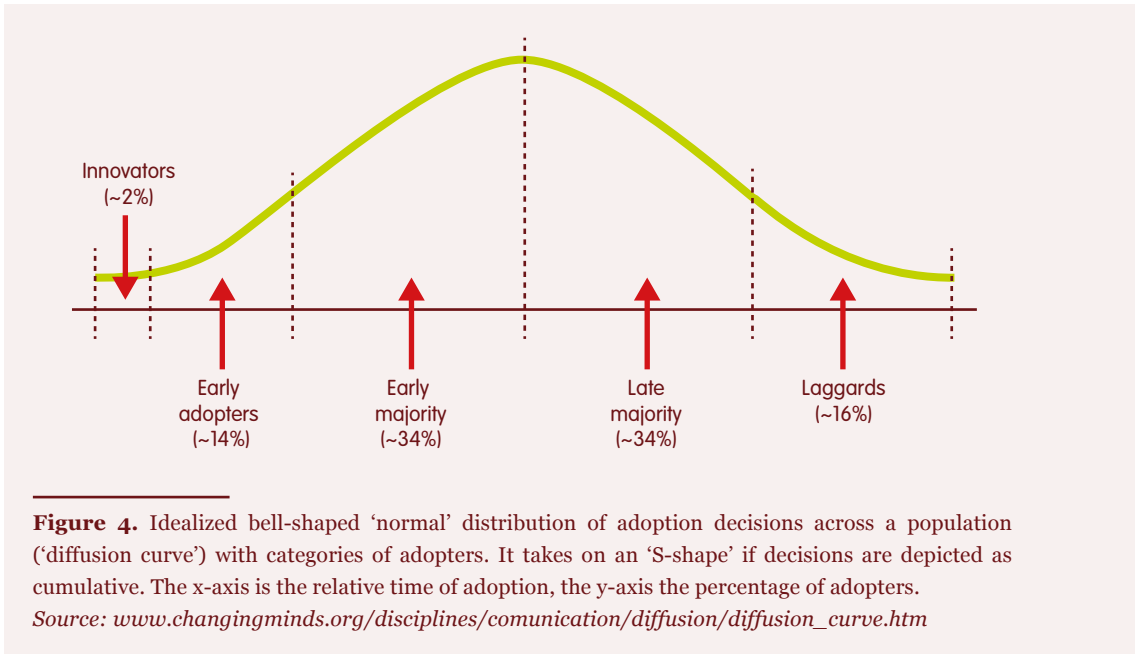
**Methodological Individualist Approaches to Innovation**

Three research-based paradigms that for some 40 years supported methodological individualist approaches to agricultural innovation came together after the Second World War.

*Diffusion of Innovations*

Ryan and Gross (1943) studied the spread of hybrid maize among farmers in Iowa and for the first time recorded the autonomous and rapid diffusion of a novel practice among farmers. Diffusion was identified as a magic multiplier of research (e.g. breeding) and extension effort and became recognized as an important component of the transformation of US agriculture during a period of phenomenal productivity growth and of capturing the economies of scale. Rogers' (1962) 'Diffusion of Innovations' became a classic also because the diffusion paradigm proved to have wide application, including such phenomena as the Hula Hoop craze, the spread of HIV/AIDS (which motivated Rogers to move into health education) (Vaughan et al., 2000), and the diffusion of cassava among Nigerian villages in the 1960s.

The diffusion paradigm has become so widely known that there is no need to explain the bell-shaped diffusion curve (Figure 4), adopter categories, the individual's adoption process, and the characteristics of an innovation that facilitate or impede adoption. Methodological individualism underlies this paradigm: diffusion is basically seen as an aggregate phenomenon, without much contextual analysis, say of government support or prices. The decisions of independent individuals be they firms, households or farmers, to adopt a novel practice or product, are sufficient to collectively transform a lifestyle or an industry.



### *The Agricultural Treadmill*

In 1958, Wilbur Cochrane described the economic mechanism that drives diffusion. He called it the 'agricultural treadmill'. It explains diffusion in terms of neo-liberal economics: individual decisions to maximize utility lead to optimal societal outcomes. The treadmill works as follows:

- Farms are seen as small firms (individual decision-makers), which all produce the same commodities;
- Each one is too small to affect the price: they are price takers who produce as much as they want against the going price (rational choice). Individuals' efforts to improve their incomes by producing more leads to a constant downward pressure on overall prices (societal outcome of individual choices);
- Since overall prices are still dictated by the prevailing state of the art, introduction of an innovation allows innovators and early adopters to capture a windfall profit;
- Soon diffusion leads to over-production and further price squeeze. Adoption becomes necessary to stay in the marketplace;
- Farmers who cannot keep up drop out. The survivors absorb their resources and capture economies of scale.

Farmers in such countries as the US and the Netherlands, who have survived years of attrition in farm numbers, have internalized the model: to stay in business you have to surf the waves of innovation and keep growing.



What makes the treadmill particularly attractive for policymakers and corporations are its aggregate outcomes (Box 2). With these perceived advantages, it is little wonder that the treadmill has been widely embraced as the model for agricultural policies, such as the EU's Common Agricultural Policy.

**Box 2. Aggregate outcomes of the treadmill: food for policymakers**

- Drives intensification and productivity growth;
- Reduces food prices;
- Eliminates uncompetitive farms and releases labour for industry;
- Increases industry efficiency and improves the nation's competitive position;
- Locks farmers into webs of corporate services and sales.

*Investment in Agricultural Research and Extension*

The influence of the diffusion paradigm and the agricultural treadmill was strongly enhanced by an oft-quoted and still authoritative article in *Science* (Evenson et al., 1979) that, based on studies of the diffusion of hybrid maize and other technological innovations and the multipliers involved, showed that investment in agricultural research and extension has a high internal rate of return (IRR, i.e. a profitable investment). Its second author, Vernon Ruttan, was a highly influential member of 'the profession' (agricultural economics), which at the time claimed the monopoly for translating science into policy.

*A Business Model of Agronomy*

The apparent success of the Green Revolution in Asia was a final vindication of the model of agricultural development built on diffusion, the treadmill and a high IRR to investment in agricultural research. Its core narrative is that investment in science-based innovation in technology and practice is the driver of productivity growth. I call this the BMA because it justifies a predominant role of agricultural science and technology in agricultural development. Its pathway of innovation is discovery, delivery and use. The linear character of this pathway comes to the fore in such terms as 'upstream' and 'downstream' and the characterization of farmers as 'ultimate users'. The 'system' is the (national) agricultural science, technology and innovation system<sup>1</sup> or national agricultural research system (NARS).

I would not have given so much attention to BMA if it were not that I consider it still to be a dominant AIS narrative in SSA. Other narratives have a hard time in getting their ideas across, for instance in suggesting the need for professionalism beyond the practice of (applied) science for technology development. Agricultural scientists and research play central roles in the organizations that drive African agricultural development. NARS, regional research organizations such as the Council for Agricultural Research and Development in West and Central Africa (CORAF/WECARD) with its 22 member NARS in West and Central Africa, the continent-wide Forum for

<sup>1</sup> Not to be confused with the International Food Policy Research Institute's Agricultural Science and Technology Indicators (e.g. Stads et al., 2014)

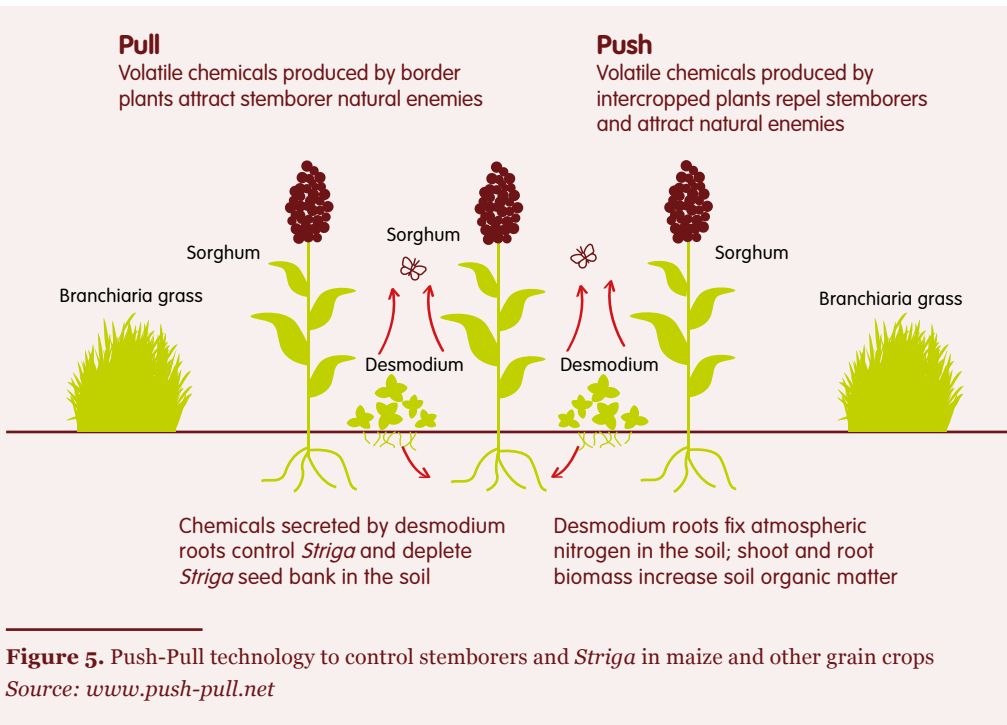
Agricultural Research in Africa (FARA), and the International Centre of Insect Physiology and Ecology (*icipe*) today operate alongside such international research organizations as AfricaRice and the International Institute for Tropical Agriculture. The utilization of the output from these research organizations by farmers has been promoted by schemes, such as the Training and Visit System of Extension (T&V), that once covered all African countries but eventually was found to be ‘fiscally unsustainable’ (Anderson et al., 2006). As we shall see, the dominance of BMA as an AIS narrative also shines through in current innovative efforts such as Integrated Agricultural Research for Development (IAR4D). Investment in agricultural research and development (R&D) is still used as an indicator for the development effort of African nations (Stads et al., 2014).

BMA tends to focus on the individual farm and plot level. Its main criterion variable is yield/ha. An illustration of this thinking is a Wageningen colleague who regards the pursuit of organic agriculture a ‘crime against humanity’ because it is said to have maximum achievable yields/ha some 20% below the potential and will therefore not allow the proverbial population of 9 billion in 2050 to be fed. The limitation of yields/ha as the criterion variable is shown by the work of Tilman et al. (2011) who estimated that moderate intensification in areas with yield gaps could help achieve global food security in 2050 while substantially reducing agriculture’s total environmental impact. In other words, if the criterion is global food security rather than yields/ha, moderate intensification (e.g. based on agro-ecological principles) can be effective. The implicit assumptions of using yields/ha as the criterion for effectiveness is one of the sources of misunderstanding among AIS practitioners.

### *The Role of Technology*

I am aware that the analysis of methodological individualist approaches to agricultural innovation and the characterization of BMA as an AIS narrative can easily lead to defensive reactions on the part of agricultural scientists. This would miss the point. What I have criticized is the dominant AIS narrative. There is no question that agricultural science has a key role to play in the innovation of smallholder farming, and good science is essential in developing technologies that work and can have an impact. Figure 5 gives an example. Where things have gone wrong is that BMA assumes that developing technology is not only a necessary but *sufficient* condition for agricultural development and ignores the role of enabling, constraining and civil society institutions in technology use.

A good example is a current research effort to develop an antiserum that is effective against the bites of all species of snakes in Africa. Given that snakes globally kill an estimated 40,000 people every year, this is a laudable initiative. But developing such a serum is not sufficient if one considers the difficulties of creating timely access to the antiserum for those who have been bitten.



### Why BMA has had Disappointing Results

In general, BMA has failed in Africa, especially where food crops are concerned. The Green Revolution never took off (Djurfeldt et al., 2005). Clark (2016) describes the low uptake of outputs from the UK's Department for International Development's major investment in agricultural research and analyses how the follow-up effort to drive Research Into Use also met with only partial success. In several countries, agricultural administrators have begun to realize that NARS are not making the expected contribution to agricultural development. In Mali, for instance, on the 50th anniversary of its independence from France, its highly regarded Institut d'Economie Rural (IER) produced a booklet featuring the major technologies the IER had produced over the years. It made painfully clear to agricultural administrators that only a few of these technologies had been taken up by farmers (M.L. Sidibé<sup>2</sup>, pers. comun. 2011).

The question is why? One issue is that most of the research institutes that make up Africa's NARS focus exclusively on soil fertility, plant protection, genetics, and other disciplinary and technical issues. Very few have a capacity to analyse the actual constraints of smallholders in their own domains of practice or to assess the institutional contexts in which smallholders in a given locality seek to secure their livelihoods. Such issues typically are considered to be outside the purview of science; agriculturalists do not know how to talk about them. Such disciplinarity should, of course, be no problem, were it not that the dominance of research organizations as expected

<sup>2</sup> In 2011, M.L. Sidibé was the Director General to the Ministry of Agriculture.

drivers of agricultural development turns the commission of technology development into an omission of interventions for helping smallholders become effective entrepreneurs. Agricultural research can be compared to a commercial company without a marketing department.

Another explanation for the disappointing impact of BMA is the Structural Adjustment Programmes (SAP) of the early 1990s. As a condition for receiving further financial assistance, SAPs forced African countries to shut down or reduce funding of public veterinary services, input distribution and produce marketing schemes, credit schemes, integrated commodity marketing boards and parastatals. Contrary to expectation, in most cases the private sector did not step into the void created. As a result, the limited public infrastructure for enabling smallholder development was more or less abolished.

### *The Forgotten Role of Enabling Institutions in Industrial Countries*

A third and key point are the blinkers of the BMA to the history of the societies in which it emerged. Hounkonnou et al. (2012) highlighted this neglected history by exploring agricultural development in the US and the Netherlands, today the two largest exporters of agricultural products by value. The rapid productivity growth in these countries as a result of diffusion and the treadmill mechanism was *preceded* by up to a century by careful and deliberate development by diverse interests (including farm leaders, nobility eager to increase the production of their estates, schoolteachers, priests, politicians and philanthropists) of an enabling institutional context for individual farm development.

*The United States.* By the 1940s when hybrid maize diffusion took off in Iowa, most US Land Grant Colleges had been established for more than 50 years to provide public agricultural research, extension and education in their State. Farmer Unions had gained strong representation in Federal and State Legislatures. Effective value chains were in place for most commodities. Farmers were embedded in effective networks of service providers, including farm mechanization specialists, and product markets. In 1932, Roosevelt's New Deal, in response to the crisis following the crash of Wall Street in 1929, initiated farmer income support through quotas and direct subsidies and established the Tennessee Valley Authority that covered several states with a far-reaching public mandate to manage the watershed for energy, erosion control, and flood protection.

*The Netherlands.* The building of the railroads across America in the 19th Century had released huge quantities of cheap grain onto European markets. The ensuing agricultural crisis led to the establishment of a State Commission in 1886 with the explicit task of creating the enabling conditions that would allow farmers to 'pull themselves up by their own bootstraps'. The measures included initiation of agricultural research and education for farmers and (explicitly) farmwomen, and the Land Tenure Act of 1917 that still gives tenants security over their usufruct and therefore makes it rational for them to invest in improving the land. The government also subsidized semi-compulsory land improvement, re-adjudication, consolidation and drainage programmes that transformed the landscape of Rembrandt for 'rational production'. It is said that at least one-third of Dutch productivity growth was due to more effective control of groundwater levels.

The Dutch public extension service is another example of the enabling institutions that were created. It was so well organized and successful that in 1951, i.e. well before the take-off of agricultural productivity growth, Wageningen University and Research (WUR) started an International Course in Rural Extension for mid-career professionals that over the next 40 years attracted thousands of international participants and became a forum for exchange of knowledge and experience in the profession. The public extension service was supported through research and capacity building by a Department of Extension Studies in WUR that spawned textbooks by Van den Ban and Hawkins (1996), translated in ten languages, Röling (1988) and Leeuwis with Van den Ban (2004).

The enabling character of the public extension service became apparent in the 1980s when the government could no longer ignore ground and surface water pollution, saturation of agricultural soils with nitrates and phosphates, and acid rain. These were the externalized costs of the 1 t of liquid slurry per head of the Dutch population that the country's livestock farmers were producing *in surplus* to what the land could absorb<sup>3</sup>. The government started using extension agents, who so far had served farmers' demands, to implement 'manure laws'. Their new policy-implementing role ('hierarchy') brought the frontline workers into conflict with their historic role of serving farmers' interests. They lost the trust of farmers. After a brief period of tension between the leadership of the service and frontline staff (Wagemans, 1987), the service was privatized. From that time onwards, the Ministry of Agriculture, historically a farmer support organization, with a minister who was usually recruited from the farmers' organizations, became an arm of government responsible for balancing the interests of nature, air and water quality and other environmental issues (public goods), on the one hand, and those of agriculture as a prime export industry, on the other.

Although we have not yet described the distinction between creating enabling conditions for individual entrepreneurship and hierarchical institutions for constraining individual behaviour, the rise and fall of the Dutch public extension service clearly demonstrates that distinction and also shows how enabling individualism can become so dominant that it becomes dysfunctional from a public interest point of view.

The overview of the history of agricultural development in the US and The Netherlands shows that the dominance of BMA is based on an understanding that is scientifically flawed, in that it ignores the deliberate creation in such countries as the US and Holland of the institutional conditions that were necessary for the treadmill to kick into action.

### *Comparing Asia and Africa*

Biggs (2007) demonstrated that the Green Revolution in Asia would have been unthinkable if governments had not created the enabling institutional conditions for its operation. Indonesia, for example, built BAPPENAS (State Ministry for National Development Planning)

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<sup>3</sup> At first, researchers (employed by the public research institutes) who established these facts were not allowed to publish their results (H. van der Meer, pers. commun. 1980)

as a quasi-military agency that handled seed and input distribution, credit, extension and quality control for millions of rice farmers. This is not the place to discuss the pros and cons of the impact of the Green Revolution in Asia, only to note that the Green Revolution, often claimed as proof for the success of BMA, was in fact as much based on creating enabling institutions, as was the phenomenal increase in agricultural productivity in industrial countries.

A study comparing Asian and African countries' experience of the Green Revolution concluded that SSA is marked by a 'pervasive bias against the smallholder sector on the sub-continent' (Djurfeldt et al., 2005:4). The conclusion is not that African countries do not have institutions. Rather the study indicates that the ones that are there tend to disable farm development. Obligations in extended families, corruption, rent seeking, lack of interest in and understanding of small farmer' issues among urban elites, under-investment, and catering to urban votes by importing cheap agricultural products that pre-empt local farm development have been cited as co-related causes. This has been explained in greater detail in Hounkonnou et al. (2012). Many African institutions can be seen as dysfunctional individualism in the absence of the effective rule of law, checks and balances, and a strong civil society. These issues are further discussed later.

## Creating Enabling Conditions for African Smallholders

### *What Enabling Conditions?*

I now turn to concrete efforts to create African institutions that enable smallholder farmers to innovate beyond indigenous innovation of subsistence agriculture through trial and error and through adopting novelties such as cassava, maize and all the other Latin American crops that now provide the staple food for most Africans. Box 3 provides a list of such enabling institutions.

#### **Box 3. Some enabling institutional conditions for individual farm development**

- Research and extension
- Supportive farm journals and other media (e.g. marketing information)
- Training courses for farm men and women
- Farmer organizations that represent (including small) farmers' interests (strong lobbies)
- Effective collection and use of statistics on agriculture
- Credit system
- Seed system
- Input distribution
- Mechanization support
- Bookkeeping support
- Integrated value chains and marketing mechanisms
- Land tenure laws
- Regulatory frameworks to create level playing fields
- Policies, including fiscal policies that support, protect and subsidize farming where necessary
- Infrastructure

The increasing consensus about the disappointing impact of technology development among African agricultural research administrators, policymakers and donors has inspired programmes that aim to create enabling conditions for African smallholders. The IAR4D philosophy that the Comprehensive Africa Agriculture Development Programme, FARA (Hawkins et al., 2009; Adekunle et al., 2016) and CORAF/WECARD (Sanyang et al., 2016) are implementing explicitly recognizes the role of enabling institutions, and focus on multi-stakeholder approaches that allow innovation to emerge from interaction on ‘platforms’. I come back to platforms later. These efforts represent a major change compared to ‘pure’ BMA.

#### *AGRA’s Initiative as an Illustrative Example*

An additional example is the 5-year, US\$180 million (€162 million) flagship initiative – first in Ghana, Malawi and Tanzania and now in 18 countries – of the Alliance for a Green Revolution in Africa (AGRA), funded by the Bill and Melinda Gates and Rockefeller Foundations (Coghlan, 2014) (Box 4).

#### **Box 4. Key ingredients of the AGRA programmes**

AGRA programmes have recruited thousands of farmers whose yields, on average, have doubled. By 2015 AGRA hoped to have reached 20 million smallholders. A central objective is to redress the continuing loss of nutrients in Africa’s soils: “Alleviating soil fertility constraints in Africa is the biggest obstacle to global food security” (Lobell, 2014). AGRA’s Soil Health Programme has set up 9,000 dealers within 5 km of AGRA farmers to sell them the supplies they need. As a result, AGRA farmers each now use 10 to 50 kg/ha of fertilizers. AGRA has appointed 2,800 inspectors to monitor soil health and advise the farmers. The dealers supply seeds, especially of nitrogen-fixing legumes such as soybeans and pigeon peas, and the inoculums to make them grow effectively. To solve the lack of service infrastructure, AGRA also offers micro-credit and links farmers to produce buying agents, thus linking farmers to the entire business chain. Groups of 15 to 20 farmers are encouraged to form collectives to develop bargaining power and collective assets. One major customer for AGRA farmers is the UN World Food Programme. It has apparently already bought 450,000 t of food from AGRA farmers, worth US\$177 million (€159 million), and the scheme is set to continue.

AGRA by these means claims to have been able to move considerable numbers of farmers into commercial agriculture. It has created the enabling conditions to ‘get agriculture moving’. AGRA’s work brings to mind my own experience with co-implementing a small hybrid maize package scheme explicitly aimed at ‘laggards’ in Tetu Division of Central Province, that was part of Kenya’s Special Rural Development Programme in the early 1970s (Ascroft et al., 1973; Röling, 1988: esp. chapter 6). Such programmes invariably experience that if one creates realistic opportunities for male and female farmers, however small and poor, they will grasp them with alacrity.

#### *Concerns about Current Efforts to Create Enabling Conditions*

Although they do focus on enabling institutions, programmes such as AGRA’s tend to focus on disseminating science-based technologies available on the shelf rather than on creating opportunities based on diagnosis of farmers’ constraints in a particular context (Clark, 2016).

The programmes introduce technology packages, e.g. high yielding varieties (HYV) of seeds, fertilizers and pesticides that smallholder farmers typically cannot afford and therefore require seasonal credit or subsidy. My involvement in the ‘Tetu programme’ taught me that such package programmes are successful within tenuous margins set by:

- Farm size and hence the amount of surplus and cash that can be generated for loan repayment.
- The ability of farmers to make a sizeable gain in yields as a result of the programme.
- Sufficient and timely rainfall in conditions where every planting season is a gamble that the rains start in time, persist, and are adequate.

The higher the costs of the inputs and the smaller the farm size, the smaller the margins within which success is possible. The removal by the then Kenyan Government of a subsidy on fertilizers raised the price to a point where, for loan repayment to be feasible, a plot of half an acre required a yield/ha that was realized only by a minority of the farmers. Failure of the rains can wipe out the success of the programme as farmers lose their investment and default on their loans. Such risky conditions do not encourage commercial companies to take over the functions and services previously provided by the publicly-funded programmes, especially where the logistics of providing the small loans and quantities of inputs that each farmer requires are expensive.

This raises a third concern. As in the Tetu programme, the creation of enabling conditions by external agencies such as AGRA and others is artificial in the sense that it is not necessarily embedded in government policy and agencies with capable and transparent management, trained staff, and a legitimate budget that is based on an ability to raise taxes. The current programmes seem as ‘fiscally unsustainable’ as the T&V system. The 2006 pledge by African governments to inject 10% of their incomes in agriculture has so far been honoured by only 8 of the 54 (Coghlan, 2014). African agriculture can develop only if governments, as a matter of routine, develop and fund the enabling institutions that would make this possible.

### *An Alternative Attempt to Create Enabling Conditions*

The Convergence of Sciences-Strengthening Innovation Systems (CoS-SIS) action research programme (Hounkonnou et al., 2016; Jiggins et al., 2016) also explicitly sets out to create enabling institutions for smallholder intensification (CoS-SIS, 2014). Its forerunner, CoS, initially focused on participatory technology development but was confronted with institutional issues to a point where it started to experiment with them (van Huis et al., 2007). CoS-SIS built on this experience. The interventions undertaken by its platforms took entry points that, inspired by authors such as Grindle (2011), were based on scoping and diagnostic studies (Jiggins, 2012; Adjei-Nsiah et al., 2013) to identify the institutional constraints and opportunities for smallholders in a given agricultural domain (e.g. cocoa, oil palm, irrigated rice) that could be changed. The big difference with the programmes discussed so far is, therefore, that the institutional innovations that the programme promoted in each domain were not in support of adoption of a *a priori* chosen science-based HYV, but emerged in the platforms on the basis of information about smallholder conditions and deliberation about what would be effective entry points for intervention by the platform.



The investment in 'knowing that we don't know' what the priorities are in smallholder development, and accepting that smallholders themselves are the experts on the issue, is a hard paradigm shift for people who have been weaned on the notion that science is the source of truth. This shift is a key point of contestation between BMA and adepts of participatory approaches (Chambers, 1994), and the PRA toolkit developed for them (Pretty et al., 1995). Again, this is not to bash scientists or belittle the essential contributions of technology development, but to highlight the myopia of the BMA.

### *Key Characterizations of Enabling Individualism*

The AIS narrative that supports the creation of enabling institutional conditions features terms such as access to input and output markets, and thresholds for entry. The system typically is the integrated value chain. Criterion variables include kilos of fertilizer per hectare used by farmers, the proportion of their product that is marketed, credit repayment and opportunity. Pathways of innovation that are promoted differ according to the objective. When the focus is on the adoption of HYVs, a great deal of emphasis has been given to creating networks of input dealers, seed systems and credit systems. In the case of CoS-SIS, the pathway includes scoping and diagnostic studies and participatory selection of entry points for intervention in a given domain.

## **Limitations of Enabling Individual Entrepreneurship and the Hierarchical Responses to them**

### *Externalities of the Treadmill*

Enabling individual farmers to pursue their self-interest eventually mobilizes the self-propelled treadmill mechanism. Although this seems not to have happened to any significant degree in SSA, it seems a good idea to summarize the experience of industrial countries as a prelude to discussing the relevance of AIS narratives based on hierarchy.

The treadmill stimulates the *externalization of costs* by individuals who seek to maximize their own utility. I already gave the example of the pollution of Dutch surface and ground water by nitrates and phosphates, and the acid rain caused by the fact that the Netherlands imports masses of feed for its intensive livestock industry, but keeps all the slurry. Such externalized costs more generally include the loss of ecosystem services, such as biodiversity, soil restoration, pollination, climate stability and resilience under extreme events. These are not luxury concerns of industrial countries; they increasingly affect Africa and other developing regions. Sherwood et al. (2004) describe how the intensification of potato production in Carchi, Ecuador, based on the treadmill, eventually led to the destruction of the land, the industry and the communities involved.

The treadmill represents a *race to the bottom* through a downward spiral of prices. Intensification involves scale enlargement that ends with a handful of farmers and farm companies. The question is how far the process should continue. In industrial countries, the expenditure on food by the average citizen is now only a few cents of every dollar or euro earned and the gap between actual yields and maximum possible yields (yield gap) has virtually closed (Slingerland, 2014). One can consider these as positive outcomes of the treadmill. Yet the race continues. For example,

the European dairy sector, that used to be protected against the consequences of the race to the bottom by production quotas, was re-liberalized in 2015 and political parties are debating measures to prevent the worst consequences. Internationally, the EU promotes free trade and the uninhibited operation of the treadmill which favours its exports, while at the same time protecting its own farmers from the race to the bottom by income supports, subsidies, production quota and other measures. International pressure to liberalize markets is resisted. For example, at the time of writing, there is increasing resistance in Europe to the Trans-Atlantic Trade and Investment Partnership (TTIP) between Canada, the EU, Mexico and the US.

The treadmill produces a great many *dropouts*. One can look at this positively as a way of getting rid of inefficient and small farmers and making labour available for industry. That no doubt has salience in certain historical periods of rapid industrialization or when other opportunities for alternative employment and emigration are plentiful. However, many developing countries retain huge numbers of smallholders with few opportunities for alternative employment. When these are suddenly exposed to competition from agriculture in industrial countries that have experienced decades of scale enlargement, the subsequent expulsion of large proportions of smallholders from land-based livelihoods has destabilizing effects. The exposure of Mexico's millions of small-scale maize producers to competition from large-scale North American farmers under the North American Free Trade Agreement is a case in point. The same mechanism operates when African countries import cheap food to satisfy their urban populations.

It is, however, not just the resultant destabilization that needs consideration. The import of cheap food pre-empts local agricultural development and prevents the productive agricultural resources under smallholder management from being mobilized for global food security. Free trade and Ricardo's principle of relative advantage, when based on short-term monetary criteria, can jeopardize our ability to feed the world's future population by preventing the mobilization of productive resources.

A final reason for pressure to introduce regulation is the *role of corporations*. An effective treadmill offers opportunities for agribusiness to sell seeds, pesticides, fertilizers and services to farmers and to market their produce. In the end, agribusiness employs more people than primary production. The intensification of farming in industrial countries has been accompanied by a concentration of life science, food and input companies. The egg-timer model features a mass of producers at one end and a mass of producers at the other linked through an ever-smaller number of corporations. Corporate investment in agricultural research is now many times that of the public sector. Extension agents have been replaced by corporate services and salesmen, who are now farmers' main source of advice on chemical use, investment, choice of varieties, mechanization and other issues.

In industrial countries, the private sector's dominance over the food system is increasingly seen to conflict with the public good when it comes to health (e.g. obesity), food safety (e.g. use of antibiotics), greenhouse gas (GHG) emissions, waste, unclosed cycles (e.g. carbon, nitrogen), loss of biodiversity, and further intensification (e.g. Struik et al., 2014).

### *The Relevance of Hierarchy for Africa*

Most of the people involved in African smallholder development are pre-occupied with the question ‘how do we get agriculture moving?’ Few ask ‘moving where?’ Given the fact that most African governments consider agricultural development a priority, and that the relevant organizations have limited capacity and access to funding to make much difference on the ground, the issue is perhaps premature. But this should not blind us to the relevance of hierarchy for helping establish a decent society, for redressing injustice and for creating equal opportunity and other public goods. Often such interventions are not only a question of national government but can be realized at the township, district, provincial or regional levels.

In most African countries, agribusiness generally is in its infancy. Numerous projects and programmes seek to develop agribusiness as part of the enabling conditions required for farm development (as we have seen in the case of the AGRA programme). Nevertheless, regulations (i.e. hierarchical institutions) are also needed and this dimension has not been sufficiently addressed. Corporations regard their bottom line and not necessarily the public good. The commercial food system provides examples. Micronutrient deficiency and obesity have become severe and growing problems that have overtaken problems of undernourishment; stunting and wasting in many African countries. The pesticide industry, in the absence of regulations, actively promotes the use of chemicals that have been found to be toxic to humans and the environment although more benign and cheaper alternatives and practices are available, and the life science industry unwittingly ‘hooks’ farmers on its seeds without due regard to the rich agro-biodiversity that has made African farmers resilient. Many African countries have started to protect farmers’ intellectual property rights in the agro-biodiversity they have developed over the centuries.

Corporations prefer regulatory frameworks that are transparent and enforceable. However, regulatory frameworks also are vulnerable to corruption. Sherwood and Paredes (2014) describe the role of pesticide companies in the politics of keeping highly toxic pesticides on the market in Ecuador and the strategic use of social mechanisms that were involved. Creation of the institutions that control individual greed cannot be left solely to the private sector. Agricultural development requires a strong, well-informed and accountable public sector that can establish and enforce the rule of law. Agricultural science has a role in carrying out research on such regulatory frameworks and in advising governments and electorates. I give some examples of recent African studies that highlight the need for effective regulatory frameworks.

Conflicts between timber companies and cocoa farmers (Ayenor et al., 2004), pastoralists and arable farmers (Dangbegnon, 1998), top and tail enders along irrigation canals (Bolding, 2004), fishermen competing for the last fish in the lake (Dangbegnon, 1998), and villagers in over-populated rural communities who suffer high stress and alienation as land and vegetation cover deteriorate (Van Haaften and Van de Vijver, 1996) are destructive and require submission to arbitration and jurisdiction, negotiation and acceptance of binding rules, and agreed ways of monitoring and sanctioning trespass. Hierarchy is the preferred type of rationality for such situations.

Both the CoS and the CoS-SIS programmes took entry points for intervention that emerged from scoping and diagnostic studies of smallholder communities. This gave rise to identification of priorities of local people themselves. Box 5 shows that many of these priorities require hierarchical institutions. CoS' impact was evaluated 5 years after it ended (Sterk et al., 2013) but for CoS-SIS it is as yet impossible to say whether and why the institutions that did emerge were sustainable.

**Box 5. Examples of priorities for intervention raised by smallholder farmers that required hierarchical institutions**

- Doctoring of cocoa weighing scales by Licensed Buying Agents (LBA) in Ghana cheated farmers by as much 10-15%. An agreement between the district administration, farmers and LBAs that effectively stopped the practice, however, did not survive the termination of CoS (Dormon et al., 2007).
- Local landowners in Benin resumed control of land leased to immigrant tenants from Attacora when the tenants invested in land improvement. This tenure insecurity resulted in the tenants exhausting the land even though they were well aware of the principles of soil fertility management. A locally negotiated tenancy agreement supported by CoS did not survive the end of the programme (Saïdu et al., 2007).
- In Benin, CoS-SIS fieldwork coincided with a disastrous period in the country's cotton industry that historically had provided most export earnings. The enforced privatization of the industry as a result of a SAP had allowed a powerful businessman to gain control of input distribution, ginning and the transport of cotton. His company made it impossible for farmers to buy the pesticides required for implementing a cheaper and more benign integrated pest management (IPM) strategy that relied less on pesticide use (Togbe et al., 2014). The CoS-SIS IP opted for a bypass of the formal system and supported local women to produce neem seed oil as an alternative pesticide. The bypass required formal admittance of neem as a permitted pesticide in cotton. At the time of writing the outcome is uncertain.
- The use of old truck tyres as fuel for boiling palm fruits in artisanal crude palm oil (CPO) production in Ghana was identified by the CoS-SIS IP as a practice that harmed the health of the women processors, the environment and the quality of the CPO. The platform's intervention led to a seemingly lasting ban on the use of tyres as fuel throughout the district concerned, with explicit support from traditional rulers (Osei-Amponsah et al., 2014).
- In Benin, the introduction of a high yielding and fast fruiting hybrid oil palm variety led to demand for improved seedlings. That demand was not met by the official source of certified seed, the public NARS. As a result, nurserymen started selling 'unofficial' hybrids of low quality at premium prices. A diagnostic study found that this had resulted in small farmers' oil palm plantations containing more low yielding and sterile trees, the more recent their planting date was (Akpo et al., 2014). Innovation at the farm level thus depended on first creating a transparent and dependable seed system. The CoS-SIS platform took up this

challenge and worked with nurserymen, two municipalities, the Ministry of Agriculture and the research organization to create such a seed system. This work has led to incorporating necessary action in the national development plan (Vissoh et al., in press).

- In northern Benin, multi-purpose dams provide water for washing, drinking, fishing, drenching cattle, swimming, and irrigation for vegetables. They have become infested by (protected) Nile crocodiles. These diverse interests are now agreed that solving the resultant conflicts among users and uses requires multi-stakeholder negotiations at various aggregation levels, and the development of regulatory measures, as well as monitoring and enforcement capability. At the time of writing, the outcome is uncertain (Kpéra et al., 2014).
- In Ghana, the COCOBOD, the apex parastatal for the cocoa industry, has remained in charge of all matters concerning the production and marketing of cocoa. One of its programmes, CODAPEC, featured mass spraying of cocoa plantations by spraying gangs hired by COCOBOD, with pesticides synthesized by COCOBOD, and paid for by COCOBOD from the proceeds of its monopoly on cocoa bean export. The costs limited the funds available to raise the price paid to farmers for the beans. The spraying service was presented as 'free of charge'. The CoS-SIS cocoa platform that took price formation and farmer reward as its entry points identified CODAPEC as technically ineffective and as a bottleneck to paying farmers a better price. Lobbying by the platform's influential members contributed to current plans to abolish CODAPEC (Adu-Acheampong et al., 2014; Adu-Acheampong et al., 2016). This is an example of the need to challenge the regulatory power of public agencies.

### *Increasing Pressure for (Global) Regulation of Rampant Individualism*

The report of the International Assessment of Agricultural Knowledge, Science and Technology for Development (McIntyre et al., 2009) authored by over 400 scientists, and signed by 57 governments, concluded that 'business as usual is not an option'. Pursuit of self-interest in competitive markets fails when it comes to ecological sustainability, poverty reduction, and optimal use of the world's productive resources for global food security, sovereignty and resilience in the face of climate change. In view of scientific evidence that human activity increasingly determines biosphere outcomes (our geological era is now called the 'anthropocene'), one can perhaps say that we are living during epochal transitions (Mytelka, 2016) that highlight societal capacity to self-regulate in the interest of common survival.

The self-propelled treadmill and profit seeking eventually lead to public outrage against externalized costs. This, in turn, elicits political activity in favour of regulatory frameworks and other constraining institutions that operate under principles of hierarchy. In the end, most agricultural politics becomes characterized by a right wing and a left wing, in which the former emphasizes entrepreneurship, less regulation, freedom to grow, profit, the reduction of transaction costs and the benefits of competition, and the latter equity, land care, livelihoods, reduction of GHG emissions, sustainability, and rights. Agricultural development requires an institutional context that not only enables individual farm households and agribusiness to follow entrepreneurial

strategies, but also one that constrains individual behaviour where necessary to ensure the sustainability of ecosystem services and resource use, as well as to level playing fields and equalize market opportunity.

Institutional analysis supports the observation of Conway (1994) and Kuyper and Struik (2014) that, instead of expecting AIS to deliver win-win solutions, it is more realistic to consider agricultural innovation as a contested *trade-off* among different criterion variables and interests, and between ‘free’ entrepreneurship and rules to regulate its undesirable consequences for the public good.

### *Characteristics of AIS Narratives Based on Hierarchy*

The hierarchy-related AIS narratives look at *systems* in terms of ecosystems and their services, and of circular systems that recycle resources. Systems can also refer to entire polities with emphasis on the destabilizing effects of income inequality. From an automatic focus on the nation as the implicit unit of analysis and management (methodological nationalism [Beck and Grande, 2010; Sherwood et al., 2013]), the system shifts to the global Earth as the appropriate unit of analysis and management of the flimsy and vulnerable biosphere, political stability and food security (e.g. Stiglitz, 2006). *Criterion variables* used in this type of AIS narrative emphasize sustainability, equity, resilience, stability, transparency and human rights. Issues raised include climate change, biodiversity, and poverty. The *pathways of innovation* of this AIS narrative typically include integrated natural resource management (e.g. water catchment management), adaptive management (Holling et al., 2002), creating jurisprudence, bringing court cases, and lobbying for rights and sustainability issues. Visionary leaders, such as Samuel Plimsoll, have a key role to play.

## **Egalitarian AIS Narratives**

### *The Role of Egalitarianism in Agricultural Innovation*

In most rural areas in Africa, both the public and private sectors are generally described as weak, not transparent, or altogether absent on the ground. Consequently, many AIS narratives focus on people’s organizations, farmer unions, cooperatives, sub-political movements (Sherwood et al., 2013), self-organization, NGOs and other expressions of civil society to fill the void and counter such dysfunctional institutional arrangements as monopolies by pesticide companies, corruption, and human rights violations, and provide access to markets and basic health and productive services. These AIS narratives are based on a very different rationality from the three types of rationality discussed so far.

Civil society organizations might have goals that focus on the adoption of HYVs, the provision of enabling services, or the rule of law and human rights, but the actual egalitarian innovation mechanisms are entirely different. They involve empowerment, emancipation, solidarity, equality, bottom-up processes, shared causes, stakeholder dynamics, facilitation of interaction, devolution, countervailing power, counter-movement, participation, networks, social capital, and other social dynamics that recur in the egalitarian narrative.

For example, in hierarchy, effectiveness is served by building the capacity of extension services to deliver the goods; in egalitarianism effectiveness only emerges when clients have claim making capacity or countervailing power to make extension workers serve their needs. The example makes clear that it is not so much a question of either or, but of both at the same time. Egalitarianism has a crucial role to play in agricultural innovation.

### *Egalitarianism in Africa*

In the 1960s, I used to visit a small rural town, Umuabi, just north of Enugu, then the capital of the Eastern Region of Nigeria. This town had a strong social organization, which included its 'sons abroad' associations, also called 'progressive unions', which were made up of villagers who had found work in the larger world but would come home around Christmas to help improve the town, not just by constructing stone houses for themselves, but especially by supporting the building of amenities, such as schools, sports fields, and churches, and by paying scholarships for villagers to attend law or medical school to help the town in legal (land) battles and disease outbreaks. The town exerted strong control in that people who did not contribute would be ostracized and barred from visiting the town. Another sanction was public ridicule and whipping of the legs by the youths of the town. In all, it effectively levied taxes to pay for public goods. Box 6 gives an example of the dynamics that were operative in the town. It is illustrative of the strong checks and balances that were/are built into local society.

#### **Box 6. The Chief of Umuabi**

Although the Igbo are a famous example of an acephalous society, one person was generally referred to as 'the Chief' because he used the experience he had gained as a bookkeeper in the coal mines near Enugu to help townspeople find their way in the larger world, and make educational choices, etc. He also represented the town in the County Council. Every year a secondary school scholarship was distributed among the towns belonging to the County. When Umuabi's turn came, the Chief decided to keep the scholarship for his own daughter. However, the clerk of the County, also from Umuabi, reported this to the town's people. They instituted a public examination to determine who should get the scholarship. The daughter of a poor widow won; the Chief's daughter came second. When I asked why the Chief was still there enjoying his special status, I was told: "we would all have done the same thing". In other words, individual pursuit of gain even by devious means is acceptable, but civil society provides the checks and balances to constrain it.

Today, such dynamics continue to operate. In his book *'Listening to the Cradle: Building on Local Dynamics for African Renaissance'*, Hounkonnou (2001) describes several interesting and successful cases of rural communities that have self-organized to stop theft, build water and health systems, provide credit, train youths, etc. He identifies the origins of these performances in early experiences of young village people in successfully organizing dances, competitive games, and other ways of building local social capital.

The void created by the end of colonialism and the later SAPs was filled by political power that was, on the whole, not constrained by the rule of law. Networks built on ethnicity or other forms of identity as well as on personal relationship, and patronage in many of the new countries, became the fabric of society. They are only slowly being replaced by more formal and impersonal institutions. In the meantime, ‘politics’ captured many ‘progressive unions’, ‘harambee’ activities and other local social capital. Early cooperatives, such as those formed around cocoa production in Ghana, were more or less destroyed in the process. In some countries, such as Mozambique and Tanzania, efforts were made to build on the coherence and solidarity of village society, but these were not successful.

Given the weakness of formal institutions, including legal pluralism (Von Benda-Beckmann, 2002), the tax system, the civil service, and the ability to implement regulation, and given the limited financial resources of the public sector, it is little wonder that egalitarianism, be it through personal networks, sub-political movements, NGOs, people’s organizations, cooperatives, or women’s groups, is relied upon for achieving many societal goals, such as providing health, housing, water, development services and education. In most African countries, a plethora of NGOs, many of them run by elites, vie for development funds to achieve public goods in the local areas on which they focus. What is of interest is that such initiatives are beginning to lead to effective institutions at the higher than village level. An example is the Forum for Ouémé Valley in Benin that provides collective management and development planning of the vulnerable water catchment (D. Hounkonnou, pers. commun. 2015). It becomes clear that contrary to common belief, it is not money that is the central ingredient in such development, but the ability of people to trust each other, and engage in binding agreements and concerted action.

In the current volume, only the chapter by Triomphe et al. (2016) truly reflects egalitarianism in its focus on local innovation. As we shall see, however, many of the IPs that have been used by the various programmes in this volume rely for their success on egalitarian dynamics and emergence from interaction.

#### *Attributes of AIS Narratives Based on Egalitarianism*

The *system* in these narratives typically refers to a group, the multiple stakeholders in an issue or resource, facilitator-clients dyads, or civil society. The *criterion variables* include solidarity, participation, empowerment, self-organization, equality, trust, and the extent of sharing a common cause. Preferred *pathways of innovation* are convening stakeholders, facilitation of their interaction (Nederlof and Pyburn, 2012), pushing ‘the cause’, proselytizing, devolution, and, importantly, investing in interaction. A good example is the IPM farmer field school. *Drivers* are trust, a common cause, negotiated agreement, concerted action, leadership, brokers (Klerkx et al., 2009), facilitation and ‘agency’. Van der Ploeg (1994) has shown that farmers are not swept up in one-dimensional historical determinism; they choose their own criterion variables and develop different ‘farming styles’ as they pursue their interests.



## Innovation Platforms (IPs)

### *Generally Accepted Features of IPs*

As a concept, the IP (e.g. Röling, 1994) appeals to many people and organizations. It has rapidly become an iconic feature of AIS, to which the contributions to this volume bear witness. The concept is attractive because it can be understood in any way that fits its proponents' pre-analytic position in the CT spectrum. My task here is to disentangle the various ways in which an IP is used.

The different perspectives have some things in common. Not one of the contributions to this volume expects agriculture to take off as a result of developing high yielding technologies on an experiment station that conforms with the BMA. Some have embraced IAR4D that calls for 'broad-based approaches' that expect innovation to emerge from the interaction among multiple stakeholders in an agricultural domain. This interaction takes place in an IP.

Interaction is seen to create mutual understanding and trust, convergence among the interests represented on the platform, and the emergence of a common identity, as well as agreement on the diagnosis of the situation, the entry points for action, collective goals, and concerted action. The IP represents the idea of synergy: the whole is more than the sum of the parts. Involvement in IPs is expected to generate commitment. The decisions that emerge from a platform process ('ownership') are expected to be better embedded in the society concerned than those that are externally imposed. In all, the common focus on platforms reflects a shift to what I have called egalitarian narratives.

However, the commonalities still leave considerable differences among the IPs reported upon in this volume. I distinguish IPs made up of package actors, value chain actors, empowered farmers and stakeholders in a domain.

### *Package Actors*

Some of the programmes described in the current volume focus on delivering packages of inputs, such as seeds, and access to credit and markets to enable adoption of HYVs. The concomitant platform is composed of the actors that can deliver the ingredients of the package. The programme goals are determined by scientists, based on entry points that arise from a largely technical diagnosis (soils, genetics, etc.) and by promising technologies already available 'on-the-shelf'. In a way, this type of platform represents the smallest deviation from the BMA (Clark, 2016). However, even if the intention was simply to disseminate HYVs, in these programmes much has happened beyond what was foreseen or planned for (e.g. Sanyang et al., 2016). The IP concept is taking off as a result of the synergies achieved on the platforms and because policy-makers have been included as platform actors.

### *Value Chain Actors*

A related form of IPs seeks to integrate the actors along a value chain that links producers and consumers. The actors in a given industry – e.g. cut flowers in Kenya (Bolo, 2016), or the wine industry in Argentina (Farinelli, 2016) – set up an institutional framework that allows the industry concerned to thrive. This form of IP can make an industry blossom for the benefit of its

smallholders/out-growers, especially if a monopoly over processing and sales allows for recovery of supervised credit. Such IPs create access to markets, enable smallholders to engage in value-adding activities, and remove obstacles in the value chain that inhibit participation of smallholders in it. Entry points for such platforms emerge from an analysis of the value chain in terms of flows of goods and money, and the constituent actors.

The CoS-SIS programme found the value chain to be a good concept to explain institutions and IS to scientists: everybody understands it, and the systemic and institutional nature of agricultural development, including issues such as the misuse of power, emerge from the experiences in the room. An example of this type of IP is the effort to develop artisanal CPO production in Ghana. Improving the quality of the CPO that the village women produce allowed them to access lucrative urban and export markets (Adjei-Nsiah et al., 2012; Osei-Amponsah, 2016). The phenomenal development of small-scale rural mechanization in Bangladesh (Biggs and Justice, 2016) is based on an integrated value chain.

### *Empowered Producers*

In Benin, where experience of the crisis in the cotton industry meant there was little trust in public and private agencies to deliver anything that benefitted smallholders, the CoS-SIS National Programme Coordinator placed his faith in IPs that built on the empowered farmer groups that had emerged from previous participatory technology development experiments. NGOs similarly work with empowered groups of farmers to develop a product of uniform and consistent quality and quantity to access urban markets. For example, the CoS-SIS IP in the shea nut domain in Mali (Sidibé et al., in press) worked with a women's cooperative to produce high quality shea butter.

### *Domain Actors*

The BMA operates on the basis of 'recommendation domains', i.e. populations that are similar in terms of agro-ecological conditions, farming system and market context, so that they can function as target groups for 'rolling out' the technology that is developed. CoS-SIS (Jiggins et al., 2016) used a different notion of 'agricultural domain': a potential system of interest (Ison, 2016) among actors who have a stake in the domain. In this approach, IPs became temporary arenas for selected domain stakeholders to negotiate concerted action to realize the changes prioritized for the domain (Röling et al., 2014). The selection of platform members and the priorities for action was based on scoping studies by post-docs seconded from national organizations (Adjei-Nsiah et al., 2012) and diagnostic studies by Ph.D. students (Jiggins, 2012). The platforms did not receive funds to finance projects but were supported to meet, interact and operate. 'Scaling' was pursued by institutionalization, i.e. by embedding the changes achieved, and the platforms themselves, or both, in the existing institutional regimes at local, district and/or national levels. The aim was not to roll out change across individuals, but system change. This type of platform, though themselves based on principles of egalitarianism, were expected to generate various forms of change in institutions, be it to enable entrepreneurship, to help develop regulatory frameworks (hierarchy) or for mobilizing self-organization. The results are reported in a special issue of *Cahiers Agricultures* (Jiggins and Jamin, in press). Here I briefly report on an IP that deliberately sought to improve the rule of law (Box 7).

**Box 7. A platform that improved the rule of law in an irrigation scheme in Mali**

The large irrigation scheme in Mali, the Office du Niger, has been deregulated in recent years, leading to a breakdown in compliance with tenancy and irrigation rules, and conflict and litigation among rice farmers, cattle keepers and trans-migrant herders. This, in turn, had an increasingly debilitating effect on the effective running of the scheme. The CoS-SIS platform engaged in translation of the official rules from French into local languages, meetings to discuss the texts with villagers, negotiation of acceptable rules for co-management, large billboards to make these public, and changes to the ‘*Contrat Plan*’ (the formal agreement between tenants and scheme authorities). These actions vastly reduced the number of conflicts and all but stopped litigation (Ouologuem et al., in press).

**Conclusion**

Perhaps my exploration of AIS narratives as types of rationality within CT runs ‘the danger of writing up’ (Matsaert et al., 2007). The analysis, summarized in Table 1, does, however, seem helpful in a number of points.

**Table 1.** Summary of main features of AIS narratives

<b>Rationality type in CT</b>	<b>Methodological individualism (BMA)</b>	<b>Enabling individualism</b>	<b>Hierarchy</b>	<b>Egalitarianism</b>
<b>Key actor</b>	<ul style="list-style-type: none"> <li>• Technocrat</li> <li>• Neo-liberal economist</li> <li>• Scientist</li> </ul>	<ul style="list-style-type: none"> <li>• Businessman</li> <li>• Institutional economist</li> </ul>	<ul style="list-style-type: none"> <li>• Bureaucrat</li> </ul>	<ul style="list-style-type: none"> <li>• Activist citizen</li> </ul>
<b>Driver of farm innovation</b>	<ul style="list-style-type: none"> <li>• Discovery, delivery and diffusion of technology</li> </ul>	<ul style="list-style-type: none"> <li>• Pursuit of individual utility</li> <li>• Opportunity</li> <li>• Treadmill</li> </ul>	<ul style="list-style-type: none"> <li>• Rule of law</li> <li>• Justice</li> <li>• Rights</li> </ul>	<ul style="list-style-type: none"> <li>• Empowerment</li> <li>• Solidarity</li> </ul>
<b>Investment in</b>	<ul style="list-style-type: none"> <li>• Research and extension</li> </ul>	<ul style="list-style-type: none"> <li>• Value chain components and integration</li> </ul>	<ul style="list-style-type: none"> <li>• Regulatory frameworks and enforcement</li> </ul>	<ul style="list-style-type: none"> <li>• Interaction</li> </ul>
<b>System</b>	<ul style="list-style-type: none"> <li>• NARS</li> </ul>	<ul style="list-style-type: none"> <li>• Market</li> </ul>	<ul style="list-style-type: none"> <li>• Polity</li> <li>• Governance</li> </ul>	<ul style="list-style-type: none"> <li>• Civil society</li> </ul>
<b>Criterion variable</b>	<ul style="list-style-type: none"> <li>• Yields/ha</li> <li>• Adoption</li> </ul>	<ul style="list-style-type: none"> <li>• Access to services, credit and markets</li> </ul>	<ul style="list-style-type: none"> <li>• Checks and balances</li> </ul>	<ul style="list-style-type: none"> <li>• Equality</li> <li>• Trust</li> <li>• Emancipation</li> </ul>
<b>Pathway of innovation</b>	<ul style="list-style-type: none"> <li>• Technology development</li> </ul>	<ul style="list-style-type: none"> <li>• Create dealerships</li> <li>• Assemble chain actors</li> </ul>	<ul style="list-style-type: none"> <li>• Rule making</li> <li>• Surveillance</li> <li>• Conflict resolution</li> </ul>	<ul style="list-style-type: none"> <li>• Convene and facilitate stakeholders</li> <li>• Participation</li> </ul>

1. The narratives ('cultures', or theories of change [J. Brouwers, pers. comun. 2015]) are seen as internally coherent, i.e. an expressed preference for, say, a certain type of driver or investment flags the entire complex of thought. One could say that the narratives appear to satisfy the need for cognitive consistency.
2. The narratives are engaged in a 'battle of knowledge' in which the scientist, businessman, bureaucrat and activist slug it out. Sometimes, they act in mutual isolation from each other, each celebrating victories the others do not recognize. In some contexts, one of the narratives has become so dominant that the others hardly get a look in (as in the case of the BMA). Yet, as Douglas (2007) suggests, healthy agricultural development requires that all of the narratives exert their influence, be it to different degrees, i.e. that they form a dynamic equilibrium and so mutually curtail the excesses that each of them, in isolation, can give rise to. AIS narratives are like political party programmes. In a healthy democracy, the dominance of one mobilizes the others. However, so far agricultural innovation lacks the required democratic mechanisms, which allows the dominance of an AIS narrative to translate into vested interests and entrenched positions that are hard to change. The CT analysis of AIS narratives provides arguments to support change.
3. One can consider the dynamic equilibrium as a 'system' in the sense of a desirable potential outcome in which some trade-off is attained. In this sense, the CT analysis seems to present a window for conceptual advance. In their review of the evolution of system approaches to agricultural innovation, Klerkx et al. (2012) say:

"The agricultural innovation systems perspective provides a comprehensive view on actors and factors that co-determine innovation, and in this sense allows understanding the complexity of agricultural innovation. However, its holism is also a pitfall as it allows for many interpretations, which complicates a clear focus of this research field and the building of cumulative evidence. Hence, more work needs to be done conceptually and empirically."

The CT analysis looks at each AIS narrative as a coherent and consistent type of rationality. Considering their dynamic equilibrium as a system adds a layer that does justice to the socially constructed nature of systems by clearly identifying the different narratives that contribute to the outcome. Such a perspective on a 'second order' IS could be a guiding concept for policy, a basis for training agriculturalists, and a framework for evaluation and research. The mechanisms by which certain narratives gain dominance and the nature of the entrenchment that props them up still require a great deal of further research.

4. Every IS practitioner has experienced how their ideas clash with other perspectives, 'fall on deaf ears', or are assimilated into other frames of reference by colleagues, donors, government officers, and businessmen. The thoughtful contribution of Hall et al. (2016) bears witness to this experience. The CT analysis allows "irreconcilable differences to be deconstructed by identifying the civilization which the narrative upholds" (Douglas, 2007). An example is a statement of the CEO of WUR in an interview in 2014:

“With respect to genetic modification, scientists and policy makers have made huge communication mistakes. As a consequence, Europe has closed its doors. The discussion has reached a stalemate. Therefore, the continent runs behind and we miss the chance to transfer our knowledge about it to farmers.”

It is not difficult to recognize the treadmill and the BMA narrative. That recognition allows one to move beyond the pros and cons of biotechnology to a discussion of the institutional issues involved.

5. The narratives clarify the nature of innovation. Most people use innovation to refer to changes in technology (productivity, efficiency), or in business practice or organization (competitive advantage). As we have seen, innovation can also occur in regulatory frameworks (public goods) or social capital (civil society). Leeuwis and Aarts (2011) have pointed out that innovation can also refer to new forms of exchange and self-organization among social actors, facilitated or not by professional ‘change makers’. Innovation happens when new platforms allow representatives of different AIS narratives to negotiate dynamic equilibriums. Perhaps this is the kind of innovation that the world is most in need of, e.g. in resolving such core issues as accommodating growth and sustainability, wealth creation and equity, and agricultural intensification and maintaining the biosphere. Platforms support resolutions based on diversity, which trumps expertise any time (Hong and Page, 2004).
6. In SSA, the BMA based on the methodological individualism of neo-liberal economics, has dominated agricultural development for a long time. The narrative draws its justification from a misguided analysis of the history of agricultural development in industrial countries. One can hardly imagine a less appropriate AIS for SSA. Yet agricultural innovation in SSA still largely is the responsibility of agricultural research organizations. At the time of writing, one sees them engage in foreign-funded value chain development that seems (fiscally) unsustainable. The helicopter view provided by CT analysis seems helpful in recognizing such situations and in providing words for making their institutional nature discussable.
7. In industrial countries, the persistence of the unmitigated belief in technological innovation driven by the free market and the treadmill and pressing for further agricultural intensification gives rise to strong counter-movements that emphasize the undesirability of the current food system, the flimsiness of the biosphere, and the need to leave most of the remaining fossil fuels in the ground, etc. Most of this discussion focuses on technical issues (e.g. diets in the case of obesity). The CT analysis adds an institutional dimension to this epochal contradiction.

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