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WP10: Africa can feed the world
Beyond expertise to new frontiers of trans-disciplinary science

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Abstract

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The International Assessment of Agricultural Science, Knowledge, and Technology for Development (IAASTD) concluded that at peak people in 2050 the best option for global food security is raising the productivity of the world's smallholders. Experts' perspectives on the pathways to make that happen turn out to be a 'battlefield of knowledge'. The dominant strategies ignore a factor that played a key role in OECD nations' own agricultural development: institutions. When it comes to African agriculture, systems thinking seems to emphasise raising productivity per hectare at the farm level and to neglect creating conducive conditions at higher levels, in terms of policies; legal and regulatory frameworks; governance; access to credit, inputs, information and knowledge; farmer bargaining clout in price formation; etc. Based on insights gained in a large research programme in Benin, Ghana and Mali, the article explores institutions as a key dimension in developing African smallholder farming. A widely shared experience is that African smallholders are dynamically adaptive and innovative in making the best of their circumstances. Equally widespread is the experience that they face unhelpful or inimical institutions that explain the 'stagnation' of productivity of African agriculture. Creating opportunity at the farm level requires institutional change at higher system levels. The article reports on mechanisms for institutional change from a farmer first perspective.

Key words: institutions, institutional change, innovation systems, technology, opportunities, smallholders, farmer first

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1. A new agenda

The vast resources held by smallholders in developing nations are the best option for ensuring global food security in 2050 when the world is expected to hit 'peak people' at 9 billion (IAASTD, 2009). The productivity of smallholder farming typically is in the order of 1000 kg grain equivalent/ha, which is technically relatively easy to double or treble without resorting to unsustainable intensification. Developing smallholder farming is seen as a key to reducing persistent rural poverty. It promises greater food security for countries that depend on volatile global markets, as well as greater resilience for countries vulnerable to climate change. IAASTD's claim seems particularly relevant for Africa. Notwithstanding its vast potential, the agriculture on the continent is habitually characterised as 'stagnant' in terms of productivity (IAC, 2004). Is it possible that 'Africa can feed the world'?[2]

The present article addresses this question, well aware of the diversity of African smallholder farming, and of the impossibility to oversee all that is relevant, especially the many new initiatives (e.g. Sanginga *et al.* 2008). The article is based on the author's participation in a research programme called CoS-SIS that is being implemented in Benin, Ghana and Mali (www.cos-sis.org).

2. The potential

Smallholders are often blamed for Africa's stagnant agriculture. To some observers, African smallholders seem illiterate, ignorant and backward; they hold miniscule parcels of land under tenuous tenancy; they use archaic technology, and seem reluctant to accept what is so obviously beneficial. This blame does not stand up to scrutiny.

There is no serious study of African farmers that does not show them to be innovative, entrepreneurial and eager to improve their situation (Rey and Waters-Bayer 2001; Mortimore 2004; World Bank 2009). Hounkonnou (2001) has called African 'rural dynamics' the most hope-giving aspect of an often dismal development scene. Indigenous farming methods and their ongoing adaptations are ingenious in terms of survival in adverse conditions (e.g. the oil palm fallow developed by Adja

[2] The title of an article in the *New Scientist* 27th June 2009, p6.

farmers in Benin in response to land scarcity and weed infestation, (Brouwers, 1993)). African farmers have, on the whole, managed to keep up with rapid population growth, but been less successful in compensating droughts, wars and imports of cheap food to keep urban electorates happy (Mortimore, 2004). Experiences with African farmers' responsiveness to opportunity generally support the idea that 'Africa can feed the world', notwithstanding its variable and generally low-fertility soils, unsatisfactory infrastructure and vulnerability to climate change. Box 1 provides some examples.

Box 1: Examples for smallholder responsiveness to opportunity

Ninety-two percent of a random sample of 268 Kenyan smallholders, with statistical procedures purposively selected as 'laggards' according to the 'diffusion of innovations' perspective that prevailed at the time, adopted a half acre hybrid maize package when a 'Special Rural Development Project' provided appropriate training as well as inputs through credit in kind, and improved their yields from an average of 4 to an average of 11 bags per acre. (Ascroft *et al.,* 1973; Röling 1988:118-141).

Under international pressure, the Government of Ghana increased the percentage of the FOB price of cocoa paid to farmers from 40% to 70% between 2002 and 2006. Together with high international prices, this motivated farmers to double Ghana's cocoa production, which had been in decline for years (Ayenor, 2006; Dormon, 2006).

"*Four years ago almost half its population depended on food aid from abroad for survival. But this year, Malawi has managed to feed itself and even export some maize to hard-pressed neighbours. This remarkable turnaround has been called the 'Malawi Miracle'. At its heart is a programme, which provides heavily subsidised seeds and fertiliser for poor farmers"* (BBC News 2009[3]). Malawi's success was partly due to good weather, but it is generally associated with the Agricultural Input Subsidy Programme introduced in 2004, by which over half of Malawi's smallholder farmers receive coupons to buy 100 kg of fertilisers for a quarter of the normal price. Another coupon entitles them to 3 kg of standard or 2 kg of hybrid maize.

[3] Accessed at http://news.bbc.co.uk/2/hi/business/8363914.stm on November 21, 2010

In 2009 the Benin Government decided to provide free fertilisers for maize and soya, and ensured that companies picked up the crop and paid farmers upfront. Farmers shifted *en masse* from cotton, which normally provides 70% of the country's foreign exchange, leading both to a decline in the cotton processed by ginneries from 600,000 to 158,000 tonnes in 2009 (Togbe, in prep.), and a glut of grains to a point where storehouses were overflowing, and food aid could be provided to Burkina Faso (pers. com. Dr Elisabeth Zannou, UAC, October 2010).

Between 2007 and 2008, Mali produced 1,082,384 MT of paddy. A sharp price increase for imported rice motivated the Rice Initiative. Its target for 2009 was 1,618,232 MT, nearly a 50% increase that would make the country self-sufficient. Seven donors provided a total of US$5 million to support the initiative. The Government subsidised the cost of seed by 60% and fertiliser by 50%. 102 extension agents were recruited, trained, and given motorbikes. Paddy production reached 1,624,436 MT across all production systems, (e.g. free submergion (42%), upland (23%), irrigation complete control (21%), controlled submergion (12%)), with an average yield of 2,7 MT/ha. It was a national success story (Sasakawa Africa Association, 2010).

This responsiveness to opportunity is not matched by its availability. In fact, African smallholders face very small windows of opportunity. That, at least, was the major conclusion of the first phase of the Convergence of Sciences (CoS) research programme, which in Benin and Ghana carried out eight sets of field experiments based on the assumption that appropriateness of technology was the key bottleneck (van Huis *et al.,* 2007). It is corroborated by global data. In 2003, added value per worker in agriculture in OECD countries was $23,081[4], with an increase between 1992-2003 of 4.4%. For sub-Saharan Africa the figures were US$327 and 1.4% respectively (FAO, 2005).

[4] US dollar value in the year 2000.

3. Dominant perspectives: a battlefield of knowledge[5]

Various approaches to unlocking Africa's unrealised potential have been proposed. Of these, three widely shared perspectives have played a crucial role (Röling, 2009):

- Technology supply push.
- The agricultural treadmill.
- Land grab.

These perspectives are grounded in the dominance of technical expertise, entrenched neo-liberal economics, the self-interest of OECD farmers and African elites, the profiteering of biotechnology companies, and the strategic interests of nations such as China and Korea.

3.1 Technology supply push

The first perspective is illustrated by the title of the Conference of the Association of Applied Biologists at Rothamsted in October 2009: 'Agriculture: Africa's Engine for Growth – plant science and biotechnology hold the key'. The perspective is summed up in an article in *The New Scientist*[6] (Box 2):

Box 2: The 'world's leading experts' on what it would take to boost yields.

"*New Scientist* has asked the world's leading agricultural experts what it would take to boost yields. They were unanimous: we need research and support of farmers so that they can make most of its results…"

"Governments will be able to mitigate the crisis, but only if they invest in the science that can increase yields and in the infrastructure to get the resulting technologies to the farmers who need them."

Experts' continued focus on scientific research to increase yields/ha at the farm level and their disregard of institutions and policies at higher system levels have considerably set back agricultural development in Africa. Adoption of science-based technologies by African smallholders has been disappointingly low (e.g. Gabre-

[5] The notion of a 'battlefield of knowledge' comes from the title of a book by Long & Long (1992).
[6] *New Scientist*, June 14th 2008: 28-33

Mahdin and Haggblade, 2004). This criticism is not a rejection of technology *per se*; the criticism regards the *pars-pro-toto* reasoning by which experts, whose professionalism usually only extends to natural science, have become blind to the societal conditions in which technology is utilised (Reina, 2008). Biotechnology companies, which are in the business of selling the products of their research to farmers, understandably promote a single-minded pursuit of technological innovation as the key to farm development. An exclusive focus on raising yields per ha at the farm level by technical means systemically ignores a key success factor in the development of agriculture in industrial countries: conducive institutional conditions.

3.2 The agricultural treadmill

The second widely shared perspective can best be summarised by Cochrane's (1958) term 'the agricultural treadmill' but it is also known as induced innovation (Ruttan, 1997). The mechanism was first observed in the mid-western states of the US. By another name, it is diffusion of innovations first described by Ryan and Gross (1943) and developed into a dominant paradigm by Rogers (2003). The mechanism is the basis for the EU's Common Agricultural Policy and the WTO. It works as follows (Röling, 2009):

- Farms are small firms in a free market, all producing the same commodities.
- Each one is too small to affect the price: they are price takers who produce as much as possible against the going price. As a result there is a constant downward pressure on prices.
- Introduction of an 'innovation' allows its early adopters to capture a windfall profit because overall prices are still dictated by the prevailing state of the art.
- Soon diffusion leads to over-production and further price squeeze. Adoption becomes a necessary condition for staying in the market place, but now it is no longer profitable.
- In the 'tail', farmers who cannot keep up (too old, too sick, too small, too uneducated, too drunk) eventually drop out. Their resources are absorbed by the survivors, who capture economies of scale.

The mechanism is not a God-given or 'natural' phenomenon. It requires the deliberate creation of specific institutional supports and a supportive ideology to make it happen. The mechanism is popular among economists, policy-makers and

industrial farmers. Industrial farmers have learned that survival means staying ahead of the game and that depending on fickle urban voters is worse than competing in the open market. Policy-makers and economists embrace the mechanism for macro reasons. Given that farmers cannot hold on to the rewards for their productivity gains, the treadmill leads to lower food prices, which is good for the economy. Scale enlargement forces labour to leave agriculture for other pursuits. The treadmill increases the efficiency of the entire national farm sector, leading to its greater competitiveness in international markets. These effects in turn lead to a high internal rate of return to investment in research and extension (Evenson *et al.,* 1979). All you need to do is feed the treadmill with new technologies. Technology supply push and the treadmill meet, need and feed each other. They represent an impervious system of thought rooted in the unprecedented increase in the productivity of industrial farming, Green Revolution success and neo-liberal economics.

Their embrace leaves no space for recognising the role of institutions in farm development, however crucial it might have been for agricultural development in OECD countries themselves. African agriculture is expected to take off merely as a result of introducing (bio)technology and liberating markets. Twenty years ago, North (1990) received the Nobel Prize in Economics for his work on institutions and their role in reducing transaction costs and creating the conditions for markets. Slow adoption of new ideas seems to afflict also experts in agricultural development.

For Africa, it is relevant to consider the *global* treadmill. African farmers face competition from OECD farmers who for over 50 years have received state support for capturing economies of scale. An example is the import into Ghana of Dutch chicken wings, a by-product of Western market demand for filets and drumsticks. It has destroyed the local broiler industry, although in the short-term it puts some meat into the pot of urban Ghanaians (OXFAM International, 2005). Fear of the impact of the global treadmill on unprotected smallholder farming motivated India and China not to sign the latest draft of the Doha trade agreement. Within a year of the North American Free Trade Agreement (NAFTA) in 1993, which dismantled Mexico's farm supports that had sustained three million small maize producers, and which allowed a flood of subsidised US food imports, Mexico's maize production fell by half and 1.3 million farm jobs disappeared (Marglin, 2008 (quoting Smith and Lindblad, 2003);

IAASTD, 2009: 219). This author has never seen NAFTA mentioned in reports on Mexican drug violence.

A key tenet of neo-classical economics, that goods should be produced where they can be produced most cheaply (‘comparative advantage’, Ricardo, 1817), does not seem to hold when it comes to making productive Africa’s vast resources. To get African agriculture going, smallholders might have to be protected from the global treadmill. Pre-emptive competition seems one reason why Africa’s resources remain unproductive and irrelevant for global food security. There is increased recognition of the need for tariffs to protect smallholder farming (IAASTD 2009:455; Khor, 2009; Bulte, 2010), while senior economists are increasingly questioning the neo-classical certainties (e.g. Stiglitz, 2006).

A final point must be made about the treadmill. Serious doubts can be raised as to whether the treadmill mechanism is an option for ensuring a sustainable and multi-functional agriculture even in industrial countries. Examples are emerging of agricultural systems in developing countries that are running into serious problems as a result of being driven by the treadmill mechanism towards scale enlargement and intensification (e.g. Sherwood, 2009; Paredes, 2010 for potatoes in Ecuador). Issues that arise are the increased dependency for fertiliser and diesel on ever-more costly fossil fuels, the large share of agriculture in the emission of greenhouse gases, the end of minable deposits of phosphorous, unhealthy Western diets, soil depletion (e.g. of minerals not available in synthetic fertilisers) and erosion, weed problems arising from Round-up Ready varieties, misuse of pesticides and related poisonings, farmer impoverishment, etc. There is no doubt that serious questions can be raised as to whether the treadmill is an appropriate institutional framework for driving agricultural development in Africa, and OECD countries for that matter.

The treadmill and the diffusion of innovations tradition assume a scale from more to less ‘modern’ in terms of technological intensification. Research in both OECD and developing countries shows that, in actual fact, farmers follow different strategies, called ‘styles’, which represent different development paths and diversity in terms of combinations of enterprise objectives, farming systems and technologies that farmers ‘enact’. This diversity among farming facing the same markets and technological contexts suggests options for more sustainable and multi-functional types of farming

than those determined by market-propelled scale enlargement (van Ploeg, 2008). These issues will not be further discussed in the present paper.

3.3 Land grab

'Land grabbing' or the 'farms race' in Africa has been described as a new neo-colonial push by foreign companies and governments to annex key natural resource. Land grab refers to the increasingly prevalent practice by which foreign governments and companies acquire in developing countries huge tracts of land with access to water, often over the heads of the smallholders and pasturalists who are using it, and invest in large-scale, input-intensive management (de Schutter, 2010; Kugelman & Levenstein, 2009; Von Braun & Meinzer-Dick, 2009; Hall, 2010). A recent example is Mali, whose politicians have made available two million hectares of irrigated land in the *Office du Niger* to a Libyan/Malian and a Chinese/Malian company that intend to apply large-scale pivot irrigation. The politicians apparently argue that the growth of food production by smallholder-irrigated agriculture is not sufficient to keep up with population growth[7].

Land grab usually represents dispossession and theft of people's means of livelihood. It transfers productive resources from the poor to the wealthy, rewards capital rather than labour, and often removes control from nationals to foreigners. The money that politicians make from these deals is unlikely to benefit their countries. The practice tends to exacerbate poverty given the absence of alternative employment and adequate compensation. Many fast-track efforts to modernise agriculture in sub-Saharan Africa have led to failure. *"Based on a comprehensive review of the literature, as well as value chain analysis …, there is little to suggest that the large-scale farming model is either necessary or particularly promising in Africa"*| (World Bank, 2009: 8). *"Background papers on commercial farming in Africa … turned up not a single case where large-scale farms, outside of settler economies, have ever achieved competitiveness in the export of food crops"* (World Bank, 2009: 9).

In all, the evidence is that expropriating smallholders' land and water resources for fast-track large-scale technological intensification of Africa's productive resources is

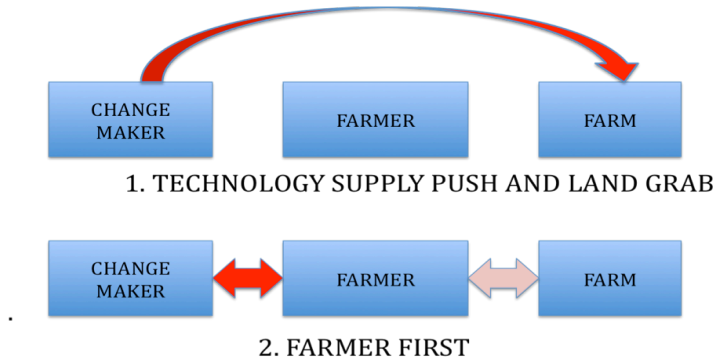
[7] Pers. com. Jacco Mebius, June 2010, former Royal Neth. Embassy staff member in Bamako who served as coordinator for international donor support of the *Office du Niger*

unlikely to contribute much to national or international food security, quite apart from any concern about human rights.

4. The essence of the new agenda

Agricultural development occurs *through* farmers (Figure 1). When change-makers decide about land and water resources *as if* they were the farmers managing them (see a), they ignore the fact that it is the actual farmers whose decisions, knowledge, labour and capital determine the productive use of those resources. Hence one cannot escape working through farmers (see b), even if one does not have in mind their benefit, but that of urban electorates, a political regime, or one's own.

Figure 1: Two approaches to agricultural development (e.g. technology supply push or land grab) and farmers first



There is a paradigmatic difference between (a) and (b). The former requires the logic of cause and effect, the latter the logic of reasons, motivations and institutions. That does not mean that technology does not play a role in (b); it certainly does. But since utilisation of technology is conditional upon decision-making by farmers, agricultural development cannot be based on natural science alone. Farmer First means that change-makers cannot escape taking into account the knowledge, skills, motivation and the opportunities of farmers. Farmers must know how to, be able to, want to and

be allowed to take advantage of opportunity (Galjart, 1971). This calls for trans-disciplinarity, for convergence of sciences.

The new agenda redefines the challenges facing agricultural development. Where the old agenda focuses on yields/ha at the farm level, the new one seeks to give African smallholders *reason* to improve their farming, which they currently have not (Box 3).

Box 3: Reasons of Ghanaian smallholders not to produce for the school-feeding programme. The arguments for the programme were ingenious. School children would be decently fed and improve their intellectual performance, while the schools would purchase food from local farmers thereby providing them with new opportunities to market their produce. The school-feeding programme is hailed as a huge success. However, procurement of food from local farmers proved a failure. Eenhoorn and Becx (2009) interviewed 1200 farmers to find out their reasons. They categorised those reasons as follows:

- *Production and processing*: lack of capital, low soil fertility, lack of access to manure and fertiliser, insecurity of land tenure, lack of labour.
- *Risk and uncertainty:* variable climate, lack of infrastructure, uncertain markets and variable prices, corruption, theft, hostile agencies, lack of farmer organisations that can defend farmers' interests.
- *Lack of incentives*: low prices, probability that members of extended family, patrons or government will cream off the profits.
- *Mentality:* lack of familiarity with being entrepreneurial, agriculture as a way of life.

Most of the reasons mentioned in Box 3 translate into shortcomings of the institutional environment in which Ghanaian smallholders have to secure their livelihoods. Sure enough, farmers complain about lack of access to manure and fertiliser, but even that apparently technical problem translates into lack of input providers, transport, and the terms of trade between food and fertiliser. These farmers seem confident that, given their seeds, knowledge and skills, they could have produced the food for the school-feeding programme if the external conditions had been in place. A key assumption of this article is that institutional change at

higher system levels can transform constraints experienced at the farm level into potential opportunities.

In addressing the question of how one can effectively work through African smallholders, the current paper therefore focuses on the institutional environment. For a long time, those who seek alternatives to technology supply push and the treadmill would have answered the question by saying that it is not *through* but *with* smallholders, i.e. by using participatory approaches (e.g. Committee on 21st Century Systems Agriculture; NRC, 2010). But that answer is increasingly shown to be insufficient. Farmers might be knowledgeable, skilled, motivated, empowered, and ready to innovate. But if opportunity is lacking, participatory approaches only lead to marginal improvement. That, at least, is the conclusion from a comparison of eight sets of carefully researched field experiments with participatory technology development (PTD) in Benin and Ghana[8]. As a consequence, a number of the researchers involved started to experiment with institutional change. It is that experience that motivated the exploration reported in the current article.

It tries to deal with the widely reported paradox that, although African smallholders have consistently been dynamic in adapting to rapidly changing circumstance, their productivity overall has remained 'stagnant' (IAC, 2004:158). Therefore, the paper focuses on *the institutional opportunities and constraints* at the *higher than farm level*, which smallholders on their own, however knowledgeable, motivated and innovative, can do relatively little about, even if their collective action can considerably improve conditions. Unchangeable parameters at the farm level can become manipulable variables at higher system levels (Fresco, 1986).

5. Institutions and agricultural development

[8] See special double issue of *International Journal of Agricultural Sustainability (IJAS)*, 5 (2&3) 2007.

"Institutions are structures and mechanisms of social order and cooperation governing the behaviour of a set of individuals within a given human collectivity. Institutions are identified with a social purpose and permanence, that transcend individual human lives and intentions, and with the making and enforcing of rules governing cooperative human behaviour" (Stanford Encyclopaedia of Philosophy, 2007). Institutions are the rules of the game or regimes that remove uncertainty in human interaction (North, 2005). It is confusing that in English 'institution' can refer to 'organisation', as in 'the World Bank is an institution'.

When promoting (bio-)technology and the treadmill, people forget that the utilisation of modern technology and the mechanism of the treadmill *assume a very specific institutional context*. By the time the treadmill started to work in the Mid-West of the US in the early 1940s, American farmers had become embedded in institutional supports of which most African farmers can only dream. Land Grant colleges and county agents provided publicly-funded access to research, information and training. Farmers were assisted to become organised and could exert political and lobbying power in state legislatures and Washington DC. Agri-business provided farmers with huge and integrated markets and market information. Insurance, input delivery, land markets, mechanisation, market protection, and subsidy schemes were in place.

The situation in The Netherlands, now the second largest exporter of agricultural products by value after the US, was no different (Schelhaas, 2009). After the crisis induced by the import of cheap grain from the American prairies in the 1880s, a State Commission was set up in 1886 to improve farmers' conditions. One of its achievements was the tenure law of 1917 that made it rational for tenants to invest in land. A tiered system of fundamental, applied and adaptive research, extension and education was set in place. After World War II, large government subsidy and land improvement programmes became available for drainage, land re-adjudication and consolidation, infrastructure development, building improvement, etc. The age-old landscapes of Rembrandt were re-designed in a matter of years. Research institutes (Wageningen University & Research has a larger budget than the CGIAR), extension services and farmer education and training centres helped farmers to become modern entrepreneurs. Value chains were streamlined and integrated, with quality controls, export subsidies, and price protection. The entire 'Holland Agriculture Ltd' became imbued with a shared focus on the competitive edge of Dutch products, with

the global treadmill as an unquestioned ideology. The treadmill works like a charm, with an average annual loss of farms of about 2% since the 1960s and concomitant 'scale enlargement'. A modern (if eventually unsustainable) Dutch farm cannot be imagined without its supporting network of institutions, including banks, book-keepers, farmer organisations, agri-businesses that provide services and inputs, cooperatives, value chains, transport, a regulatory framework, subsidies, insurance, and, until 2010, a special Ministry that looked after its interests. For years, the minister was recruited among CEOs of farmer organisations.

In contrast, African smallholders face institutional conditions that usually only frustrate farm development. In colonial times, cotton, cocoa, and other export industries were set up to extract wealth for Western countries. In post-colonial Africa, millions of civil servants and other rent seekers still live from the wealth extracted from farmers. In Benin, for example, three million people live off 35,000 cotton farmers (Togbe, in prep.). Patrimonial structures ensure that wealth accumulates at the top instead of being distributed among farmers and farm workers. The public services and other farm supports that were in place, albeit often through corrupt and rapacious government departments and parastatals, have been removed under Structural Adjustment, but the private sector has not stepped in because the conditions do not favour profit from service provision (Khor, 2009). Meanwhile, globalisation of trade and the import of cheap food to please urban electorates expose African smallholders to withering pre-emptive competition. On average, African countries spend only 4–5% of their national budgets on agriculture, compared to 8–14% in Asia (Fan *et al.*, 2008), even though in 2003 African leaders called for a 10% budget allocation to agriculture by 2008/2009, as part of their commitment to the MDGs and CAADP goals in the Maputo Declaration (Commission of European Communities, 2007). *"In contrast to Brazil and Thailand, which benefited from a stable and competent civil service, the capacity of African government bureaucracies to manage and facilitate coordination of different actors in value chains while maintaining a competitive environment remains underdeveloped…"* (World Bank, 2009:15). Zwlinzima Vavi, the South African labour union leader, puts it more bluntly and speaks of *"a full-blown predator state, in which a powerful corrupt and*

demagogic elite of political hyenas increasingly controls the state as a vehicle for accumulation"[9].

An unhelpful African institution is the 'big man syndrome'. This phrase points to the deeply embedded values that favour acceptance and support of a 'big man' on his way to increased patrimonial power, in exchange for patronage. Patrimonialism is a type of rule in which the ruler does not distinguish between personal and public patrimony and treats matters and resources of state as his personal affair (Quimpo, 2007). It is interesting to speculate about the deeper cultural reasons for this syndrome, borrowing a leaf from Weber's (2008) analysis of the role of the protestant ethic in the rise of capitalism. In such a speculation, the 'big man syndrome' could perhaps be linked to the central role African cultures give to ancestors. 'I am because we are'. The 'we' includes the living, the dead and the unborn (Millar, 2005). Not everybody becomes an ancestor; being a 'big man' might help. Box 4 provides an example of the syndrome.

Box 4: The chief of Umuabi (author's field notes 1964)

Umuabi is a village in East Central State of Nigeria. At the time, it was well preserved, with priests who daily pledged palm wine to appease the spirits. It had a living tradition of masks. Yet it was also modern, with two rivalling factions that had respectively embraced the Catholic and Anglican religions. The village had a 'Chief', a misnomer in this acephalous Igbo society. The title was an honorary one: the Chief had been an accountant for the coalmine and had retired to the village. Because of his connections and knowledge of urban life, he was a source of information and advice. He represented the village in the County Council.

Once a year, the Council made available a secondary school fellowship to one of its constituting villages. When Umuabi's turn came, the Chief took the scholarship for his daughter. However, the clerk of the Council, also from Umuabi, reported the misdeed. The village had strong collective leadership. It was decided to hold a public examination and the school leaver with the best result was to be given the scholarship. The Chief's daughter came second; she was beaten by the daughter of a single mother.

[9] *The Economist* 4th-10th 2010:43

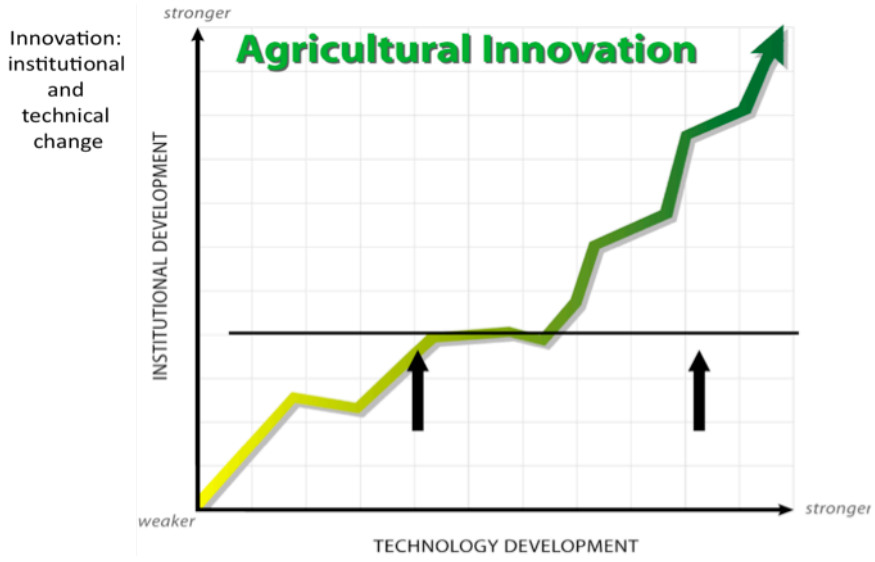
I asked my friend and informant, a primary school teacher, why the Chief was still respected. *"We would all have done the same."* In other words, the big man behaviour was acceptable, except that in this case checks and balances (i.e. institutions) were in place to ensure an equitable outcome. They are not when it comes to ministers, or police forces.

In many African countries, farming is the main, if not only source of wealth, especially at local and district levels; hence national and local governments, politicians, businessmen, chiefs, policemen, and extended family members try to extract rent from farmers. Smallholders often have no understanding of the mechanisms by which they are impoverished, especially when it comes to price formation in value chains, and are not organised effectively to mobilise countervailing clout. Farm innovation in West Africa can come about only once checks and balances substantially reduce this systemic extraction without investment.

Institutions can be positive or negative in their effects on different kinds of people, as we have seen. They can be inclusive or exclusive, extractive or wealth-creating, oppressive or liberating, etc. At best, they provide a historically evolved set of checks and balances that defines civilised society, limits corruption, levels the playing field, and creates opportunities for innovation. An example of an institution that this author would classify as an 'advance of civilisation', an example that also shows that institutions evolve as a result of effort and struggle, is the Plimsoll Line, a statutory line drawn on the hull of a ship to show the maximum depth to which it can be loaded. Mr Plimsoll was a 19th century philanthropist who fought hard to correct the practices of unscrupulous ship owners that caused loss of ships and lives at sea through over-loading (Jones, 2006).

By way of summary, Figure 2 presents agricultural innovation as the result of both technological and institutional change with the institutional context setting a ceiling for technological change. As such, the figure tries to succinctly pose the key argument of the present article.

Figure 2: Institutional development sets the limit for technological change



Source: Huis, 2010, based on Dorward *et al.* (1998)

6. Institutions for agricultural development: towards measurement

When institutions are as important as argued above, it becomes necessary to think about ways of assessing institutional innovation in terms of increased support for smallholder development. Indeed, this question has emerged as paramount in the nine domains[10] of the CoS-SIS research programme, which experiment with an innovation systems approach to institutional change (www.cos-sis.org; Röling, 2010). At the time of writing this question has not been answered to the satisfaction of all involved. An option on the table is not to try to operationalise sociological or institutional economics concepts, but to stay close to mechanisms at higher system levels that are directly linked to opportunities/constraints experienced at the farm level. Box 5 suggests such mechanisms; potentially they could each be rated according to explicit criteria and, together, measure the level of institutional support

[10] *Benin*: oil palm, integrated water resources management, cotton; *Ghana*: oil palm, cocoa, food security (in the North); *Mali*: integration of agriculture and livestock production (Office du Niger); Integrated water resources management (Office du Niger), karité (shea butter).

for smallholders. This 'rating' would require a methodology that would include 'investigative journalism'.

Box 5: Mechanisms of institutional innovation relevant for smallholder support

- *Price formation*: Through what processes do farm gate prices become established (including e.g. product quality assessment)? Which actors and mechanisms are involved? What are the historical trends? Watch for seasonality of price fluctuations and distress sales after harvest and timeliness of payments. Of the value added in the value chain, what percent do smallholders get? To what extent are prices at local markets depressed by cheap imports? To what extent do smallholders benefit from the recent rise in food prices?

- *Credit provision*: What are the main sources of credit? What are the main mechanisms in terms of repayment, interest, and liability? History of credit in the community? Micro-finance? Tontines for production credit?

- *Access to services*: Education, extension, inputs, transport, legal support…? Make an inventory of such services and describe whether and how they benefit smallholders. Take into account such issues as: the difference between the official description of the service and the factual operation; and the extent to which services are selective (i.e. only serve larger farmers/politicians). Don't only look at government (national/local) services, but also at commercial, cooperative and NGO service providers. Collect numbers of smallholders that benefited from each service (if any) and the costs of the service.

- *Farmer representation*: In what ways are (different categories of) smallholders organised? What is the purpose of these organisations? Are they inclusive/exclusive? What influence can they exert at: (a) the village; (b) local government; and (c) national levels? To what extent are they exploitative, hierarchical, or democratic and egalitarian? Is there any collective action with respect to use of natural resources?

- *Extraction mechanisms*: What are the main mechanisms by which smallholders are exploited, be it by formal or informal taxes, levies at road blocks, corrupt leaders, patrimonial networks of accumulation (village, local and national

government), cheating at weighing stations, cheating with quality grading, cheating by input sellers, extended family slavery, etc.

- *Diversification of organisation*: An inventory of the different types of organisations: including religious, governmental, commercial, voluntary and community developmental, and the way they impact on smallholders.

- *Access to information*: Extent to which local people have access to local/national information through TV, radio, newspapers, internet, mobile phones. Understanding of national and district agricultural politics, price formation, tariffs and foreign trade impact, corruption mechanisms, etc. Grasp of institutional as opposed to technical issues (e.g. which organisations, offices, or people take vital decisions about their future?). Do smallholders know that they have rights? If so, what rights?

- *Land/water tenure*: What mechanisms exist for access to land and water? How exclusive/inclusive are these mechanisms? What mechanisms exist to protect or undermine smallholders' rights to land and water? What is the history of expropriation and compensation?

- *Long-term trends*: What are the threats of climate change? To what extent are mechanisms in place to protect smallholders from the consequences? What is the implicit or explicit longer-term vision of key decision-makers with respect to establishing a remunerative, sustainable agriculture? What are the consequences of globalisation for smallholders?

Indicators or proxies for the extent to which such mechanisms support (categories of) smallholders could, as said, be used to develop a general 'index' for the status of an agrarian society, or a specific agricultural sector, such as an export crop.

The cotton industry in Benin provides an example. Cotton is an important, if not *the* source of wealth in the country. Such a situation holds promise in terms of finding interesting mechanisms for extraction. The *Association Interprofessionelle du Coton* (AIC) is a mechanism that the Benin Government created in 1999 and revised in 2006 to manage the industry after the World Bank and IMF had enforced its privatisation under structural adjustment. This Association is a multi-stakeholder platform, which according to its website http://www.aicbenin.info *"facilitates dialogue*

among the professional families in the cotton value chain with the perspective of promoting an inter-professional management". Its responsibilities include:

- To organise and facilitate price-setting for seed cotton (i.e. the cotton bolls as harvested, including lint and seed). This price is announced every year in advance of the growing season, and is the outcome of negotiation among the 'professions', not a price determined by the market.

- The distribution among the ginneries of the seed cotton harvested. This a hot issue because all ginneries have over-capacity so the allocation is fought over,

- Planning the annual cotton campaign, i.e. the distribution of seeds, fertilisers and pesticides on credit among the recently initiated village cooperatives (with collective liability for paying back the credit),

- To be responsible for financial transactions, the setting of prices, credit costs, deductions from farmers' pay, etc.

- The organisation of the transport of seed cotton.

- The provision of agronomic and economic information.

The '*professions*' include the National Council of Cotton Producers, with 40 members in the AIC General Assembly; The National Council of Importers and Distributors of Cotton Inputs (12); and the National Council of Cotton Ginners (9).

According to its formal description, the AIC therefore ensures that the important decisions about cotton production are made on the basis of negotiated agreement among the main parties, including a strong input from cotton farmers. 'Investigative journalism' by Togbe (in prep.) suggests that the reality presents a very different picture. The ginneries and input distribution are monopolised by one 'big man', admiringly called 'The Gates Man', who has grasped the opportunity created by the imposed privatisation. He is alleged to benefit a considerable number of politicians. The farmers on the AIC have been 'bought' and do not actively defend the interest of the smallholders who produce Benin's cotton. Two examples suffice.

Researchers have recently produced a variety, of which the bolls contain 30% less seed, while the cotton lint is of better quality. The cotton seed for planting that is now

provided to farmers on credit is of this variety. No slow diffusion process here, but a compulsory introduction. Farmers are paid for seed cotton, i.e. the bolls with lint and seeds that they harvest. The seeds give the seed cotton its weight. This means that, in order to get the same weight as with the old variety, farmers have to produce more bolls. One would expect the price for seed cotton set by the AIC to reflect the change in variety. Farmers complain bitterly that it does not.

The second example is the availability of Chefros, a pesticide that is an essential ingredient in the *Lutte Etagée Ciblée* (LEC), an Integrated Pest Management (IPM) approach that can save farmers a great deal of money and considerably reduces the toxicity of pest management in cotton. But pesticide companies, monopolised by 'The Gates Man', do not make Chefros available in Benin. It simply is not for sale (Togbe, in prep.). 'The Gates Man' makes more profit from selling conventional pesticides. This situation has existed for a number of years (Sinzogan, 2006) but the Benin Government apparently is unable to do anything about it. Thus the interests of one 'big man' jeopardise the competitiveness of Benin cotton on the world market.

To end on a more positive note: African organisations, including Farmer Based Organisations, NGOs, the Alliance for the Green Revolution in Africa (AGRA) with Kofi Annan, the Forum for Agricultural Research in Africa (FARA) with its Challenge Programme, and the International Fertiliser Development Centre (IFDC) with its programmes to develop agricultural input markets and dealer networks, are actively targeting institutions for smallholder development. What we need now is a consolidated effort from the international community and African governments to give institutions the centre stage, as happened in OECD countries in a comparable stage of their agricultural development.

7. Changing institutions

Institutions cannot be imported and adopted as if they were technologies. They are always embedded in the historical context and change as a result of endemic processes that can at best be facilitated (Vodouhé, 1996; Biggs, 2007). A concern for institutions implies embracing unaccustomed theory. On the one hand, it draws on the emergence of the New Institutional Economics (e.g. North, 1990 and 2005;

Williamson, 2000, both Nobel Laureates in economics), and on the other, on a long-standing tradition in sociology and anthropology that started with Emile Durkheim (Durkheim and Traugott, 1994), and is now represented by people such as Douglas (1986), Hood (1998); Giddens (1984); and Biggs (2007), who seek alternatives for the ubiquitous assumptions of methodological individualism.

In the end, the rules of the game are agreements about some social purpose among key actors that become encoded, legitimated, more or less permanent and part of social structures. Institutional change therefore refers to events by which agreed rules become 'institutionalised' and lead to system innovation (Hall *et al.,* 2003).

Leeuwis (2009) has elaborated this reasoning. The dynamic status quo is reproduced through dominant institutions, i.e. formal/informal rules of the game, also referred to as the regime (Geels, 2005). Smallholders operate in institutional contexts shaped by interaction in networks of key actors. This interaction perpetuates the rules that determine smallholder opportunities. Changing opportunities implies identifying key actors and their networks and strategically trying to change their interaction through multi-stakeholder approaches (Woodhill, 2010), facilitated by innovation brokers (Klerkx *et al.*, 2009). Such change occurs in niches and is not necessarily scaled up to regimes and landscapes (Geels, 2005). It is relatively easy, with special funding and expertise, to create niches which 'prove the principle', but hard to replicate those lessons in normal government or company policies, procedures and rules of the game.

To understand why institutional innovation took place and to be able to trace 'the causal process' leading up to it, it is crucial to record the relevant empirical events over time. Box 6 provides an example of a retrospective effort to map such events: a study of policy change with respect to urban agriculture in Kampala over the period between 1990 and 2006 (Smith *et al.*, 2008).

Box 6: Creating a supportive institutional context for urban agriculture in Kampala, Uganda

A number of different studies on the contribution of urban agriculture to healthy food and food security in Kampala (Cole *et al.*, 2008) allowed the authors to map the

different events that could be construed to have contributed to the positive outcome on a time-line from 1990 to 2006. They categorised the events as:

- *Policy related* (e.g. no specific laws about urban agriculture (1990); decentralisation implemented in Kampala (1993); decision to review all outdated ordinances (1999); decision to develop national policy on urban agriculture by the Ministry (2006)).

- *Meeting/conference* (e.g. seminar on urban agriculture based on Maxwell research (1993); final workshop on strengthening urban agriculture (2004)).

- *Funding/investment* (e.g. funds from DfID to support harmonising ordinances (2004); DfID support for pilot testing guidelines (2005)).

- *Research related* (e.g. Kampala urban agriculture study (1992); several MSc studies on urban agriculture (1992-2000); major collaborative research on urban agriculture led by Urban Harvest, e.g. on livestock, health, food (throughout the period)).

- *Other events* (e.g. technical officers move from Ministry of Agriculture to Kampala City Council as part of decentralisation (1994); field visits of councillors and Mayor to urban agriculture activities (2004)).

A key governance structure for the entire effort was the Kampala Urban Food Security and Livestock Coordination Committee (KUFSALCC) comprising the Kampala City Council; an NGO working with urban farmers; the Ministry of Agriculture; Makerere University; and Urban Harvest (a cross-CGIAR group based at the International Potato Centre (CIP)).

Based on experience in the CoS-SIS research programme, it seems important to distinguish between (a) causal events that can be classified as *unintended history*, and (b) causal events that were *deliberately enacted* to foment institutional innovation. In turn, such causal events can be the outcome of natural experiments, i.e. interventions by e.g. government, donor or NGO activities that took place without one's own involvement, or of deliberate action in which one was intentionally involved oneself. Box 7 provides examples of (a) and (b) to stimulate discussion and research.

Box 7: Empirical events that can constitute a causal process for intervention or traced retrospectively to respectively foment or explain observed institutional innovation

Unintended history

- Extreme climate events, such as droughts floods, changes of seasonality.
- Disease outbreaks.
- International or national price changes/fluctuations.
- Political changes with new parties, or regimes entering national or local government.
- Uprisings, rebellions, strikes, or other conflicts between local people and those eating from the trough.
- Commercial developments, company activities, establishments, campaigns.
- Major crimes, robberies, insecurity.

Deliberate interventions based on institutional innovation strategy

- Farmer organisation, or reconfiguration. New activities of farmer organisations. Connections between local and higher-level farm organisations. Representation of farmers in meetings and multi-stakeholder processes in which they did not feature before. Roles of smallholders in value chains. Advocacy, lobbying. Production cooperatives.
- Linkages between local and higher administrative levels: visits of dignitaries from to 'lower' levels. Representations or delegations to higher levels.
- Re-configurations of networks: meetings of (temporary) coalitions of actors, forms of formal or informal collaboration among agencies, be they public, private, or civil society. Value chain integration.
- Policy change: legislation, by-laws, regulations, procedures, subsidies, decentralisation, changes in price formation procedures.

- Infrastructural changes, e.g. roads, communication facilities, etc.
- Financing, funding or investment.
- Commercial activities, enterprise development, value adding activities, increased volume of trade.
- Introduction of new products, new technical or process innovations (e.g. seeds, inputs, etc).
- Increased organisational diversity: organisations, professions, employment opportunities.
- Research projects, evaluations, generation of evidence.
- Media reports or campaigns; adult education initiatives to create awareness/information through extension, media, mass meetings, etc.
- Social movements: self-help groups, rebellions, protests, representations, political action.
- New ways to organise access to land, water, common grazing or forests, including appropriation of resources by rich people.
- Campaigns to enhance civil society: social construction of 'improved' gender relationships, enhanced roles of women and young people. Loss of power of established elites. Exposure of patrimonial networks, corrupt leaders, etc. Agreed new checks and balances to stop exploitation, etc. Greater inclusion of (categories of) smallholders.

At this point, it should be clear that the current article does not report on empirical outcomes of the CoS-SIS research programme. That is the task of the 10 Post-doc Research Associates and 11 PhD researchers who are currently in the field. What the article aspires to report is the extension of the boundaries of the trans-disciplinary science that deals with one of the global challenges of our time: enlisting smallholders in the struggle to ensure sustainable and healthy global, national and local food security.

8. Conclusion

Peak people by 2050 under conditions of climate change is expected to tax the world's ability to ensure global food security. It is time for level-headed strategising. One serious option is making more productive the vast resources held by smallholder farmers, especially in Africa. Realising that option promises also to reduce persistent rural poverty and ensure food sovereignty for countries vulnerable to climate change and market volatility. This article reviewed what it would take for 'Africa to feed the world' and draws the following conclusions:

- There is a great deal of evidence that African smallholders are responsive to realistic opportunities and dynamic in adapting to changing circumstance.
- Africa's present food production is stagnant and African countries are importing an increasing proportion of their food.
- Three prevalent bodies of expertise and practice for increasing the productivity of African agricultural resources have been examined and found wanting: 'technology supply push'; the agricultural treadmill; and land grab. These dominant perspectives do not recognise institutional change as a necessary condition for agricultural development.
- Only smallholders themselves can make those resources more productive, i.e. they must have *reason* to innovate their farms. Smallholders currently have few reasons to become more productive. They face small windows of opportunity and largely predatory institutions.
- The current emphasis on productivity per ha at the farm level ignores the crucial institutional context at the higher-than-farm level. Yet the history of agricultural development in industrial countries points to institutional development as the key entry point for making family farming more productive.
- The institutional contexts for African agriculture emphasise rent extraction without investment rather than support for farm innovation. African smallholders have become masters in adapting to inimical institutions.
- The article provides a list of institutional mechanisms that can be used to measure institutional conditions from a Farmer First perspective. These have

emerged in exploratory context of the CoS-SIS research programme in Benin, Ghana and Mali.

- The article also provides a list of empirical events that can make up a causal process for institutional innovation, to be used strategically for intervention or retrospectively to trace the path from baseline to outcomes.

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