

THE POLITICS OF SEED DELIVERY IN AFRICA'S GREEN REVOLUTION

J. Thompson¹, I. Scoones² and H. Odame²

ABSTRACT

As calls for a 'uniquely African Green Revolution' gain momentum, a focus on seeds and seed systems is rising up the agricultural policy agenda. Much of the debate on seeds stresses the technological or market dimensions, with substantial investments being made in seed improvement and the development of both public and private sector delivery systems. But this ignores the political dimensions of the policy processes behind this agenda: who wins, who loses, and whose interests are being served? Furthermore, the question of how these new agricultural technologies are to be delivered to farmers has focused attention on the central role of agro-dealers. With considerable funding from both philanthropic foundations and donor agencies,

these small-scale rural entrepreneurs are now being provided with a range of technical support from international NGOs, including training in business management, in many African countries. This paper draws on lessons from Kenya, Malawi and Zimbabwe to assess the evolution of seed system policy processes across the region and the potentials and limitations of the agro-dealer model. By examining how contrasting politics and different configurations of interests affecting this agenda, the paper highlights opportunities for reshaping the terms of the debate and opening up alternative pathways to more sustainable and socially just seed systems.

KEY WORDS: *CONTRASTING POLITICS, POLICY PROCESSES, RESEARCH, RESHAPING, SEED SYSTEM*

1 Future Agricultures Consortium and Institute of Development Studies, University of Sussex, UK
2 Future Agricultures Consortium and Centre for African Bioentrepreneurship, Nairobi, Kenya



INTRODUCTION AND OBJECTIVES

In recent years, significant amounts of international research and development (R&D) assistance have been channelled into technical, financial and institutional support for crop breeding, market development and input subsidies in an attempt to kick-start agricultural growth based on smallholder production across sub-Saharan Africa. The hope is to replicate the successes of the Asian Green Revolution of the 1960s and 1970s, based on the promotion of new seeds and fertilisers and, to a lesser degree, on improved irrigation and infrastructure. Today the emphasis combines the old technological focus with a new zeal for market-based solutions with the aim of delivering the Green Revolution through networks of local entrepreneurs, typified by the small-scale stockist or agro-dealer.

There is no question that boosting agricultural production in sub-Saharan Africa is needed urgently. While crop output in Africa has been increasing, this has largely been driven by the expansion of cultivated land rather than productivity gains. Between 1990 and 2006, the area under cultivation increased by more than 10% annually, while cereal yields over the same period were largely stagnant. The average yields of grain crops in sub-Saharan Africa have stayed below 1 t/ha since the 1960s, compared with average cereal yields of 2.5 t/ha in South Asia and 4.5 t/ha in East Asia (Hunt, 2011). Fertiliser use by

smallholder farmers has remained at very low levels of about 8–10 kg of nitrogen per ha. Today, fertiliser prices are double their levels in 2006 and Africa accounts for less than 3% of global fertiliser consumption (FAO, 2011). Moreover, the use of synthetic fertilisers by smallholder farmers to improve production is often not economically feasible, due to high prices and the risk of drought stress. The uncertainty of obtaining higher crop yields is further worsened by the prevailing erratic weather patterns and increasing climate variability (Ingram *et al.*, 2010). Current projections are that higher temperatures and lower rainfall in parts of Africa, combined with a doubling of the population, will lead to a 43% increase in food insecurity and induce a 60% increase in food aid expenditures in the next two decades (Funk and Brown, 2009).

Producing more food for a growing population in the coming decades, while at the same time combating poverty and hunger, is therefore a huge issue facing African agriculture. Proponents of the standard prescription to this food security challenge argue that, while we need to think comprehensively about what a Green Revolution for Africa would look like, the primary emphasis should be on delivering new technologies to farmers to drive agricultural development (World Bank, 2007; Ejeta, 2010; Otsuka and Kajima, 2011). It is assumed that once technology is made available, constraints on adoption and diffusion can be identified and addressed strategically,

giving priority to the best endowed lands and the potentially most successful crops, such as rice and maize (Hunt, 2011).

A range of major initiatives, including the Alliance for a Green Revolution in Africa (AGRA), the Millennium Villages Programme (MVP) and the US Government's new Feed the Future Program, are all focusing on different elements of this agenda. Under the umbrella of the Comprehensive Africa Agriculture Development Programme (CAADP), a programme of the Africa Union's New Partnership for Africa's Development (NEPAD), national governments are signing up to 'compacts' with the aim of channelling further funds in the support of the agricultural sector.³ Broadly speaking, these initiatives share a theory of change that may be described as 'market-led technology adoption' (Toenniessen *et al.*, 2008; Denning *et al.*, 2009; Sanchez *et al.*, 2009; AGRA, 2011) and which has three essential components:

1. to help farmers realise a higher proportion of their potential yield by planting new varieties of

³ For details on these initiatives: Alliance for a Green Revolution in Africa – <http://www.agra-alliance.org/>; Millennium Villages Project – <http://www.millenniumvillages.org/>; Feed the Future – <http://www.feedthefuture.gov/>; Comprehensive Africa Agriculture Development Programme (CAADP) – <http://www.nepad-caadp.net/> (accessed 5 May 2011).



Africa's staple food crops that significantly reduce losses and increase the stability of yields while meeting human nutritional needs and consumer preferences;

2. to help farmers increase the yield potential of their fields by enhancing agricultural productivity through increasing use of synthetic fertilisers and soil management practices to supply adequate plant nutrients;
3. to build and make more equitable both the input markets that can deliver better seeds, small fertiliser packets, and other inputs to farmers, and the output markets that enable farmers to convert surplus production into profits and to generate greater income.

The politics of innovation in African agricultural systems

Not surprisingly, given this orientation, much of the focus of the current debate and the framing of many of these initiatives, is on overcoming the narrowly defined technical and market challenges. These are of course very real and should not be underestimated. But much less discussed, and sometimes almost completely forgotten, are the political, institutional and social dimensions of designing and implementing a new Green Revolution for Africa. As Djurfeldt *et al.* 2006 observe:

[T]he problem with African food production is neither technology (i.e. wrong crops) nor nature

(i.e. poor soils and erratic rainfall). Nor [is it] that African governments have been reluctant to engage with the agricultural sector. On the contrary, there have been repeated attempts at ... [agricultural] intensification. Nevertheless, during the last decades attempts to implement Green Revolutions in Sub-Saharan Africa have seen short-lived spurts of production rather than lasting improvements in productivity. Instead of asking, 'Why have Green Revolutions been absent in Africa?', we need to ask 'Why have Green Revolutions not been sustained in Africa?'

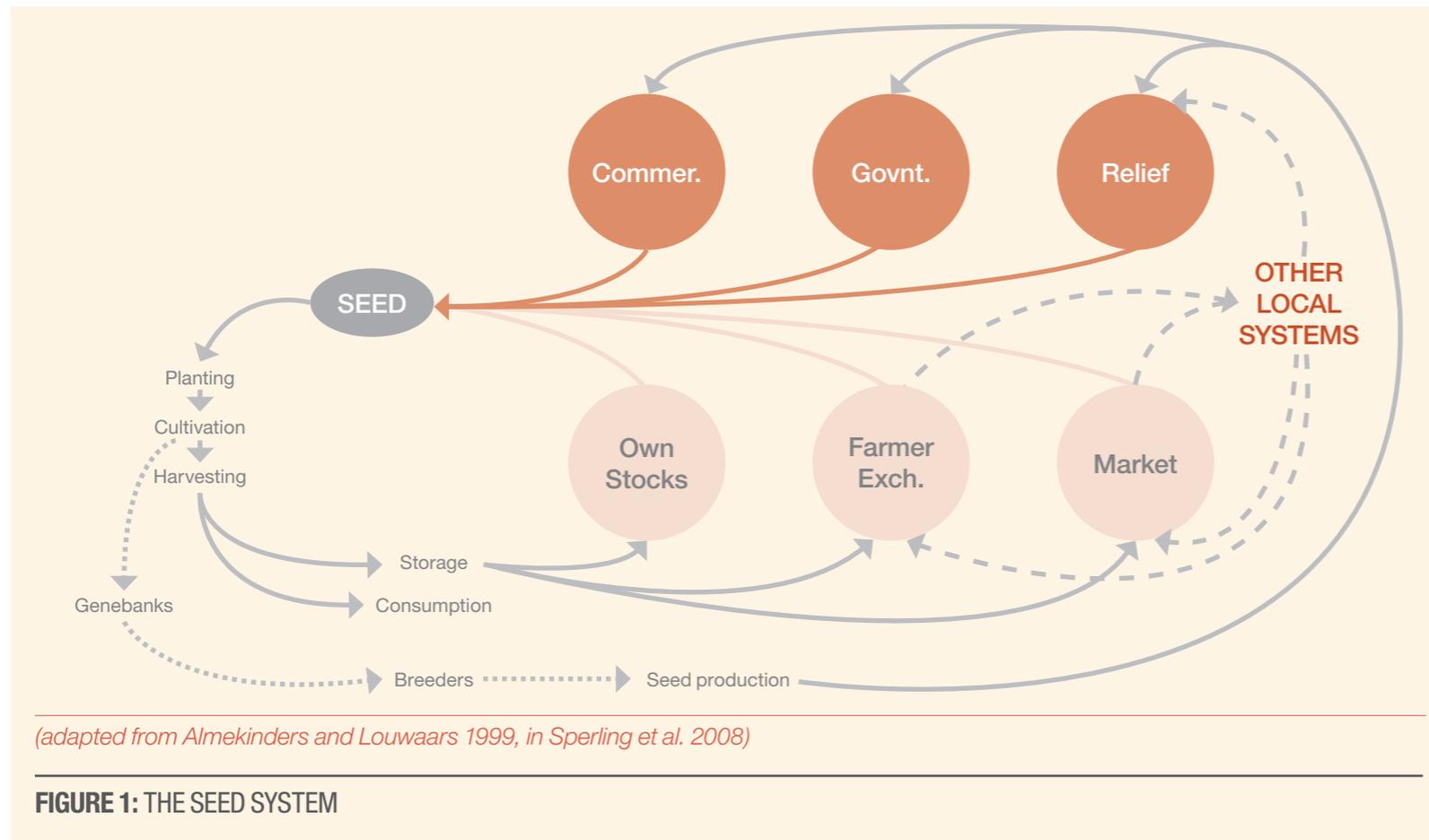
This paper, with its central emphasis on cereal seed systems, focuses on the under-addressed political-economic dimensions that have hindered the emergence and spread of lasting improvements in agricultural productivity. It examines how the new Green Revolution in Africa is unfolding in Kenya, Malawi and Zimbabwe, highlighting both the diversity of experiences and the common challenges and pitfalls. Moving beyond the generic hype of much policy discussion, these cases draw out historical lessons, as well as contemporary experiences from the field.

Debates about agricultural innovation in Africa are open to a variety of competing narratives about key science and technology problems and their potential solutions, each suggesting different pathways to reach more sustainable and productive agricultural futures. These narratives –

or storylines – are promoted by particular actors in specific contexts (some with more power and influence and some with significantly less) and embody different framings, values and goals. But questions remain as to why certain narratives and pathways come to dominate debates in African agricultural policy circles, while others remain marginal or even hidden from view (Keeley and Scoones, 2003). In addition, which pathways are pursued and which are not is in large part a question of the governance of technology: a politics of narratives and pathways shaped by power relations and institutional interests (Scoones, 2005; Leach *et al.*, 2010; STEPS, 2010).

Seed system politics

There has been much important work on African seed systems, ranging from studies of agricultural science and technology development (InterAcademy Council, 2004), seed research and development (De Vries and Toenniessen, 2001; Minot *et al.*, 2007), seed marketing systems (Morris, 1998; Crawford *et al.*, 2003;), local seed systems (de Boef *et al.*, 1993; Almekinders *et al.*, 1994); seed policy (Wiggins and Cromwell, 1995; Tripp, 1997; Cromwell *et al.*, 1992; Rohrbach *et al.*, 2003; Tripp, 2000; 2001) and seeds in the context of humanitarian aid (McGuire and Sperling, 2008; Sperling, 2008; Sperling *et al.*, 2004; 2008; 2009). Seed systems can be characterised in terms of the interaction of different elements. Figure 1 depicts the



farmer-to-farmer networks or even sold in local markets. At the same time, local varieties, or landraces, may be brought into the formal system for testing, certification and multiplication and then released officially through conventional channels. Figure 1 shows the special importance of local seed or grain markets. These markets are vital for farmers to meet their seed needs, especially for poor farmers and in difficult times. Thus, a 'seed system' is the sum of physical, organisational and institutional components, their actions and interactions that determine seed supply and use, in quantitative and qualitative terms, and include formal, informal and seed aid elements. In Africa, seed supply is dominated by informal systems – in some estimates around 80–90% (Almekinders and Louwaars, 1999). This varies by crop, of course, with the cereals and particularly maize, where hybrids now represent an estimated 44% of maize area in Eastern and Southern Africa (outside South Africa) and 60% of maize area in West and Central Africa, being supplied more through formal systems – although often only sporadically and inconsistently, depending on seed supply capacities, private sector development and market linkages (Smale et al., 2011). Relief seed, especially in Africa, has increased significantly since the 1990s and in some years is delivered to farmers each year and may be the major component of seed supply in some countries.

Overall 'seed security' arises from the

formal and informal seed systems, their component channels and how these are linked (Almekinders and Louwaars, 1999; Sperling et al., 2008).

The dark cylinders represent 'formal' seed sources, where bred seed is distinct from 'grain' and where the system includes formal breeding, gene banks, commercial companies, agro-dealers and others. The formal sources are distinguished from the light 'informal' sources, where seeds are selected from home farm production and saved and the system includes household seed selection

and saving, farmer networks of gift and exchange and local markets. Also highlighted is a significant third category, 'seed aid', delivered through humanitarian efforts as part of post-conflict recovery and emergency programmes (McGuire and Sperling, 2008; Sperling, 2008).

There are many flows between the formal and informal systems. For example, new 'modern' varieties of seed, launched by the formal system, may move into informal channels quickly and may be recycled by farmers, disseminated through



combination of seed availability, access and quality (Remington *et al.*, 2001). This is dependent on the functioning of the seed system and its ability to deliver all three of these key functions. Green Revolution efforts focus primarily on the formal system – on seed quality (increasing yield levels through breeding, and in some cases genetic engineering) combined with issues of seed availability and access, through the focus on private sector development, the facilitation of market channels and the support of agro-dealers. The technological innovations of the Green Revolution will be delivered through an improvement of the formal system, with spin-off benefits through the provision of new genetic material to the relief and informal systems.

This delivery of new technologies assumes a particular structure and function of the existing seed system, whereby strengthening of the formal system is all that is required. It is often thought that informal systems are inefficient and supply only low quality seed in variable quantities. Many assume that availability and quality are severely constrained and therefore urgent intervention is warranted. This is often the premise of relief and recovery programmes for example. Informal systems have been shown to be remarkably resilient (Almekinders and Louwaars, 1999; 2002), offering high levels of genetic diversity and the ability to adapt to changing circumstances through local innovation systems (Richards *et al.*, 2009; Richards

1986; 1989). Recognising the importance and potential of informal systems is essential to Africa's agricultural future and a narrow focus on the formal system to drive a new Green Revolution in the region may mean missing out on the largest, most vibrant area of technological development and potential transformation. Informal systems are resilient and productive in many respects but are not perfect and there are major opportunities for improvement through innovation, which links local systems with cutting-edge science and technology in new ways (van Etten, 2011).

Yet most discussion of the Green Revolution, whether concentrating on the formal seed system or more rarely on the informal system, focuses on the technical elements: breeding, regulation, marketing etc. All of these are important factors in shaping the overall performance of the total seed system. But what is often missing is an analysis of the politics that influences both the understanding and the functioning of the seed system (Scoones and Thompson, 2011).

Politics affects the framing of the system, influencing what elements are given priority over others, where investments are channelled, what institutional arrangements have the power to govern seed policy and practice, and how the overall narrative of system objectives is constructed. Politics also affects the interactions between these elements. Thus the cylinders and the arrows in Figure 1 are all constituted through

political relations. How big a particular element is and how it relates to others depends in large part on the political economy setting. These dimensions are however often not highlighted in the literature and frequently discussed only in superficial ways in discussions of seed policy.

To get at these seed system politics, the Future Agricultures Consortium undertook a broad mapping of the national seed systems in three countries, examining its historical origins, key narratives (defining key seed policy problems and solutions), actors and networks (the individuals and organisations involved and their connections) and political interests (the power relations and interests that push particular perspectives above others, and define winners and losers in the policy process) that shape particular socio-technical trajectories of innovation. The lessons emerging from those analyses comprise the core of this paper.

The special role of agro-dealers: Lessons from country studies

This paper draws on lessons from three case-studies of seed systems in Kenya (Hannigton Odame and Elijah Muange), Malawi (Blessings Chinsinga) and Zimbabwe (Charity Mutonhodza-Davies and Douglas Magunda) that were undertaken as part of the Future Agricultures project on the Political Economy of Cereal Seed Systems in Africa. In different ways in different contexts these studies asked a series of common questions:



- Are the emerging alliances at the heart of the new Green Revolution, backed by international aid and philanthropic funding, opening up opportunities for particular (multinational) agribusinesses with clout and influence, and so undermining others?
- Is the dominance of certain players in subsidy programmes providing a platform for market dominance in the future and the introduction of products – including genetically-modified crops – by stealth?
- What forms of patronage – linking State officials and private/NGO players – are emerging on the back of subsidy programmes? Who is excluded as a result?
- Is the support for a free-market private sector, based on small-scale entrepreneurs serving poor and marginalised farmers, or simply support for elites (including foreign capital)?
- Which small-scale entrepreneurs can operate under these conditions? Who are the new entrant entrepreneurs, in social, political and ethnic terms? How is this redefining these rural economic relations and to whose benefit?
- Who are the losers from the new Green Revolution – what products, which people and what institutions are missing out and lose support – or worse, are undermined?
- What opportunities exist for reshaping the debate and opening up alternative pathways to a more sustainable new Africa's Green Revolution?

The focus on *cereal* seed systems allowed the Future Agricultures team to concentrate on a similar set of crops with a key influence on food security at household and national levels across the countries. Whether grown for local subsistence or traded commercially, the significance of cereal crops to national politics (and arguments about food security and sovereignty), commercial interests and local livelihoods is profound.

The three country cases offered insights from a wide range of political, economic and agro-ecological contexts. For example, Kenya has a strong and growing private sector, with a long history of providing modern agricultural technologies to farmers. Malawi has a relatively nascent private sector and a long history of State intervention in the seed system. By contrast, Zimbabwe provides an example of a once vibrant seed system only now emerging from a decade of political and economic turmoil, which has been exacerbated by seed relief programmes implemented by the government and aid agencies, which by-passed the normal market chain. However, all three have seen the rise in recent years of major initiatives to promote agro-dealers to deliver new seeds and other technologies to small-scale farmers.

Kenya is in many ways the 'poster child' for Africa's new Green Revolution, and it supports several major public-private partnerships seeking to build on a strong private seed sector and a well-

developed and extensive network of small-scale agro-dealers to promote the spread of new agricultural technologies (Odame and Muange, 2011). The authors report, however, that agro-dealers are spread unevenly throughout the country and are inevitably concentrated in the higher potential agricultural areas. Even here, they are mainly found in urban centres away from the farms – and lack supportive infrastructure, such as roads and properly equipped storage facilities. These challenges lead to increased price of seeds and inputs, limiting their accessibility by farmers. With funding from both philanthropic foundations and government, these small-scale rural entrepreneurs are now being provided with a range of technical support from international NGOs, including training in business management. Nevertheless, making a business out of selling seeds and fertilisers to poor farmers is risky, especially in the dryland areas where demand is low and often variable. As Odame and Muange report, several actors promote the agro-dealer agenda, but due to different politics and interests, they also support parallel activities that seem to undermine development and expansion of the agro-dealer network in some places. Links with particular seed companies are essential for the survival of these enterprises, but the changing structure of the Kenya seed industry and the entry of large multinational players is changing this dynamic. This is acting to reduce the choice of seeds and crop types for farmers in all areas. These alliances



have thus far largely ignored informal seed systems, which often serve the majority of poor farmers in more marginal areas, and remain beyond the reach of new initiatives and investments.

In Malawi, maize politics has come to dominate that country's particular brand of electoral politics and created a seed industry controlled by multinational companies, who offer farmers a narrow range of products (Chinsinga, 2011). The interests of seed companies, donors and the State coincided around a set of input support programmes over the past decade, especially the Agricultural Input Subsidy Programme (AISP), which since 2005 has been providing farmers with vouchers to purchase hybrid seed and fertiliser from agro-dealers. The AISP has contributed to Malawi's success in improving its food security situation, which has raised its profile in the international press. In reality, however, it has been an intensely political initiative, with government wrangling with donors and the private sector over the best approach. The subsidy programme is a major drain on government resources, and a significant focus for donor and NGO investments too. Moreover, the AISP has been exploited as a source of political patronage and 'capture' at different levels. Although in 2010–11, there has been some reduction in subsidies (e.g. to tobacco growing), the core focus on hybrid maize for food security remains.

Over time, and pushed by the donors in

particular, there has been a greater incorporation of the private sector in the delivery of the programme. Global seed companies – notably Monsanto – provide seed in bulk and a network of agro-dealers deliver this through a voucher programme. This has proved a boon for major seed companies, as well as small-scale entrepreneurs. The alliance between the State, the donors and the private sector (both global multinational and very local) is strong. This has excluded alternative perspectives and has had a diversity of indirect effects, including favouring certain enterprises over others (those with capital and ability to link up with the large seed houses), certain seed products (hybrid/OPV maize over other seed options) and research priorities (undermining national breeding capacities).

In Zimbabwe, as part of the relief and rehabilitation programme of both government and donors/NGOs, a similar dynamic exists (Mutonhodza–Davies and Magunda, 2011). Again, major input subsidy programmes have been rolled out since 2009. These were focused on getting improved seed to poor farmers in both communal areas and new resettlement areas. The donors provided funds through NGOs who focused on communal areas, while the government channelled funds through State agents and focused on the new resettlements. Despite differences in implementation strategy, the overall narrative justifying the interventions was the same: there was a major gap in supply of seed and in order for

food security to be assured, subsidised (indeed free in most instances) improved seeds should be supplied. These efforts were deemed 'emergency' measures, and so implemented in a hurry. In most instances they by-passed existing channels for the delivery of seed and relied on those commercial suppliers who could deliver quickly and in bulk. For many, the programme has acted to undermine the longer-term recovery of the seed sector, while providing support to a narrow group of commercial interests, and offering a form of patronage to State and NGO actors implementing programmes at the local level.

Alternative pathways to diverse Green Revolutions

There are many political and economic factors that shape Africa's seed systems, and potentially many pathways to a new Green Revolution for the region. These include the technological focus of breeding efforts on certain key crops and varieties through particular breeding or genetic engineering techniques, which means that other 'orphan' crops or alternative breeding strategies get lower priority, with limited funds, low prestige and inadequate R&D. They may also include the emphasis on market solutions through alliances with the private sector and the promotion of agro-dealers which gears the Green Revolution towards certain 'bread-basket' areas with well-connected market linkages, a substantial network of agro-dealers and



high market demand for certain types of seed. These elements are central to the marketing operations of established seed houses in the formal systems, and away from support for informal seed systems in more remote areas with limited market access. The market solutions approach may also include the focus on direct seed distribution as part of seed aid and relief programmes, which in ways may act to undermine local markets and seed production and sharing.

In other words, political–economic interests create certain pathways for the new Green Revolution, constructing seed systems in their wake in particular ways, while obscuring or even disrupting alternatives. What then are the alternative pathways to a new Green Revolution that do not subscribe to the narrow framings and particular constructions of the mainstream versions described above? Can they perhaps deliver the same benefits, or indeed more to a wider group of people, through different means? And what are the political–economic obstacles to achieving these alternative pathways?

For example, can informal seed systems, as an alternative pathway, be galvanised more effectively? These systems are after all by far the dominant source of seed and despite decades of effort by research and extension systems across the continent, the penetration of the formal system, even in crops like maize, remains patchy. The mainstream Green Revolution focus of attempting

to replicate a particular technical–economic success story from Asia perhaps underestimates the importance of informal systems, as responsive, adaptive and flexible systems, more suited to the agro-economic contexts of Africa. Where the importance of informal systems is recognised, the focus is often an attempt to articulate them within the formal, mainstream Green Revolution project. Too often, participatory plant breeding becomes a route by which farmers are co-opted into private sector projects for the multiplication and delivery of seed on a low-cost, decentralised basis. While such systems have advantages, certainly over the centralised, controlled systems of seed supply in the past, they do not offer a farmer-led source of innovation and seed supply rooted in a local seed system (Dawit, 2011).

But this does not mean that all is well and that ‘indigenous’ systems are all that is needed. How can local expertise be mobilised, together with external sources of technological innovation and business skill, in new ways? Perhaps the old top down, linear model of upstream to downstream research and innovation linked to delivery through public extension and private business is inappropriate (van Etten, 2011). The extraordinarily rapid development of genomics techniques now allows testing, sequencing and selection at costs which are decreasing by the day (Richards *et al.*, 2009). Combined with farmer innovators connected by internet and cell phone, even in

remote areas of Africa, the potential for radically new alliances for open-source and low-cost innovation, rooted in local systems and appropriate to local circumstances, is enormous. This is not a romantic reification of the traditional, but a radical shift in doing things which by-pass and subvert conventional approaches, so easily captured by elite forms of expertise and business interests. This requires new thinking on innovation systems and the relationships between key players, linking farmers to other forms of skill and expertise based on new power relations and networks (Sumberg, 2005; Hall, 2009; Scoones and Thompson, 2009). Supporting the Green Revolution in Africa would, under such a pathway, take on a different form, with different investments in different things in different places.

Releasing the idea of a Green Revolution for Africa from the technocratic grip of a narrowly-defined framework offers the opportunity for diverse framings. Gordon Conway talks of the ‘Doubly Green Revolution’, for example, one that combines conventional technologies for promoting production with those that assure sustainability (Conway, 1997; 2007). Others argue for a low external input Green Revolution that focuses on the application of agro-ecological principles, minimising environmental impacts, reducing agricultural pollutants and carbon footprints (Pretty *et al.*, 2006). Others view seeds as part of bio-cultural diversity, a patrimony linked to histories and



landscapes replete with deeper meanings and forms of cultural belonging (Haverkort and Rist, 2007). Still others focus on the importance of locale, and the value of locally-based economies and ‘food sovereignty’ (Altieri, 2009; Mulvany and Arce Moreira, 2009; Pimbert, 2009). All these visions of a Green Revolution have their validity and their place. But how can such diverse framings, with such diverse implications for alternative pathways, be debated in ways that allow a plurality of visions to flourish? This requires a more mature political debate about the future of agriculture – and within it seeds – in Africa, one that gets away from narrow technical–economic framings, and sees a Green Revolution as essentially a socio-technical transformation, where technological elements (including seeds) are combined with social, cultural and ecological dimensions in complex ways resulting in multiple configurations, suited to different settings.

In discussing alternative pathways, we do not want to set up an artificial dichotomy – good and bad, mainstream and alternative. As we have argued repeatedly, and as the country cases reviewed by Future Agricultures show, we need a more plural vision for Africa’s new Green Revolution. In some settings, such as the well-endowed, high-potential, ‘bread-basket’ areas, the mainstream, rather narrow, vision may be highly appropriate, as it was in Asia’s Green Revolution. While in others we need alternative perspectives and alternative

pathways, or some hybrid combination.

Of course arguing for plural pathways and a diversity of responses has long been done. Indeed, concessions to alternatives and arguing that a ‘one-size-fits-all’ approach must be avoided as part of the wider rhetoric, with some calling for Green Revolutions (in the plural) or even a ‘Rainbow ‘Revolution’ (Swaminathan, 2004). But this does not mean that in practice a plurality of diverse options are realised. Some pathways are more privileged than others – supported by powerful interests and actors. And the reason for this is, as repeatedly highlighted, the politics that shape the way pathways are constructed, what gets prioritised and funded and what gets ignored or undermined.

CONCLUSIONS, RECOMMENDATIONS AND IMPLICATIONS

The discourse about the future of seed systems in Africa must stop treating Africa’s Green Revolution agenda in strictly technocratic terms. A large part of the failure of previous attempts to kick-start large-scale agricultural transformation on the continent was the result of ignoring the political economy of agrarian change and focusing narrowly on transferring the latest technologies through standard ‘packages’. To repeat the errors of the past, when they have been so well-documented and their consequences are still so clearly visible, is morally unacceptable. Africa

needs new seeds and associated technological and market solutions to increase its farmers’ productivity, enhance its economic growth and improve its people’s food security. But this ‘market-led technology adoption’ cannot be sustained on any large scale without addressing the politics of innovation – and with it, the interests, values and choices that drive that innovation. For this reason, this agenda cannot, and must not, be left only to the technocrats. It must be rescued as part of a legitimate, open, political debate about future options and pathways – about direction, distribution and diversity (Millstone *et al.*, 2009; STEPS, 2010).

One of the central lessons from the earlier Green Revolution in Asia is the need to respond actively to diverse geographical and social settings. For Africa, everything cannot be delivered as part of the ‘maize model’ – where germplasm responds to breeding efforts, hybrid varieties offer significant returns, the private sector is geared up and interested in breeding and multiplication, where agro-dealers are present and well-trained, and where farm-level demand is widespread. This approach has certainly had its successes, and is central to the ambitions of major initiatives, such as AGRA, the Millennium Villages and CGIAR centres such as CIMMYT (Sanchez *et al.*, 2009; Smale *et al.*, 2011). It is also central to the business models of Monsanto, Pioneer and other multinational purveyors of seeds and agrochemicals. But the



maize model has clear limits. For many crops including other cereal crops (i.e. teff, millet and to some extent sorghum) the model doesn't work. And many women, poorer people and those living away from markets miss out.

If the Green Revolution is to be a broad-based, inclusive revolution, focused on poverty reduction, as well as yield increases and production growth, those who miss out from the mainstream must be a concern, for they represent the majority of Africa's population. Here the public sector becomes crucial. This may be an unfashionable focus in the welter of discussion about PPPs and new forms of African entrepreneurship, but in this field there are some basic public goods which are required if this wider ambition is to be realised. Even in the context of the mainstream Green Revolution narrative, the public sector is important: for upstream breeding work, the conservation of germplasm and crop biodiversity, as is well recognised by AGRA's Programme for Africa's Seed Systems (PASS) (AGRA, 2011). But, as we have discussed, public sector research and development capacity in Africa is in desperately poor shape. Decimated by a combination of structural adjustment, 'reform' programmes, government neglect and a brain drain of expertise, most national research organisations are left without well-qualified staff and with few resources. Relying on the private sector, NGOs or the CGIAR to fill the gap is simply inadequate, and the rebuilding of effective national agricultural research and extension

systems, even if their mandates are refocused and narrowed, must remain central, whatever the pathways followed for Africa's Green Revolution.

We need to encourage a more robust and inclusive debate about alternatives, with different visions of different pathways, which may be pursued in parallel or in combination, to foster a wider diversity of pathways for the new Green Revolution in Africa. In order to do this we need a more open political debate about the future, which challenges the vested interests, which create singular, narrow views. And through a more diverse vision of Africa's Green Revolution, and the role of seeds within it, we need to open up the innovation process, making use of new information technologies and networking opportunities to link high-end genomics with local adaptive research with farmers. These must be connected to public research and extension. One size must not fit all, especially in such diverse settings as are found across Africa.

LITERATURE CITED

AGRA. 2011. 'PASS programme for Africa's seed systems: Supporting the seed value chain in Africa.' PASS Programme Brochure, Alliance for a Green Revolution in Africa. Nairobi, Kenya.

Almekinders, C.J.M. and Louwaars, N.P. 1999. *Farmers' Seed Production: New Approaches and Practices*. Intermediate Technology Publications, London, UK.

Almekinders, C.J.M. and Louwaars, N.P. 2002. 'The importance of the farmers' seed systems in a functional national seed sector.' *Journal of New Seeds* 4 (1): 15–33.

Almekinders, C.J.M., Louwaars, N.P. and Bruijn, G.H. 1994. 'Local seed systems and their importance for an improved seed supply in developing countries.' *Euphytica* 78 (3): 207–216.

Altieri, M.A. 2009. 'Agroecology, small farms and food sovereignty.' *Monthly Review* 61: 102–111.

Chinsinga, B. 2011. 'Seeds and subsidies: The political economy of input programmes in Malawi.' *IDS Bulletin* 42 (4): 59–68.

Conway, G. 1997. *Doubly Green Revolution: Food for All in the Twenty-First Century*, Penguin Books, London, UK.

Conway, G. 2007. 'A doubly green revolution: Ecology and food production', In May, R.M. and McLean, A.R. (eds) *Theoretical Ecology: Principles and Applications*, Oxford University Press, Oxford, UK.



Crawford, E., Kelly, V, Jayne, T.S. and Howard, J. 2003. 'Input use and market development in sub-Saharan Africa: An Overview.' *Food Policy* 28 (4): 277–292.

Cromwell, E., Friis–Hansen, E. and Turner, M. 1992. *The Seed Sector in Developing Countries: A Framework for Performance Analysis*. Overseas Development Institute (ODI), London, UK.

Dawit, A. 2011. 'The political economy of Ethiopian cereal seed systems: State control, market liberalisation and decentralisation.' *IDS Bulletin* 42 (4): 69–77.

De Boef, W., Amanor, K., Wellard, K. and Bebbington, A. 1993. *Cultivating Knowledge. Genetic Diversity, Farmer Experimentation and Crop Research*. Intermediate Technology Publications, London, UK.

Denning, G., Kabambe, P., Sanchez, P., Malik, A., Flor, R., Harawa, R., Nkhoma, P., Zamba, C., Banda, C., Magombo, C., Keating, M., Wangila, J. and Sachs, J. 2009. 'Input subsidies to improve smallholder maize productivity in Malawi: Toward an African green revolution.' *PLoS Biology* 7 (1): e1000023.

De Vries, J. and Toenniessen, G.H. 2001. *Securing the Harvest: Biotechnology, Breeding and Seed Systems for African Crops*. CABI Publishing, Wallingford, UK.

Djurfeldt, G., Holmén, H., Jirström, M. and Larsson, R. 2006. *Addressing Food Crisis in Africa: What Can Sub-Saharan Africa Learn from Asian Experiences in Addressing its Food Crisis?* Swedish International Development Cooperation Agency (SIDA), Stockholm, Sweden.

Ejeta, G. 2010. 'African green revolution needn't be a mirage.' *Science* 327: 831–2.

Evenson, R.E. and Gollin, D. 2003. 'Assessing the impact of the green revolution, 1960 to 2000.' *Science* 300 (5620): 758–62.

FAO. 2011. *Current World Fertilizer Trends and Outlook to 2013*. Food and Agriculture Organization of the United Nations (FAO), Rome, Italy.

Funk, C.C. and Brown, M.E. 2009. 'Declining global per capita agricultural production and warming oceans threaten food security.' *Food Security* 1: 271–289.

Hall, A. 2009. 'Challenges to strengthening agricultural innovation systems: Where do we go from here?' In Scoones, I. and Thompson, J. (eds) *Farmer First Revisited: Innovation for Agricultural Research and Development*, Practical Action Publications, London, UK.

Haverkort, B. and Rist, S. (eds) 2007. *Endogenous Development and Bio-cultural Diversity: The Interplay between Globalization, Worldviews and Locality*. ETC/Compas, Leusden, The Netherlands and Centre for Development and Environment, Bern, Switzerland.

Hunt, D. 2011. 'Green revolutions in Africa.' Programme Paper AFP 2011/01. Chatham House, London, UK.

Ingram, J., Ericksen, P. and Liverman, D. (eds) 2010. *Food Security and Global Environmental Change*. Earthscan, London, UK.

InterAcademy Council. 2004. *Realizing the Promise and Potential of African Agriculture. Science and Technology Strategies for Improving Agricultural Productivity and Food Security in Africa*. InterAcademy Secretariat, Amsterdam, The Netherlands.



Keeley, J. and Scoones, I. 2003. *Understanding Environmental Policy Processes: Cases from Africa.* Earthscan, London, UK.

Leach, M., Scoones, I. and Stirling, A. 2010. *Dynamic Sustainabilities: Technology, Environment and Social Justice, Pathways to Sustainability Series.* Earthscan, London, UK.

Longley, C., Dominguez, C., Saide, M.A. and Leonardo, W.J. 2002. 'Do farmers need relief seed? A methodology for assessing seed systems.' *Disasters* 26 (4): 343–355.

McGuire, S.J. and Sperling, L. 2008. Leveraging farmers' strategies for coping with stress: Seed aid in Ethiopia. *Global Environmental Change* 18: 679–688.

Millstone, E., Thompson, J. and Brooks, S. 2009. 'Reforming the global food and agriculture system.' STEPS Working Paper 26, STEPS Centre, University of Sussex, Brighton, UK.

Minot, N., Smale, M., Eicher, C., Jayne, T., Kling, J., Horna, D., and Myers, R. (eds) 2007. *Seed Development Programs in Sub-Saharan Africa: A Review of Experiences.* International Food Policy Research Institute (IFPRI), Washington, DC, USA.

Morris, M.L. 1998. *Maize Seed Industries in Developing Countries.* Lynne Rienner Publishers, Boulder, CO, USA.

Mulvany, P. and Arce Moreira, M. 2009. 'Food sovereignty: A farmer-led policy framework.' In Scoones, I. and Thompson, J. (eds) *Farmer First Revisited: Innovation for Agricultural Research and Development,* Practical Action Publications, London, UK.

Mutonodzo–Davies, C. and Magunda, D. 2011. 'The politics of seed relief in Zimbabwe.' *IDS Bulletin* 42 (4): 90–101.

Odame, H. and Muange, E. 2011. 'Can agro-dealers deliver the green revolution in Kenya?' *IDS Bulletin* 42 (4) 78–89.

Otsuka, K. and Kajima, Y. 2011. 'Technology policies for a green revolution and agricultural transformation in Africa,' *Journal of African Economics* 19 (suppl 2): 60–76.

Pimbert, M. 2009. *Towards Food Sovereignty: Reclaiming Autonomous Food Systems.* International Institute for Environment and Development (IIED), London, UK.

Pretty, J.N., Noble, A.D., Bossio, D., Dixon, J., Hine, R.E., Penning de Vries, F.W.T. and Morison, J.I.L. 2006. 'Resource-conserving agriculture increases yields in developing countries.' *Environmental Science and Technology* 40 (4): 1114–1119.

Remington, T., Maroko, J., Walsh, S., Omanga, P. and Charles, E. 2002. 'Getting off the seeds-and-tools treadmill with CRS seed vouchers and fairs.' *Disasters* 26 (4): 316–328.

Richards, P. 1986. *Coping with Hunger: Hazard and Experiment in an African Rice-Farming System.* Allen and Unwin, London, UK.

Richards, P. 1989. 'Farmers also experiment: A neglected intellectual resource in African science.' *Discovery and Innovation* 1 (1): 19–25.

Richards, P., de Bruin-Hoekzema, M., Hughes, S.G., Kudadjie–Freeman, C., Kwame Offei, S., Struik, P.C. and Zannou, A. 2009. 'Seed systems for African food security: Linking molecular genetic analysis and cultivator knowledge in West Africa.' *International Journal of Technology Management* 45 (1/2): 196–214.



Rohrbach, D., Minde, I. and Howard, J. 2003. 'Looking beyond national boundaries: Regional harmonization of seed policies, laws and regulations.' *Food Policy* 28 (4): 277–292.

Sanchez, P.A., Denning, G.L. and Nziguheba, G. 2009. 'The African green revolution moves forward.' *Food Security* 1 (1): 37–44.

Scoones, I. 2005. 'Governing technology development: Challenges for agricultural research in Africa.' *IDS Bulletin* 36 (2): 109–114.

Scoones, I. and J. Thompson (eds) 2009. *Farmer First Revisited: Innovation for Agricultural Research and Development*. Practical Action Publications, London, UK.

Scoones, I and Thompson, J. 2011. The politics of seed in Africa's green revolution: Alternative narratives and competing pathways. *IDS Bulletin* 42 (4): 1–23.

Smale, M., Byerlee, D. and Jayne, T. 2011. 'Maize revolutions in Africa', Policy Research Working Paper 5659. World Bank, Washington, DC, USA.

Sperling, L. 2008. *When Disaster Strikes: A Guide to Assessing Seed System Security*. International Center for Tropical Agriculture (CIAT), Cali, Colombia.

Sperling, L., Remington, T., Haugen, J.M. and Nagoda, S. (eds) 2004. *Addressing Seed Security in Disaster Response: Linking Relief with Development*. International Center for Tropical Agriculture (CIAT), Cali, Colombia.

Sperling, L., Cooper, D. and Remington, T. 2008. 'Moving towards more effective seed aid.' *Journal of Development Studies* 44: 586–612.

Sperling, L. CIAT, CRS, World Vision, Care, AGRITEX and CIMMYT. 2009. *Seed System Security Assessment, Zimbabwe*. US Agency for International Development (USAID), Washington, DC, USA.

STEPS Centre. 2010. *Innovation, Sustainability, Development: A New Manifesto*. STEPS Centre, University of Sussex, Brighton, UK.

Sumberg, J. 2005. 'Systems of innovation theory and the changing architecture of agricultural research in Africa.' *Food Policy* 30: 21–41.

Swaminathan, M.S. 2004. 'Africa's rainbow revolution.' *TWAS Newsletter* 3/4: 72–76.

Toenniessen, G., Adesina, A. and De Vries, J. 2008. 'Building an alliance for a green revolution in Africa.' *Annals of the New York Academy of Sciences* 1136: 233–242.

Tripp, R. 1997. *New Seed and Old Laws: Regulatory Reform and the Diversification of National Seed Systems*. Intermediate Technology Publications, London, UK.

Tripp, R. 2000. 'Strategies for seed system development in sub-Saharan Africa: A study of Kenya, Malawi, Zambia, and Zimbabwe.' ICRISAT Working Paper Series No. 2, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Bulawayo, Zimbabwe.

Tripp, R. 2001. *Seed Provision and Agricultural Development: The Institutions of Rural Change*. Overseas Development Institute (ODI), London, UK.

van Etten, J. 2011. 'Crowdsourcing crop improvement in sub-Saharan Africa: A proposal for a scalable and inclusive approach to food security.' *IDS Bulletin* 42 (4): 102–110.



Wiggins, S. and Cromwell, E. 1995. 'NGOs and seed provision to smallholders in developing countries.' *World Development* 23 (3) 413–422.

World Bank. 2007. *World Development Report 2008: Agriculture for Development*. World Bank, Washington, DC, USA.