Environmental Change & Maize Innovation in Kenya: Exploring Pathways In and Out of Maize

The STEPS Centre, University of Sussex, UK and ACTS, CABE and Tegemeo, Kenya www.steps-centre.org

4 Maize Security ≠ Food Security? Breaking the 'Lock in' to the Dominant Maize Pathway

Why maize?

Maize is central to household food security for most Kenyans. As a result, policies that affect maize directly influence most Kenyan families' access to food. Moreover, 'maize politics' is played out at the highest levels of government and involves some of the most influential public-sector and private-sector actors in the country. Repeatedly, the STEPS Kenya team heard from key informants interviewed for this project that maize is the 'most sensitive political issue in the country'. Furthermore, from the national policy level to the individual household level, maize security has come to be equated with food security. They are seen as one and the same. Without maize, many Kenyans believe they do not have 'food'. Consequently, concerns about maize production and access drive national food and agricultural policy, leading to a virtual 'lock-in' of maize as the dominant pathway to food security.

For these reasons, the question 'Why maize?' has been a core theme of this project. Our research findings from in-depth fieldwork and extensive interviews highlight diverse ways in which maize finds its way into multiple farming and livelihood systems, even in places where other crops might be more suitable. This observation has led us to question a technology supply 'pipeline' model informing interventions to generate drought-tolerant maize varieties and make these available – together with extension advice on crop management – through networks of private agro-dealers. These strategies share certain core assumptions:

1 that an extension of the 'choice' of new varieties to farmers of their primary crop, maize, will respond to the diversity and uncertainties of local contexts in which farmers attempt to build sustainable livelihoods, even those living in marginal environments

2 that this extension of choice is to be facilitated through an extension of the formal 'maize system', displacing a diversity of informal systems on which many resource-poor farmers rely.

Such technical–institutional arrangements are unlikely to meet the needs of most poor farmers in drought-prone areas of Kenya.

Faced with balancing multiple types of uncertainty in their daily lives, farmers in ASAL areas of Kenya choose elements of formal and informal systems in ways that enable them to tap into multiple sources of socio-technical diversity, as a basis for building resilient, robust livelihoods. It is this precarious balance that may be undermined by linear approaches that seek to impose one dominant system at the expense of other viable, but less well-researched and less well-resourced alternatives. This briefing paper argues that interventions that recognise the fragility of maize-dependent livelihoods, and attempt to promote alternative pathways in and out of maize may hold more promise. However, such approaches face challenges given the complex dynamics that keep farmers in even the most drought-prone areas 'locked in' to maize, discouraging local innovations that might have led to more sustainable livelihood options.

From Food Security to Maize Security

Anyone remotely familiar with the recent history of maize in Kenya knows it has become the pre-eminent staple crop over the past 100 years. Prior to that time, millet and sorghum were the staple cereals of most Africans. However, maize was regarded as eminently suitable by British settlers for mixed farming because:

1 it required less capital investment and technical skill than did cash crops (e.g., cotton and tobacco) and could therefore be produced by newly arrived novices

2 It gave higher returns to land than other indigenous cereals under reasonably favourable conditions, though not throughout the entire range of agro-ecological conditions.

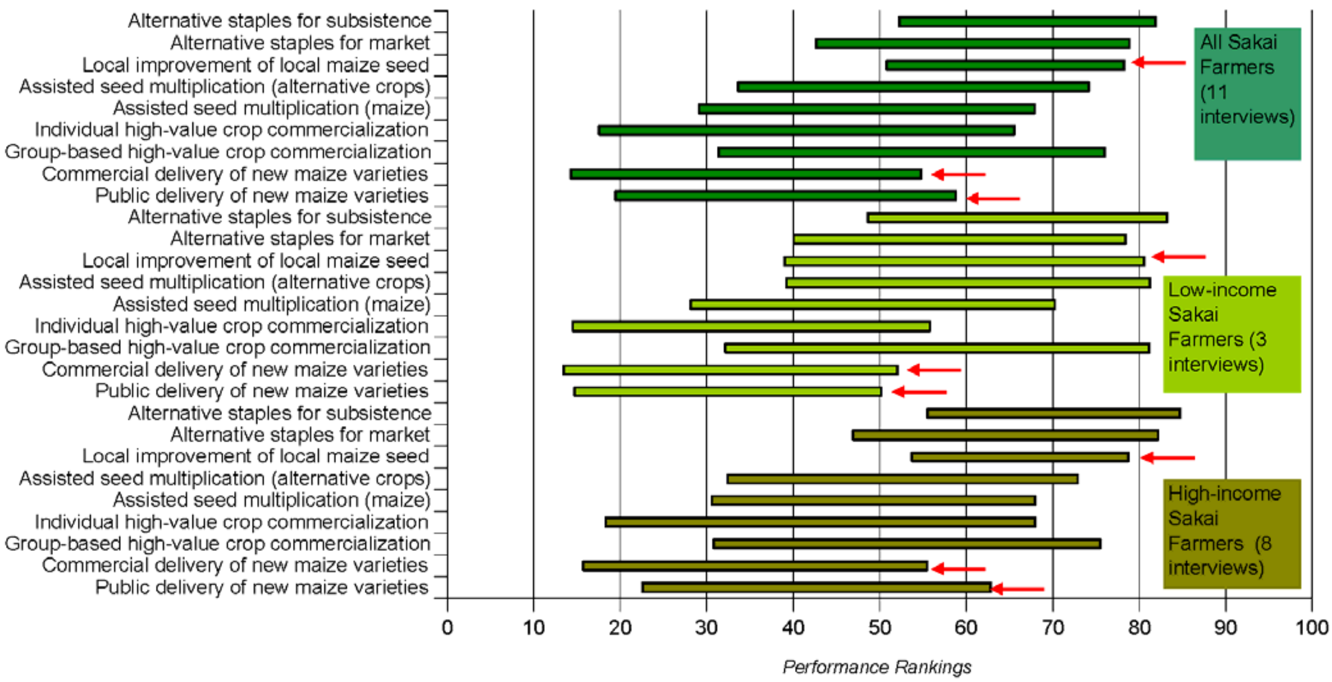
The investments by the colonial government and European settlers in the maize research that radically transformed production in Kenya began as early the 1930s, soon after hybrid maize was introduced in the United States. Released on the eve of Independence, Kenya's first hybrid maize – H-611 – diffused among both small-scale and large-scale farmers in the high potential areas of western Kenya at rates that matched those of farmers in the US Corn Belt during the 1930s and 1940s.

During the 1970s and 1980s, Kenya achieved impressive rates of maize production driven by interacting innovations in policies, institutions and technology. The four Kenyan maize programmes (Kitale, Embu, Katumani and Mtwapa) have since released a succession of hybrids and improved open-pollinated varieties (OPVs), and one of the greatest achievements has been the release of a range of materials to suit different growing conditions. In particular, both national and international crop science institutions responded with research into improved maize varieties more able to withstand the effects of drought. The goal of maize breeding for drought-prone conditions has been pursued in particular by plant breeders in Kenya since scientists at KARI's dryland research station developed their first drought-escaping 'Katumani' variety in 1968 and at CIMMYT since 1975. In recent years these efforts have been given new prominence in light of increasing concerns about the effects of climate change, and led to multi-million dollar grants by the Bill and Melinda Gates Foundation to support research and development of drought-tolerant maize varieties. Meanwhile, some private seed companies, frustrated in their attempts to penetrate the more commercially attractive high altitude market dominated by a parastatal, the Kenya Seed Company, are pursuing a loss-leader strategy in drought-prone Eastern Kenya.

As investments in maize research and development have grown, so too has the country's dependence on the crop as its primary staple. Today, maize covers nearly 80% of the total cereal area of the country and the average Kenyan citizen consumes well over 90 kg/yr of maize, one of the highest levels in Africa. In interviews with policy makers and farmers in both Eastern and Western Kenya, maize was often equated with 'food', while other crops were seen as inferior products to fill gaps and supplement the intake of the primary crop. These views are reinforced by national policies that equate 'maize security' with 'food security'. Thus, achieving food security is the incentive for many to allocate a disproportionately large part of their land to maize, leaving little area to other crops.

These strategies rely on several core assumptions: firstly, that an extension of the choice of varieties available to farmers of their primary crop, maize, will respond to the diversity of local contexts in which farmers attempt to build sustainable livelihoods; and secondly, that this extension of choice is to be facilitated through an extension of the formal 'maize system', at the expense of the informal systems on which many resource-poor farmers currently rely. In particular, today's Green Revolution for Africa relies

Figure 1: Performance rankings of the nine pathways by Sakai farmers, differentiated by income



on the promise of a strengthened network of private agro-dealers to serve as a de facto extension service, disseminating commercially available technologies and crop advice. This research, however, leads us to question the technology supply 'pipeline' model that ends in an interface between the agro-dealer and farmers as consumers of technologies. In this context, concerns about climate change present an opportunity to explore alternative 'pathways in and out of maize' (such as those promoted under the Arid Lands Resource Management Project – ALRMP II).

Attempts to find alternatives to the maize 'lock in' face considerable challenges for the Government of Kenya, for the agricultural research community, for private agricultural input and service providers, for traders and above all for farmers. When scientists interviewed for this study were asked about maize in Sakai, they would invariably said, 'Well of course farmers there shouldn't grow maize'. Yet they continue to do so, despite the advisability of moving out of maize and into alternative dryland crops (e.g. sorghum and millet) some of which were habitually grown and consumed just one or two generations ago and which would fare better in the prevailing harsh conditions. In Sakai, the shift from dryland crops to maize seems hard to reverse. People's tastes have changed, as have local knowledge and practices in food preparation. Very few farmers in Sakai have thus far been able to break their maize dependence completely, despite a number expressing a desire to do so, but many are pursuing innovative strategies to intensify, diversity and commercialise their production of other crops, either individually or collectively.

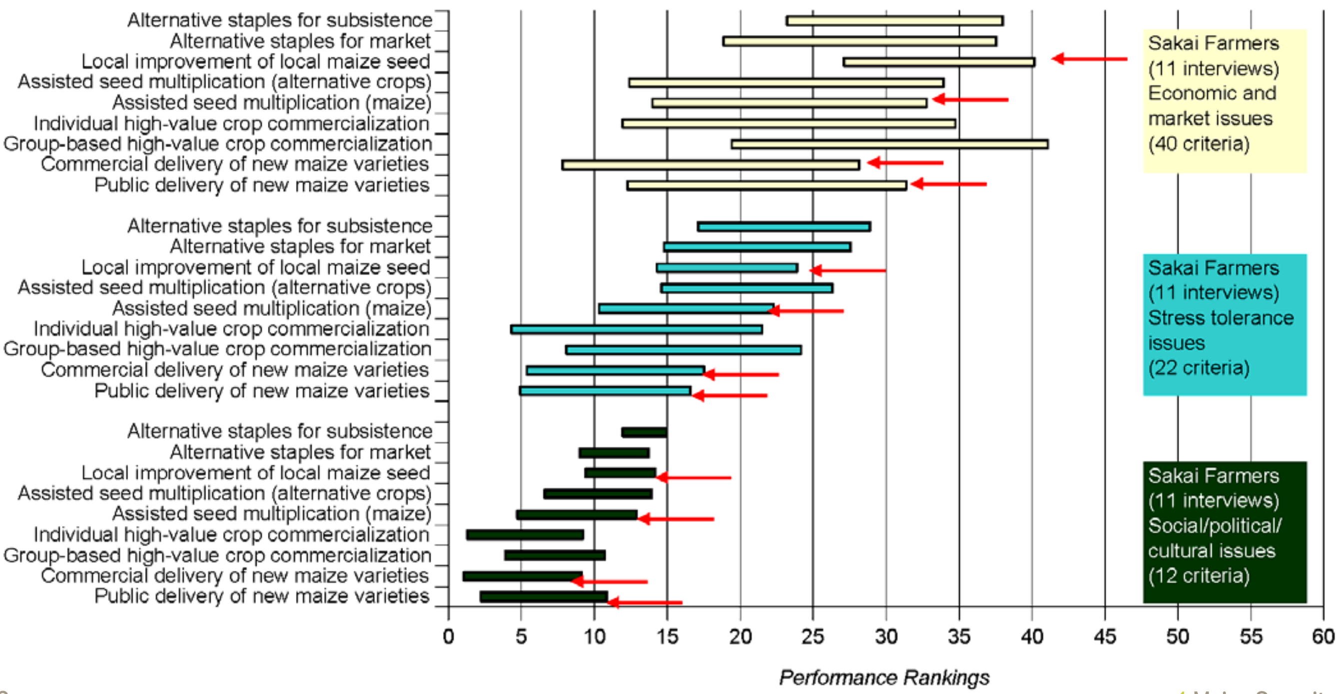
Beyond maize: lessons from Multi-criteria Mapping

In Sakai, some 'high maize' pathways (i.e. those where maize is the primary crop of choice in the farming system) examined in the Multi-Criteria Mapping study (see Figure 1) were highly ranked, but only under certain conditions, as discussed below. Regardless of those conditions, the 'high maize' pathways were not ranked highly overall. In particular, Sakai farmers ranked the pathways defined as 'commercial delivery of new maize varieties' and 'public delivery of new maize varieties' to have a consistently low performance across all issues. This was true even amongst different groups of farmers, such as those with high or low incomes, or with different genders.

This leads us to an important question: If the farmers in communities like Sakai do not see these 'new maize varieties' as a viable pathway in terms of overall sustainability for the future, how can they claim to be a 'single' answer for all the people facing sustainability problems in Kenya?

Even more force is given to this question when we consider the variation in the performance rankings of the 'high maize' options (as indicated by the red arrows) across individual issues which Sakai farmers addressed during the evaluations. For example, under economic and market issues (see Figure 2) the 'new maize variety options' have the lowest performance rankings, while the more 'locally based' seed systems as seen in pathway 3 – Local improvement of local maize seed – and pathway 5 – Assisted seed multiplication (maize) – had higher performance rankings. Detailed analysis reveals this is because at

Figure 2: Performance rankings by Sakai Farmers of the nine pathways according to three sets of criteria



harvest time, when maize becomes plentiful, prices fall. This caveat is important. There was a wide variation in farmers' uncertainty about the costs of cultivating different types of maize and how they would fair in the market. That is, even if new maize varieties had better crop yields, their higher cost and restricted availability made the farmers' assessments of them lower and more uncertain.

There was also a tension between how farmers evaluated the economic and market performance of the various pathways in relation to stress tolerance. Judged by those criteria, the 'high maize' pathways all had lower rankings than those that emerged when they were judged by reference to economic and market issues. This suggests there is a difference in the conditions under which the 'high maize' options are seen as preferable to farmers, when compared to the pathways that would be less maize-dependent. That is, pathways 3 and 5 may facilitate market access, but they could also lower the farmers' ability to adapt to changing environmental stress.

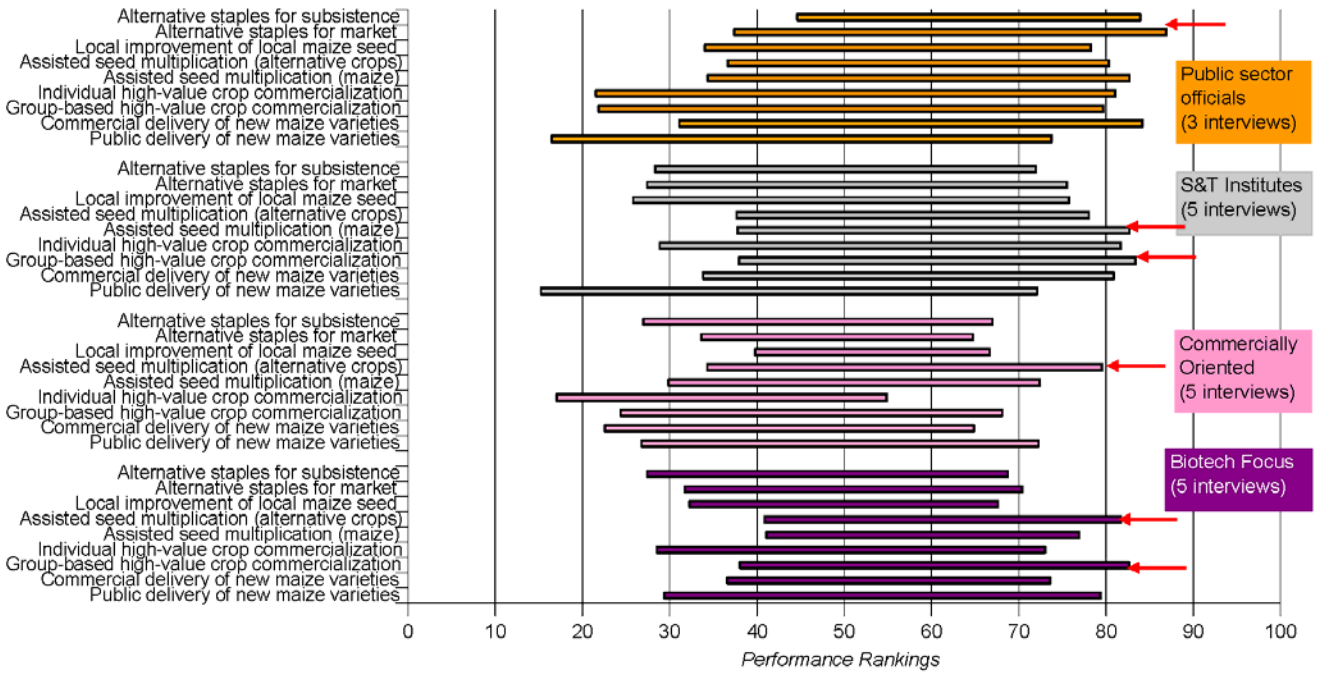
Interestingly, but perhaps not surprisingly, the perspectives of urban-based informants interviewed for this study tell a rather different story when it comes to the role of maize compared to the other pathways (Figure 3). Most notable is the fact that when looked at in aggregate, the performance rankings among different perspectives show that a variety of options were highly evaluated as the best and the worst. (Optimistic rankings indicated in red arrows below, show that different options were preferred by each urban-based perspective.) Despite the dominant rhetoric of maize having such high political and social importance, amongst the scientists, regulators, biotechnology managers and other stakeholders we spoke with, no 'high maize' option dominated in any of those perspectives.

When we looked at the performance rankings of the nine pathways under individual issues, however, the picture changed. While a lower ranking was given by Sakai farmers to the 'new maize variety' pathways under all issues, most 'urban' perspectives showed a greater tendency to express a preference, as indicated by higher performance rankings, for 'new maize' variety options especially, and most markedly under 'stress tolerance' issues (Figure 4), although they often favourably evaluated the options under 'social/political/cultural' issues too.

Juxtaposed with this is the finding that where the performance of pathways was generally high (and often more uncertain) when judged by reference to stress-tolerance issues, rankings were lower under 'economic and market' issues for the two 'new maize' options, especially the 'commercial delivery' pathway (Figure 5). This illustrates an important similarity between Sakai and 'urban' perspectives on the economic front, but a very different one when judged by reference to stress tolerance.

In addition, pathway 8 – 'commercial delivery of new maize varieties' – was also highly ranked under 'social, political, cultural' issues. However, this was often shared at the optimistic end with pathways that featured 'alternative' or locally-based options, such as local improvement of local maize seed or alternative staple crops. This suggests that even within the policy networks that are promoting 'high maize' pathways, there is an implicit acknowledgement that that high maize is *not* the only or even the best solution.

Figure 3: Performance rankings of the nine pathways by four groups of urban-based informants



In sum, our MCM results show that the 'high maize' options consistently have wider uncertainty ranges and tend to have some of the lowest performance rankings under pessimistic conditions across all stakeholder groups. This is especially true for 'new maize variety' options (i.e. the new drought-tolerant varieties). Alternative pathways, on the other hand, were widely judged as adapting better to different sets of circumstances, or (to put it in the language of MCM) they perform well across a variety of different issues, especially those related to stress tolerance (drought, pests, diseases, etc.) and adaptability. This show that there is greater perceived resilience in those alternative pathways, even within maize.

Figure 4: Performance rankings by four groups of urban-based informants of the nine pathways against the criteria of stress tolerance

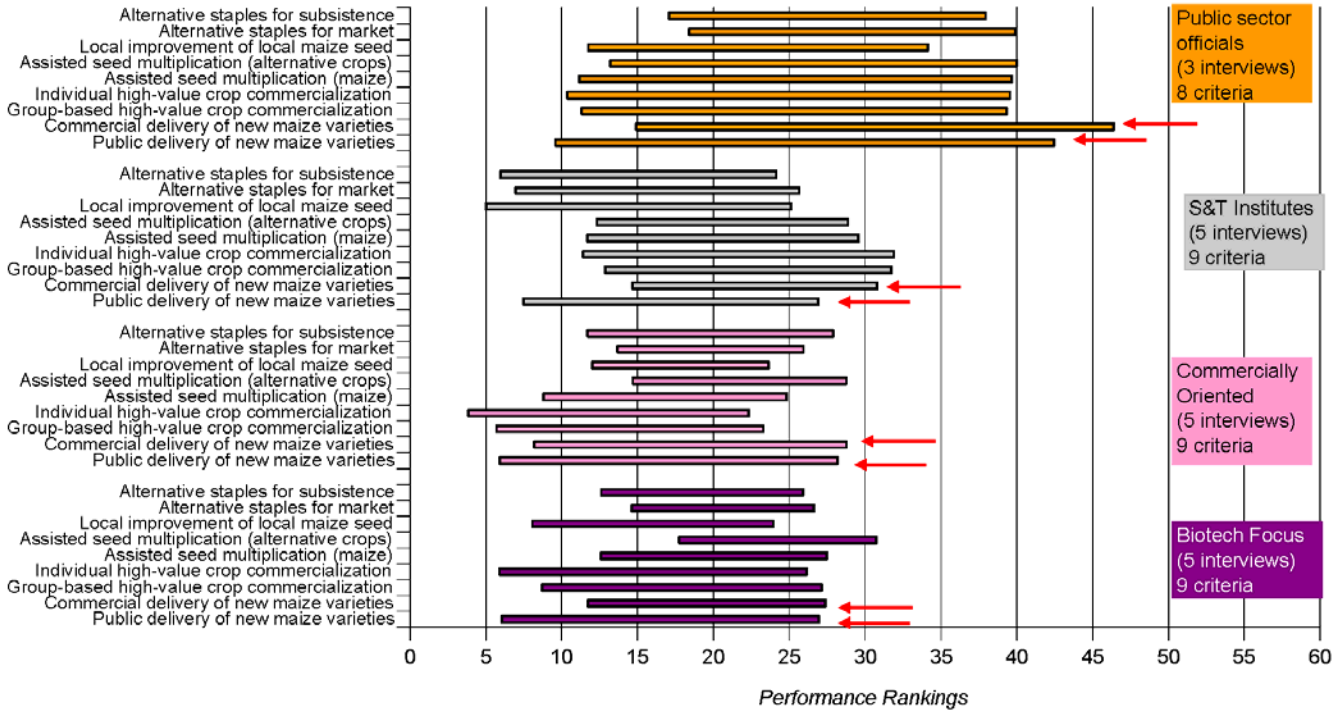


Figure 5: Performance rankings by four groups of urban-based informants of the nine pathways against economic and market criteria