Environmental Change & Maize Innovation in Kenya: Exploring pathways in and out of maize

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3 MCM Maize Project Method

In the course of the STEPS maize project, the research team, which included both Kenyan and UK-based researchers, met and talked at length with a diverse range of farmers in the Sakai valley about how to respond to the challenges posed by frequent droughts and the threat of climate change.

At an initial stage, a rapid rural appraisal (in May 2008) indicated that diversification – of maize varieties, crops and (on and off farm) livelihood options – appeared to be the main overall strategy for dealing with the challenges of increased rainfall variability and drought. That appraisal also indicated that the farmers selected the varieties of maize they chose to plant by reference to six main sets of criteria, including availability and price, which explained the continued preference of many poorer smallholders for traditional local seeds, rather than the newer commercial varieties.

Subsequently a chronological 'biography' of maize cultivation in the Sakai Valley was constructed, from the 1960s to 2006, by drawing on the recollections of mature local farmers, which divided the interval into three main periods. A range of different perspectives was also gathered from richer and poorer farmers, from plant breeders in crop research institutes, from policy-makers, extension workers and executives in commercial seed companies. Those discussions explored the strategies that are being, or could be, employed by farmers. Discussions with agricultural researchers, public policy-makers and other key stakeholders helped identify the pathways on which their efforts have been focused.

In the course of those discussions and our analysis of them, nine distinct pathways were identified that farmers in semi-arid regions of Kenya such as the Sakai valley could pursue in response to the challenge of repeated droughts and the threat of climate change.

One set of pathways depended on high external inputs, such as commercially bought seeds, fertilizers and irrigation, while another assumed low levels of such inputs. The pathways could also be differentiated in terms of whether they would entail concentrating on maize farming or on diversification from maize into other crops, including staples such as sorghum and cassava, vegetables or tree fruits such as mangos.

The concept of 'pathways' was chosen in part because it highlights the fact that farmers are not confronted by fixed and determinate futures; they are confronted by the need to make choices, even though the choices available to poor farmers may be fewer and more restrictive than those open to their wealthier counterparts. The decisions farmers have to make are further complicated by the fact that the consequences of their choices are often uncertain and the outcomes may be risky; it is not surprising therefore that farmers often prefer risk-reducing pathways, rather than high-risk-high-reward options. A fuller account of the 'pathways' approach is provided in paper 2. The nine pathways in and out of maize for poor farmers in the Sakai valley are set out in a table on pages 2 and 3.

Multi-Criteria Mapping

The next stage of this project involved using an innovative investigative tool, called a Multi-Criteria Mapping (or MCM) exercise. MCM is a data-collection tool that can be used during interviews or group discussions; its power lies in its ability to identify and compare the defining characteristics of a range of different perspectives. The data it collects are both quantitative and qualitative assessments of a range of

Beans being used by interviewees to indicate how they score different pathways against a range of criteria.

DIVERSIFICATION

	LOW MAIZE	HIGH MAIZE
Low External Input (LEI)	**1 Alternative staples for subsistence** Farmers diversify away from maize to alternative dryland staple crops (also known as orphan /traditional /indigenous crops) such as sorghum, millet, cassava, sweet potato, pigeon pea, cowpea and others. These crops are increasingly grown alongside maize on the farm and are used mainly for household consumption (self-provisioning). Local varieties of alternative crops are used with minimal or no external inputs (certified seeds, chemical fertilizers, etc).	**3 Local improvement of local maize seed** More farmers learn to select and multiply local varieties of maize seed for local use (planting on the local farm or sale/ exchange with other farmers). Local varieties of maize are used with minimal or no external inputs (certified seeds, chemical fertilizers, etc).
	2 Alternative staples for market Farmers diversify away from maize to alternative dryland staple crops such as sorghum, millet, cassava, sweet potato, pigeon pea, cowpea and others. Maize is increasingly purchased for consumption with the proceeds from the sale of alternative crops. Local varieties of alternative crops are used with minimal or no external inputs (certified seeds, chemical fertilizers, etc).	
FICATION	**4 Assisted seed multiplication (alternative crops)** Farmers are assisted in multiplying seeds of available improved varieties of alternative dryland staple crops such as sorghum, millet, cassava, sweet potato, pigeon pea,	**5 Assisted seed multiplication (maize)** Farmers are assisted in multiplying seeds of available improved, open-pollinated, drought-tolerant /drought-escaping maize varieties. These seeds are used for planting

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cowpea and others. These seeds are used for planting on the local farm or for sale/exchange with other farmers. Varieties are provided to farmers and assistance is given in seed multiplication, farming techniques, etc.

on the local farm or are used for sale/exchange with other farmers. Varieties are provided to farmers and assistance is given in seed multiplication, farming techniques, setting up cereal banks, etc.

High External Input (HEI)

6 Individual high-value crop commercialization

Farmers diversify into high-value/high-risk horticultural crops such as tomatoes, onions and fruit trees. Maize is gradually replaced on the farm by these high-value crops. Maize is increasingly purchased for consumption with the proceeds from the sale of high-value crops. Crops are grown with external inputs (certified seeds, chemical fertilizers, etc.) and require access to a water source and/or water storage techniques.

8 Commercial delivery of new maize varieties

Farmers purchase new hybrid maize seed varieties such as drought-tolerant hybrid maize from commercial dealers such as private agro-dealers and stockists. Maize is grown on the farm for local consumption and/or sale. These crops are grown with external inputs (certified seeds, chemical fertilizers, etc.).

7 Group-based high-value crop commercialization

Farmers form groups to diversify into high-value/high-risk horticultural crops such as tomatoes, onions, fruit trees. Maize is gradually replaced on the farm by the high-value crops. Maize is increasingly purchased for consumption with the proceeds from the sale of high-value crops. Crops are grown with external inputs (certified seeds, chemical fertilizers, etc.) and require access to a water source and/or water storage techniques.

9 Public delivery of new maize varieties

Farmers purchase new hybrid maize seed varieties such as drought-tolerant hybrid maize from public delivery mechanisms. Maize is grown on the farm for local consumption and/or sale. These crops are grown with external inputs (certified seeds, chemical fertilizers, etc.).

options, in this context 'pathways', as well as their underlying reasoning.

MCM was selected for several reasons, firstly because it allows interviewees to access the pathways by reference to any and all criteria of their own choosing. The only constraint on their choice of criteria is that each of the criteria must be applicable to all the pathways. Secondly, it allows interviewees to introduce further options or pathways, over and above the initial set of nine pathways that were identified at the previous stage of the study. Another unusual feature of the MCM method is that it does not just ask interviewees to score each pathway against all the criteria; it asks them to provide two scores – an optimistic score, and a pessimistic score – for each criterion. This approach is particularly useful when responding to assessments during which interviewees qualify their judgements with expressions like 'it depends'.

MCM CAPTURES INTERVIEWEES' REASONINGS

A key feature of MCM is that the tool not only identifies the interviewees' perspectives and judgements, but also their reasons for those judgements. Another distinctive feature is that the interviewees can choose whichever numerical scale they prefer, which is often 1 to 10 or 1 to 100; the software normalises their scores to a uniform ordinal scale. When an interviewee has assessed all the pathways against each of the criteria, they are asked to weight their criteria against each other, to indicate the relative importance the interviewee attaches to the criteria. The software then uses a standard and straightforward algorithm to calculate their aggregated weighted optimistic and pessimistic scores for all the pathways against all the options.

At that stage, the software provides the interviewees with a graphic representation of their comparative assessments of all the pathways, represented as a series of horizontal bars, the positions of which represent the magnitude of the scores, and the width of which represent the differences between their optimistic and pessimistic scores. The interviewees can then modify their scores for individual pathways and adjust the weighting of the criteria until they are satisfied that the graphic representation accurately captures their perspective and judgements.

To identify and understand a wide range of perspectives, interviews were conducted with a broad cross-section of different groups of farmers, both male and female, some wealthier some poorer, as well as national and local government officials, agricultural researchers, plant breeders, donor organisations and agricultural input suppliers. Once those interviews were completed, the research team set about analysing the result by comparing their criteria, scores, weightings and uncertainties, to explore how different groups assessed the pathways, . It is the results of this analysis that are presented in this document.

Interviewees debating how to score the pathways.

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