CHAPTER 4

SCALING UP

Making change visible

Farmers the world over are sceptics when it comes to new ideas. They have seen too many instant solutions turn out to be instant failures. They have seen enthusiasts come and then leave before the long term results of their endeavours are evident. They have seen market opportunities wrecked by events from outside over which they have no control. They are not resistant to change – they just want to be sure that the change that is promised is a reality and not a mirage.

We have seen so far the need for long term and innovative thinking in the development of improved technologies. A new technology has to be a major improvement on the old if it is to impress farmers. The variability between seasons is so high that something that is 10 or 15 percent better than existing farmer practice is simply not going to be noticed. Farmers will see at least this variation from season to season with their current practices. The change that is being proposed to farmers has to have an effect that will grab their attention. It is rather like tossing a stone into a pool. If you want to be noticed, you toss a big one. A small splash doesn't even interrupt the conversation. A large rock creates a fountain of water and makes everyone nearby wet.

So now you have tossed in your big rock and stopped everyone talking. That is the first part of the job. The second, which is just as challenging, is to make things happen on a scale which will impinge on the welfare of a substantial number of farmers at a cost which is bearable in terms of promotion and expansion. Eicher has shown how the requirement for short term success from externally funded and designed projects has led to overinvestment on buildings, inappropriate training activities, and vehicles. The typical outcome is:

> "a large staff, a magnificent set of buildings, limited scientific capacity, and a bloated and fiscally unsustainable institution".[1].

The contrast with the Asian experience is marked. In the 1960s, a spectacular collaboration between the official American aid agency (USAID) and the Ford and Rockefeller Foundations put together in India a coordinated effort to help that country build a firm institutional base for agricultural development. This effort had a clear focus on agricultural growth as a key to overall development. Certainly mistakes were made. We know that human welfare requires more than simply greater quantities of food. But at the time, there was serious talk of possibly having simply to accept that large numbers of Indians would have to be left to starve. The concept of 'triage' – deciding which

[1] C. Eicher 1999, "Institutions and the African farmer", CIMMYT Economics Program, Third Distinguished Economist Lecture, Mexico DF: CIMMYT

countries or regions in Asia were salvageable and which would have to be abandoned to survive (or not) on their own resources was under active consideration amongst policy makers. The focused collaboration between major donors, and their consistent efforts to use and extend local skill and expertise was central to creating the massive changes in human welfare that have been achieved in Asia. Much remains to be done but that does not diminish the progress that has been made.

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Africa is, in some respects, a more difficult challenge than Asia. The large number of relatively small countries, the ecological variability, the more limited contact with the outside world before the 20th century, add to the difficulty of creating change in Africa. But the smaller press of population, at a minimum, provides a window of opportunity in Africa that was denied to much of Asia. What Africa is missing is a clear strategy and priority for its development activities. In no small part this is because the voice of Africans is overwhelmed by the chorus of (largely external to Africa) special interests – child survival, vitamin A, microcredit, poverty, microenterprise (but excluding agriculture), empowerment of women, environment, wildlife preservation – that drive donor priorities today**.** At independence in 1947, the American led development effort was able to draw on substantial Indian experience and expertise. Nearly all the research scientists, for example, were Indian. By contrast, in 1960 (which is around the time when many African countries became independent), some 90% of agricultural researchers in Africa were expatriate (Eicher, 1999). There have been major efforts by many agencies to increase the quality and depth of African human capital in the closing years of the last century. In numerical terms the numbers are impressive – a tenfold increase in the number of scientists in many countries, for example (Eicher, 1999). But the African development agenda remains largely driven by outside interests and voices.

Most recently, disillusion with the performance of public sector agencies has led to a sharp shift of resources to non governmental organisations (NGOs). These are perceived as being more effective and also more representative of local needs than the type of cumbersome government agencies criticised by Eicher. The biggest NGOs have a substantial funding base and claim an impressive track record in creating change. But their costs are high and there is little real evidence of their performance over time. Public sector agencies, given the same resources and freedom to operate, might well perform equally well. As Eicher points out, the NGO effort typically relies heavily on previous local development efforts but seldom acknowledges the debt:

> "….we can glean some insights from Zimbabwe's experience in laying the foundation for increasing maize production:
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> - The government – not Oxfam – developed Zimbabwe's impressive all-weather road network,

- The government – not private seed companies – conducted research for 28 years (1932-1960) that led to the development of the SR-52 hybrid that increased maize yields by 40%,

- Commercial farmers – not external pressure – developed a politically powerful farm organisation that made the case in Parliament for public investments in research and farmer support organisations."

Africa does not have to be a failure. Although it has a modest base of Africans with requisite field experience, such people undoubtedly exist. Their names appear regularly on development proposals. Most typically today, they are overloaded with requests for 'collaboration' from outside agencies desperate to find a local partner to justify an expensive project. They are in wide demand as consultants to review, or develop, projects designed by outsiders. Frequently, their names will appear on multiple project proposals – and all concerned know that it is physically impossible for them to deliver the commitment they have apparently made.

This is no way to get a proper African voice into the development process. The examples which form the basis of this chapter show a different model. In each, the vision and leadership come from African sources. Support and expertise may well be drawn from external agencies but the context and the priorities are clearly local. In each, there are strong local institutional bonds built – most importantly between public agencies and private business. The private business may be a major international fertiliser company – or it may be a group of local shopkeepers. In each there is a simple, clear focus and direction. None claim to solve every problem but each can show it is making a significant impact on its chosen priority issue. Each is bringing to farmers something that farmers want and need – and breaking the endless process of problem diagnosis which underlies so many development activities. Finally, each shows that even in an unhelpful policy environment, there is much that can be achieved through the skilful exploitation of local networks and contacts.

Zimbabwe smallholder cotton

Zimbabwe smallholders (black Zimbabweans mostly farming under traditional tenure in various 'native reserves' – or, as they were then more euphemistically termed, 'tribal trust lands') were largely marginalised by the pre-independence Smith government of what was then Rhodesia. That story is well known. Yet, in the year of true independence, 1980, some 42000 smallholders produced nearly a third of the national cotton crop. A few years later the number of registered smallholder cotton growers had doubled and they were producing consistently more than half the national cotton crop. Not only were smallholders growing more cotton than their large scale counterparts, typically they were producing a higher quality lint through careful picking and sorting before delivery. Cotton had become the biggest smallholder cash crop in Zimbabwe. But, just twenty years earlier, virtually no cotton was grown by smallholders.

Understanding this transformation requires a little history. Cotton was first grown commercially in Zimbabwe after the First World War. Favourable prices during the early 1920s led to a rapid expansion of cotton growing amongst white large scale commercial farmers; there was no effort to interest black smallholders in growing the crop. In the event, a build up of insect pests had devastated the fledgling industry by 1928.. A modest revival occurred with the introduction of pest resistant varieties but the increasing attractiveness of tobacco as a cash crop held back any major expansion of the cotton industry amongst large scale farmers. The absence of any realistic promotion efforts with smallholders precluded their participation in production of the crop.

By 1965, tobacco, grown entirely by large scale farmers, produced some 80% of Zimbabwe's agricultural exports. In that year, Ian Smith illegally declared the then Rhodesia an independent country. One outcome was the imposition of international trade sanctions against Rhodesia. These sanctions had a devastating effect on traditional agricultural exports such as tobacco. To counter this, the nation embarked on a major effort in agricultural diversification and, in consequence, once again cotton became an important crop. By 1968, some 75000 hectares of cotton were being grown (almost entirely by large scale growers). At independence in 1980, cotton was Zimbabwe's second biggest export crop, but, surprisingly (against all previous trends), smallholders were major growers of the crop.

Over the same period, Ian Smith's government was resorting to increasingly desperate measures to control unrest in black smallholder farming areas. Ever since first white settlement in Zimbabwe, access to land has been one of the dominating political issues. In the early 1970s, there remained quite large areas of 'Crown land' – land for which no agreed settlement arrangements had been made. Several of these areas abutted the Zambezi valley where tsetse fly had earlier precluded human settlement . An extensive programme of fly clearance had, over quite large pieces of land, removed this constraint and the decision was made to settle smallholders from some of the more densely populated farming areas to some of these remote, but potentially productive, new lands.

That was the easy bit. The challenge was what to do with these somewhat unwilling settlers once they were on their new farms. Melville Reid, one of the most innovative extension workers involved with smallholder agriculture, was given this task in the Gokwe area. He reviewed the options carefully. Through careful discussion with both farmers and colleagues, he devised a low cost cotton production system suited to the family labour and cash availability of the typical smallholder household in his area. He arranged training courses for farmers and for farm advisors, and ran regular field days to promote the crop.

As importantly, he worked closely and effectively with the sole cotton marketing agency in Zimbabwe at that time, the parastatal Cotton Marketing Board (CMB). Recall this was a time when the country was desperate to build new agricultural export markets in a world which was actively working to prevent this happening. Zimbabwe needed the foreign exchange from agricultural exports - it did not matter whether these exports were produced by black or by white farmers. In a tough trading environment, only high value, high quality produce would generate the margins to make the uncertainties of growing the crop worthwhile. Reid knew his farmers could grow cotton of the requisite quality. The CMB participated in courses for smallholders in cotton production, pest control, and harvesting methods so that the new farmers understood what quality factors were important and why. They also ran courses which explained how cotton was graded for quality.

Importantly, in collaboration with Reid and others, the CMB designed a delivery and grading system that was positively helpful to smallholders. The grading system was fair, unbiased, simple, and related to factors which the farmer could adjust. The four grades on which the farmer was paid were based on cotton colour and cleanliness (which the farmer can influence by careful reaping) and on staining (which is related to husbandry or insect damage). Payout was prompt, and there was an accessible and efficient disputes process. While farmers were encouraged to bring their crop to market in standard packs, delivery would be accepted in cardboard boxes provided it was properly sorted and clean .. Transit depots, where cotton was accepted and graded, were established in smallholder farming areas.

The Zimbabwe smallholder cotton story has several other actors. The commercial large scale farmers set up and ran their own training establishment for producers – which was open to large and small scale producers alike. There was constant and effective liaison between the government cotton breeders, the CMB, and the farmers with respect to required varietal characteristics. A reliable system of cotton seed production was put in place. Reid's achievement was to link his farmers into this system so that they quickly became major, not marginal, producers. The outcome he achieved relied on:

- leadership: he had a clear idea of what was needed, worked closely with farmers and others to make it happen – but the vision and the direction were his,

- networking: this was not a task that could be accomplished by a single individual. There were existing programmes into which he could link. He did so successfully – and adapted them, where necessary, to his own ends,

- sound technology: the opportunities he was offering his farmers were sound in theory and in practice. He adapted what was available and matched it carefully to the circumstances of the farmers with whom he was working. He, and the farmers, shared information and experiences routinely.

Crucially, Reid did not work alone. He used and modified existing networks to contribute to his objective of creating a sound cash basis for the farmers with whom he was working. Thus the programme did not require a large staff and was feasibly accomplished with the constraints of public sector funding at the time. The momentum for expansion was provided by the linkages to other agencies with expertise and interest in expanding cotton production. Reid, as a respected member of the national agricultural extension service, was well placed to help other extension workers in suitable areas to promote cotton. He did not set up a 'stand alone' exercise but took advantage of the concern of the Rhodesian government in agricultural diversification. While this last contributed to a favourable environment for success, it was countered by the fact that, at the same time, smallholder farming areas were increasingly devastated by the guerrilla war which led to the eventual independence of Zimbabwe.

The Sustainable Community-Orientated Development Programme (SCODP)[2]

We have already seen, in a previous chapter, that one of the fundamental reasons for Africa's food problems is declining soil fertility. We have also seen that there is a well established body of knowledge that contributes to the understanding of how added nutrients can contribute directly to redressing the soil fertility deficit. But despite this information, fertiliser use in subSaharan Africa is a dismal 8 kilograms per hectare and soils continue to be mined for what residual fertility they have. The situation is particularly serious in western Kenya where there is a high population (around 500 person/km^2), and some 80% of soils are severely deficient in phosphorus and almost all lack adequate nitrogen. Few farmers have sufficient access to organic sources of nitrogen or phosphorus for their needs. Most available manures do not provide adequate replenishment of either nitrogen or, importantly for soils that are inherently poor in phosphorus, phosphorus. When SCODP started its work in western Kenya in 1990, very few farmers used inorganic fertilisers to address the fertility deficit – due to two main factors:

- Farmers simply could not buy fertiliser even if they wanted it. Fertiliser was only available at the very few Kenya Farmers Association shops open in the region. These shops stocked fertiliser only in standard bags of 50 kilograms. Few farmers had the cash to buy a whole bag of fertiliser and credit for fertiliser purchases was unavailable[3]. There were numerous private stores throughout the region but these had found that the demand for fertiliser was so low that it did not pay them to stock it.

- Farmers did not know what the best fertiliser was for their needs and how much they should buy. The existing fertiliser recommendations were inaccurate and unhelpful. If followed precisely, they actually caused rapid depletion of other soil nutrients and led to soils becoming acid and infertile.

SCODP, a Kenyan NGO, set out in 1990 to address these issues[4]. The area of focus initially was Siaya district in western Kenya which was home to some 100000 farm families. The area was potentially highly productive but few families produced enough food for their annual needs. SCODP set out to show that fertiliser use (and consequent food security) could be stimulated amongst very poor farmers without resorting to free handouts or setting up expensive credit operations. The objective was to create a self sustaining farm input supply system which would serve smallholders effectively and at a cost that the poorest could afford.

The approach was very simple. Firstly it had to show that there was a demand for fertiliser. SCODP set up several shops which it stocked and managed itself. SCODP basic hypothesis was that a major obstacle to smallholders using fertiliser was simply that farmers were unable, unwilling, or

[2] The union of so many politically correct adjectives in one name suggests a rather more prim organisation than this very effective agency has proved to be. The name is largely imposed by the difficulties faced by a small local organisation in catching the attention (and the resources) of the outside world.

[3] In 1998, 50 kgs of monoammonium phosphate fertiliser represented the equivalent of 18 days labour at the official minimum wage or the selling price of a 90 kg bag of maize in the market. By contrast, 10 kgs represented the selling price of a single chicken, and 1 kg the cost of 500ml bottle of beer (Seward and Okello, 1998).

[4] The following material draws heavily on various SCODP reports and evaluations – (especially Seward and Okello, 1998, Seward and Okello, 1999, Ochieng, Okello, and Seward, 1999 and Berg,1999).

both, to invest in a whole 50kg bag. Information from other parts of Kenya reinforced the fact that there was a definite demand for fertiliser in small quantities. A survey of 139 retailers in 74 market centres in 6 provinces of Kenya showed that some 79% were repackaging fertiliser in smaller quantities. A study of Kisii district showed a greater demand for 10kg bags of fertiliser than the standard 50kg bag (Smaling, *op cit*).

Consequently, fertiliser and other farm inputs were made available in SCODP shops in small quantities. Commercially available fertilisers were purchased by SCODP in the standard 50 kilogram bags and then sold on to farmers in small amounts according to farmer demand. The selling price was not subsidised and the shops operated on a commercial basis. Information on the types and amounts of fertiliser that farmers wanted was recorded to guide future planning.

Data from sales in SCODP shops supported the initial hypothesis with most farmers buying fertilisers in 1-2kg packets. Demand for fertiliser, provided in this form, grew sharply. By 1995, SCODP shops were selling some 10 tonnes of fertiliser annually, mostly in 1-2kg bags. By 1998, SCODP's shop at Ugunja was alone selling over 10 tonnes of fertiliser a month to nearly 2000 customers. As farmers became more familiar with, and confident of, the returns from fertiliser, somewhere between a quarter and a half of sales increased to 5-10kg bags .

SCODP also believed that fertiliser demand required that the commodity be readily available close to the point of use. In 1997, a detailed study in one of SCODP's most successful shops showed that most farmers only travelled 1-2 kilometres to buy fertiliser, and that this journey was on foot. SCODP management therefore aimed at having a store selling farm inputs at key trading centres within 10 kilometres of any farmer. Where possible, local existing outlets would be encouraged to participate in the programme. There was, as already noted, a comprehensive network of existing shops which would readily stock fertiliser if there was a demand for it. Based on its own trading experience, SCODP sold fertiliser in small packets at wholesale prices to market traders, and once the demand for farm inputs had grown sufficiently, planned to phase out its own shops and rely on local traders to continue supply. By 1998, SCODP had established a network of farm input shops served by modest fertiliser repackaging centres.

Some 40% of fertiliser sales were to women and most customers were 20 years old or over. The main use of the fertiliser was for maize and sorghum. But it was not adequate simply to stimulate demand. If farmers were to get the best out of their fertiliser purchases, they needed to know what fertiliser to buy, and how to use it. Shopkeepers were trained, not only in booking keeping ands stock management, but also in advising customers on which fertilisers best met their needs. Field experience showed that two main tasks needed to be undertaken in the promotion of fertiliser use amongst poor smallholders:

- Ensuring that the correct fertiliser was available for local conditions and that the best recommendations for its use were known and understood locally, and

- raising awareness of the value of appropriate fertilisers amongst smallholder communities and, thereby stimulating the demand for the commodity.

Matching demand to need

Basic soil analyses showed the soils in the SCODP areas to be highly deficient in phosphorus and nitrogen. Sulphur deficiency was also becoming a problem. The SCODP approach was to use focused farmer participatory methods to identify the appropriate fertiliser types and management practices for the areas in which it was working. Careful research protocols, which could be understood by farmers and extension workers, were developed to:

- identify the nutrients limiting crop productivity in any one area,
- raise awareness of the potential from using fertiliser amongst local farmers, and,
- ensure that SCODP would be stocking the correct fertiliser for the area.

Farmers were active participants in the research. Importantly, the research was aimed, not just at understanding local soil nutrient deficiencies but, at the same time, building farmer awareness of, and confidence in, fertiliser technology. Thus, once the appropriate fertiliser was identified and available locally, farmers would also be aware of its benefits and demand would quickly grow.

The trials were quite simple in design and included a 'no inputs' plot and plots which either used solely organic manures or a combination of fertiliser and organic materials. A typical trial would measure about 17x11m and would be sited on fields which were known to be highly infertile. The data were analysed statistically and a detailed economic recommendation produced to justify the resultant recommendations. The first trials focused on the fertiliser needs of maize and sorghum, since these were the crops that farmers favoured for fertiliser. As the work progressed, the research extended to consideration of leguminous crops, and to refine the fertiliser management practices so as to improve profitability.

Stimulating demand

SCODP encouraged farmers to experiment for themselves with fertiliser through the promotion of 'mini-pack' small packages of 100g or 200g of the appropriate fertiliser. These were available at all SCODP shops and at SCODP sub-stockists. These last were generally cooperating farmers who had participated in the fertiliser verification trial programme. These farmers sold the mini-packs on commission – and, because of the understanding as a result of their input to the trial exercise, were able to advise their customers on the use of the mini-pack.

The mini-pack is simply a low cost method whereby farmers who have never used fertiliser before can experiment with it on their own farms. The amount, and the cost, is modest. Ministry of Agriculture extension workers also promote mini-packs on market days at trading centres. Users are given advice on the use of the mini-pack. Leaflets and colour posters supplement this advice. A Raising Awareness programme targeted schools where SCODP teams visited, with the agreement of the headmaster, and encouraged pupils to buy mini-packs and experiment with them in collaboration with their parents. A similar programme focused on churches and church groups.

An evaluation of the mini-pack programme showed that nearly 70% of purchasers were women, mainly aged 30-50 years old. Most commonly mono-ammonium phosphate was bought, although most farmers purchased more than one type of mini-pack. Over 70% of buyers were first time fertiliser users. 37% of packs were used on maize and some 31% on vegetables. Over 80% of the users reported either an excellent, very good, or good result for their experiment and 94% planned to buy more fertiliser in the coming season.

Impact

A 1999 evaluation of SCODP's impact was impressive. Almost all farmers in the district[5] had bought some fertiliser for SCODP and over 90% of farmers reported an increase in their daily consumption of their staple food (maize, sorghum, or cassava). The average increase was some 47% from 292g to 431g daily. Importantly, SCODP had been remarkably successful at reaching the poor. Two thirds of the sample interviewed were food insecure before the SCODP programme but this had fallen to fewer than 20% as a result of the SCODP activities. Families were now eating a more varied and diversified diet and food stocks (a useful measure of food production stability over time) were increased. The amount of food stored after harvest in a SCODP area was almost four times that in a comparable area not served by SCODP.

SCODP's results are determined by the same three factors of leadership, networking, and sound technology. The exercise relied on a very modest staff – two leaders with tertiary education complemented by a small group of local people as storekeepers, accountants, fertiliser packers, and extension leaders. Farmers wanted to improve the fertility of their soils. Existing options did not meet their needs. The programme was designed to bring a fertility enhancement package within the reach of the poorest farmers. SCODP leadership provided the vision and the direction for the whole programme. Longer term success, and, importantly, impact beyond the immediate SCODP area required that government extension workers, market traders, schools, and churches all played their role. These existing networks were tapped to enable the effort to be scaled at a cost that was feasible and during a period of increasing economic difficulty in Kenya.

At the time there was increasing tension between the Kenya government and major international donors. Inflation was high, government services declining in quality and availability, and the economy generally going through a difficult period. Even in these unpromising circumstances, poor farm households showed themselves willing and able to raise modest amounts of cash to invest in improving their own food security within the context of a well designed programme of technical change.

The Zimbabwe Soyabean Promotion Taskforce

Both large scale and smallholder farmers in Zimbabwe have experimented with soyabean production since around the 1950s. As part of the agricultural diversification programme initiated by Ian Smith's government after 1965, the area under soyabeans grown by large scale farmers expanded considerably. However, the crop was never seriously promoted as one suitable for

[5] The evaluation was undertaken in the area SCODP had been working longest

smallholders. Many conventional soyabean varieties do not yield adequately unless they are able to form a symbiotic relationship with soil bacteria known as *Rhizobia*[6]. Most commonly, soyabean seed, planted in fields which have not grown the crop in the recent past, are inoculated with a suitable rhizobium species at the time of planting. This involves purchasing the correct rhizobium inoculant from a reliable supplier, storing it under suitable conditions before it is used, and then mixing it properly with the seed so that all the seed has an adequate coating of rhizobia before planting. This is quite a daunting exercise for a farmer with an experienced labour force and with access to proper refrigeration for storage of the rhizobia as well as transport to collect it and get it into cool storage quickly. For smallholders, in remote areas, with poor communication links with the outside world and a critical shortage of labour at planting, the whole process can prove impossible. Typical smallholder yields of soyabean were about 10% of their potential. In the early 1990s, a soyabean promotion campaign, focused on the relatively good growing area of Hurungwe in northern Zimbabwe, resulted in around 1300 hectares of the crop being grown there. Suitable inoculant was supplied to producers who stored it safely for up to four months prior to use in traditional clay pots. However, when the promotion project ended, it was difficult for farmers to obtain the necessary inoculant and the production dwindled.

Around the same time, Dr. Sheunesu Mpepereki was studying soil microbiology at the University of Zimbabwe. He determined that soyabean did not necessarily require inoculation with rhizobia. Against conventional wisdom, he hypothesised that African soils frequently included adequate populations of suitable indigenous rhizobia species[7]. The short version of the story is that plant breeders, mainly in the US, learned to increase soyabean yields by developing soyabeans and rhizobia that were very closely tuned to each other's needs. Thus a specific variety of soyabean would be developed alongside a very fast growing and effective strain of rhizobia. By moving to less highly bred soyabeans, the range of rhizobia which could infect soyabean roots was increased and thus the need for inoculation could be reduced or eliminated. In Zambia, work by Javaheri in the early 1980s had resulted in the release and promotion of the 'promiscuous' varieties "Magoye" and "Hernon 147". These varieties proved easy to grow under smallholder conditions and rapidly became popular, not only in Zambia. They were also taken up spontaneously by numbers of smallholders in adjacent areas of Malawi and Zimbabwe[8]. In Zambia, within three seasons of the release of Magoye and Hernon 147, some 3000 smallholders were growing the crop. Numbers of producers continued to rise until the parastatal marketing agency was closed down in the early 1990s.

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[6] Rhizobia spp. are soil bacteria which invade the roots of leguminous plants such as soyabean and enable the plant to fix nitrogen from the air. Thus legumes can provide their own nitrogen (as well as leaving some for subsequent crops) without the need for added fertiliser. Some legumes are highly 'promiscuous' and form associations with a wide range of soil bacteria, others are quite 'specific' and need a defined species of bacteria to be present in the soil if they are successfully to fix nitrogen and grow effectively without fertiliser.

[7] The reader is referred to "Sex, soyabeans, and sustainable agriculture: 'promiscuous' soyabeans in southern Africa", Mpepereki S., Javaheri F., Davis P., Giller K. , (1999) which provides a comprehensive analysis of the scientific evidence

[8] The Malawi case is particularly interesting. A Malawi NGO in 1989 introduced Magoye to smallholders there in an attempt to increase the food security of the poorest rural families but was prevented by the Ministry of Agriculture from promoting the variety. It took until 1998 for 'official' permission for smallholders to be supplied with Magoye seed to be granted. In the interim, thousands of farmers along the Zambia/Malawi border were cheerfully (and successfully) ignoring the Ministry of Agriculture recommendation and growing Magoye soyabean with seed smuggled over the border.

After reviewing the results of his own research as well as experience elsewhere, Mpepereki decided that smallholder soyabean production could be rapidly expanded if growers:

- had access to the necessary inputs, and,

- were given proper advice, not just on growing the crop, but also how to use it as a food in their own households.

Mpepereki based his analysis on the following considerations:

- Easy to introduce - soyabean is a relatively cheap crop to grow, with the most expensive input being the initial purchase of seed. Farmers can retain their own seed for use in subsequent years and only need to replenish with fresh seed every third or fourth year. On acid soils (common in many smallholder areas) modest amounts of lime and fertiliser may be needed but cattle manure can substitute well for these inputs where available. Thus it could be a relatively simple crop for the smallholder to introduce into his or her farming system.

- Market - there was an evident market for the crop. The oilseed processing firms in Zimbabwe identified that there was an annual shortfall of some 30-50000 tonnes of soyabean and they were keen to purchase additional supplies from local growers.

- Food security - an increasing number of smallholder households in Zimbabwe were chronically food deficit, and, as the expansion in cropped area encroached on livestock grazing, the availability of adequate food for livestock feed was also becoming problematic. Soyabean had potential uses in the home and crop residues were valuable for livestock during the long dry season.

In 1997, after detailed discussions with various actors in the farming sector, Mpepereki put together a small 'Soyabean promotion Taskforce'. This included senior farmer representatives, scientists, economists, and extension staff. The chief executive of the Commercial Oilseeds Producers Association (which represented large scale growers) was a member of the task force, as was the chief economist of the Zimbabwe Farmers Union (a body representing smallholders). Modest funding for some of the activities of the taskforce was obtained from donor sources but, just as importantly, local agro-industries were persuaded to provide inputs both in cash and kind to the initiative. For example, to assist the programme get off the ground, one of the major processors offered a modest premium for smallholder soya in the early years of the work.

In the first year of the programme, ten different smallholder farming areas (all with soils conventionally considered to be unsuitable for soyabean production – but adequate rainfall) were targeted. Some 55 farmers participated in this first phase of the work. Crop packs (containing the necessary inputs to grow 0.1 hectares of soyabean) were assembled and sold to participating farmers. At the same time, members of the task force team visited these farmers. The farmers were helped with information, not only on production methods, but also on marketing and on utilisation of soyabean as a food source in the home. At harvest time, task force members visited as many of the project sites as time and resources allowed. They helped in the identification of

markets and with ensuring that farmers were able to get their crop to the best markets. A major concern of the farmers was fear of being cheated by buyers. Through personal contacts, combined with formal and informal meetings, the task force built up a reputation as an unbiased and reliable source of market information and advice.

The numbers of smallholders growing soyabeans grew, in just three years, from the initial 55 participants to some 10000.[9] The area planted increased to around 4000 hectares and sales to about 4000 tonnes (around 30% additional production was estimated to be retained as seed). There was evident increased economic activity in the main participating areas – demand for consumer goods in local shops increased sharply, farmers were investing in new implements and carts, and rents for stores in trading centres were rising. Youth employment in activities such as guards and loaders at collection points was becoming significant.

A detailed survey carried out in four of the targeted soyabean areas showed that the crop was somewhat biased towards the better off and larger farm households. On 1999 crop prices, the gross margin from soya production was some Z$1922, compared to Z$918 for maize, and Z$4563 for cotton. However, soyabean required about a third of the labour needed for cotton production and the residual nitrogen left by the crop was not valued in the gross margin analysis. Forty percent of farmers grew soyabean as a cash crop, 25% because it was both a cash and a food crop, and 16% for its soil fertility benefits. The main advantages of the crop were seen as the fact it did not require much in the way of purchased inputs, it sold readily for cash, added to the family food supply, and was easy to grow without much labour.

In order to increase the attractiveness of the crop to the poorest farmers, the task force, which included a food scientist from the university, embarked on an intensive programme to introduce farm families to soya as a food crop. Unsurprisingly, few households knew how to process and use this new commodity. The focus was particularly on the incorporation of soya into traditional foods such as maize meal porridge and home baked breads. The longer term outcome of these activities remains to be seen but there is evident enthusiasm amongst participating women's groups for soya as a food source.

The soyabean task force achieved its objectives through the same key factors of leadership, networking, and effective technology delivery. Mpepereki was convinced that smallholders could benefit substantially from building soyabean into their farming systems. His research showed that it was feasible to grow soya in areas which had conventionally been assumed to be unfavourable to the crop. The taskforce provided the networking mechanism needed to build the initial concept into an activity involving thousands of households. The national extension service, the university, private business, and large scale farmers all played a collaborative role in making the programme a reality. The whole exercise was undertaken with a very modest input of donor funding, and without employing any additional people or large investments in trucks or infrastructure.

[9] 3000 soyabean 'packs' were distributed in the third year of the programme – the remaining growers were those from earlier years as well as others who had decided to grow soya based on what they had learned from field days and contact with neighbours growing the crop

The Malawi "Starter pack" programme

Malawi smallholder agriculture is based on maize as the dominant cereal, with small grains and cassava adding diversity. In the wetter parts of the country, the cereal crop is interplanted with common bean (*Phaseolus*) - in the drier, pigeonpea. Groundnuts are typically rotated with maize (and have been an important cash crop). The reasons for the preference for maize are not difficult to find. Maize is a very efficient converter of carbon dioxide to carbohydrate and thus has a high yield potential. Maize is well suited to the climate of the high southern Africa plateau of Malawi, western Mozambique, Zambia and Zimbabwe. Relative to other crops, the labour demands of producing and processing maize are lower. It has been a highly reliable crop, has suffered few catastrophic crop failures and is not widely attacked by pests and diseases, especially birds (a major source of grain loss for sorghum and millets in the field).

Maize has become increasingly dominant in the farming system as farm households seek to maintain their calorie production under declining soil fertility and land holdings. Household food security is poor, as indicated by widespread and pervasive malnutrition and one of the highest levels of child mortality in the world. In the smallholder sector, neither improved nor unimproved maize showed any clear increase in yields per hectare in the period from 1985[10]. National food security declined to the stage that, in the early 1990s, Malawians found themselves queuing for rationed supplies. The free market price of maize in the seasons immediately following 1996 soared to four times the official price creating high inflation and even greater levels of malnutrition in the (majority) desperately poor sector of the population.

Even when heavy subsidies and an overvalued currency encouraged some adoption by smallholders of improved maize seed and fertiliser technology in the late 1980s and early 1990s, per hectare yields of smallholder maize remained well below attainable levels. Widespread poverty and chronic lack of cash explain this phenomenon. Only a third of the rural population have surplus maize to sell - part of which is transferred to food-deficit rural households, the poorest of whom pay for maize by selling their labour (known locally as *ganyu* labour). Most maize producing households therefore rely on the market (as *ganyu* or for cash) for an important part of their consumption. Since their income levels are so small, purchases of food leave little to spare for other things - housing, education, or farm inputs.

Separate studies carried out by national analysts, donors, and international research agencies came to common conclusions. Agricultural change in Malawi required widespread adoption of improved resource efficient production technologies, particularly for maize.

In the mid-1990s a more appropriate range of maize varieties became available but with no evident effect on aggregate maize yields. Promotion of the associated fertiliser technology over most of this period was unhelpful; ignoring what farmers know well - that the yield response to fertiliser is related to soil type, available soil moisture, weeds, and previous farming practice. It was not until

[10] Subsequent years data suggest that unimproved maize yields were trending downwards towards around 800 kg/ha, with improved maize yields to around 2500 kg/ha. The very low figures for 1991/2 are the result of a particularly bad drought in that season. The area planted to new hybrid seed has been declining since 1992/3.

1995 that Kumwenda, through a comprehensive analysis of on-farm fertiliser response rates, showed conclusively that existing fertiliser recommendations were simply unprofitable.

This put policy makers in a bind. Producers could not afford the fertiliser that was needed to increase productivity and bring grain prices down. For most households in Malawi, the cash requirement needed to buy inorganic fertiliser far exceeded their total annual cash income . Even if delivery costs were reduced through attainable improvements in efficiency, fertiliser would remain a high cost item for Malawi farmers for the foreseeable future. The evident outcome was, at best, a steady decline in already unsatisfactory nutrition and living standards, and, at worst, widespread starvation.

On the positive side, there was evidence that improvements in fertiliser use efficiency could be substantially more effective in improving the economic attractiveness of fertiliser to smallholders than feasible price changes in either fertiliser or maize.. A recent and comprehensive national fertiliser verification trial showed that, over the full range of agro-ecologies in Malawi, good physical returns from fertiliser use can be expected if the correct fertiliser is applied in appropriate amounts (mirroring exactly the experience of both Piha and SCODP).

The data suggested that, for at least the next decade, on present trends, population growth would exceed growth in food production by 1 percent or more annually. Kumwenda *et al* (op cit) reckoned that in 1995 there was a structural food-deficit in Malawi of some 300,000 tons of maize - which, if present productivity trends were continued, led to a deficit of some 2 million tons by the year 2015. Improved maize seed and fertiliser technology was essential to the survival of most Malawians into the foreseeable future. Carr *op cit* estimated that, on conservative productivity and adoption figures, some 19,000 tons of improved maize seed and 78,000 tons of urea equivalent would provide a generous national food self sufficiency. This compared with the 1998 season use of about 3,000 tons of seed and 25,000 tons of urea equivalent. The incremental cost of providing this seed and fertiliser at present prices was estimated, in 1998, at about US$30m per year. There was an immediate and short term soil fertility crisis which needed swift action – and the technical options were few.

Creating change

Malawi needed urgently to implement a strategy for broad-based income growth. A small group of Malawian policy makers, scientists, and academics decided to review the options for themselves. They drew on the expertise of selected outsiders – Charles Mann of HIID, Anne Conroy of the Ministry of Finance . Their conclusion was that the best way to break out of the downward spiral and to restart vigorous economic growth in a non-inflationary environment was to get hybrid seed and fertiliser into the hands of all of Malawi's farmers. Nothing would help quell inflation and dispel the current state of gloom and insecurity like a bumper maize harvest shared by all of Malawi's farmers, and delivered to the consumers at lower and reasonably predictable maize prices.

The liberalisation upon which Malawi's future growth depends was being tarnished in people's minds by the high prices they faced in the market and the enormous rents conspicuously being

extracted by private traders[11]. The economy was experiencing all the downside effects of liberalisation, with few evident benefits. Small and large growers alike reported massive theft of maize from fields – which undermined the potential profits from the high prices of maize in the market. Malawi's deteriorating food security situation threatened to undo completely the progress made in laying the policy framework for growth:

- High maize prices create powerful inflationary pressures, compromise household food security, promote labour unrest and fuel demands for higher wages.

- Emergency maize imports contribute to unplanned government expenditure, further feeding inflation.

- Interest rates rise and the national currency (the kwacha) falls, undercutting productive investment and further driving up the cost of fertiliser for the next crop.

A short crop and empty silos will reinforce inflation, the continued erosion in the value of the kwacha, and the continued rise in fertiliser prices.

The Malawi team concluded that a strict policy of non-intervention in the market came at an unacceptably high cost. A strategy was required which was primarily concerned with the immediate survival of rural households, and especially children, while longer term policies were developed. The choices were few, those rejected included:

- Subsidies: The evidence showed that subsidies on inputs and on credit were discredited. Those that benefit directly from an input subsidy are mainly farmers who already purchase the fertiliser and seed. Credit schemes aimed at funding inputs for food crop production in Africa had almost universally failed. Diagne, in probably the most comprehensive study of smallholder credit in Malawi to date, had shown that increasing access to credit, for most households, had only marginally beneficial effects on household annual income[12].

- Increasing cash crop production: Increased income from the sale of cash crops could enable smallholders to purchase the necessary inputs for maize. But under the most optimistic assumptions, only some 20 percent of the farming population would be affected.

- Changing the food staple: Maize has become dominant in the high plateau of southern Africa, not because it has been promoted by the authorities at the expense of other choices, but because it is an excellent choice for the environment. Other food staples, to be competitive with maize, have to be reliably more productive at lower cost and less risk than the preferred technology of improved maize and fertiliser. Proposals to change the food staple (as opposed

[11] These are not profits received for the services of assembling, storing and marketing the crop, but rents from successfully competing with consumers for maize from public stocks.

[12] A.Diagne 1997 "Impact of access to credit on income and food security in Malawi". Paper presented at the IAAE XXIII meeting, August 10-16, Sacramento, California) notes that, in the longer term, credit programme members may establish a wider difference between themselves and others. However, he emphasises that this is most likely to occur where the farmer is borrowing for a cash crop rather than for maize. He also observes that it is those farmers on small holdings who are least likely to benefit from access to credit.

to adding some modest diversity to the farming system) were compromised by both by technical flaws and misconceptions.

The decision was made to improve the productivity of smallholder maize based cropping systems by:

- increasing access to the improved maize seed and fertiliser technology, and,
- diversifying the cropping system through the adoption of locally suitable combinations with grain legumes, principally as rotations.

These are complementary to one another and have the prospect of being widely adoptable. The chosen strategy had several components:

- providing all farmers with small packs – "starter packs" - of improved seed and fertilizer. These could be appropriately modified for their own circumstances, on their own fields, using the new area-specific recommendations from the work of the Maize Productivity Task Force (MPTF),
- ensuring that supplies of improved seed and fertiliser are readily available for purchase in all rural markets in small bags of 1-3 kg at a price which is comparable, per kilogram, to those of existing large bags, and,
- providing opportunities for able-bodied individuals to increase their purchasing power for seed and fertiliser through a structured fertiliser (and seed) for work programme implemented during the dry season.

Starter packs were specially packaged 2.5 kg packets of hybrid seed and the fertiliser recommended for that quantity of seed. Each pack would plant 0.1 of a hectare. If it yielded 1,800 kg/ha on average and replaced local unfertilised maize yielding 800 kg, then the household would gain an extra 100 kg of maize on the 0.1 ha of fertilised hybrid maize. This incremental production will feed a household for more than a month in the hungry season - a meaningful contribution to family welfare at the household level[13]. At the national level, 1.8 million households producing 100 kg more per household provides incremental national production of 180,000 tons.

The programme provided all smallholders with the means to test for themselves improved maize seed and fertiliser technology under their own conditions, without the risk inherent in purchasing the necessary inputs. It was a technology testing and demonstration programme for a small part of each farm, facilitating experimentation by farmers of promising but not yet widely adopted technologies. The effort would result in more production than an equivalent subsidy since it went directly to people who had no hope of purchasing inputs - all inputs thus generating incremental production. It would also be more robust than a credit programme for the poor and reinforced the effective operation of the liberalised market.

[13] At 1998 prices, this was the equivalent of more cash income than a poor family would see in a year.

The vast majority of the smallholders were so short of cash that they represented no market for hybrid seed or fertiliser. Giving these a starter pack would not displace any commercial purchases. The package being small was likely to stimulate, not diminish the incentive to purchase more inputs[14]. Even with such a small package of high productivity inputs, there are large rewards to good husbandry, especially to timeliness of planting, fertilising, and weeding. There was thus an incentive and reward for using effectively any inputs provided. The aim was that familiarity and confidence with this recommended technology should help to expand its use; as farmers accumulated experience with hybrid seed and fertiliser, they would start buying small supplementary quantities on their own. Thus the programme would stimulate, not substitute for, market demand.

Even the "rich" smallholders in Malawi could not afford sufficient fertiliser and hybrid seed. Thus it was decided that the target population should be the smallholder population[15]. Excluding "larger" smallholders would omit from the programme many of the most promising farmers, community leaders, and innovative elements. If starter packs were intended for all, it is far more likely that all would receive them. The poor would be a bit better off with this programme, but still poor. The starter pack programme was designed to be complementary to other needed poverty alleviation activities. Important amongst these were a national fertiliser for work programme, and an effectively functioning credit and savings programme. The estimated cost was US$18 per household to make up and deliver the pack. With an assumed value of the incremental maize of US$180/tonne, the programme would more than offset its cost

The starter pack programme proposed would put an extra bag of maize in every smallholder household. This effort, combined with fertiliser for work and other initiatives could help stem the tide of inflation and stagnation.

[14] The package was designed to be of a size that can be carried away easily by an individual on foot and not contain inputs for more than 0.1 hectare. The package needed to be small enough, at a household scale, that it really was a starter pack, but yet adequate, on a national scale, to create a significant production difference when distributed to 1.8 million households.

[15] Only 12 percent of smallholder households have more than 2 hectares. A recent survey showed the top income quartile had an annual cash income of around MK600 (US$20). Only in a relative sense were they rich compared to the bottom quartile with annual cash incomes of around MK40.