SAFE-World Project/Initiative Summary

Country: Kenya

Project/Initiative Title: Adaptive Research Program, Environmental Action Team (EAT) 1996

Scale: Communities Nos. farmers: 130 Hectares: 79

Agro-Ecological Zone: III

Improvement types

1x	2	3x	4	5x	6x	7	8	9

Success and Limits to spread

Success	Limits
1a,3c,3e	2a,2c,3a,4c,6b

A. Key Impacts

A1 – Productivity

	Before/Without	After/With	% change
Maize	670kg/ha	2335 kg/ha	249
Beans	1780 kg/ha	5550 kg/ha	212

A2 – Impacts on natural capital

i) improved management of organic resources (especially recycling maize stovers and other crop residues rather than burning them

A3 – Impacts on local community (social capital)

i) new farmers from each of our 4 communities wanting to join the project each year due to results they see their neighbors achieving
ii) participating farmers joining hands to help each other in weeding their farms, or establishing other on farm projects (simple zero grazing or poultry units for example).
iii) negative impact on group cohesion during the first year when we were working with only a few farmers from existing women's groups drawn from 5 different communities (other members were jealous that they were not being visited or being invited for training and farmer tours) As a result of this, we changed our approach in 1997, to working with any interested farmer in our target communities.)

A4 – Impacts on households and individuals (human capital)

i) increased participation and interest of men (we generally start with a group composed largely of women, who play the key role in farming in the region. with time, we have observed increased participation by husbands who are being attracted by the dramatic changes in maize productivity on their farms.)
ii) decrease in the number of hunger months experienced by adopting farmers
iii) improved crop diversification and rotation strategies (from planting the whole farm to maize/bean intercrop to also planting finger millet, potatoes, vegetables, bananas, soyabeans, and other grain legumes) resulting in improved family nutrition

iv) increasing the workload of farmers both because the technologies themselves are labour intensive; crop diversification also adds additional labour demands

A5 – Key changes in farm / regional system

Changes in input use: farmers moving from sole reliance on inorganic inputs to either sole reliance on organic inputs, or, more commonly, use of organic inputs, supplemented with small amount of inorganic inputs, resulting in a synergistic effect

a) dramatic increases in maize production achieved by adopting farmers has increased family food security (reduced the number of hunger months)
b) virtually all trained farmers recycle rather than burn crop residues; a good number also manage their compost and farmyard manure to optimize quality
c) noticeable progress being made towards crop diversification

crop diversification

B. Types of Sustainable Agriculture Improvements

Type 1: Better use of available renewable natural capital
Type 2: Intensification of single sub-component of farm system
Type 3: Diversify by adding new productive natural capital and regenerative components
Type 4: Better use of non-renewable inputs and technologies
Type 5: Social and participatory processes leading to group action for making better use of natural capital
Type 6: Human capital building through training-learning programmes
Type 7: Access to Finance
Type 8: Add value by processing to reduce losses and increase returns
Type 9: Add value by direct or organised marketing of produce to consumers

	Yes / No	Narrative
Type 1	x	Green manures
Type 2		
Type 3	x	
Type 4		
Type 5	x	Farmer research groups, farmer to farmer extension
Type 6	x	Training / Adult Education
Type 7		
Type 8		
Type 9		

C. Key Lessons: Success, Spread and Constraints

C1 – Key Lessons Learned

a) the most development occurs in households where both the men and the women are partners in development
b) participatory methods are vital for achieving results
c) working with discrete groups (women's groups, etc.) may be too exclusive. It is better to try and work with as many people / households in a community as are interested.

d) more success can be realized by focusing on farmers with at least a half an acre of land who own the land
e) it may take up to 3-4 years of working in a community before there is widespread adoption of technologies
f) having farmers perform simple experiments on their own farms is an effective extension tool that convinces farmers of the superiority of a technology
g) helping farmers to understand the principles and processes of biological agriculture and how to perform simple experiments is a more sustainable / empowering approach than teaching farmers isolated techniques

C2 – Aspects of local/national context contributing to success

a)the state of national economy = the widespread occurrence of households living below the poverty level with little or no capital to purchase external inputs
Thus, the technologies being promoted are relevant to small holder's production constraints (farmers don't have capital and are desperate for low cost alternatives).

b) donor support
The Adaptive Research Programme has been receiving donor support from the Rockefeller Foundation and this has enabled it to conduct it's activities without major financial constraints.

c) collaborative links with other projects
Project has established good collaborative links with other development projects, including:
* Legume Research Network (see enclosed newsletter and articles)--information sharing, direct collaboration on research projects, farmer to farmer exchange visits, initial access to legume germplasm
* Kenya Agricultural Research Institute--information sharing, direct collaboration on research projects, farmer to farmer exchange visits, access to bean and potato germplasm
* CIAT-Uganda--information sharing, access to bean germplasm
* ICRISAT--information sharing, access to pigeon pea and groundnut germplasm* IITA--access to cowpea germplasm

C3 – Limitations preventing spread

a) large family size, polygamy and extreme poverty of the clientele

Most of the clientele have large families (7-10 children / woman) and a significant number of them come from a culture which practices polygamy, meaning that one man may be having more than 20 children.

Some farmers are so poor that they have a hard time maintaining their own and their family's health, thereby affecting both their ability to work and their morale. Lack of access to clean water, adequate food and medical attention causes some farmers to be chronically ill, which prevents them from carrying out agricultural activities in a timely fashion . (Under conditions of extreme food insecurity in a household, we have found that it is difficult for a farmer to save seed for the following planting season, since everything is consumed before the next season arrives.)

Other farmers, in search of cash, hire themselves out as casual labour at neighboring large scale farms. This also prevents them from doing their own work on their own farms in a timely fashion, thereby reducing the chance of them being able to feed their families from their own farm. Furthermore, the amount of money they make doing this casual work is only enough to buy food on a day to day basis rather than giving them the ability to accumulate savings.

b) land tenure

Farmers who do not hold title deeds to their land are often not willing to invest the time and energy in sustainable agriculture practices since they are uncertain of how long they will be able to occupy the land.

Those that do mak e such an investment may be removed from the land by the owner when he sees crop productivity improving. This happened to one of our farmers.

c) security issues

Some of our clientele live in areas where there is conflict between different ethnic groups. For example, pastoralists stealing the livestock of those engaged in settled agriculture. This creates a lot of tension and makes the farmers less motivated to develop their farm holds.

d) gender issues / disparities

Women are the people who are primarily involved in farming the land, but men are considered to be the owners and the primary decision makers.

Any income generated may be considered to belong to the men who may want to use it for their own recreation (esp. drinking) rather thenfor the development of their families. A woman is demoralized if the yield increases she is able to achieve are siphoned off by the husband.

It may be hard for a woman to be given the power to decide how crops will be deployed on the farm. Thus, although a woman may wan t to diversify her cropping and practice crop rotation, this is often not possible if the husband wants to keep planting the whole farm to maize.

e) population pressure resulting in shrinking farm sizes

Subdivision of the land among family members may result in extremely small land holdings, such as an eighth of an acre, which leads to extreme poverty and the types of consequences described in # (a) above

f) livestock left to free range during the dry season

Free ranging livestock eat the green manure and other crops (pigeon peas) that can be growing during the dry season. This makes these technologies only viable for those who can either fence their farms or live in an area where livestock are few or confined.

C4 – Policy issues

a) demoralization of government agricultural personnel-- lack of government resources (fuel, vehicles, etc.) and poor salaries makes them less active than in the past when the

economy was healthier.
b) limited organizational resources / capacity to increase the number of households we are able to work with at a given time due to number of staff, vehicles, funds in general
c) donor fatigue with Kenya in general because of the scale of corruption and the lack of results with past projects

C5 – Scaling-up

a) more personnel and funds
b) more innovative strategies for dissemination of information about successful technologies
c) more networking with other organizations

D. Contact Point for Project/Initiative

Beth A.M. Kirungu, Adaptive Research Coordinator
Adaptive Research Program,
Environmental Action Team (EAT),
P.O. Box 2605,
Kitale,
Kenya

Telephone: 254-325-30938
E-mail: eat@AfricaOnline.co.ke

E. Project Narrative

The EAT is a small on-farm research project based in Kitale in western Kenya, working with 130 farmers on about 80 hectares. In this area of Trans-Nzoia, food insecurity is widespread amongst small-holders. Farmers typically plant whole 0.5-1 hectare farms with maize, usually intercropped with beans. They use late maturing hybrids, which remain in the ground for 8-9 months. But due to low soil fertility, and farmers' inability to purchase fertilizers, yields are only 650-1750 kg / ha. The yields of the main source of household protein, beans, are also very low, mainly die to pests and diseases (especially root rot and bean fly) and low soil fertility. This leads to protein malnutrition amongst poorest households.

EAT seeks to address these problems through participatory research and training. Farmers are trained in the principles and practice of biological agriculture, with a particular focus on soil health. New technologies are tested on farm, adapted, and then spread by farmers to neighbours if they work. The project helps farmers form groups –mostly it is women who come together first, and men who are attracted once the dramatic changes in productivity have been achieved.

A variety of technologies and practices have been adopted to improve household food production. These include: i) legumes and green manures - eg relay cropping of lablab into maize after 120-140 days – the legume takes over the land during the dry season, and the legume and maize residues are incorporated into the soil after harvest; and ii) composts and farmyard manure, with or without diammonium phosphate fertilizers, Tithonia and Sesbania. As a result, maize yields have improved to 3300-5500 kg / ha, and bean yields 4-8 fold. Further research is focusing on the trade-offs of harvesting legume grain and / or leaves compared with retaining all the g reen manure residues for the soil. EAT also promotes crop diversification with finger millet, soyabean, groundnut, pigeon pea and Irish potatoes, as well training farmers in intensive organic vegetable production in raised beds in home gardens.

Source: Beth Kirungu, Joseph Mureithi

experimental on-farm research with 130 farmers drawn from 4 communities;
complementary on-station research component

1996-20 farmers involved
1997-54 farmers involved
1998-80 farmers involved
1999-130 farmers involved

Food insecurity is rife among small scale farmers in Trans Nzoia district, where farmers plant their whole 1-2 acre farms with maize, usually intercropped with beans. Farmers plant late maturing hybrids which remain in the field for 8-9 months. Due to the inherently low fertility of the soil, farmers inability to afford chemical fertilizers and poor crop management practices, typical maize yields range from 3-8 bags (90 kgs / bag) of maize per acre--although potential yields are in excess of 25 bags / acre.

Small farmer bean yields are also extremely poor due to the susceptibility of local bean varieties to a root rot complex that is associated with intensively cropped, low fertility soils. This disease, in combination with bean fly, often results in complete crop failure.

EAT's has sought to address these problems with farmers within a participatory research / training context. Farmers are trained on a variety of issues related to the principles and practices of biological agriculture, esp. soil management. Farmers subsequently participate in simple experiments, usually to verify biological agriculture technologies but sometimes to generate new technologies as well. EAT research assistants follow-up individual farmers, both to help motivate them to put what they've learned into practice and to monitor the farmer's experiments. Success is measured by the degree to which farmers take what they learned both in training and in their experimental plots and apply it to the farm at large.

1. Ways of increasing maize production

Farmers first priority has always been to increase maize yields. To facilitate this, the program uses farmer experimentation as an extension tool (verification trials) to demonstrate the dramatic increases in maize productivity that farmers can achieve by using alternative fertilization strategies in combination with improved crop management practices (early planting, optimum spacing, timely weedings, etc.). The program also uses participatory research to generate new technologies, such as its maize / green manure system.

Alternative fertilization strategies that all farmers involved with the project between 1996-99 have experimented with include the use of either FYM or compost alone (5T/acre) or reduced rates of either compost or FYM (2.5 T/acre) in combination w/ 28 kgs/ha inorganic N in the form of diammonium phosphate.

The differences between maize performance in the plots vs. the farmer's own field are striking and this attracts both the spouses and the neighbors' interest. Farmers repeat the trial for one more season to confirm the results. By the third year, more than 50% of the farmers have taken the technologies to their own fields where they are now able to double, triple or even quadruple their maize yields, compared to before they started with the project.

Farmers have also been actively involved in developing a green manure system for maize (technology generation). This work is still in the experimental stage, although some farmers have already started using it on their farms.

The system involves relaying Lablab purpureus into the maize 120-140 days after planting. The legume takes over the field during the dry season (4-5 months, when the land is otherwise idle) and the legume residues plus preceding maize crop stovers are incorporated into the soil for a subsequent maize crop. In the past 3 years, mean on farm legume dry matter production has ranged from 3-7 T/ha. Maize yields in on-farm research trials have ranged from 15-30 bags of grain per acre. This has convinced farmers that the technology can work. Current on -farm research is focusing on the mechanical incorporation of the residues plus examining the trade offs of harvesting legume grain and/or leaves (both of which are edible) compared to returning all the green manure residues to the soil. EAT currently has over 100 farmers involved in this work. It also has a number of on-station experiments which look at issues arising from the on farm work in more detail.

EAT has also recently been trying to help farmers gain access to open pollinated maize seeds that can perform well in the area (Farmer adoption of hybrid maize is virtually 100% in the region and adapted open pollinated varieties are not widely available). Hybrid maize seed is becoming too costly (Kshs. 1,000 for 10 kgs) and farmers are trying to replant the hybrid seed in subsequent seasons, resulting in poor maize performance.

2. Improving common bean production

Small holder bean yields have been declining in the district and crop failure has become a common occurrence. During a season when beans are harvested, bean grain yields of 200-300 kgs/ha are the norm. This can lead to protein malnutrition among the poorest households since beans are their main source of protein.

Root rot and bean fly appear to be the major factors constraining small holder bean production as per the results of on-farm research EAT began carrying out this year. Results from the first bean planting season have shown that farmer bean yields, using their root rot susceptible varieties, can be increased two to three fold by fertilizing with farmyard manure. More dramatic increases (four to six times) can be achieved by planting unfertilized root rot resistant varieties (screened earlier in other parts of Kenya by CIAT and KARI(Kenya Agricultural Research Institute) at Kakamega). Fertilizing the root rot resistant varieties with farmyard manure can result in an eight fold (or more) increase in bean production.

Bean fly can be controlled by planting early in the first season and by using an insecticidal seed dressing in the second. Varieties that are resistant to both root rot and bean fly may soon be available from KARI-Kakamega.

This work will be scaled up next year, as EAT is in the process of assessing the second season bean production constraints and multiplying the root rot resistant varieties. Much emphasis will also be place on educating farmers on the causes of bean failure and the role of improved soil management (organic fertilizers, crop rotation) in increasing bean production.

3. Improving use / quality of locally available resources

Farmers are taught how to manage crop residues, make compost and use farmyard manure. They are also taught how to manage the compost and farmyard in order to obtain the best possible quality. They are taught how to make liquid organic fertilizers, using either manure, Tithonia diversifolia, or Sesbania sesban. They learn about green manures as discussed under improving maize production above.

4. Improving crop diversification

EAT promotes crop diversification as a critical component of improving both food security and soil management. Towards this end, farmers have been involved in conducting variety trials on various crops which to date have included finger millet, soyabeans, groundnuts, pigeon peas, and Irish potatoes. Farmers have also been trained on intensive organic vegetable production (using raised beds fertilized with compost and diagonal offset spacing to increase crop yields per unit area).

EAT also holds utilization days within the community on new crops (i.e. soyabeans and pigeon pea utilization days have been being held to date).

Participatory Processes

i) Training / adult education

Farmers receive training on a wide variety of issues over the 3-4 year period that the Adaptive Research program devotes to a particular community. Training topics include the following:

a) Soil Management

- soil genesis
- the creation and destruction of soil fertility
- nutrient cycles and management (esp. of nitrogen and phosphorus)
- role of organic matter
- principles of crop residue management
- compost production and management
- farmyard manure management
- the judicious and effective use of inorganic fertilizers
- the preparation and management of organic liquid fertilizers (plant and manure teas for top dressing crops)
- propagation and uses of Tithonia diversifolia
- green manures- principles and management
- crop rotation principles / practices for soil management

b) Food Security

the importance of crop diversification

maize production (alternative fertilization strategies and improved management practices)

common bean production (what's causing their repeated crop failure and coping strategies)

production and utilization of other grain legumes (soya, groundnuts, cowpeas, pigeon peas, field peas, hyacinth bean)

small grain production (finger millet and wheat)

banana production

sweet potato production

Irish potato production

farm planning for food security and income generation

c) Pest Control

the balance of nature

natural pest control (biological, cultural controls)

evaluation, preparation and use of natural pesticides (tephrosia, etc.)

safe, effective, and judicious use of pesticides

d) How to conduct a simple agricultural experiment

principles (replication, randomization, other controls of variability)

practices (design, layout, management, data collection, evaluation andinterpretation)

examples of the design, execution and interpretation of simple experiments

e) Training on results of EAT's on-station trials related to the verification of organic farming practices promoted by other Kenyan NGOs (i.e. double digging does not increase yields on the deep, well drained soils prevalent in the district; some bio-pesticides being promoted by other sustainable agriculture NGOs are not effective, including a variety of concoctions for the control of late blight on tomatoes, or the use of soil and various types of ash for the control of maize stalk borer; use of plant and manure teas--increased soaking times of up to 4 weeks improve the N content of plant teas made from Sesbania sesban and Tithonia diversifolia compared to the often recommended practice of soaking the plant materials for 7 days.)

ii) farmer research groups

After an initial one week training on biological soil management (# (i) a above), farmers identify the sustainable agriculture technologies they want to experiment with. If more than 6 farmers are interested in a particular topic, that group forms a farmer research group and conducts a trial on that topic--with each farmer having one complete set of treatments, thus serving as a replicate for the trial. EAT uses a participatory research approach--farmers identify the research topics of their choice, participate in designing treatments, they plant and manage the experiment, collect data, measure yields using agreed upon volumetric containers available in every household and evaluate the results. EAT research assistants are available to facilitate the process.

iii) farmer to farmer extension

Farmer to farmer extension is considered a key component of the program. This is pursued by facilitating farmer to farmer tours (both within and between communities), farmers holding field days for non-participating members of the community. Farmers are also challenged to take responsibility for training 5 other farmers in their community on a technology that they have found to be especially useful and relevant.

EAT uses small research plots (i.e. 27 m2 for maize, 12 m2 for beans) for on-farm trials and, in most cases (bean trial w/ farmer's own bean varieties=exception), EAT provides the collaborating farmers with exactly enough seed to plant a trial. The farmers keep whatever they harvest from the trial, except when the trial involves new varieties that are hard to get. In the latter case, the farmer must give an amount of seed, equivalent to what they were given, to a neighbor so that the neighbor can also try planting it.