The Eotulelo farmer field school:

Learning and promoting conservation agriculture

By

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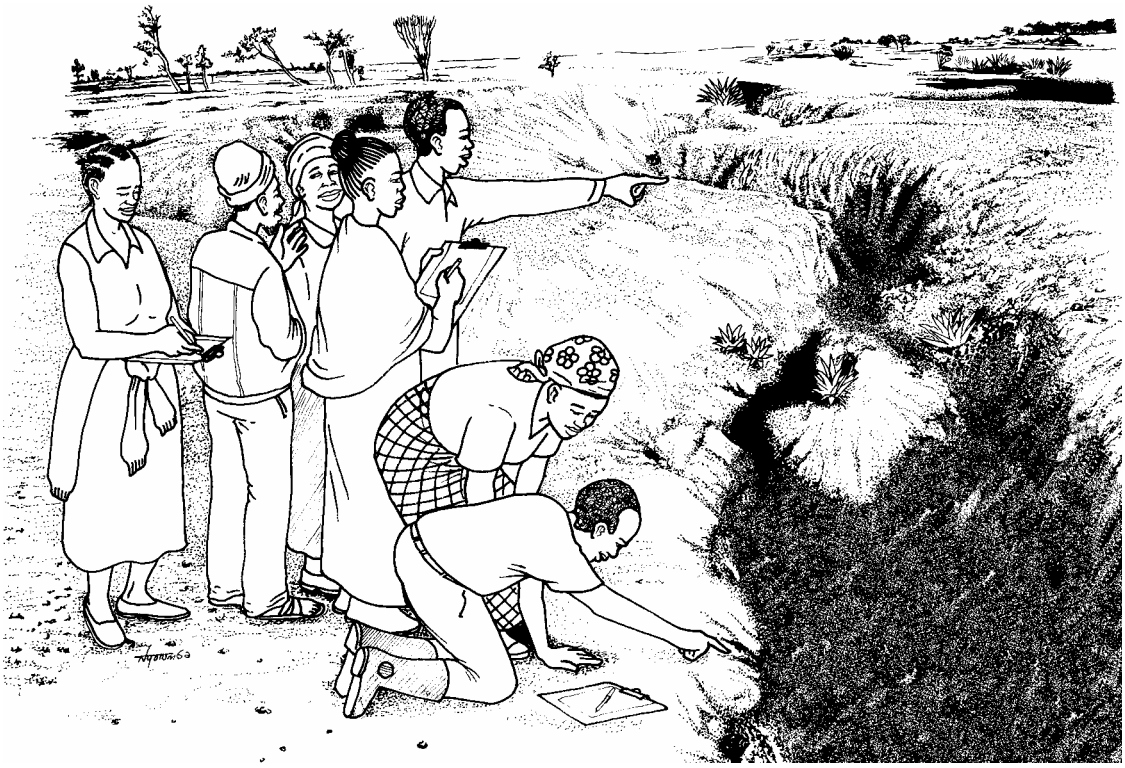
"*Gullies! Gullies! Gullies! If you look this side it is gullies, the other side you see gullies, far away you still see gullies, there are no trees! Aaah, it is not possible to live here!*"[1]

The visiting farmers were shocked by what they saw in Likamba village, on the outskirts of Arusha, in northern Tanzania. The environment was being destroyed: soil erosion was eating into the fields, and herds of cattle roamed the area, eating whatever they could find. There were few trees left: cut down for firewood.



The farmers in Likamba were well aware of the problem. But what could they do about it? They were getting poorer and poorer: the impoverished soil produced very little of their staple crops – maize and beans – and they had no other source of income apart from their cattle.

[1] Prof. R. E. Malimbwi et al. (2002): S*ustainable land use system: Lessons from Mount Meru*. Sokoine University of Agriculture, Morogoro, page 10.

In 1997, the villagers came together to discuss what to do. They knew that Regional Land Management Unit (RELMA), a development programme focusing on land management, was helping people in the nearby village to stop the erosion. The Likamba farmers decided to join in. But they found that some of the people in the other village were suspicious of the RELMA programme: they feared that foreigners might take their land. They pulled out the trees at night, destroyed the contours bunds that their fellow-villagers had built, and let their livestock graze there.

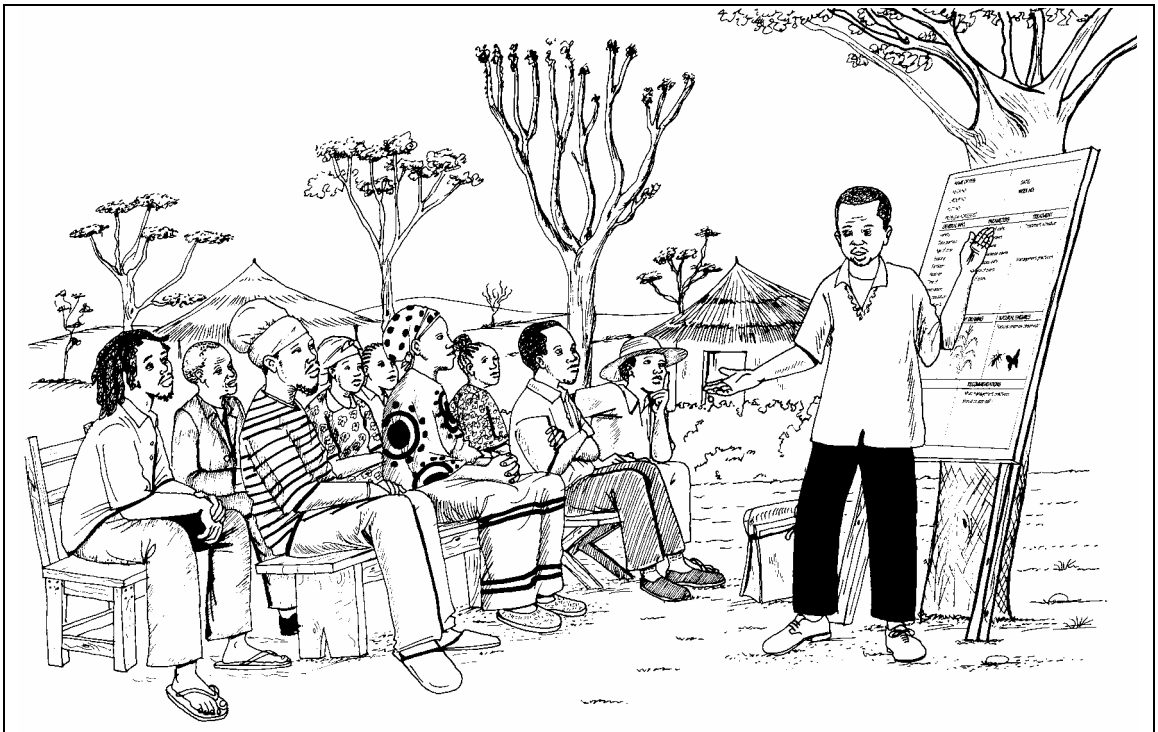
Disappointed, the Likamba villagers decided to begin their own self-help group in 2001. They started off with 20 members. They copied some of the RELMA erosion-control technologies – tree planting, building contour bunds, as well as ways to earn money such as beekeeping and chicken raising. They called their group Eotulelo, which means "come and join us" in the local Maasai language.

The Eotulelo group's leadership is particularly dynamic. They knew that in order to get assistance from outside, they would have to register as a formal organization. They did so in 2002. They contacted Selian Agriculture Research Institute (SARI), a government research station in Arusha to ask for help. Shortly afterwards, in 2004, SARI was starting to implement a project called Conservation Agriculture for Sustainable Agriculture and Rural Development Project (CA-SARD). SARI recognized that the Eotulelo group was one of the most active self-help groups in the district, so the institute included it in the CA-SARD project.

The project works through farmer field schools (see box), and the Eotulelo group decided to use this approach too.

Farmer field schools

A farmer field school is a school without walls. A group of farmers gets together in one of their own fields to learn about their crops and things that affect them. They learn how to farm better by observing, analysing and trying out new ideas on their own fields. The farmers meet every week from planting to harvest, to check on how the crops are growing, look at the amount of moisture in the soil, count the numbers of pests and beneficial creatures such as earthworms and spiders.



They do experiments in the field. For example, they may divide the field into several smaller plots, and try out different types of crops or technologies (such as intercropping, different ways of preparing the land for planting, and so on). They compare the various plots each week and discuss what they see. They also keep records of the amount of work needed, the types of implements used, the inputs used, and so on. At the end of the season, they record the yields of the tested crops.

The facilitator of a farmer field school is normally an extension worker or another farmer who has graduated from another field school. The facilitator guides the group, helps them decide what they want to learn and think of possible solutions, and advises them if they have questions. The farmers draw on their own experience and observations, and make decisions about how to manage the crop.

The group must hold two or more field days to show other farmers what they are doing. In conservation agriculture field schools, the first field day is a demonstration of how to use the implements and manage crop residue. The second field day, held just before harvest, is to demonstrate the effect of different technologies.

The farmers also host exchange visits for members of other field schools, and visit the other field schools themselves. This allows them to share ideas and see how others are dealing with similar problems.

At the end of the crop season, the farmers “graduate”: they receive a certificate from the field school organizer (in this case, the CA-SARD project). The members are then qualified to start a new field school as a facilitator.

The field school includes team building and organization skills, as well as special topics suggested by the field school members themselves. The field schools are a way for farming communities to improve their decision making and stimulate local innovation for

sustainable agriculture. The emphasis is on empowering farmers to implement their own decisions in their own fields.

What is conservation agriculture?

Gullying and severe erosion are not natural: they are caused by the way the land is farmed. Ploughing destroys the soil structure and leaves the soil surface open to the sun, wind and rain. The precious topsoil is easily washed away, lowering fertility and leaving the surface scarred with gullies.

Conservation agriculture is a way of growing crops that conserves the soil and maintains soil fertility. It combines three principles:

- Disturb the soil as little as possible – i.e., not ploughing.
- Keep the soil covered with crops or residues.
- Rotate or mix crops.

These three practices have many advantages: they conserve moisture in the soil, maintain a good soil structure (making it easy for roots to grow), regenerate the soil's fertility, encourage earthworms and other soil life, and protect the soil from erosion hence gullies.

There are many ways of applying these three principles. For example, farmers can sow seed using a simple stick, a jab-planter, or a no-till planter drawn by donkeys or oxen. They can protect the soil by planting cover crops or by spreading crop residues over the surface. They can intercrop cereals, legumes and other crops.

Conservation agriculture needs less labour than conventional farming because it avoids ploughing. It produces higher yields because it maintains the soil fertility.

Weed control may be a problem, especially in the first few years after farmers start practising conservation agriculture. They can control weeds by slashing them or using herbicides. Eventually, the cover crops will smother most weeds, making them easier to control.

The CA-SARD project

The objective of SARI's Conservation Agriculture for Sustainable Agriculture and Rural Development (CA-SARD) project is to improve food security and rural livelihoods of small and medium scale farmers in Tanzania by promoting conservation agriculture (see box). It is a collaborative project funded by the German Ministry of Agriculture and Consumer Protection and implemented by FAO and the Tanzanian Ministry of Agriculture, Food Security and Cooperatives, and hosted by SARI. The project started work in June 2004. It is being implemented in three districts: Arumeru and Karatu in Northern Tanzania, and Bukoba in the Lake Zone. Each district has at least ten farmer field schools, each with about 30 farmers.

The CA-SARD project coordinates the farmer field school groups. It provided training to extension workers (*as field school facilitators)*, on conservation agriculture principles so that they can advice farmers whenever it is necessary. They also trained farmers on how to use and maintain conservation agriculture equipment. Seeds of maize and cover crops,

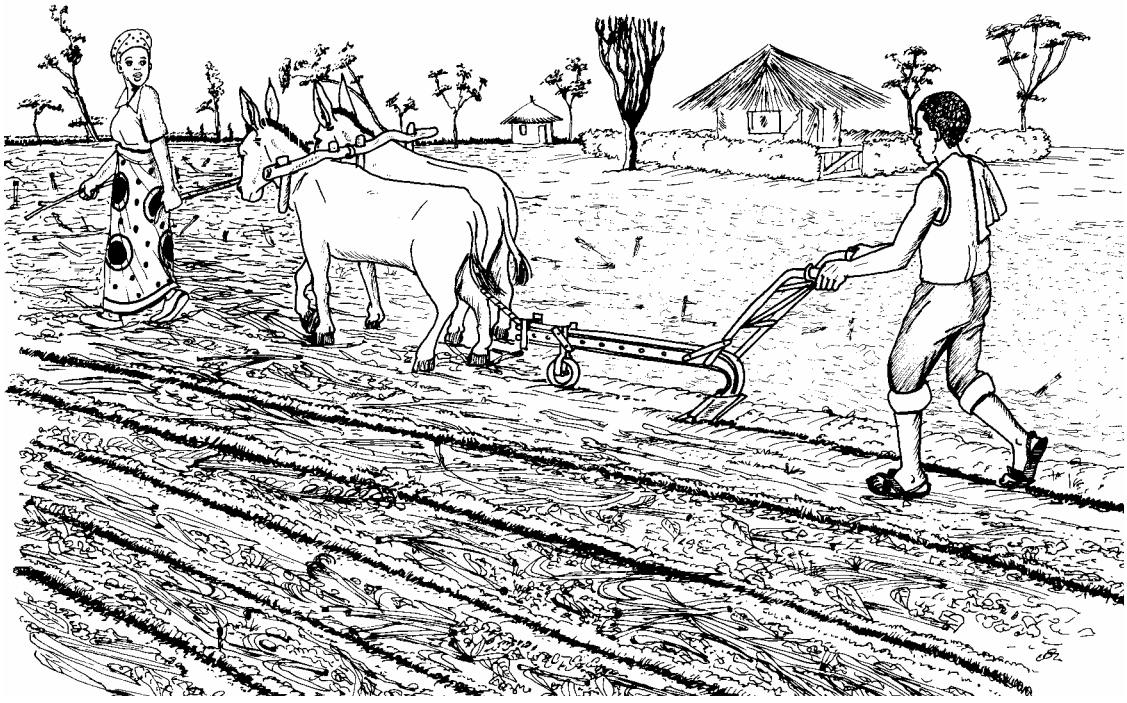
conservation agriculture equipment, herbicides (to control weeds during the transition period from conventional to conservation agriculture), insecticides as well as stationery were also provided.

The Eotulelo group's experiment

The Eotulelo group had several questions: should they plough as usual, use a ripper before planting, or plant without using a ripper? And would it be better to plant lablab (*Lablab purpureum*, a type of legume) or pigeon peas in between the rows of maize?

They used a hired one-acre (0.4 ha) field as their field school site. They divided the field into five plots, each with a different combination of techniques:

- Ripped plot, planted with maize intercropped with lablab (yield: 58 kg maize, no significant harvest of lablab because of drought)
- Direct planting without ripping plot, maize intercropped with lablab (yield: 40 kg maize, no significant harvest of lablab because of drought)
- Ripped plot, planted with maize intercropped with pigeon peas (yield: 35 kg)
- Direct planting without ripping plot, maize intercropped with pigeon peas (yield: 15 kg maize, pigeon peas dried and were not harvested)
- Ploughing twice, then planting maize intercropped with beans, pigeon peas and pumpkins (this was what the farmers normally did). (yield: 12 kg maize, pigeon peas not harvested)



The techniques were chosen by the farmers with the assistance of and advice from the facilitator. CA-SARD suggested the use of adequate conservation agriculture implements.

The group divided up responsibility for each of these plots. Each week, a subgroup checked on the crops in their plot, and then reported back to the whole group. The group was then able to compare the situation in each plot.

By the end of the season, the farmers had decided that it was best to rip the soil, then plant maize intercropped lablab. The lablab covered the soil well, protecting it from the sun and rain, and cutting erosion dramatically. Ripping with maize and pigeon pea was also good: the ripped furrows allowed rainwater to seep into the soil, producing an excellent crop stand.

The four conservation agriculture plots were all better than the farmers' traditional practice of ploughing twice and planting a mix of crops.

Unfortunately, bad weather prevented the Eotulelo group from completing all the steps in 2005, so they have not yet formally graduated from the farmer field school. But some of the group members had learned enough that they were able to start new farmer field schools with new members. One group called Upendo-nyuki was established through the help of one member of the Eotulelo group.

Outside the field school

The Eotulelo farmers did not confine their conservation agriculture work to their small experimental plots. They also implemented at least one of the three principles of conservation agriculture on their own land. Some tried just one or two technologies, on one part of their farm. Others implemented different technologies on a larger area. The most popular practices were minimum soil disturbance (ripping and no-till direct planters or jab planters), keeping the soil covered (not burning crop residues, not allowing animals to graze freely, and planting lablab). In mid-2005, 18 of the 22 group members ripped their fields, four rotated their crops, and all of them planted lablab. During the regular weekly meetings, they were able to share their experiences and compare notes with the other group members. They also compared the performance of experimental plot with their plots.

The farmers were pleased with the results. They found their conservation agriculture fields produced 50% more than their conventionally ploughed fields. Water sank into the soil through the ripped lines, so the soil stayed moist for longer time. The crops grown with conservation agriculture suffered less from drought than those grown in the conventional fields. The cover crops protected the soil from the heavy rain, reducing erosion.

The farmers also found that conservation agriculture was less work. Ripping was a lot easier than ploughing, needed only two people instead of three, and could be done a lot faster. That was especially important for physically weak individuals who could not

handle heavy work. The women group members said the conservation agriculture implements were light and easy to use.

Because it is not necessary to plough, the farmers can do field operations faster. They can quickly sow their seed after the first heavy rain because there is no need of ploughing. That means earlier harvest, and avoids the risk of drought at the end of the growing season. Those who practice conventional farming have to wait until the soil allows them to plough, so there is a delay 3-7 days.

Conservation agriculture cost less than conventional farming. The farmers did not have to buy fertilizers, or hire tractors or oxen for ploughing. They expect to have to buy even fewer inputs such as herbicides and cover crop seeds in the future, so are looking forward to higher profits. Herbicides are just used in the first year to control weeds, and cover crop seeds can be produced by the farmers themselves.

Conservation agriculture uses lablab as a cover crop, so it has become far more important. The beans – green or dried – make nutritious food, and the young leaves can be eaten as a vegetable or used as fodder. Instead of going in search of fodder, women can now fetch few armfuls of lablab leaves each day from their fields to feed to their animals. The farmers can also sell lablab beans, or dry them and sell the seeds.

Equipment

Conservation agriculture uses certain types of special equipment:

- **Rippers.** These cut a narrow furrow without turning the soil over. The seed is sown in the furrow, and rainwater can sink into the soil easily. Rippers are pulled by oxen or donkeys.
- **Subsoilers.** These break up a hardpan deep in the soil, often formed by trampling by animals or repeated ploughing to the same depth. Subsoilers are also pulled by animals.
- **Direct planters.** These are animal drawn implements with disks to cut the trash on the soil surface, and a chisel to open a narrow furrow. They drop the seeds into the furrow, then cover them over again with soil.
- **Jab planters.** These are hand-held implements that plant seeds directly into the soil.

Because conservation agriculture is new to Tanzania, this equipment is not easily available. It has to be imported, or made specially. CA-SARD started by ordering equipment from Brazil, where conservation agriculture is widespread. It has since purchased equipment from NANDRA Engineering, a firm based in Moshi, about 80 km away from Likamba. The equipment can be expensive: TSh 85,000 for a ripper and frame, and TSh 375,000 for a no-till direct planter. But farmers are used to paying such prices: an ox plough costs around 75,000 Tsh (??$$$). The project also trains blacksmiths to maintain and repair the equipment.

Because farmers are not familiar with the equipment, CA-SARD has to demonstrate it to them, and provide the first groups with equipment to use. The project advises farmers to organize themselves into small groups to buy equipment. It also links them to credit

schemes such as the Ministry of Agriculture's Department of Mechanization, banks and other NGOs so they can buy equipment.

Once a group has some equipment, it can earn money by renting out their conservation agriculture equipment to other farmers. The project encourages groups that do not have their own equipment to rent it from others.

The project hopes that it will be possible to stimulate enough demand for the equipment for local firms to start manufacturing and selling it themselves. The increased demand should also result in lower prices for the equipment. CA-SARD encourages suppliers to invest in equipment and sell it or rent it out to farmers via village shops.

Other benefits

Although the Eotulelo group has been running a farmer field school only since July 2004, they have learned a lot. They have become experts in both conservation agriculture and in the farmer field school approach. One member, Thomas Loronyo, convinced a neighbouring farmer group called Upendo-nyuki, to start their own field school. Thomas became the facilitator of this new group.

Farmers in Likamba village were also gained knowledge on special topics such as management skills, financial issues or HIV/AIDS. In the field school, farmers have the chance to include special topics which they are interested in into their time table. The facilitator then invites an expert for the requested topic. Other development organizations are keen to disseminate information through existing field school groups. They offered to train the Eotulelo group on subjects such as goat raising, credit management and banana production.

The women members of the group gained confidence because they got used to speaking in front of larger groups.

Problems and lessons learnt

Free grazing. Farmers in the Likamba area normally allow their livestock to graze freely. This is a problem for conservation agriculture fields, because animals compact the soil and remove all the soil cover, leaving it open to erosion hence gullies. It is important to keep animals out of the fields – obviously while the crops are growing, but also after the harvest. Other farmers do not appreciate this need.

To solve this problem, the village leaders told the villagers to confine their animals, reduce the flock and backed this up with by-laws to protect the environment. Punishments were given to farmers who were violating the by-laws. As a result, many of the farmers stopped allowing their animals to graze freely, and joined in the efforts to conserve the soil. Hence reduce the speed of gully formation.

Unreliable rainfall. For 3 consecutive years, Likamba experienced long dry periods, which affected crop yields. To cope with the situation, the field school trials should include practices that are likely to produce positive results even with low (or high) rainfall.

Weeds. During the transition period from conventional to conservation agriculture, weeds may become a serious problem. Farmers may have to use herbicides in the first year. In the following years, cover crops should be well enough established to smother

weeds. An option to control weeds in the transition period without herbicides is to plant a high population of mucuna (a leguminous cover crop which covers the soil very densely) for at least two seasons. Mucuna can be used as fodder, but the utilisation for humans is still in research, so prices on the market are low compared to lablab. To reduce the loss of income, the transformation of the farmer's land should be done portion wise if mucuna is used.

Marketing. Most farmers sell their crops directly after harvest to middlemen, who offer very low prices. They could overcome by storing or processing their produce, selling as a group to increase their bargaining power, or seeking new markets.

Further replication. In order to promote conservation agriculture, it is necessary to build up the number of individuals who are skilled in conservation agriculture. This can be done in part by formal and informal training of more facilitators and farmer leaders in conservation agriculture and farmer field school techniques. CA-SARD is also working with other organizations that are involved in conservation agriculture, such as Research Community and Organizational Development Associates (RECODA), Selian Agricultural Research Institute, the Livestock Department, Catholic Relief Services, and Canadian Physicians for Aid and Relief. RECODA is using the FFS groups which CA-SARD has established to disseminate additional technologies. CA-SARD provides CRS with cover crop seeds and information about how to grow the crops with conservation agriculture. CPAR recognized the impact of conservation agriculture practices and copied the approach of disseminating conservation agriculture through Farmer Field Schools from CA-SARD. Through one CA-SARD facilitator, who is as well working with CPAR, they gained information about how to implement the approach.

Adoption and Scaling-Up

In Likamba, the CA-SARD project has directly benefited 22 households through the Eotulelo group. Indirectly, another 15 households in the village improved their livelihood. In Arumeru, Karatu and Bukoba districts, it has reached about 900 families directly (as group members) and 300 indirectly.

Technologies such as conservation agriculture spread quickly through farmer field schools. The people of Likamba are fairly similar: they all come from the same ethnic group, and they all have similar amounts of land. No one is very wealthy. People who knew more about conservation agriculture adopted the approach more quickly. Conservation agriculture is suitable for farmers of all income groups, but poorer people adopt faster because they need to make sure they have enough food, and conservation agriculture enables them to save labour.

Many farmers in Likamba and from other villages learned about conservation agriculture through the farmer field school, and some have started copying the techniques. All the members of the field school and 15 other farmers planted lablab in 2005, and they say they will do so again in the following years, and 26 non-group members hired ripping services from the group. In 2006, 64 non-field school members asked to use the group's ripper and no-till direct planter.

The new Upendo-nyuki field school has had similar success. Other farmers have seen the results of their trials, and have come to the group to learn or asked for help in forming their own field schools. Upend-nyuki assisted the formation of two more farmer field

schools in the village of Likamba, which are also doing conservation agriculture. The farmers see that conservation agriculture is a solution to their low yields, so they want to continue even without support from CA-SARD.

CA-SARD presented itself at the III World Congress on Conservation Agriculture with a key note, and invited top officials to come to this congress. After this, on the post-congress tour, the top officials visited several CA-Project sites in Arusha Tanzania. Impressed by what they saw during the congress and the visit, the Ministry of Agriculture decided to start 100 pilot farmer field schools in ten districts each with 10 groups. CA-SARD advised the ministry on the technologies to be copied, the formation of FFS groups and with implementation of conservation practices.

Conclusion

The project hopes that many farmers will adopt the CA technologies hence achieve the goal of improving food security and change their livelihood positively. For the case of Likamba village wider adoption together with other benefit like increase in yields, soil fertility restoration, labor and time saving, timely operations will also reduce soil erosion hence formation of gullies.

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