



Enhancing Agricultural Development

TARP II SUA PROJECT

**ENHANCING AGRICULTURAL
DEVELOPMENT**

Lessons from Njombe

March 2003

Compiled by

Prof. R. E. Malimbwi
Dr. J. G. Lyimo-Macha
Mr. E. Kiranga
Mr. P. Kawamala

Edited by

Members of the Project Implementing Team:

Prof. L. D. B. Kinabo
Prof. A. J. P. Tarimo
Prof. E. K. Batamuzi
Dr. P. J. Makungu

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Preface

Sokoine University of Agriculture (SUA) in collaboration with the Ministry of Agriculture and Food Security (MAFS) and the Agricultural University of Norway (NLH) is implementing the research project “Food Security and Household Income for Smallholder Farmers in Tanzania” under the Tanzania Agricultural Research Project, Phase Two (TARP II – SUA Project). The project started in September 2000, and is financially supported by the Governments of Norway and the United Republic of Tanzania.

One of the objectives of the project is to facilitate and strengthen interaction between researchers, farmers and extension agents in order to address important issues that need joint intervention to improve agriculture. One way of achieving this objective is to organize farmer’s inter-visits within and between zones.

This publication summarizes the proceedings of an interzonal visit to Njombe District, Iringa carried out in April 2003. The visit involved farmers and Village Extension Officers (VEOs) from the Eastern Zone that includes districts of Handeni, Lushoto, Morogoro, Bagamoyo, Kibaha and Korogwe. There were also farmers and VEOs from Southern Highlands Zone, districts of Mbeya Urban, Njombe, Sumbawanga, Songea, Rujewa, Namtumbo and Iringa Urban. This report is also available in Kiswahili language.

Prof. L. D. B. Kinabo
Coordinator, TARP II-SUA Project
March, 2003

Acronyms

ARI	Agricultural Research Institute
MAFS	Ministry of Agriculture and Food Security
NLH	Agricultural University of Norway
SCAPA	Soil Conservation and Agroforestry Project, Arumeru
SUA	Sokoine University of Agriculture
TARP II	Tanzania Agricultural Research Project Phase Two

1.0 INTRODUCTION

The enhancement of linkage between farmers, VEOs and researchers is one of the intended outputs of the TARP II – SUA Project which is jointly implemented by the Ministry of Agriculture and Food Security (MAFS), Sokoine University of Agriculture (SUA) and Agricultural University of Norway (NLH).

One way of improving the linkage is to conduct study visits within or outside the target zones i.e Eastern zone and Southern Highlands zone. This report summarizes the proceedings of a study visit carried out in Njombe district, Iringa region from 22nd to 27th March, 2003 to learn from farmers who have advanced considerably in zero grazing, manure management, use of animal draft power for transporting goods, ploughing and weeding crops. The visitors learned on pasture management and storage for use during the dry season when there is fodder shortage, in addition to rainwater harvesting and agroforestry.

Farmers who participated in the visit are livestock keepers who use weak animal husbandry techniques such that the benefits gained from the animals are much less compared to the resources spent to keep the animals. Most of the farmers come from semi-arid areas so it is obvious that they would benefit in adopting rainwater harvesting technology for domestic use, livestock and irrigation purposes. The organizers of the visit were aware of this problem and hence the need to carry out such a visit.

Based on the major objectives of the visit, which are outlined in Chapter 2, a total of 19 farmers (6 women) got the opportunity to exchange experience with fellow farmers in Njombe. It is realized that the number of female participants is much lower than men. This is due to lower female participation in most events in the Eastern zone especially in activities, which involve traveling. There have been instances when a woman appointed to participate in a forum or visit is literally accompanied by her spouse. In the

Southern Highlands Zone, women are much more liberal. Most husbands in the Eastern zone do not allow their wives to travel alone. In this visit, out of the six women, only one came from the Eastern Zone. The study visit also involved Village Extension Officers (VEOs) and Researchers (Annex A).

2.0 OBJECTIVES OF THE VISIT

The major objective of the visit was to expose farmers to sound technologies on:

- Use of Animal Draft Power (ADP)
- Zero grazing
- Manure management
- Rainwater harvesting
- Agroforestry

Villages visited that are using these technologies are Kisilo, Mayale, Ibumila, Utiga, Wanging'ombe and Isimike.

3.0 LESSONS LEARNED

3.1 Animal Draft Power

Participants visited villages of Kisilo, Mayale and Utiga in Njombe District to experience the following aspects of ADP:

3.1.1 Selecting Draft Animals

Animals for draft power should have the following qualities:

- Age that does not exceed 15 months, older animals are difficult to train.
- Must be healthy
- Should be free from defects such as bowlegs. It should have a straight back, strong and straight legs, wide rump and breast, and generally large and strong body.

In addition to the above qualities, the animal should be castrated. A pair of oxen should be more or less of the same size to ensure efficiency at work.

3.1.2 General Appliances for ADP

Different farmers from ADP groups described and explained how various appliances work. These appliances include; the plough, ripper, cultivator, anglo-alfa, etc. In Utiga village farmers met a creative farmer (**Lutango Malekela**) who has invented his own plough called *chapakazi* (Photo No 1)



Photo No 1: Plough, Chapakazi invented by Mr Lutango Malekela in Utiga village, Njombe

The appliances may generally be used for the following purposes.

- Ploughing
- Weeding
- Making ridges
- Planting

The visiting farmers also got an opportunity for a hands-on practice on how to dress an ox with short and long yokes ready for work. The farmers later practiced how to plough using ADP as demonstrated in Photo No 2.



Photo No 2: Weeding maize using ADP

3.1.3 Specific Appliances for ADP

- **Plough**-This plough which is drawn by oxen is normally used for tilling land, but it can also be used as a ridger
- **Ridger**- as its name implies this appliance is for making ridges but it can also support a tie ridger which ties up the ridges to prevent soil erosion and conserve water
- **Hand Ripper**- This ripper is used for breaking the soil especially in cover crops. It enhances moisture and nutrients retention in the soil, and simplifies tilling such that a large area may be worked in a short time.
- **Ripper planter**- This ripper breaks the soil while planting at the same time. It has an advantage of working a large area in a short time in addition to enhancing moisture and nutrients retention in the soil just like the hand ripper.
- **Cultivator**- There are many types of cultivators and these include; *Agro-alfa*, *spring tine cultivator*, *light cultivator* and *rigid cultivator*. These appliances are used for weeding, ridging and spreading fertilizers. Weeding is simplified significantly using the cultivator. For example while it will take ten working days for a farmer to weed 2 acres using hand hoe, with the cultivator it will take only 3-4 hours.
- **Planter**-this is best used where there are cover crops where planting and fertilizer application are done simultaneously.

3.1.4 Advantages of ADP

According to Dr. Aboud, leader of the project on ADP, the farmer benefits substantially using ADP compared to hand hoe in an area of 1 acre as shown in Table 1.

Table 1. Comparing performance using hand hoe and ADP

Activity	Hand hoe	ADP
Ploughing	It takes three weeks, 5-8 hours per day for a family of four.	One pair of oxen takes 12 hours at 2-3 hours per day, supervised by 2 people
Planting	The family takes up to 2 days	Takes 2 hours
Weeding	The family takes up to 1 week	Take 6-8 hours
Cost	All activities cost Shs 56,000/=	All activities cost Shs 12,000/=

3.2 Improved dairy cattle keeping

In Ibumila village, Igongolo ward farmers practice the following activities related to dairy cattle keeping worth noting.

- Manure management
- Production, preservation and utilization of fodder

3.2.1 Manure management

The first fact that the visitors appreciated was that most farmers use manure in their farms. However such manure is often less useful because in most cases it is deficient of important soil nutritional elements due leaching by rain and over exposure to the sun. The issue of proper manure management, which was well explained by Ibumila villagers aroused the interest of the visitors. Manure management includes use of cattle urine as fertilizer.

Storage of manure

- Manure should be stored near the cow shed to simplify transportation
- Construct wooden boxes with dimensions of 1.5m width, length and height, i.e 1.5x1.5x1.5 m. The wall timber joining adjacent boxes should be loose or removable to simplify movement of manure from one box to the next.
- The boxes should be roofed to protect manure against rain and direct sun.



Photo No 3: Storage of manure

- Fill the first box with fresh cow dung including fodder remains.
- When the first box is full, move the manure to the next box and fill the first box again. The process of moving manure is simplified if the timber separating the boxes is removed since it is loose.
- Keep on moving manure to the third and fourth box as each time the first box is full.

Notes:

- Using manure which is not fully decomposed results in scorching the plants. To confirm the manure is ready for use, insert a wooden stick in the manure pile in the last box and feel the temperature of the stick with your hand. If the stick is warm, decomposition is still going on and the manure is not ready for use. Manure may only be used if the stick is cold.
- In the dry season, it is not advisable to collect cow urine and apply it directly to the plants, they will get scorched.

3.2.2 Production and storage of fodder

Production and storage of fodder for use in the dry seasons is best practiced by small scale farmers in Ibumilo village. Mrs Huruma Mhapa explained in detail how to prepare, plant, manage and harvest fodder and its seed. She also explained on how to keep a nursery for fodder trees. She narrated the advantages of fodder trees as follows:

- Control of soil erosion
- A source of fuelwood
- Improving soil fertility
- Marking farm boundaries
- Improving the quality of animal feed

- Flowers of most fodder trees attract bees, facilitating beekeeping
- Improving site scenery
- May be used as feed for fish in a pond
- It is a source of income for the household through sale of seedlings

Mrs Mhapa participated in the first farmers' forum, which targeted to strengthen linkage between farmers, VEOs, and researchers conducted in Njombe in 2000. She also participated in an exchange visit to Lushoto in 2001 where she picked most of the technologies she is practicing today. During the Agricultural shows, better known as *NaneNane* in Morogoro in 2002, she was among the farmers selected to participate based on her ability to grasp and implement technologies while at the same time abundantly willing to share her knowledge with others. Several visitors, in groups or individually visit her home to learn.

3.2.2.1 Harvesting and storage of hay

Farmers from Eastern and Southern Highlands zones learned on better hay harvesting and storage practices for use in the dry season. They also got the opportunity to prepare hay bails from grass and fodder trees.

How to prepare dry grass bails

To obtain quality grass feed the following points should be observed;

- Harvest the grass when flowering starts.
- Harvested grass should be left in the farm to dry properly to avoid rot. In case it is in the dry season, a platform should be constructed for drying fodder. It should be roofed to avoid rain or any moisture. Well dried grass should show a light green color when ready.

Notes

- Well dried grass may be detected by trying to scratch the stems with finger nails. They will not scratch easily if they are dry, and therefore ready for bailing to be stored
- Make an wooden box, open at the top and bottom. The dimensions should be 75 cm length, 45 cm width and 35 cm height. Use hinges to join the sides, which close in one angle
- Before filling the bail with grass close the box and place 3 or 4 pieces of rope on the box, long enough to tie the bail
- Fill box with grass by pressing them hard
- Tie the bail firmly with rope
- Use biological ropes such as sisal or tree bark. Synthetic ropes such as manila may kill the animal if eaten
- Open the box to remove the bail. A well prepared bail weighs 13-15 kg
- Prepare bails enough to feed animals for at least three months
- Store bails in a dry place

Advantages of bailing grass

- A large amount is stored in a small place
- Animals get feed in the dry season
- Nutritional content is preserved
- Bails are easy to handle

3.2.2.2 Harvesting and drying fodder tree leaves

Fodder trees are important in improving the quality of animal feed and manure. Mrs Mhapa explained how to harvest and dry tree fodder.

Qualities of a tree ready for harvesting

- The tree should be of not less than 50 cm in height
- The trunk, not less than 2 cm in diameter
- A forked tree may be cut even if the trunk is not less than 1 cm diameter.
- Stump height should be 20 cm

Drying the leaves

- The leaves should be plucked out from the branches and placed on a mat or canvas.
- The leaves should be sun-dried and protected from rain or moisture.
- Well-dried leaves should crush into powder when pressed between the fingers.

Notes

- If the leaves are not well dried, they will rot when stored, and they form gases inside the stomach of an animal and death may occur.
- It is recommended that dry fodder should be mixed with bran in the ratio of 1:2, fodder to bran. It is important to feed cattle with this mixture as an additional feed twice a day. Lactating animals should be given this mixture during milking.

4.0 RAINWATER HARVESTING

Most parts of Tanzania receive inadequate rain, and the water usually disappears into the atmosphere before it is utilized due to evaporation or flowing to the sea. This causes unavailability of water for domestic use, livestock and support crops. Rainwater harvesting is used to conserve rainwater for future use.

Often in dry areas women and children waste considerable time searching for water in valleys and shallow wells far from dwellings. Livestock have to cover long distances pursuant for water and in other cases animal herders are forced to adopt nomadic life in search of water. It is for this reason that some of the participants were selected from areas with water problems in order to expose them to different rainwater harvesting techniques for their own benefit and adopting neighbors.

4.1 Rainwater harvesting techniques

4.1.1 Rainwater harvesting for domestic use

- Harvesting from house roofs
- Harvesting by *rain trap*
- Harvesting using *trickle tank*
- Harvesting using *sand tank*
- Collecting water on rocks



Photo No 4: Rainwater harvesting using trickle tank

4.1.2 Water harvesting for irrigation

- To facilitate infiltration of rainwater into the soil by constructing terraces or cover crops
- Collection of rainwater and directing it into gardens
- Directing water in rivers and streams into gardens

4.2 Advantages of rainwater harvesting

- Availability of clean water for domestic use in close proximity to residences at low cost
- Availability of water for livestock
- Improving pastures
- Increased crop production even in arid areas
- Enabling production of vegetables in dry season
- Increased farmers' income through sale of crops
- Controlling soil erosion
- Improved protection of the environment through tree planting
- Keeping of fish ponds

5.0 OTHER LESSONS

Participants were able to learn other things including:

- Construction of improved cow shed
- Keeping records and simple book keeping
- Bush planting of maize
- Agroforestry
- Construction of contours
- Allocation of land for pastures and crop production
- Building of improved residential houses

Participants were also able to share experiences in the use of traditional medicines in controlling livestock diseases and protecting grain against pests. They appreciated the importance of

involvement of the entire household in making development decisions.

6.0 CONCLUSION

In general participants learned many things related to agriculture and livestock. This influenced the choice of the title of the report "*Enhancing Agricultural Development*" which the editors labored a bit to adopt. Seeing is believing. Participants seemed particularly to be impressed by Mrs Huruma Mhapa who has demonstrated real change in various avenues of agriculture through adoption of technologies learned during similar visits or forums organized by TARP-II SUA Project. This lady throws a challenge to farmers, VEOs and researchers that visit her. She receives many visitors, individually or in groups.

Several farmers spend money and time preparing land, buying and planting seed, but they end up failing to weed larger portions of their farms, leading to gross wastage of resources. The use of ADP seems to be a practical solution to this problem since farmers will now be able to till a large area and weed within the season.

We hope that farmers will benefit from what they have seen, and readers of this report will be stimulated to adopt progressive agricultural techniques at different levels and eventually achieve food security and improved household income for the development of the Tanzanian farmer.

7.0 ANNEXES

ANNEX A: LIST OF PARTICIPANTS

No	JINA	Sex	Occupation	Village	Ward	Address
1	Elina Issowe.	Female	VEO	Lubungo	Mikese	Box 747 Morogoro
2	Mjema Mweta, W.J.	Male	VEO	Korogwe	Korogwe	Box 172 Korogwe
3	Ramadhani S.Kiboko	Male	VEO	Media Centre	Mbeya	Box 57 Mbeya
4	Renato Makafu	Male	VEO	Makambako	Makambako	Box 664, Makambako
5	Aloisi S. Mwanyika	Male	Farmer	Uwemba	Uwemba	Box 54 Uwemba, Njombe
6	Alphonse Kabume	Male	Farmer	Mwakaganga	Ubaruku	Box 35 Rujewa, Mbeya
7	Atwidiche Ngewe	Female	Farmer	Malinzanga	Mlowa	Box 642 Mlowa Iringa
8	Chrisanti A. Kalotu	Male	Farmer	Katonto	Kaengesa	Box 34 Kaengesa Sumbawanga
9	Davidina Kabume	Female	Farmer	Mwakaganga	Ubaruku	Rujewa, Mbeya
10	Donatus W. Mwageni	Male	Farmer	Uwemba	Uwemba	Box 54 Uwemba, Njombe
12	Gerald E. Singano	Male	Farmer	Kihitu	Vuga	Box 25 Soni Tanga
13	Hamisi Haridi,	Male	Farmer	Mtakanini	Msindo	Box 897 Namtumbo
14	Hamisi Palango	Male	Farmer	Kengo	Yombo	Box 94 Bagamoyo
15	Japheti Kagusa	Male	Farmer	Nsemlwa	Nsemlwa	Box 42 Mpanda
16	Joseph Ole Mameo	Male	Farmer	Magindu	Magindu	Box 30180 Kibaha
17	Mary Damas	Female	Farmer	Misunkumilo	Mpanda	Box 1 Mpanda
18	Mary Fabiani Mapunda	Female	Farmer	Peramiho	Maposeni	Box 201 Songea
19	Minael E. Mduma	Female	Farmer	Kabuku	Mgambo	Box 19 Kabuku,

20	Mohamed A. Mbega	Male	Farmer	Lubungo	Mikese	Korogwe S/M Muungano Box 610 Mikese, Morogoro
21	Norbeti Morisoni	Male	Farmer	Malinzanga	Mlowa	Box 642 Mlowa Iringa
22	Patrick V. Mahimbo	Male	Farmer	Majani mapana	Mgambo	c/o R.C. Kabuku Box 61 Korogwe
23	Petro Malila	Male	Farmer	Mwakibete	Mwakibete	Box 2230 Mbeya
24	Yusta Lyela	Female	Farmer	Katonto	Kacngesa	Box 34 Kaengesa, Sumbawanga
25	Aboud A.O	Male	Rescarcher	SUA	SUA	Box 3004, Morogoro
26	Akwilin JP Tarimo	Male	Researcher	SUA	Morogoro	Box 3035 Morogoro Simu 0744 477790
27	Elimpaa D.Y. Kiranga	Male	Rescarcher	Ari-Uyole	Mbeya	Box 400 Mbeya
28	Emmanuel Batamuzi	Male	Researcher	SUA	Morogoro	Box 3020 Morogoro
29	Joyce Lyimo-Macha	Female	Researcher	SUA	Morogoro	Box 3044 Morogoro
30	Philemon Kawamala	Male	Rescarcher	Ari-mikocheni	Dar	Box 6226 Dar es Salaam
31	Rogers E Malimbwi	Mc	Researcher	SUA	Morogoro	Box 3013 Morogoro

ANNEX B. FARMERS' PLEDGES

No	JINA	PLEDGE
1	Aboud A.O	<ol style="list-style-type: none"> 1. I will organize farmers from Kisilo and Mayale to visit Ibumila village to learn manure and pasture management 2. I will build a tank to harvest rainwater
2	Aloisi S. Mwanyika	<ol style="list-style-type: none"> 1. I will practice proper manure management techniques and use it 2. I will keep draft animals
3	Alphonse Kabume	<ol style="list-style-type: none"> 1. Manure management 2. Improve standard of living includes building better houses and protection of the environment 3. I will keep draft animals
4	Atwidiche Ngewe	<ol style="list-style-type: none"> 1. I will plant maize using recommended techniques 2. I will practice proper manure management techniques and use it 3. I will organize a farmers group and teach them what I have learned from the tour
5	Chrisanti A. Kalotu	<ol style="list-style-type: none"> 1. Manure management and ADP 2. I will use the manure during planting 3. Maize bush farming 4. I will organize farmers group and practice modern agricultural techniques.
6	Davidina kabume	<ol style="list-style-type: none"> 1. Maize bush farming 2. I will keep any type of livestock depending on my financial ability 3. Practice ADP
7	Donatus W. Mwangeni	<ol style="list-style-type: none"> 1. I will practice proper manure management techniques and use it 2. Practice ADP 3. Use cow urine as fertilizer
8	E.D.Y. Kiranga	<ol style="list-style-type: none"> 1. Train VOEs and farmers using video tape 2. Collaborate with researchers to organize such visit 3. I will tell researchers on the the importance of such visits
9	Elina Issowe	<ol style="list-style-type: none"> 1. Collaborate with village management to clean office surroundings 2. Sensitize farmers to harvest rainwater 3. Sensitize farmers in sloppy areas to use contours or terraces.

		<ol style="list-style-type: none"> 4. I will sensitize dairy goat keeping for a start in order to get manure 5. Advise farmers to use Jab Planter to simplify maize and rice planting
10	Gerald E. Singano	<ol style="list-style-type: none"> 1. Plant maize and beans using techniques learned 2. Plant and manage fodder 3. Modern cow shed 4. Advise fellow villagers to protect water sources
11	Hamisi Haridi,	<ol style="list-style-type: none"> 1. Use ADP 2. Build modern house 3. I will practice proper manure management techniques and use it
12	Hamisi Palango	<ol style="list-style-type: none"> 1. Improved cow shed 2. I will practice proper manure management techniques and use it
13	Japheti Kagusa	<ol style="list-style-type: none"> 1. I will practice proper manure (including swine manure) management techniques and use it 2. Make a cow shed 3. Collaborate with my friends to harvest rainwater
14	Joseph Ole Mameo	<ol style="list-style-type: none"> 1. Use of ADP 2. Modern livestock keeping 3. I will practice proper manure management techniques and use it 4. Bush maize farming 5. Practice ADP 6. I will practice proper manure management techniques and use it
15	Mary Damas	<ol style="list-style-type: none"> 1. Plant rice 2. Keep goats and chicken 3. I will practice proper manure management techniques and use it
16	Mary Fabiani Mapunda	<ol style="list-style-type: none"> 1. I will practice proper manure management techniques and use it 2. Plant Irish potatoes 3. Modernize my house
17	Minael E. Mduma	<ol style="list-style-type: none"> 1. Build water harvesting tank 2. I will practice proper manure management techniques and use it 3. Sensitize farmers to adopt modern technologies including use of ADP
18	Mjema mweta, W.J.	<ol style="list-style-type: none"> 1. Bush maize farming 2. Cover crops

		3. Use of manure in farming
19	Mohamed A. Mbega	1. Improve my house and its environment and convince neighbors to emulate 2. Follow expert advise in farming 3. Keep chicken and goats to get income
20	Norbeti Morisoni	1. Organize farmer groups and practice ADP 2003 – 2004 2. Use modern ways of keeping cattle and manure management 3. To be an example in bush maize farming
21	Patrick V. Mahimbo	1. Water harvesting structure 2. Train oxen for ADP, which I already have 3. Improve up keep of animals as I have learned in the visit
22	Petro Malila	1. Keep dairy cattle 2. I will practice proper manure management techniques and use it 3. Use the manure in maize farming
23	Philemon Kawamala	1. Train farmers on cover crops 2. Promote ADP after registration of groups 3. Train farmers on improved cow shed and use of manure 4. Train farmers how to construct terraces and plant fodder trees 5. Train farmers on bush maize planting
24	Ramadhani S. Kiboko	1. Rainwater harvesting from the roof 2. Use ADP in weeding in collaboration with Uyole researchers
25	Renato Makafu	1. Build cow shed for dairy cattle 2. I will practice proper manure management techniques and use it 3. ADP in my 2 acre 4. To train 5 farmers on - Improved cow shed - Improve fodder by making hay
26	Yusta Lyela	1. Bush maize farming 2. Modern farming techniques 3. Use of ADP