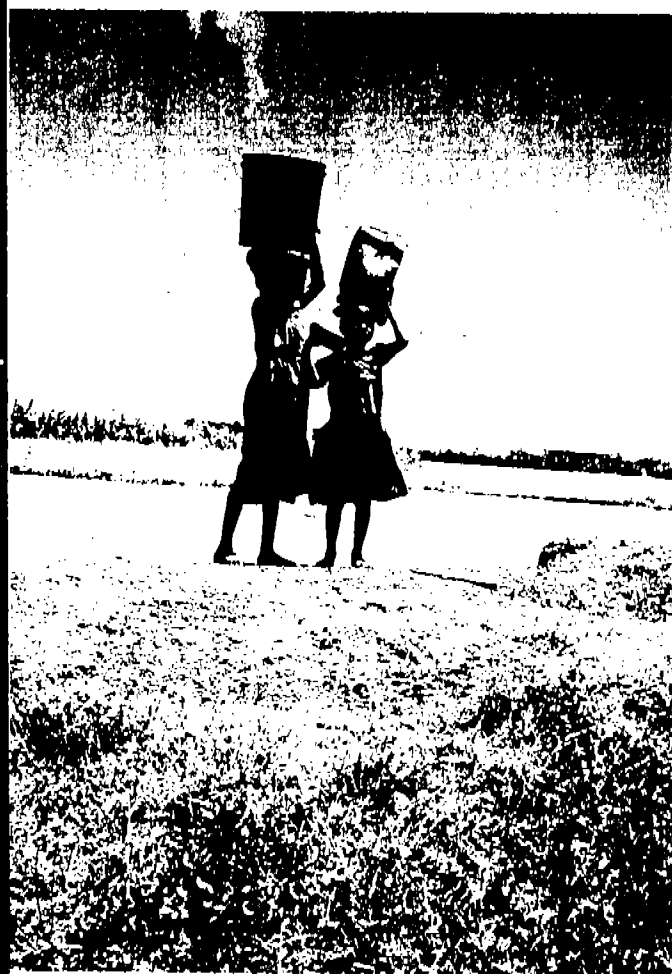


AGROTEC

PARTICIPATORY BASELINE STUDY

SMALLHOLDER TECHNOLOGICAL CONSTRAINTS IN SHINYANGA DISTRICT, TANZANIA

THE CASE OF BULAMBILA VILLAGE



by

**Nuhu Hatibu, PhD
Ngoyako A. Mtenga, MSc**

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EXECUTIVE SUMMARY

BACKGROUND

1. AGROTEC (Agricultural Operations Technology) was a regional project for small holders in East and Southern Africa. It was designed to increase the understanding on how agricultural engineering inputs (including labour) interact with other inputs in the biological-technical farming operations. It was also assessing infrastructural features in form of manufacturing, distribution and repair service which have to be present for the farming system to work. The project was started in 1989 with financial assistance from SIDA through UNDP/OPS and then FAO.
2. AGROTEC ended on 30th June 1996 and was superseded by a new project known as Farm-Level Applied Research Methods in East and Southern Africa (FARMESA). This project is designed to build on the work of AGROTEC and three other regional programmes which were operating separately in the Eastern and Southern Africa.
3. In preparation for FARMESA, AGROTEC decided that one of its final activities would be to initiate Participatory Baseline Studies on technology (especially engineering) requirements in the participating countries. The purpose was to study at least one representative smallholder farming location and establish at the "grass roots", farmers' needs and wishes in relation to improving/introducing technologies.
4. This study was therefore commissioned by the FAOR-Tanzania to undertake a PRA baseline study in villages which are representative of a wide agro-ecological zone. FAOR-Tanzania appointed a two-person study team composed of an agricultural engineer with specialist experience in rural development work and an extension expert with specialist experience in PRA methods, to implement the study.

SELECTION OF THE STUDY AREA

5. Tanzania mainland covers a land area of 881,300 km² while the islands cover 2,000 km². The mainland can be divided into three major physiographical categories:
 - The coastal plain covering 20% of the land;
 - The inland plateaux at 750 - 1,500 masl which is 60% of the land; and
 - Highland areas, around the periphery of the plateaux, with altitudes of 1,500 - 2,300 masl, which account for another 20% of the land.
6. Agriculture is the most important sector of the Tanzania's economy. It is estimated that there are about 3.7 million households (HH) involved in smallholder agriculture. More than 90% of the farmers cultivate less than 2 ha per household.

7. Most households in the rural areas of Tanzania are in general characterized by poverty attributes such as low returns to labour and low calorie consumption. For example, in the sorghum/millet farming system, calorie intake is as low as 1,500 kCal per capita.
8. Shinyanga region was selected for this study because it is located in the inland plateau zone. Further to this, reports have been written about the region in relation to high production of cotton, livestock and paddy rice along side reports which say "In Shinyanga the share of the population below the national poverty line is 91 percent". It was therefore an interesting case study.

METHODOLOGY

9. Secondary data was collected from four main sources; these were:
 - Ministry of Agriculture and FAO offices in Dar es Salaam
 - The National Agricultural Library at Sokoine University of Agriculture in Morogoro
 - Agriculture and Livestock offices in Shinyanga region and district
 - Projects and NGOs visited during the field work in Shinyanga.
10. The field work was carried out by staying in the village of Bulambila for twenty days, and using the following PRA tools and techniques:
 - Direct observations
 - Informal discussions
 - Focus group interviews
 - Gender analysis
 - Discussion with key informants
 - Questionnaire interviews.
11. A good amount of the information and data was gathered from working with key informants. This approach was chosen as it was realised that discussion with the whole village would not be possible for several reasons; namely:
 - Villagers were very busy with field work,
 - Dealing with too large a group would not be very productive, and
 - Keeping a large group motivated for the whole duration of the exercise would have been difficult.The techniques used to get information from key informants were construction of diagrams, ranking and group discussions.
12. A questionnaire was designed and used to survey 16 households selected randomly from a full list of 400 households. Due to cultural constraints the block leaders were reluctant to list households which fall under certain wealth ranks. In the end, all households were categorized only into three distinct wealth ranks namely, ownership of draft animals and plough (25%), non-ownership of draft animals and plough (70%) and female headed households (FHHH) (5%).

BULAMBILA VILLAGE

13. The study was conducted in Bulambila village which is located to the North of Shinyanga town at latitude 3°30' South, longitude 33°25' East and altitude of 1000 masl. The general topography of the village is relatively flat.
14. The soils are divided into two main types by the villagers. These are locally called mbuga (black cotton soil) which is estimated to occupy 60% of the land, and "magulia" (reddish sandy clay soil). There are very few remaining natural trees in the village, limited to baobab and acacia bushes.
15. The rainfall of the area varies between 600-1000 mm per year with poor distribution coupled with high evaporation rates of up to 2000 mm per year.
16. The inhabitants of the village are mainly Wasukuma, who are agro-pastoralists. It is estimated that the population of the village is 2,492 divided into about 400 households. The household size varies between 1 and 15 members with an average of 7. A high proportion of the household members are children under the age of 15 years, and the dependency ratio is 95%. The majority (95%) of the households are male headed.
17. Institutions found in the village are village government, primary school, religious centres and local police force (Sungusungu). This has been formed in the lake regions of Tanzania to fight cattle rustling. In Bulambila, the force has grown to be the most effective and respected institution. It was for example, ranked first among the villagers' most preferred channel for extension packages.
18. Generally, land of at least moderate quality is not a limiting factor to most of the households. Accessibility to land is through customary inheritance, and purchase system which provide land-use rights respected by all village members.

AGRICULTURAL PRODUCTION

19. Nearly 100% of the population of the study area depend on agricultural production for their livelihood, with equal emphasis put on both crops and livestock production.
20. The dominant aspects of the farming system can be summarized as follows:
 - Unfavourable rainfall is a serious limitation to both crop and livestock production.
 - The level of technological inputs is low and is a major constraint.
 - Agriculture is considered by many as the best method of production and nearly all young people remain in the rural areas and invest their labour in agriculture.

- Livestock management is based on extensive grazing. Due to shortage of pasture this requires movement of livestock to distant grazing areas, reducing productivity.
 - Use of draft animal power is widely spread, but is limited only to primary tillage operations and transport.
 - Most crops are grown on flat cultivated land, but ridges are used for sweet potatoes and where soil-water conservation is considered necessary.
 - Livestock are kept as a social security and their full production potential is not realised.
 - There is little integration of crop and livestock enterprises, which is limited to:
 - the use of draft animals
 - the use of income from sale of crops, to purchase livestock, especially heifers.
 There is very little use of manure or use of livestock income to invest in crop production.
 - Paddy rice production using rain-water harvesting techniques is becoming very important, and is rapidly replacing cotton as a cash crop for many farmers.
 - Crop and livestock pests and diseases are serious problems.
21. Thirty different crops are produced in the village. The leading crops in terms of acreage and volume are maize, cotton, sweet potatoes, yellowgram, sorghum, groundnuts, paddy, cowpeas and greengrams.
 22. The rainy season starts in mid October and ends in May. However, the cropping season runs nearly throughout the year. Labour demand in the village is low only during May and October.
 23. For most major crops, land preparation and sowing operations are carried out between October and December. Transplanting of paddy rice seedlings may extend to March depending on the season. Land preparation (ridge making) for sweet potatoes is usually done by women between December and April. Yellowgram is grown as a relay crop after maize, and normally no fresh land tillage is done.
 24. Weeding is the most labour intensive operation, and is normally carried out in the months of January to March.
 25. Most crops are harvested and processed at the same time during June to August; processing, storing and selling goes on until September.
 26. Shortage of farm power and absence of vegetation on crop fields towards the end of the dry season has led to adoption of a variety of tillage and sowing/ planting approaches, which include:
 - zero-tillage, on more than 70% of the cotton and maize fields
 - ploughing (with oxen or tractor) followed by pit sowing
 - broadcasting followed by ox-ploughing
 - Ploughing (with oxen or tractor) followed by broadcasting.

27. The Bulambila people like most of the Wasukuma, are agro-pastoralists, and thus livestock keeping is an important enterprise for the majority of the households. More than 70% of Bulambila villagers keep cattle, which are the most important livestock. The other animals kept in Bulambila are goats, sheep, donkey and poultry.
28. The use of fertilizers, both organic and inorganic, to enhance soil fertility was hardly mentioned by the villagers throughout the PRA study. However, the medium size owners keep the livestock in kraals at night, throughout the year. Therefore, a lot of manure accumulates but is never used on the farms.
29. The output of the livestock is low in the study area. For example, milk production varies between 1.0 -1.5 lt/cow/day during the wet season and almost nil during the peak of the dry season. The average live weight of cattle is between 200-250 kg.

HOUSEHOLD SOCIO-ECONOMY

30. Major sources of income for Bulambila village are from crops and livestock. Supplementary sources of income include:
 - Salary employment: mainly primary school teachers
 - Labourers
 - Kiosks: about four in the village
 - Crafts: tailors, masons, bicycle repairer
 - Traditional doctors
 - Local beer brewing.
31. Almost all houses are simple structures (locally called "tembe") which are made of mud-brick walls and mud flat roofs. Sisal poles are used for roofing to hold the mud in place.
32. The staple food of Wasukuma is Ugali (maize meal) served with green vegetables. Consumption of animal protein is very limited in Bulambila.
33. Agriculture is done by men and women almost on equal basis. However, sweet potatoes and cowpeas are strictly women crops. Almost all domestic work is done by women assisted by female children.
34. The political power is highly controlled by men, for example:
 - village government is composed of men only
 - all the ten cell block leaders are male
 - members of the school management committee are all men, and
 - of the five school teachers only one is a woman.

35. When asked to list the aspects which makes a household to be considered as wealthy, the villagers listed the following symbols in order of importance:
- i) Ownership of livestock mainly large herd of cattle
 - ii) Ownership of engineering technologies such as plough
 - iii) Having adequate quantity of food throughout the year
 - iv) Ownership of adequate land
 - v) Ownership of a charco-dam.

MAJOR SOCIO-ECONOMIC CONSTRAINTS

36. The villagers identified nine major problems/constraints facing them, and ranked them in order of importance as follows:
- i) Poor education/literacy status
 - ii) Poor health
 - iii) Shortage of clean domestic water supply
 - iv) Low production of crops, especially food crops
 - v) Poor quality of livestock
 - vi) Inadequate post-harvest crop handling and marketing
 - vii) Insecurity
 - viii) Land disputes
 - ix) shortage of firewood.

It can be seen that out of the nine major constraints, five belong to the social category.

EXISTING TECHNOLOGIES

37. There is a very high understanding of the benefits of tractor and draft animal power. The villagers are also sufficiently aware of the main constraints limiting farm power supply and availability. However, when power is available, it is only used for land preparation.
38. There is a general lack of exposure of farmers to implements for operations other than primary tillage.
39. Generally, available labour-saving technologies favour men in that, what are considered to be men's tasks are the first to be mechanized or when a woman's task is mechanized it is often taken over by men and a woman is pushed to another manual work.
40. Conventional irrigation is not used at all. However, rain water harvesting is being practised for paddy rice production. The practice of rain water harvesting and storage in charco-dams for human and stock water supply is an important and widely known technology in the study area. However, lack of troughs for watering the livestock is a major limitation in the operation of the charco-dams.

41. Agro-chemicals are only used in cotton and stored maize. However, often wrong types are used and sometimes are wrongly applied. Technologies for applying chemicals are poor and the farmers and consumers are over-exposed to poisoning hazards.
42. Animal draw-carts are used for transporting more than 70% of crops.
43. All primary processing of crops is done manually with high labour demand on women. Villagers were not aware of the different possibilities available for saving labour in primary processing. For example, not a single villager was aware of the existence of technologies such as the ram press.
44. Preservation of perishables (sweet potatoes and vegetables) to increase their shelf life is very advanced in the study area. However, no labour-saving equipment are used and packaging and storage is poor.
45. Storage is a well understood issue by most farmers and most use basket-like cribs constructed inside the store room. The main constraint mentioned by villagers is poor control of pests.
46. Technologies for the production, preservation and storage of fodder are not among the consideration of all livestock keepers. Feeding is largely constrained by the seasonality in the growth of pastures and fodder.
47. Engineering structures such as crushes and dips are largely missing in the study area and were mentioned as major constraints to livestock production. The main issues raised were related to construction, operation and maintenance costs.
48. The study team was surprised by the lack of cost-benefit analysis by livestock owners in relation to dips. The opportunity cost of livestock death is so high compared to the cost of dipping, that one wonders how can people who are cattle rich fail to effectively operate and maintain cattle dips.
49. The only priority areas mentioned by farmers outside crop and livestock enterprises; were Production of better soil blocks for housings and Improvement of sources of domestic energy supply, which is currently wholly dependent on firewood. Solar power technologies are not known in the study area.
50. Farmers access to Information is very limited and as a result they are not aware of many alternative technologies. The main reason is inadequacy of the extension service as well as biasness in the emphasis given by different programmes.
51. Video shows are now popular in the rural areas, but are only used for entertainment due to lack of good promotional and educational videos on technologies.

DRAFT RECOMMENDATIONS FOR FARMESA IN RELATION TO FARMERS' PRIORITIES

52. Management of Charco-dams and Water Reservoirs (Rain-Water Harvesting)

- i) Support the training of villagers in the design, construction, operation and maintenance of charco-dams, with greater emphasis on establishing strong grassroot institutions for dealing with water issues.
- ii) Produce training and extension materials, for example videos for promotion of rain-water harvesting and storage for domestic and stock supplies.
- iii) Support research to establish the basic data required for catchment and reservoir design and water use management.
- iv) Support on-farm research and development of evaporation control measures.

53. Improvement of Weed Control

- i) Generally support the project proposed in section 5.2.3.2.
- ii) Assist in promoting the use of donkeys in pulling weeders.
- iii) Assist private entrepreneurs to deal with tractor hire service and provision of back-up service for draft animal power systems
- iv) Assist in the training of extension workers and farmers on different aspects of draft animal power management and utilization.
- v) Encourage the use of kraal manure to control striga.

54. Improvement of Primary Processing and Preservation of Food

- i) Support an in-depth study on the processing and preservation of sweet potatoes and green vegetables to capture the indigenous knowledge which seems to be extremely rich.
- ii) Identify, test and adapt appropriate labour and energy saving technologies in the processing and preservation of sweet potatoes.
- iii) Assist in the improvement of shelf life of dried sweet potatoes (especially michembe) through storage and packaging facilities to reduce damage.
- iv) Assist to develop markets and marketing strategies for the dried sweet potatoes to increase sources of cash income for women.

55. Production of Housing Blocks

- i) Assist in the promotion of technologies for the production of stabilised-soil-blocks

56. Source of Domestic Energy

- i) Support the training of local people and establish grassroot experts for the design, construction and operation of bio-digesters.
- ii) Test and adapt solar powered systems.
- iii) Support the efforts of HASHI in order to achieve optimum crop-livestock-trees integration.

57. Control of Crop Damage

- i) In general collaborate with MOA/GTZ IPM project.
- ii) Investigate engineering techniques for bird scaring on paddy rice.

58. Soil Fertility Management

- i) Collaborate with FAO Plant Nutrition Programme and specifically intervene in the transportation of kraal manure

59. Processing of Milk

- i) Milk is the only regular product from livestock and an important component of the diet of the population. Therefore, assist in exploring opportunities for the improvement of preparation and preservation of yogurt.

60. Vegetable Oil Processing

- i) Assist in the promotion of edible oil-seed processing technologies such as the ram press.
- ii) Support the use of by-product cake for livestock feeds.

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