

CONTRIBUTION OF THE CILCA TANZANIA VILLAGE LEVEL FOOD PRODUCTION PROJECT TO INCREASED CROP YIELDS IN MBOZI DISTRICT

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ABSTRACT

The Tanzania Village Level Food Production Project is a rural development project in Mbozi District of Mbeya Region, in the Southern Highlands of Tanzania. It is co-ordinated by the International Liaison Committee for Food Crops (CILCA) and operates in the Ministry of Agriculture under the guidance of Uyole Agricultural Centre (UAC). It began in 12 villages in 1982/83, with the aim of reducing the hunger and poverty of low income farmers. To achieve these objectives, the project organized the farmers to work on those problems affecting crop production and economic growth. Training became the key element, backed up by research activities. The project has conducted several training courses for project staff, extension agents (Liaison Officers) and selected farmers (Village Animators). Numerous small scale crop research trials and demonstrations have been initiated in order to develop and refine production packages. These have been followed by large scale production demonstrations on communally owned farms, to show the production potential of maize, beans and potatoes and the use of animals in agriculture. Achievements of the project so far have been considerable, with substantial increases in the adoption of improved production practices leading to greatly increased yields of maize, beans and potatoes.

INTRODUCTION

In the late 1970s and early 1980s, Tanzanian agriculture was characterized by poor productivity and occasional food shortages. Yet during the same period crop research conducted across the country showed that high yields of maize, soyabeans and cassava were possible with the help of low cost inputs and appropriate technology. Bolton (1971) and Croon *et al.* (1984) showed that maize responded positively to fertilizers, improved cultural practices and seed selection. High plant populations up to a certain level can increase maize yields per unit area. However, to produce high crop populations requires a substantial amount of seed which the majority of small farmers cannot afford unless given assistance. The Tanzania Village Level Food Production Project, is committed to assisting low income farmers by working with them on income generating activities and self-help programmes. It is based on the experiences of the Plan Pueblo of Mexico and the Sarvodaya Shramadana Movement of Sri Lanka.

Plan Pueblo emphasizes the adaptation of agricultural technology to the needs of farmers in specified locations, through research programmes conducted in farmers' fields and the coordinated efforts of researchers and farmers in developing and disseminating improved production techniques. The Sarvodaya Shramadana Movement, on the other hand, directs its efforts towards mobilizing farmers on voluntary self help initiatives. Plan Pueblo and the Sarvodaya Movement work with national programmes, so that each participating country makes its own plans to meet its national requirements.

In Tanzania, the Village Level Food Production Project has the aims of improving crop productivity and increasing farmer income. It operates in Mbozi District in particular in Songwe, Iyula, Igunda, Idiwili, Nyimbili, Isangu, Mbimba, Wasa, Halungu, Itepula Chapwa and Kakozi. In more detail, the main objectives are:

1. to improve farm productivity and yield;
2. to encourage and support the participation of women development activities;
3. to strengthen the existing relationships between researchers, extension agents and farmers;
4. to provide practical training for project personnel and farmers;
5. to increase the number of on-farm research trials and demonstrations, in order to up-date farmers' skills and knowledge, and to develop location-specific recommendations for improved production practices.

Efforts over the past ten years in the project area have shown positive results in terms of increased crop yields, farmers income and awareness of improved production practices. The participation of women in development activities has also increased in most of the villages.

In this paper, achievements of the project's activities area discussed, concentrating first on the training programmes and then on the activities for increasing food production (research and demonstrations, mechanization, and encouraging increased potato production, and the adoption of improved production practices).

TRAINING PROGRAMME

Between 1982 and 1991, the project sent the first four Project Servicing Unit (PSU) staff to Mexico to study the philosophy of the Comité International de Liaison du Corps pour l'Alimentation (International Liaison Committee for Food Crops, CILCA) International and Working Methodology, by examining the experiences of Plan Pueblo. In 1986, two newly recruited PSUs and a women's liaison officer went to Sri Lanka to study rural development programmes as experienced by the Sarvodaya Shramadana Movement.

In 1985, four PSU, two farmers and six liaison officers visited the Wedza Project in Zimbabwe, examining various animal-drawn implements and the use of animal power in general. In 1988, the project sent two Agricultural Engineers, two PSUs, and two liaison officers together with ten farmers, to see the various uses of animal power in agriculture in Njombe. During these visits the farmers and staff were exposed to the different methods of crop production in the Southern Highlands, and had the chance to exchange views with their fellow farmers and officials.

In addition to these visits, the project implemented intensive local training for over 60 village animators, ten liaison officers and numerous farmers.

The training programmes are continuing to up-date the skills and knowledge of extension agents and farmers. The benefits of the training programmes are numerous. They have helped farmers to participate more fully in the implementation of project activities and to gain a better understanding of the aims. They have facilitated to rapid transfer of improved production techniques from research stations to the rural community. The training of village animators and extension staff liaison officers has strengthened the relationship between research scientists, extension workers and the target group of farmers. Communication between farmers, extension agents and researchers has been much enhanced. To a limited extent, training has help liberate women from the drudgery of field work and the constraints of domestic taboos.

So far the project has two female liaison officers and three female village animators, and many other women play a leading role in their respective farmer groups. Two of the farmer groups are purely for women.

INCREASING FOOD PRODUCTION

Research and demonstration activities

Research in the context of the CILCA project means trials conducted in farmers' fields with the full participation of farmers and extension agents. Most of these trials are designed to test the various recommended crop production practices. Between 1983 and 1991 the project conducted over 200 maize and beans trials, and 150 potato trials, over the entire project area. Results of the maize trials and demonstrations are shown in Tables 1-3. The results were used to refine recommendations on varieties and fertilizer rates for maize.

Table 1. Yield response of maize varieties (t ha⁻¹) to different levels of nitrogen and phosphorus (kg ha⁻¹) in four of the project villages, 1983/84-1984/85

N	P	Variety	Idiwili		Iyula		Wasa		Itepula	
			83/84	84/85	83/84	84/85	83/84	84/85	83/84	84/85
		H614	3.75	3.25	5.37	4.81	0.91	1.52	5.37	2.45
0	0	H614	4.30	5.74	4.91	5.49	4.76	2.68	6.92	3.90
120	0	H614	4.29	4.29	5.30	4.19	2.09	2.38	4.15	1.67
0	60	H614	7.46	6.79	7.39	5.41	5.71	4.04	7.32	3.76
60	60	H614	5.99	7.44	6.48	4.40	4.49	3.12	6.78	3.30
120	30	H614	5.23	5.98	6.66	4.64	5.82	3.80	6.59	3.30
120	60	UAC	5.64	2.75	5.75	5.47	5.16	4.38	6.72	3.07
120	60	H6302	4.34	4.96	6.31	5.21	5.40	4.23	6.71	4.24
		Mean	5.13	5.15	6.02	4.95	4.29	3.27	3.83	
		LSD (P<0.05)	1.89	1.43	2.68	2.36	1.15	1.48	3.83	1.27

Table 2. Response of maize yield (t ha⁻¹) to two common nitrogen sources; calcium ammonian nitrate (CAN) and Urea (with blanket application of 60 Kg P₂O₅ ha⁻¹) in six of the project villages (maize variety shown in parentheses)

Variety	Songwe (UCA)	Iyula (H6302)	Igunda (H61402)	Nyimbili (H6302)	Idiwili (H6302)	Chapwa (UCA)
No N	3.53	6.13	3.64	2.63	2.27	2.64
Urea (kg ha ⁻¹)						
40	4.78	6.76	3.24	4.13	2.47	3.66
80	4.46	6.02	4.78	3.10	3.30	3.90
120	4.87	6.69	5.15	3.60	2.57	4.14
CAN (kg ha ⁻¹)						
40	4.14	6.93	3.73	3.57	3.17	3.90
80	4.55	6.99	3.68	3.13	3.33	4.50
120	5.83	7.36	4.71	3.30	4.10	4.77
Mean	4.61	6.70	4.13	3.27	3.03	4.02
CV (%)	24.49	15.91	22.16	31.97	20.74	15.68

Table 3. Yields of maize (t ha⁻¹) from farmer managed demonstration plots in six of the project villages (mean of two years, maize variety shown in parentheses)

	Igunda (H6302)	Mbimba (H6302)	Chapwa (UAC)	Wasa (H6302)	Nyimbili (H6302)	Iyula (H6302)
Farmer 1	2.52	2.46	2.46	2.46	3.44	3.40
2	4.97	2.46	2.46	2.46	2.46	5.20
3	4.73	3.93	1.47	4.66	2.46	5.70
4	2.21	4.91	1.96	6.38	1.96	6.30
5	2.70	4.42	2.95	5.16	1.72	4.10
6	4.17	4.91	1.96	3.93	1.47	5.50
7	2.70	6.14	1.96	3.19	1.47	7.00
8	1.23	6.14	2.14	4.42	2.46	6.20
9	4.17	2.46	1.96	6.14	1.96	4.50
Mean	2.94	4.30	2.21	4.40	2.19	5.17

Adoption of improved production practices for beans has been slow, so that yields of beans are still only moderate. In view of this, the project is actively working on testing suitable varieties, appropriate cultural practices and improved weed and pest control. Special attention is being given to field trials comparing the production of beans on ridges (the traditional practice) with planting on flat beds. Ridging is said to have several advantages: it is said to be the most economical means of maintaining soil productivity, to contribute to reducing soil erosion, to be a way of maintaining soil moisture, and to make the crops less prone to diseases and pests. On the other hand, ridging is labour intensive and wasteful of land and seeds. Flat beds are better suited to mechanized agriculture and facilitate field operations such as weeding and spraying. Results of the trial comparing ridges and flat-beds are presented in Tables 4 and 5; only in Chapwa in 1989/90 were the differences in yields between the treatments significant. Yields in the 1989/90 trials were generally poor, because of infestation with bean fly, late planting and late harvesting.

Mechanization

Poor weed management and the use of unsuitable cultivation implements have been singled out as the major factors limiting crop yield in the project area, particularly for maize and beans. In view of the potential advantages of animal traction together with the abundance of cattle and forage in the area the project gave top priority to determining how to achieve greater use of animal power, and to the selection of appropriate implements. In collaboration with the Uyole Agricultural Centre (UAC) and the Mbeya Oxenization Programme (MOP), the project team organized more than 30 trials and 25 demonstration in farmers' fields. A range of implements were tested for their suitability and the farmers' approval. Training of farmers in the use of animal traction was intensified in all the villages.

Table 4. Comparison of the use of ridges and flat beds, at two rates of phosphorus fertilizer application (kg P₂O₅ ha⁻¹) on the yield (kg ha⁻¹) of beans (variety Kabanima) in three of the project villages, 1988/89

	P ₂ O ₅	Iyula	Igunda	Chapwa
Ridges	60	1255	1706	574
Ridges	120	1492	1785	500
Flat bed	60	1442	1485	563
Flat bed	120	1525	1417	537
Mean		1428	1598	544
LSD (P<0.05)		NS	NS	NS
CV (%)		5.0	17.0	15.0

NS, not significant.

Table 5. Comparison of the use of ridges and flat beds, at three rates of phosphorus fertilizer application (kg P₂O₅ ha⁻¹) on the yield (kg ha⁻¹) of beans (variety Kabanima) in two of the project villages, 1989/90

	P ₂ O ₅	Iyula	Chapwa
Flat bed	0	233	67
Flat bed	30	490	263
Flat bed	60	623	97
Flat bed	90	490	343
Ridges	0	190	375
Ridges	30	447	247
Ridges	60	553	350
Ridges	90	713	387
Trad. ridges	0	210	273
Mean		470	270
LSD (P<0.05)		NS	0.27
CV (%)		33.47	64.03

NS, not significant.

The results of these efforts in terms of maize yields, labour inputs and operational costs are shown in Tables 6-8. Preliminary results indicate that in economic terms, the best weed control practice for maize is to cultivate the crop with an inter-row cultivator assisted by hand weeding between plants. In potatoes, the inter-row cultivator can be used at the first weeding, before the ox-drawn ridgers. Ox-carts with pneumatics tyres have been recommended for the project area. Animal power programmes are progressing successfully in nine villages, where the adoption rate has reached 30%.

Potato Production

Mbozi district, which used to be mainly a maize and bean growing area, has now started to produce potatoes, adding to the production of staple foods. Apart from its monetary value, the crop has a high food value, a short growing period, and a low cost of production. Research efforts in the project have shown that the crop can successfully be grown in the higher parts of the district (at Iyula, Igunda, Wasa, Mbimba, Isangu, Nyimbili and Itepula). Results from the 1988/89 and 1989/90 trials are shown in Tables 9 and 10. In monetary terms, the selected villages in 1988/89 were able to obtain about 40,000 TSh from sales from the demonstration plots. Yields at Idiwili were reduced by low temperatures, eroded soils, low soil phosphate content and poor management of the trials. Weeding and earthing up were not done on time. Yields at Nyimbili were poor because part of the crop was harvested before the recommended time.

Table 6. Yield of maize (t ha⁻¹) under different weeding systems in three of the project villages

	Mbimba	Nyimbili	Iyula	Mean
1 Hand hoe at a maize height of 10-15, 45 and 90 cm	7.60	4.50	7.60	6.90
2 MOP cultivator at 10-15, 25, 45 and 90 cm	5.40	2.85	7.50	5.25
3 MOP cultivator at 10-15 and 45 cm, ridged at 90 cm	5.15	3.45	5.75	4.78
4 MOP cultivator at 10-15 cm followed by hand hoe, MOP cultivator at 45 cm followed by hand hoe, ridged at 90 cm	8.25	3.45	9.70	7.13
5 Consul cultivator at 10, 25, and 45 cm	5.20	3.15	5.70	4.68
6 Consul cultivator at 10-15 and 45 cm, ridging at 90 cm	4.55	4.75	5.95	5.08
7 Consul cultivator 10-15 cm followed by hand hoe, consul cultivator at 45 cm, hand hoe and ridging at 90 cm.	7.30	3.00	9.20	6.50
8 Hand hoe at 35-40 cm and at 90 cm	6.80	3.45	7.65	5.97
Mean	6.28	3.58	7.38	5.75
LSD (P<0.05)	NS	NS	NS	NS

Table 7. Labour input (h ha⁻¹) by ox-operators (two people per team), and manual weeders, ox-team, and for the total operation, in different weeding systems

Weeding system ¹	Ox-operator	Manual weeders	Ox-team	Total operation
1	-	220.7	-	220.7
2	50.0	-	25.0	25.0
3	44.4	105.6	22.2	120.8
4	49.8	105.6	24.9	130.5
5	55.4	-	27.7	27.7
6	49.8	-	24.9	24.9
7	52.6	92.9	26.3	119.2
8	166.0	166.0	-	166.0

¹Weeding systems 1-8, as in Table 6.

Table 8. Operational costs involved in weeding for different weeding systems

Weeding system ¹	Manual weeders (h ha ⁻¹)	Ox-team (h ha ⁻¹)	Cost of using implement (TSh ha ⁻¹)	Cost of labour (TSh ha ⁻¹)	Total cost (TSh ha ⁻¹)
1	321.7	-	72	2895	296
2	-	21.5	1290	-	1290
3	-	22.8	1350	-	1350
4	-	21.8	1374	-	1374
5	-	22.9	1374	-	1374
6	23.7	23.7	1422	1144	2422
7	127.1	24.7	1554	1144	2698
8	209.4	-	72	1885	1957

¹Weeding systems 1-8, as in Table 6.

Table 9. Yield of potatoes (t ha⁻¹) from trial plots in five project villages in 1987/1988

	Yield
Iyula	9.3
Igunda	28.9
Mbimba	8.3
Wasa	14.4
Nyimbili	7.0
Mean	13.6

Adoption of improved production practices

Adoption of improved production practices has been successful in the case of the maize, bean and potato crops, as indicated in the evaluation reports of 1986 and 1988/89. There has been an overall increase of 300% in the yields of maize, 200% in potatoes and 150-200% in beans, as shown in Table 11.

Table 10. Yield of Potatoes (t ha⁻¹) with different rates of N and P₂O₅ application (kg ha⁻¹) in three of the project villages

N	P ₂ O ₅	Iyula	Idiwili	Igunda
0	0	5.56	1.79	3.58
0	60	6.17	14.90	6.47
0	90	13.15	2.65	7.42
60	0	6.91	4.84	5.53
60	60	12.40	10.72	7.53
60	90	12.90	5.74	10.00
100	0	8.64	3.77	7.00
100	60	9.75	4.20	7.62
100	90	14.44	5.79	10.84
Mean		9.99	3.78	6.74
LSD (P<0.05)		7.14	3.46	4.52

Table 11. Comparison of farmers' yields (t ha⁻¹) in 1982/83 and 1988/89

	1982/83	1988/89
Maize	0.5-1.0	2.5-4.5
Beans	0.25-0.5	1.5-2.5
Potatoes	3.5	10-25

Other successful outcomes

Mobilization of farmers into farmer groups has begun. So far, there is one group in each of the 12 project villages. Women have been helped to participate fully in development programmes. The project has distributed ox-carts to seven of the villages. Ridgers, inter-row cultivators and ploughs have been sent to all the areas where the project operates.

CONCLUSION

Although the activities of the project, together with the activities other people in the area, have been successful in increasing food surpluses both in the project area and in the district as whole, more work is needed to assist farmers to increase their income. Farmers' incomes are still rather low, resulting in low standards of living. Income generating activities will be emphasized in future, and commercial mechanisms for assistance from financial institutions will be established and intensified. We hope that by the means of the consolidated efforts of scientists and farmers, the life of rural communities can be further improved.

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