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AN EVALUATION OF THE PROGRESS OF THE
NATIONAL MAIZE PROJECT
AT THE END OF ONE CROPPING SEASON
IN MOROGORO AND ARUSHA REGIONS

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An Evaluation of the Progress of the National Maize Project
at the End of One Cropping Season in Morogoro and Arusha Regions

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The National Maize Plan (NMP) appears to be handling the logistical problem of supplying villages with inputs in a reasonably organized and efficient way. The program was successful in teaching farmers about good maize production practices. However, in both conception and implementation the program suffers from some critical flaws. At no point in the program is serious consideration given to developing a local capacity to continue the project functions. As it now operates the project reinforces a pattern of passive village dependency on the government. The problems connected with paying for inputs should be carefully reviewed. This includes the economic return to inputs at unsubsidized prices, the extension of credit, and improving the transport and marketing systems. Local people and local conditions must be included as a central consideration of the project. Recommendations made to farmers must be locally appropriate. Package sales must be locally evaluated. The local need for credit should be evaluated. The extension effort should be adopted to local conditions. Local people must be involved in the planning and operation of the project. Unless these things are done, NMP will be just another oneshot bandaid project which contributed little or nothing to development.

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Introduction

In 1973 the production of maize, the main food crop in Tanzania, fell to such a low level that massive imports of grain were required. In response to the drain on foreign currency which these imports produced, a national maize production campaign, was launched. This campaign, popularly known as "kilimo cha kufa na kupona" (life and death agriculture), included required minimum acreages of maize and free distribution of improved seeds, fertilizer, insecticide and herbicide.

In 1975, with the assistance of IDA/IRBD and USAID, the National Maize Project was begun. A continuation of earlier production stimulation efforts, the aim of the project was to make Tanzania self sufficient in maize production by 1980 by increasing small farmer maize production. This in turn, it was assumed, would improve the welfare of small farmers. It was estimated that the project would increase family income by an average of US \$ 47 per year at full development.

The project consisted of supplying production packages including subsidized inputs and strengthening supporting services. The project was to be placed in the better maize producing areas where average yield was estimated to be 1100 kg/hectare compared to the national average of 750 kg/hectare. The project production packages were expected to increase yield as follows:

Package 1 consisted of extension efforts to improve time and density of planting, use of improved seed, pest control and improved weeding. Yields were expected to rise to 1500kg/hectare with the adoption of package 1. After attaining yields of about 1500 kg/hectare, villages were to be eligible for package 2.

Package 2 consisted of the provision of the equivalent of 50 kg/hectare of triple super phosphate (TSP) and 100 kg/hectare of sulfate of ammonia (SA). Yields were expected to rise to 2200 kg/hectare with the successful adoption of package 2.

Package 3, to be instituted in high potential maize areas, consisted of 150 kg/hectare of SA and the use of hybrid rather than composite maize in most cases. Yields were expected to rise to 2700 kg/hectare with the successful adoption of package 3.

In addition to the provision of subsidized inputs, the project was to supply support services as follows:

1) Extension

- a) Provide one resident extension worker per village provided with adequate transport and extension aids. Two demonstration plots were to be planted in each project village.
- b) Provide special staff training on maize production.
- c) Provision of a mobile film unit for each project region.
- d) Increased printing and distribution of Ukilima wa Kisasa the agricultural newspaper.

- e) Preparation and distribution of maize production leaflets.
- 2) Transport. Provide transport at the regional level to ensure timely delivery of farm inputs and maize marketing.
- 3) Storage. Construct farm input and maize stores at project villages and regional locations.

This report is an evaluation of general project operations and its village level impact in Arusha and Morogoro Regions at the end of one cropping season.

Methods

This research was carried out in 9 program villages and 3 control villages in Morogoro Region and 12 program villages and 3 control villages in Arusha Region. The sample villages include the predominant agro-climatic zones and a proportional sample of program stages in each district. Descriptions of the sample villages can be found in Appendix A.

Data were collected by male university students who lived in the villages for three weeks. The Kiswahili questionnaires and their translations are available on request from USAID/Tanzania in Dar es Salam.

Data on village infrastructure for 24 project villages and 8 control villages were collected using a community checklist filled out by observation or with community residents. These data were combined into a Guttman scale of commercial differentiation using a program written by Dr. Carolyn Nolan, Dept of Rural Sociology, Cornell University modified by the Computer Division, Dept. of Statistics, Malaysia.

The following scale was obtained:

<u>Scale Step</u>	<u>Item</u>
1	Duka (small shop)
2	Tailor
3	Maize Mill
4	Pombe (local beer) shop
5	Butcher
6	More than 3 dukas
7	Tea shop
8	Market in the village
9	Beer bar
10	Hotel
11	Petrol pump

Coefficient of scalability 0.710.

Coefficient of reproducibility 0.922.

The extension agent (Bwana Shamba) was to be interviewed in each village. Because some villages shared the same Bwana Shamba and others had no Bwana Shamba at all, only 20

interviews were obtained. The Bwana Shamba was also asked to supply records on the arrival and distribution of project inputs. As is the case with most records kept at the village level, these were not always of the best quality. Figures on quantity and sales of inputs should be taken as estimates only. In depth research on the activities of the extension service in Morogoro Region was undertaken by Faculty of Agriculture Students just prior to this survey. Their reports are available from USAID/Tanzania in Dar es Salam on request.

Field supervisors carried out informal interviews with National Maize Project District and Regional Staff.

Data on village cooperative maize farming were obtained from interviews with the village chairperson, secretary and three village agricultural or development committee members in each village. A panel approach was used as there is no one official who can be relied upon to give accurate information in every village. When village leaders gave different answers to the same question, the most frequent answer or an average of the answers was used depending on the nature of the question and the spread of the answers.

Data on individual farmers was collected from a stratified random sample of 485 farmers chosen from Bwana Shamba records and village membership lists. In control villages a sample of 10 males and 10 females was chosen. In program villages a sample of 10 purchasers and 10 non purchasers, each consisting of 5 males and 5 females was to be chosen. Because women were underrepresented in the program, it proved impossible to obtain a sample of purchasers comprised of 50 percent women. In villages in which the total number of female buyers was less than five, all female buyers were included in the sample. The remainder of the sample of 10 purchasers was comprised of males. In this way a sample of purchasers consisting of 37 percent females was drawn. The composition of the sample is presented in Table 1.

By its own definition, program success or failure will be measured by increases in yield and income and ultimately in national self sufficiency in maize production. Obviously the end of the first cropping season is far too early to establish any but the most preliminary indicators. In this survey both yield and income were measured by the farmers own estimate which was not particularly satisfactory. Estimating yield by field plot sample was hampered by the timing of the survey. In most places, some piecemeal harvesting had already begun. In some places the harvest was completed. Farmers, fearing jealous neighbours or potential taxes or desiring to cover smuggling activities, had no particular reason to be candid about their yield. Only in those areas where the crop was a total loss could yield estimates be said to be accurate.

Table 1. Composition of Farmer Sample by Sex and Purchase Status.

	Non - Purchasers		Purchasers	
	Male	Female	Male	Female
<u>Morogoro Region</u>	70	72	53	40
Kilosa District	27	29	23	21
Kilombero District	14	14	5	5
Morogoro District	29	29	25	14
<u>Arusha Region</u>	65	58	85	42
Hanang District	21	19	34	17
Mbulu District	20	19	26	14
Arumeru District	24	20	25	11
Total	135	130	138	82

Income statistics obtained from peasant producers are notoriously unreliable. For this reason farmers were asked which of a list of possessions they owned. The list included: tin roof, concrete floor, glass windows, bicycle, radio, clothes for special occasions, paraffin lamps, teapot, teacups, forks and spoons, clock, wristwatch, shoes, umbrella, flashlight (torch), and metal bed. Yearly additions to this list should provide some indication of positive changes in income. Its shortcoming is that it will not indicate decline in income due to the loss of a crop using purchased inputs. Hopefully such information could be obtained from farmers' complaints to interviewers.

Each farmer was asked if he/she knew what maize production practices were recommended by the Bwana Shamba and what practices he/she followed in his/her own shamba. With the assistance of National Maize Research Program staff a Good Maize Practices Scale was constructed. Weighted scores were given to recommended practices as follows:

observes recommended planting time	1	uses TSP at the recommended rate .	1
uses recommended seed	2	follows spacing recommendation	2
uses fertilizer or manure	1	uses insecticide	1
uses SA/CAN	1	uses recommended rate for stalk borer	1
uses TSP	1	uses recommended rate for army worm	1
uses SA/CAN at recommended rate	1	uses herbicides or weeds at least twice	2

Cutting points for adequate (Morogoro 5 points, Arusha 7 points) and excellent (Morogoro 8 points, Arusha 10 points) Levels of maize farming practice were set for these scores with the assistance of National Maize Research Program staff.

The score for knowledge of the Bwana Shamba's recommendations (knowledge score) was the number of recommendations the respondent was able to give correctly.

The score for contact with various sources of information about improved maize farming practices (Information Contact Score) was the number of indications of contact with sources of information by the respondent. The items indicating contact with these sources were : knows the Bwana Shamba's name, visited by the Bwana Shamba this year,

attended meeting called by the Bwana Shamba, attended farming demonstration, someone has discussed maize recommendations with respondent, knows of a maize demonstration plot in the village, listens to Mkulima wa Kisasa (radio program on modern agriculture), reads Ukulima wa Kisasa (Kilimo newspaper on modern farming), has seen a film on maize growing. Farmer data were analyzed controlling for region and sex. Dr. Peter Walker, International Centre for the Improvement of Wheat and Maize provided a computer program for doing t tests. Ms. Yildiz Akin, Pennsylvania State University Agricultural Experiment Station, provided computer programs for Spearman's Rho and multiple regression. A program for frequency runs was written by Mr. Valentine Kalindo, Ministry of Finance and Planning, United Republic of Tanzania.

Information on Iringa and Ruvuma Regions reported by project staff and outside observers has been included as part of the general information on program operations.

Description of Survey Areas.

Morogoro Region lies due west of Dar es Salam in the central area of the country. It is transversed by the new Uhuru Railway, the railway built by the Germans in 1905, and the paved east-west highway. The Uluguru Mountains around Morogoro town contain areas of high rainfall. The poor road network of this area which includes Mgeta, Luholole and Gozo villages poses a transportation problem. Msongozi village lies in the plains at the foot of the Ulugurus, adjoining Mikumi Game Park.

The hilly area in the northwest part of the Region (Kilosa District) has suffered from lack of sufficient rainfall for three years with some improvement this year. The government has provided famine relief to several villages in this area for the past two years. Wanani, Magubike and Chakwale villages are in this area. Mvumi and Zombo lie in the southern part of the district. Mvumi which was chosen as the best Ujama village in the region in 1972 grows part of its maize under irrigation.

Sonjo and Msolwa lie in the Kilombero floodplain, an area of high soil fertility. A Chinese aid team lives in Msolwa and has aided in teaching about good maize production. At the time of the survey, the village chairperson was experimenting in wheat production. Msolwa is also the site of a National Maize Research Program village trial.

Wami/Dakawa lies on the Wami floodplain. This year the village suffered extreme drought and most of the maize crops was lost.

There are two large commercial agricultural ventures in the area: the Kilombero Sugar Estate and processing plants and a series of Tanzania Sisal Corporation Estates in Kilosa District. In addition Tanzania Tobacco Company has a processing plant in Morogoro Town. Morogoro Town is the site of the Faculty of Agriculture. Pesticides are available

from Fisons Chemical Company. Ilonga Agricultural Research Institute is 6 miles from Kilosa. Two miles away is the Msimba Seed Farm which produces maize, bullrush millet, finger millet, sorghum, sesame and soy bean seed.

Cotton is grown as a cash crop in the region mostly on a small holder basis. In 1976 every family in the cotton areas of Kilosa District was required to produce one acre of the crop. Vegetables, sometimes grown under irrigation, are shipped for sale in Dar es Salam from the Mgeta area of the Uluguru Mountains.

Arusha Region lies on the northern border with Kenya. The region is famous for its game reserves (Lake Manyara, Ngorongoro Crater, Serengeti) and the nomadic Masai people. The north-west paved highway to Kenya runs through the eastern end of the region.

Arumeru District, including Samaria, Nshupu, Kikatiti, Kingori Kati and Kambia Chai, is a high rainfall, high potential area. Hanang District, including Gallapo, Endakiso, Masakta, Singe and Singino, was once inhabited by many European settlers. It has areas of reasonable rainfall although Endakiso and Gallapo lie on the edge of the plain area. Mbulu District, high on the escarpment, is considered a high rainfall, high potential area. Hasha, Titiwi, Mbulumbulu, Upper Kitete and Bashay/Karatu are included in this area. Hasha is toward the drier western end of the District. Upper Kitete was originally a highly capitalized wheat settlement scheme.

Maize, wheat, coffee and beans are grown as cash crops.

Arusha town is larger and more diverse than Morogoro town. Most agricultural supplies are readily available at the Tanganyika Farmers Association store in town. Arusha is the site of the East African Community administration. The Tengeru Agricultural Research Station is 12 miles out of town. The Arusha Seed Farm which produces wheat and maize seed lies about 12 miles from the opposite side of town.

General Program Operations

Choice of Villages

The project was originally to be placed in "villages in the best maize growing areas". Selection of villages, however, did not always adhere strictly to NMP criteria. Part of the problem was pressure resulting from the nature of the program which included the provision of subsidized inputs. An Iringa official expressed the dilemma. How, he said, can you say to 90 out of 400 villages, "you are in" and to the rest "you are out". In Ruvuma Region insistence that all areas get what others get has resulted in the addition of less suitable areas to the program. At the time of the Morogoro survey one district official speculated that one entire division might have to be dropped from the program due to bad weather (in the end they were not). While weather is always unpredictable, inclusion of villages which had suffered drought for 3 years seems

somewhat dubious. At the same time as the NMP was being instituted, residents of some villages were demanding that they be given drought tolerant crops such as bullrush millet and cassava.

Since the loss of an NMP crop means a financial loss to peasant producers who live on the margin as it is, choice of villages should be made as closely as possible according to program criteria. The crop was a complete or nearly complete loss in 3 of the 21 sample project villages this year. In at least two others it was not particularly good. In three of these cases wiser selection of villages probably would have prevented the disaster.

An additional indication that some errors were made in selection of villages is that 16 percent of the knowledgeable persons said that maize was not the best food crop in their area.

It would probably be helpful to local program administrators if it were made clear that restricting the program to the best maize producing areas is quite consistent with the national policy of equal development. It makes no sense to put costly maize inputs into an area best suited to bullrush millet. Allowing marginal areas to be included in the NMP is detrimental to those areas as it diverts attention from their real development potential and needs. The most effective use of scarce resources would involve adhering to the NMP guidelines for village selection. Production from these areas can solve the problem of self sufficiency in maize production. Other areas can be used to solve other problems.

One aspect of the choice of villages which is not in accordance with national policy is that the project has tended to be placed in the more developed villages. Twenty four project villages and eight control villages in the same districts were compared for level of development. 62.5 percent of the project villages fell above scale step 4 on an eleven step Gutman scale of commercial differentiation, an indicator of level of development (see page 2). 87.5 percent of the control villages fell at or below scale step four. The less developed villages were significantly less likely to be included in the program than more developed villages. (χ^2 significant at .02 level). This practice of providing advantages to already advantaged villages contributes to widening the gap between more and less developed villages. Greater effort to place the project in the less developed villages in suitable areas should be made in the future.

Choice of stage

A number of villages in Morogoro Region were designated as stage II villages although fertilizer use does not pay in most of the region (see page 11). At the end of the first year this was corrected in Morogoro District. Only Mgeta and Morogoro town will be

stage II in the 1976/77 season. In the rest of the Region villages where fertilizer use does not pay are continuing to be classified as stage II. This should be corrected. The fact that one District reversed the region's designation of village stages indicate that the original designation may have been somewhat arbitrary. Such errors might be avoided in the future by greater use of research station and university research results where they are available.

The extension of credit

The project inputs were to be sold on a cash basis. This policy encountered several complicating circumstances. First, the free distribution of inputs in the Kilimo cha Kufa na Kupona campaign had created the expectation that subsequent distribution of inputs would also be free. In one case village officials went to get herbicide on the assumption it would be free. When they discovered it would cost them sh. 312/-, they decided not to use it.

A second complication was that inputs for other crops such as tobacco and cotton are extended on credit. Unlike maize, the sole outlet for these crops is a crop marketing authority which is able to deduct the amount of the debt before paying the producer. Since much maize is grown as a subsistence crop and there is no consistent control over the marketing of the rest, this arrangement is not possible with maize.

Finally, the inputs are sold long enough after the previous harvest that many farmers have already run short of cash. Combined with desire to have a high program participation rate, these factors generated considerable pressure for the extension of credit.

The response to this varied. In Morogoro Region staff held firm and all inputs were sold on a cash basis. In Ruwuma Region about 30 percent of the inputs were sold on a credit basis depending on the credit worthiness of the farmer. No information was available on rate of repayment. Observers estimated that about 50 percent of the inputs in Iringa Region were extended on credit. No repayment information was available.

In Arusha massive amounts of credit were extended as can be seen in Table 2.

Table 2. Extension and Repayment of Credit in Arusha Region June, 1976 (Shillings).

District	Total Value Sold	Cash	Credit	Credit Repaid	Credit Outstanding
Arumeru					
Sample villages	259,694/-	None	259,694/-	17,688/-	242,006/-
Mbulu					
Sample Villages	43,664/50	None	43,664/50	6,500/-	37,164/50
Mbulu District	Information Not Available		414,000/-	14,000/-	400,000/-
Hanang					
Sample Villages	186,709/50	52,000/-	134,709/50	6,884/75	127,824/75
Hanang District	Information Not Available		474,000/-	74,000/-	400,000/-

Arusha program personnel estimated that 50 percent of the sales to farmers and 80 percent of the sales to villages had been made on credit. Individual farmers were given credit on the basis of the village chairperson's recommendation.

While the figures in Table 2, obtained from village records, may not be particularly accurate, they are indicative. In 3 of the villages for which information was available none of the credit had been repaid. In another village in which a small amount had been repaid, the crop was a total loss, effectively eliminating the hopes for further repayment. Only 7.8 percent of the credit reported in the sample villages had been repaid as of June, 1976. In Hanang District approximately 15 percent of the credit for the entire district had been collected. In Mbulu District this figure was 3 percent (about 14,000 Shillings). Shillings 1.5 million remained outstanding for the region as a whole. The Regional Coordinator expressed the hope that villages would soon be registered with the government which would entitle them to a National Bank of Commerce (NBC) loan with which they could pay off their debt. In the meantime farmers reported that they were being pressured for immediate repayment although they had been told they could pay when they sold their crop.

As the subsidies are withdrawn, it is possible that credit will become a necessary part of the program. If credit is to be extended, it should be done in an organized manner. The present practice of hoping that uncollected debts can be passed on to NBC avoids the need to keep the program on an economically sound basis. The extension of credit should not be used to induce farmers to use inputs which do not provide a reasonable economic return. If credit is to be extended, it is essential that the recommendations are correct for the area, that competent technical personnel are readily available to advise the farmer, and that an effective marketing system enables the farmer to sell his/her crop at a reasonable price. At present these conditions do not exist in all areas.

If the NMP does not wish to undertake a credit program itself, alternatives are available. At present most loans go to cooperatives and villages. NBC could set up a small farmer loan program in association with NMP. While village leaders could be involved in advising on the credit worthiness of individuals, it would be preferable for professional bank staff to handle all other aspects of the loans. If an effective marketing system were established, maize loans could be handled in the same manner as cash crops. Financing maize loans through cash crop proceeds would be possible but bureaucratically unmanageable.

Considerable care should be taken that any credit program be placed on a sound base. A credit program which only creates farmer indebtedness is worse than no program at all

Arrival and Distribution of Inputs

Information on arrival and distribution of inputs is presented in Appendix B. Again, these figures are generally only estimates. The timeliness of arrival varied by region. In Ruvuma Region the seed never arrived. Fertilizer arrived only when an extremely slow army effort was replaced with private trucks. Only 4 farmers in Morogoro and Arusha Regions said the inputs arrived after they had planted. With the exception of the delivery of fertilizer to a stage I village, distribution of inputs to the villages appeared to have been done in a well organized and timely manner.

Distribution within the village was done in a number of ways. In seven Arusha villages farmers had to buy seeds and fertilizer together as a package. In Bashay/Karatu each family in the village was required to buy inputs for one acre at a cost of Sh. 70/90. Credit was supplied if necessary. In Morogoro Region farmers could buy part or all of the package of inputs as they chose. In some ujamaa villages a certain amount was reserved for the ujamaa shamba, the remainder being sold to private farmers. In Endakisu all inputs were reserved for the ujamaa shamba. In some villages people from outside the villages were permitted to buy inputs. However, two farmers from a control village reported they were turned away when they tried to buy inputs in a project village.

The sale of inputs in compulsory packages may be necessary to induce farmers to adopt less familiar or more expensive inputs. The Ruvuma Regional Coordinator said that farmers in that region would buy seed only if it were included in a mandatory package with fertilizer. Farmers in the region are enthusiastic about fertilizer on maize. They use fertilizer on their maize sold by the Tobacco Authority for use on tobacco. However, they are convinced that the local variety, Songea Select (which is, in fact outyielded by Ukiriguru Composite) is an adequate variety. In such cases package sales are probably justified. However, in other cases package sales constitute a hardship for the farmer. For example, in some Arusha villages, farmers were forced by package sales to buy SA which they could not use due to low rainfall. Package sales must be evaluated on a locality basis.

Most of the inputs went to individual farmers. RMP staff estimated that 95 percent of the inputs in Arusha Region and 90 percent in Ruvuma Region were sold to small farmers. Detailed information on distribution was available for 20 villages. (See Appendix B). In 5 villages in Arusha Region only part of the seed was sold. In 6 of the 9 Arusha villages receiving fertilizer, some of the fertilizer remained unsold. According to Bwana Shamba figures only 10 percent of the fertilizer delivered to sample villages in Morogoro Region was sold. Unsold fertilizer remained in 8 of the 9 Morogoro villages which received it.

The strikingly low sales of fertilizer, particularly in the lowland areas, raise significant questions about the program. Many farmers did not use free fertilizer distributed in earlier programs. Many of them are not buying it at subsidized prices. What then, is the likelihood of their buying even at their present low rate once the subsidy is lifted?

Appropriateness of Recommendations

Major problems were encountered with the planting time, spacing and fertilizer recommendations. If herbicides had been more vigorously pushed, they too could have been problematic. The source of much of the problem with recommendations is that they are made on a blanket regional or district basis. Although attempts are made to adjust recommendations to local conditions, this is not always successful. A major problem is lack of information in many areas.

In Morogoro Region there were particular problems with planting time and fertilizer recommendations. Planting is traditionally done with the rains which fluctuate widely in their time of arrival. Farmers may stagger their planting in order to hedge against bad weather, insects and disease. The recommendation for most of Morogoro Region was a reasonable short period which did not coincide with the traditional planting time. In some cases the Bwana Shamba ignored the official recommendation altogether and told the people to plant with rains. The official recommendation was in fact correct as it falls in the beginning of the most reliable rainy season. Those who plant early with the "short rains" sometimes lose their crops due to lack of moisture.

The fertilizer recommendations for most of Morogoro Region were already inappropriate. In 2 years of village trials in Kilosa District 6.5 Kilos of grain were produced for every kilo of N applied. The economic breakeven-point at unsubsidized fertilizer prices is 19 kilos of grain per kilo of N¹. Since the subsidy can not be continued indefinitely, the recommendation is an uneconomic one which should be changed.

Arusha regional staff felt that the regional fertilizer recommendation was too low. In fact the SA recommendation was too high for the dry areas and too low for the high rainfall areas. Since the effectiveness of fertilizer depends on local soil and rainfall conditions there is definitely a need for a program of local soil testing and the establishment of local recommendations.

The spacing recommendations ran into problems because of the practice of intercropping. Of the private maize acreage reported by sample farmers 48.6 percent in Arusha Region and 40.1 percent in Morogoro Region was intercropped. (See Table 6). Since intercropping

¹Personal communication from Dr. D.W. Sperling, Coordinator, National Maize Research Program, Tanzania.

allows the efficient use of land, in situations of land pressure, it can be extremely important. Hence intercropping may be an existing farming system to which NMP recommendations will have to be adjusted. The adjustment could be as simple as stating the recommendation in terms of stand count rather than spacing.

The practice of intercropping also limits the use of herbicides. Beans were intercropped with maize in 55.6 percent of all intercropped maize acreage. In Arusha Region this figure was 65 percent. (See Appendix C). Hence herbicides containing atrazine can not be used on over half the intercropped acreage and a quarter of the total private maize acreage.

The Effort to Extend Information

Part of the project plan was to have a resident extension agent (Bwana Shamba) in every project village. In June, 1976, only 9 of the 21 sample project villages had a resident Bwana Shamba. One of these was a local resident with agricultural training who was doing the work voluntarily. None of the 6 control villages had a resident Bwana Shamba. Two project and 3 control villages were receiving no extension service at all at the time in the survey. Knowledgeable persons in 8 villages said the Bwana Shamba never or rarely came. Extension contact was so scarce in another village that the farmers thought the interviewer was the Bwana Shamba. One control village had not been visited by a Bwana Shamba for one year.

The effort to extend information is not confined to the extension service. Improving agriculture is a national priority. Every one from politicians to reading books carries the message. As part of Kilimo cha Kufa na Kupona agricultural supply companies took a slide show and demonstrations of good maize practices to the villages. Mkulima wa Kisasa, a regular radio program, on agriculture, includes information on maize farming. Ukulima wa Kisasa, the Ministry of Agriculture (Kilimo) newspaper, also carries information on maize.

Effectiveness

The various extension efforts have not, however, reached very many people, nor have they been noticeably effective with the people they have contacted. Only 31 percent of the sample farmers had been visited by a Bwana Shamba within the last year. 47 percent of the purchasers had been visited, but only a dismal 16 percent of the non purchasers had been visited. In 3 villages no one at all had been visited. Mass methods were somewhat wider reaching. Fortyeight percent of the people had attended a meeting called by the Bwana Shamba. Thirtysix percent had been to a farming demonstration. Although there were to be two demonstration plots in every project village, only 12 of the 21 sample villages had even one plot. (Observers in Iringa Region found no

demonstration plot at all). Only 25 percent of the farmers knew of a demonstration plot in their village. Thirtyfive percent of the farmers listen to Ukulima wa Kisasa. Seven percent said they read Ukulima wa Kisasa which was to have been printed in greater numbers and distributed by the project. The average information contact score was 2.89 indicating less than 3 items of contact with various sources of information. (See page 4) Twenty percent of the farmers did not know the name of their local Bwana Shamba. There are indications that farmers who did come into contact with information sources may not have benefited greatly. As can be seen in Tables 3, 4 and 5, females had significantly lower information contact scores than males for all groups except Arusha purchasers. Despite this there were no significant differences in actual practice. Nor, in the case of Morogoro purchasers was there any difference in knowledge.

Table 3. Comparison of Purchaser and Non Purchaser Information Contact Scores (By Region and Sex)

	Average Scores		t
	Males	Females	
<u>Arusha</u>			
Purchasers	4.08	3.54	0.68
Non Purchasers	2.16	1.24	2.27*
t	4.33***	5.73***	
<u>Morogoro</u>			
Purchasers	5.18	2.87	2.52**
Non Purchasers	2.75	1.51	2.60**
t	4.66***	2.89**	

Table 4. Comparison of Purchaser and Non purchaser Good Maize Practice Scores (By Region and Sex)

	Average Scores		t
	Males	Females	
<u>Arusha</u>			
Purchasers	9.88	9.88	0.00008
Non Purchasers	4.09	4.17	0.125
t	9.38***	7.39***	
<u>Morogoro</u>			
Purchasers	6.81	5.83	0.856
Non Purchasers	4.08	3.55	0.896
t	4.07***	3.34***	

*Significant at .05 level.

**Significant at .01 level.

***Significant at .001 level.

Table 5. Comparison of Purchasers and Non Purchasers knowledge Scores (By Region and Sex)

	Average Scores		t
	Males	Females	
<u>Arusha</u>			
Purchasers	4.91	4.81	0.104
Non Purchasers	2.38	0.96	2.921**
t	5.00***	8.50***	
<u>Morogoro</u>			
Purchasers	4.21	2.93	1.692
Non Purchasers	1.96	0.85	3.126**
t	5.41***	6.38***	

In addition, using multiple regression analysis, information contact was not found to be a predictor of maize practices. On the whole it would appear that the major contribution of the various extension efforts to NTP was the distribution of inputs by the extension service.

The attitudes of farmers largely bear out the assessment of extension ineffectiveness. In two villages farmers thought the job of the Bwana Shamba was to sell inputs. When farmers in a more remote Uluguru Mountain village were asked if they were helped by the extension service, they replied "Oh no, the Bwana Shamba has no transport. He never comes here." On another occasion a farmer was asked if he had learned to use insecticide from the Bwana Shamba. "You must be joking," he said. "All they do is sit in their offices and write reports. I learned from my neighbours." A farmer in this survey remarked, "The Bwana Shamba doesn't do anything of importance." While there are excellent Bwana Shambas, the general image is not exactly one of a hard working, dedicated corps of competent men and women.

Why has the extension effort been so ineffective? Part of the problem is that some of the efforts are inappropriate for the population to which they are addressed. Ukulima wa Kisasa, for example, has little chance of being effective until more of the population is literate. In 1967, 69 percent of the population above the age of ten were illiterate. 52 percent of the farmers in this sample had attended less than a year of school or attended adult education classes only. Similarly, the effectiveness of Mkulima wa Kisasa depends in part on access to radios, still a luxury item. Finally, such secondary methods, as acknowledged by all but one Bwana Shamba, are simply not as effective as an immediate and practical demonstration.

The village of Luhlolole offers some useful lessons in the limits of extension efforts. In 1973/74 it was the site of a university extension practical on maize production. It being a dry year, the people learned conclusively from the demonstration plot that fertilizer decreases yields. Since the Bwana Shamba never bothers to go there, they have yet to see another demonstration. The lesson of the demonstration plot firmly in their minds, they say the high yields they hear about elsewhere are due to factors other than fertilizer. Extension efforts can be counterproductive.

As part of Kilimo cha Kufa na Kupona the village received and was shown how to use herbicide. They were quite enthusiastic about it as it eliminated the need for large

²Dey, Ajoy K. and Norman Magil. 1973. "Literacy and Education" in Bertil Egero and Roushdi A. Henin (eds.) The Population of Tanzania, Census Volume 6. Bralup and Bureau of Statistics. (Dar es Salaam) : 121.

amounts of labor for weeding. They went to get herbicide this year but decided not to use it because it would have cost Sh. 312/-. Extension efforts can demonstrate the effectiveness of a practice but they can not always generate the willingness to spend money for the practice. This is particularly true where the expectation of free inputs has been established or where there is no marketing system to allow the investment to be recovered.

Extension Service Staffing

The extension service itself suffers a number of problems. The first is an inadequate number of staff. Regional NMP staff in both Morogoro and Arusha Regions mentioned the problems of understaffing. The extension staff in sample villages were responsible for 1 to 7 villages apiece, averaging 5 villages in Arusha Region and 3 in Morogoro Region. Some of these villages are as far as 25 miles from where the Bwana Shamba lives.

Transport Problems

The effect of the large area to be served is aggravated by the lack of transport. While some Bwana Shambas have bicycles, most must travel on foot or pay for buses. Fifteen Bwana Shambas cited lack of transport as a major problem. The expected arrival of motorcycles in December should alleviate the problems. District supervisory personnel are also hampered by the lack of transport. The Ruvuma Regional Coordinator said it had been impossible to adequately supervise the Bwana Shambas who had received written instructions about demonstration plots. It was the impression of the researcher that the only time District Coordinators were actually able to get to most villages was when they travelled with her.

Extension Staff Training

Part of the project help was to be special training in maize production. A special course was held at MATI, Mbeya for regional personnel. The three regional personnel interviewed about the training said they learned nothing new except for the growth stages of maize. The lack of practicals outside the classroom were criticized. Finally blanket recommendations were given which trainees felt were not appropriate to their regions.

The Bwana Shambas themselves had received an average of 10 years of schooling with a range of 7 to 12 years. By comparison only 11 percent of the sample farmers had 7 or more years of schooling. They had received up to 4½ years of agriculture training. In Arusha Region 6 had 2 years or more, 3 had less than 1 year and 1 had no agricultural training. In Morogoro Region 7 had received 2 years, 2 a year or less and 1 no agricultural training.

In addition, regional coordinators were to set up training programs in their areas on maize production. Seminars were organized for most districts. However, only 8 of the 20 Bwana Shambas reported having received special training in maize production. Part of the problem may have been due to timing as some seminars were held when staff needed to be in field. No inseason follow up sessions were possible due to lack of transport.

People in some villages complained that their Bwana Shamba knew nothing about maize production. Of the 20 Bwana Shambas interviewed 2 were unable to give the correct recommendation for seed. One could not give the spacing recommendation. Eight could give neither the recommendation for TSP nor SA. Five did not know the recommendations for the control of stalk borer or army worms. At least 2 did not follow the recommendation on their own shambas. One, who had been working since 1949, said he simply did not understand chemicals. Others knew the recommendations but not the reasons for following them.

Extension Staff Attitudes

The attitude of the extension service is another critical problem. The extension service has been a favorite target of academics who accuse extension agents of being aloof and part of the elite.³ To a degree this is true. Extension agents may live in government housing - cement block, tin roofed structures which are significantly better than the mud and thatch homes of the farmers. And while the virtues of working with the peasants is extolled in theory, in practice the money and the action are in the larger towns. Since the Bwana Shamba's salary and rating do not depend on the villages, the ambitious put their energies into looking good and getting out.

Many extension agents tend to have negative opinions of the peasants with whom they work. Only 10 Bwana Shambas spoke the local language, an ability often crucial for working with older persons and women who do not speak Kiswahili. Only 8 disagreed with the statement "It is hard to get a sense of accomplishment working with peasants." Fifteen felt that by working with a few of the better farmers they would get better results. Only 7 felt that farmers usually have good reasons for not adopting recommendations. The small farmer, as perceived by the Bwana Shamba in this sample, does not adopt because he/she does not have enough education, does not understand, is slow and hesitates to take risks. To an extent attitudes toward people condition the response of those people to what one is saying. For this reason the negative attitudes of the

³See for example: Van, Velsen, H.U.E. 1973. "Staff, Kulaks and Peasants" in Lionel Cliffe and John Saul (eds.) Socialism in Tanzania Vol 2. East African Publishing House (Dar es Salaam): 153 - 179.

Bwana Shambas can be detrimental in their work.

Extension Staff Duties

Extra duties add to the Bwana Shamba's dilemma. They are supposed to be in the field, be in the office, attend Party functions, distribute supplies and so on. In some villages crop specialists in cotton suddenly had the responsibility for the maize project added to their duties. Half the agents said they were able to spend most of their time talking to farmers either individually or in groups or demonstrating new farming methods. But another third said they spent most of their time in office, distributing supplies or walking from place to place. District personnel also complained that too many duties made their jobs impossible.

Not only do extra duties take time, but they may give the Bwana Shamba a negative image. In Mbulu District the Bwana Shambas were responsible for announcing the price for inputs and produce. Since these prices fluctuated for a while, the farmers began to distrust the Bwana Shamba. In other areas the extension staff were required to help people move during Operation Vijiji. People who were reluctant to move resented the help and the helpers. This bad feeling carried over to the Bwana Shamba's normal activities. These problems could be avoided by confining the Bwana Shamba's duties to agricultural activities.

Coordination with other officials

Some agents complained about problems with politicians who in all good faith gave agricultural advice or made local agricultural policy which was not always technically well grounded. Closer coordination between agricultural technicians and various administrative and political officers would probably benefit everyone concerned, including the farmers.

Commercial Infrastructure

A potential problem with the program is that farmers must have cash with which to purchase the inputs. At present maize is not a cash crop in many areas. One of the problems impeding greater commercialization of the crop is the difficulty of transporting inputs in and crop out. Many roads are badly maintained. Impassable in the rainy season, they cause such wear on vehicles in the dry season as to make transport costly. Much of the NMP transport of input was done by private trucks. There were complaints that the truckers were not reliable and did not want to take their trucks on bad village roads. Since small traders are not supposed to buy the maize crops and an effective government buying effort has not been perfected, transporting the crop out is even more of a problem. Of the seven villages which sold maize in 1974/75, one moved the crop by bicycle to the cooperative, two used government trucks and one hired a private truck. No information was available for 3

villages. In seven villages private maize was moved by headload. In four villages private trucks were hired. One village lorry was used to transport private maize. One person moved his maize by bicycle and 2 by bus. NMP personnel said that problems involved in transporting maize to the godown resulted in loss due to wastage, spillage and rain.

The NMP could ease the transport hired by encouraging and/or providing assistance in regular road maintenance. This does not mean massive applications of asphalt. It does mean regular grading, digging and maintaining culverts and drainage ditches, repairing bridges and applying murrum(a local gravel).

Constructing farm input and maize stores is part of the project. At present 9 sample villages have no village storage facilities. (One has a private godown.) Twelve villages have storage facilities which are not adequate for storing crops and/or which are too small or in disrepair. Six villages have storage facilities which are adequate for the storage of seeds, fertilizer and crops.

Impact on Village Cooperative Maize Production

There are two types of village level farming in Tanzania which have three names. Ujamaa farming is collective farming of a communal shamba (plot or farm), the proceeds of which are divided among the members of the collective at the end of the cropping season. Under a block farming system each farmer has his/her own plot of land (generally part of a contiguous block), the produce of which belongs to him/her. Bega kwa bega farming (shoulder to shoulder) is sometimes a more inspirational name for block farming. Sometimes it simply indicates compliance with the policy of increased food production. In some villages the fact that each adult had one acre of maize somewhere in the village was referred to as a bega kwa bega farm. Ujamaa farming is the only truly village level farming in which decisions about the plot as a whole are taken by the village unit. Eleven sample villages grew maize on an ujamaa shamba during the 1975/76 season. These were:

<u>Morogoro Region</u>		<u>Arusha Region</u>	
Mvumi	20 acres	Singe	113 acres
Chakwale	58 acres	Endakiso	400 acres
Msolwa	63 acres	Upper Kitete	321 acres
Luholole	5 acres (control village)	Hasha	44 acres
		Titiwi	85 acres
		Bashay/Karatu	160 acres
		Nshupu	134 acres

The large acreages are all in Arusha where maize is a cash crop.

All villages in Morogoro used improved seed and followed the weeding and spacing

recommendations. (The control village used Ilonga Composite saved from the previous year). None used fertilizer, one used insecticide and herbicide. The control village leaders wanted to use herbicide. All used tractors for plowing. One tractor was rented from a private individual, one was rented from the government, one had been loaned for free by the government and one belonged to the village.

All Arusha villages used improved seed, fertilizer and insecticide. None used herbicide. Two did not follow the weeding and spacing recommendations. All villages used a tractor for plowing. Three of these used it for clearing; one using it for planting as well. Two villages owned tractors. The others were rented from private individuals. Decisions about what should be done in the ujamaa shamba are in theory made by the village development committee or the village agricultural committee. In practice they often do what the Bwana Shamba tells them to do if only to ensure the continued flow of government support. The knowledgeable persons (village chairperson, secretary and three committee members) for the 4 Morogoro and 7 Arusha ujamaa villages with a maize shamba were asked about the maize recommendations. On the whole they were, in fact knowledgeable. A majority of knowledgeable persons in all Morogoro villages knew the recommendations for seeds, spacing and weeding. In half the Morogoro villages, (including the control village except for the fertilizer recommendations) they know recommendations for planting time, use of SA and TSP, use of insecticides to kill army worms and the use of herbicide. None knew the recommendation for stalk borer. In five Arusha villages they knew the planting time and army worm recommendations. In six villages they knew the stalk borer recommendation. Herbicides are not recommended in Arusha Region. No control village in Arusha Region had an ujamaa maize shamba. Ujamaa villages are relatively advantaged in the production of maize. The extension service is instructed to work closely with the ujamaa shamba, sometimes putting their only effort into it. Most government assistance including agricultural assistance goes to ujamaa villages.

In the case of this project, villages could and some did reserve all inputs for the ujamaa shamba. The most critical problem they have traditionally had is labor. Asked about problems of maize production, knowledgeable persons in all eleven villages replied in terms of labor shortage. Eight reported problems in cultivating the land, claiming they needed a tractor. In five villages they reported a problem in getting enough labor for planting. In four villages weeding was a problem. Two villages said they did not have enough money for inputs. One did not have enough know-how to use fertilizer. Sufficient labor and transport for harvesting was a problem in one village.

The major effect of the NMP on village level agriculture has been to regularize the supply of inputs by the government. It has had no effect on the critical problem, reliable labor. In a way, NMP has been detrimental in that it reinforces the dependency relationship which has grown up between ujamaa villages and the government. The tendency is to expect the government to give something to solve problems rather than to undertake to solve the problems by local initiative. Asked what the government could do to increase maize production, the vast majority replied in terms of what the government could give them - a tractor, free inputs, transport. In 15 villages there were also complaints about the extension service. They said there should be a Bwana Shamba living in the village who was forced to do his job. "We need someone to show us what to do," they said. "We need more demonstration plots." Only 3 people suggested raising the price of maize to increase incentive. Two suggested that village people be included in decision making by the government.

In two villages the need for accountants was cited. This stems from problems arising from the distribution of the proceeds of the ujamaa shamba, be they cash or kind. In 1 village the wajamaa claimed they they had received nothing from the harvest of the previous year. NMP could help by including elementary accounting in the training it provides the Bwana Shamba.

If NMP is not to be just one more in a series of government give away programs, serious efforts should be made to involve villages in making it run. In a few places, village or cooperative officials sold the inputs. In most places this was done by the Bwana Shamba alone. A place to begin self sufficiency might be involving village leaders in the distribution of the inputs. A further step would be to involve selected villages in the process of procuring inputs. While this would take time and planning, it would leave the village with a capacity for local action rather than only the capacity to use what is delivered to their doorstep. It is the development of this capacity for local action which is critical if the NMP is to have more than a seasonal impact.

Impact on Individual Farmers

The first impact of the NMP was to stave off hunger in three villages where part of the seed was eaten.

Available figures (see Appendix D) indicate that participation in the National Maize Project varied from seven percent to 100 percent of the households in any given village. The program appeared to reach about 54 percent of the households in the sample project villages. This figure is an overestimate as some inputs were purchased by farmers from outside the sample villages.

The number of acres planted by sample farmers and villages using various inputs is presented in Table 6. 30.4 percent of the private maize acreage planted by sample farmers in Arusha Region was grown without any improved inputs. The corresponding figure for Morogoro Region was 48.8 percent. In Arusha Region 26.9 percent (246.15 acres) of the private maize acreage planted by sample farmers was grown using improved seed, SA, TSP and insecticide. In Morogoro Region this figure was 1.8 percent, 11.2 acres consisting mostly of demonstration plots. Fortyfour percent of the Morogoro acreage (277 acres) was grown using just improved seed.

The use of improved inputs does not necessarily indicate National Maize Project impact. Twentyfive farmers in 2 control villages in Morogoro and 10 farmers in 2 control villages in Arusha used improved seed. In Arusha two farmers probably went to a nearby project village to buy hybrid seed. Since agricultural supplies are more readily available in Arusha town than in Morogoro town, some farmers may have bought seed in Arusha. In Morogoro Region improved seed had been saved from the free distribution of the previous year. Planted in pure stands of 10 or more acres, composite seed will retain its yield advantage for 2-3 years. Since much of the maize grown during the 1974/75 season was government-distributed Ilonga Composite the farmers in the control villages are, for the moment, still enjoying the benefits of that distribution.

TABLE 6

Maize Acreage of Sample Farmers and Villages 1975/76 Cropping Season by Inputs and Cropping System

Area	Number of Farmers	Village Shambas	Private Shambas: Monoculture				Private Shambas: Intercropper				TOTAL ACREAGE
			No Improved Inputs	Seed Only	Some Inputs	All Inputs	No Improved Inputs	Seed Only	Some Inputs	All Inputs	
Hanang District	67	All inputs 513	56.8	11.5	80.3	125.7	23	6.75	20	0	847.05
Mbulu District	82	All inputs 289 Seed, Fertilizer 321 Seeds, SA	7.25	0	36.28	16.2	34.5	2.8	90.5	21.45	818.98
Arumeru District	70	Insecticide 404 ^a	53.2	10.	28.1	34.5	93.5	67.8	35.4	48.3	774.8
ARUSHA REGION	219	1527	127.25	21.5	144.68	176.4	151	77.35	145.9	69.75	2440.83
Kilosa District	99	Seed 78	63.6	157.95	12.25	Dem. plots 0.7	12.1	33.3	2	0	367.9
Kilombero District	39	All inputs 63	21.65	15.5	2.4	1.5	19.9	10.8	0	0	134.75
Morogoro District	95	Seed 5	61.17	27	4.25	1	128.99	32.9	12.75	0	273.06
MOROGORO REGION	233	146	146.42	200.45	18.9	11.2	160.99	77	14.75	0	775.71

a. Includes reported work farm acreage

Adoption of Inputs and Recommendations

The program was successful in teaching farmers about good maize production practices. A comparison of knowledge of maize practices of farmers in project and control villages is presented in Table 7.

Table 7. Percent of Sample Farmers in Project and Control Villages Knowing Selected Recommended Maize Practices.

Village	Recommendation Practice				Army Worm Control	Stalk Borer Control
	Seeds	SA use	TSP use	Spacing		
Project (N=378)	64.0 %	34.9 %	29.9 %	55.5 %	17.7 %	26.9 %
Control (N=107)	15.8 %	1.9 %	0.9 %	3.7 %	1.9 %	0.9 %

A significantly greater proportion of farmers in the project villages knew the recommendations. (χ^2 significant at the .001 level for all recommendations.)

The success of the program in persuading farmers to put the recommendations into practice varied by region and by practice. The percent of male and female farmers following the recommended practices is presented in Table 8 broken down by region and program participation.

Table 8. Percent of Male and Female Sample Farmers Following Recommended Maize Practices (By Region and Program Participation)

Recommendation	ARUSHA				MOROGORO			
	Male Purchs N = 85	Female Purchs N = 42	Male Non Purchs N = 65	Female Non Purchs N = 58	Male Purchs N = 53	Female Purchs N = 40	Male Non Purchs N = 70	Female Non Purchs N = 72
Planting Time	89.4	88.1	81.5	67.2	33.9	22.5	52.8	44.4
Use Improved Seed	95.3	97.6	26.1	43.4	100	100	34.3	26.3
Use Fertilizer or Manure	87.	95.2	27.7	31	32	7.5	1.4	0
Use Insecticides	71.7	66.6	18.5	13.2	22.6	7.5	2.8	2.8
Proper Spacing	54.1	52.4	23	18.9	54.7	65	54.3	38.9
Weed at least Twice	96.4	92.9	86.1	82.8	98.1	95	98.5	90.2

As can be seen in Table 8, a much greater proportion of Arusha farmers than Morogoro farmers used chemical inputs. This in part reflects the sale of inputs in Arusha Region in mandatory packages. Only 18 farmers purchased fertilizer in Morogoro Region. Ten of these lived in a village where fertilizer is used in vegetable production. It appeared that most of the NMP fertilizer in the village was in fact used on cabbages destined for sale in the Dar market. Only 19 Morogoro farmers used insecticide. Six of these were farmers whose shambas were used as demonstration plots with inputs supplied by the Bwana Shamba.

The reasons given by farmers for not following NMP recommendations are presented in Table 9.

Table 9. Reasons Given for Not following NMP Recommendations (Percent)

	Planting Time	Seed	Fertilizer	Spacing	Insecticide	Number of Weeding
No Answer	27.9	20.7	11.9	22.9	18.4	18.4
Input Not Available	0.6	27.2	28.5		32.8	
Expense		16.7	14.9		7.3	
Labor or Time Consuming			1.9	7.6	1.1	5.2
Traditional Practice is as Good or Better	56.4	15.2	24.3	35.7	16.3	39.5
Previous Bad Experience	0.6	6.6	2.5			
Lack Information	2.9	12.1	14.9	25.1	18.9	15.8
Practice is too Complicated	0.6			4.0	1.1	
Other	11.0	1.5	1.1	4.7	4.1	21.1
Total (N)	(172) 100%	(198) 100%	(362) 100%	(275) 100%	(369) 100%	(37) 100%

The population of Morogoro farmers who followed the planting time recommendations was reasonably low (Table 8). As can be seen in Table 9, the majority of the farmers who did not follow the recommendations felt the traditional practice was better. As noted above (see page 11) traditional practice is a protection against uncertain rainfall. It also supplies farmers with a source of food over a longer period. Some farmers said they had to plant early as they were running out of food. The farmers' rationale can be summed up as a strategy for survival. A strategy with demonstrated survival value in an uncertain environment is unlikely to be lightly abandoned.

As can be seen in Table 8, the spacing recommendation was not followed by many farmers, particularly in Arusha Region. Arusha Bwana Shambas said this was the recommendation least often followed. As can be seen in Table 9, this is another case where a traditional practice, intercropping, conflicts with the recommendation.

The need for competent and effective extension personnel is demonstrated by the farmers who cited previous bad experience as the reason for not following practices. Some farmers saved seed from the hybrids they planted and were unpleasantly surprised by the resulting segregation. Their explanation was that hybrid seed is destroyed by smoke. (Seed is often stored in the rafters above the kitchen where smoke from cooking fires reduces insect damage.) Had there been an effective extension agent, they would have known not to save seed from hybrids. Other farmers used SA under extremely dry conditions and burned their crops.

It is clear that the program has had some impact on maize practices simply by making inputs available. However, inputs remain unsold and recommended practices ignored. The explanations given for this can be summed up by five basic factors: the subsistence nature of the crop, the existing farming system, labor demands, applicability of recommendations, access to knowledge.

The difference in purchase of inputs between Morogoro and Arusha Regions is largely the difference between a subsistence and a cash crop. A subsistence crop does not generate cash for buying inputs. A farmer with little or no cash income has no reason to spend money on a crop from which he/she expects no cash return. Given the present inadequacies of the marketing system, many farmers could not sell excess maize even if they produced it. In order for farmers to be able to purchase inputs, the marketing system must be improved. This is particularly crucial as the subsidy on inputs is progressively reduced. Without an improvement of the marketing system, one can reasonably expect the number of purchasers to drop as the subsidy is decreased.

The existing farming system which includes a good amount of intercropping, particularly of beans, precludes the use of herbicides and lowers the likelihood of spacing recommendations being observed. The farmer may have goals other than the maximization of maize yield such as most efficient use of limited land or variety and quality of diet. In such cases the NMP recommendations can not be demonstrated to be superior and may have to be adopted to the existing farming system and farmer goals.

While the amount of labor required was not cited as a problem by large numbers of respondents, both interviewers and Bwana Shambas felt that it was a problem.

In one village an interviewer remarked on the excellent crop in the Bwana Shamba's plot. The people replied that "his yields are very good but he uses so much energy." Repeated requests for tractors and planters are indicative of the labor problem. The unwillingness or inability to put more labor into the crop is in part a problem of levels of nutrition and level of health, in part of problem of a low level of participation of men in subsistence farming and probably partly a problem of motivation. If one can get an adequate amount of a subsistence crop for a given amount of labor, there is not too terribly much point in exercising a lot more effort if selling the excess is likely to be difficult.

Some recommendations, as noted above, (see page 11) are simply inappropriate and should be changed, this is particularly true in the lowlands fertilizer recommendation.

A fairly constant 15 to 20 percent of the people who did not follow recommendations said they did not know the recommendation or did not know enough to put it into practice. This was particularly true of agricultural chemicals. While such an answer is a useful way to make an interviewer go away, it was also probably true in a reasonable number of cases. The knowledge score (the number of recommendations the farmer could give correctly) was found to be highly correlated with the good maize practice score. (Spearman's Rho. 631, significant at .01 level.) In multiple regression analysis, knowledge was the single most powerful variable for predicting practice. The relationship between knowledge and practice is obviously circular - one learns by doing. However, except where it was mandatory, purchasing inputs was also an indication that the buyer knew something good about what he/she was buying. It is not enough to provide access to inputs. It must be shown that inputs and associated practices are effective. For this reason it is most unfortunate that not all the proposed demonstration plots were planted.

Not only must information be supplied but mis-information must be corrected. Farmers in Arusha said they would not use herbicide because it killed cattle. According to the staff of the manufacturing company, gesaprim, the maize herbicide is so safe one can drink it. However, gramoxone, an herbicide used on coffee, is highly toxic. Such confusion concerning chemical inputs, which is not uncommon even among extension staff, impedes their adoption, by farmers.

Comparison of Purchasers and Non-Purchasers

It is sometimes the case that programs of this sort serve primarily the upper strata. In order to determine whether there were such a bias in this program, characteristics of buyers and non-buyers were compared controlling for sex and region.

There were no significant difference, between buyers and non-buyers in age, education, number of acres in maize production or possessions. That is, the program appears to reach both the old and the young, the educated and uneducated, the poor and the not-so-poor. The policy of mandatory participation by all village members adopted by some villages undoubtedly helped to create this effect. There was a low amount of active participation by women in the program which will be discussed in the following section.

There were significant differences between purchasers and non-purchasers in good maize practice, knowledge and information contact scores as can be seen in Tables 3, 4, and 5. In every case the purchasers scored significantly higher than the non-purchasers. They knew more, they farmed better, they had more contact with sources of information. Eighty five percent of the purchasers scored as adequate or better maize farmers. Only 23 percent of the non-purchasers received adequate or better scores. The higher good maize practices score is to be expected since using program inputs contributed to the score. However, the purchasers also constituted 70 percent of those who used fertilizer or manure on other crops. It is possible that the purchasers were better farmers on the whole than non-purchasers. Part of the information contact score is indicative of farmer initiative - reading the paper, going to meetings, etc. However, the extension service also make more effort to help purchasers. Only 16.2 percent of the non-purchasers had been visited by an extension agent in the past year as compared with 49 percent of the purchasers.

Effect on Yield and Income

Although it was not possible to collect accurate yield data, some assumptions can be made about the effects of using program inputs. In the project proposal it was estimated that yields could be raised from a project area average of 1100 kg/hectare to 1500 kg/hectare using package I and 2200 and 2700 kg/hectare using packages II and III. However, research data show that in Kilosa District (basically lowlands) improved seed alone (package I) results in a yield increase of 15 percent and fertilizer is uneconomic.⁴ Hence for the lowlands the projected effects were overoptimistic. For the highlands they may be accurate.

While it is fairly certain that except in the case of bad weather, use of program inputs will result in some increase in yield, its effect on income is not as clear. In three Arusha and one Morogoro sample villages the crop was a total or

⁴Personnel Communication from Dr. D.W. Sperling, Coordinator National Maize Research program, Tanzania.

near total loss. Program participants bear not only the usual effects of crop failure but face a financial loss as well. Thus the program can have a negative effect on income.

Special Problems

In order for the program to have a positive income effect, farmers must be able to harvest the extra yield and use it or sell it. Warthogs and monkeys cause considerable crop damage in many villages. Due to gun control regulations the villagers' only defense is to sit up with fires all night making loud noise. This method is only partially effective. Villages bordering the numerous game reserves have additional problems with other wild animals. The amount of damage the average elephant can do to a maize field is not to be underestimated. Rats are serious problems, eating both newly planted seeds and stored grain. Until the problem of animal pests is dealt with, the full potential yield will not be realized.

Disease, particularly rust, was a problem in some areas. This is a problem for the Maize Research Program.

Sales

Only 15.3 percent of the Morogoro farmers and 39.6 percent of the Arusha farmers reported they sold any maize in 1974/75. The Arusha figure is probably an underestimation. Only 2507 bags of maize were reported as sold by either villages or farmers in 1974/75. In Arusha a ready market does exist across the border. This constitutes a set-back to Tanzanian self sufficiency in maize although it does contribute to farmer income. In Morogoro marketing is less easy. There even some export crops are lost due to transport difficulties. If both the farmer and the nation are to reap the benefits of increased maize production, effective transportation and marketing systems must be established.

The Impact on Women

"Women who live in the villages work harder than anybody else in Tanzania."
Julius Nyerere.

Traditionally most agricultural work in Tanzania has been done by women as is the case in most hoe cultures.⁵ When colonial administrators introduced cash crop farming to men (who used female labor on these crops), subsistence crops became

⁵Baumann, Hermann. 1928. "The Division of Work According to Sex in African Hoe Culture" Africa 1(3): 289-319; Boserup, Ester. 1970. "Woman's Role in Economic Development". George Allen and Unwin Ltd. (London): 20-32, 49.

"women's crops."⁶ Women bear much of the burden of food production in Tanzania today, including maize production.⁷ The NMP inevitably will effect women. In some it may be the first organized opportunity to participate in "modern agriculture."

Women are involved in the NMP both directly as purchasers of inputs and indirectly, using the inputs and recommendations adopted by their husbands or fathers. Eighty two female purchasers and 130 female non-purchasers were interviewed in this survey. Despite a concerted effort to draw samples equally divided between males and females, only 37 percent of the sample of purchasers consisted of women. In part this is due to Tanzanian family structure. Traditionally the male is head of the household, handling all cash transactions. Thus in most households the male would purchase inputs. Women buyers would be expected to be primarily female heads of households or women who had their own plots and a source of cash with which to buy inputs. Sixty percent of female purchasers in this survey were female heads of households or women whose husbands lived away from home. Since data on the number of female heads of households were not obtainable, it is difficult to tell if this is disproportionately high.

There are often social pressures against independent or assertive women in rural Tanzania.⁸ It would not be surprising if in some cases such pressures were exerted against women who wanted to buy inputs. Only 8 percent of the purchasers were women. In at least 2 villages there were no female buyers. There are no data to indicate whether women did not buy because they were discriminated against, because

⁶Boserup, op. cit.: 54-56.

⁷Bader, Zinnat K. 1975. "Women, Private Property and Production in Bukoba". University of Dar es Salaam. Unpublished M.A. Thesis: 41, 117; Levin, Roger. n.d. "Matetereka" Mbioni 5(3): 21; Mapolu, Henry. 1973. The Social and Economic Organization of Ujamaa Villages. University of Dar es Salaam. Unpublished Masters Thesis: 164; DeVries, J and L.F. Fortmann. 1974. "A Study of Ujamaa Villages in Iringa Region." Prepared for FAO/UNDP Planning Team. Mimeo: 65-66; Schneider, Harold K. 1970. The Wahi Wanyaturu. Aldine Publishing Company (Chicago): 63; Mbilinyi, Marjorie J. 1972. "The State of Women in Tanzania" Canadian Journal of African Studies: 373. Swantz, Marja-Liisa. 1975. "Women's Workload is Double that of Men" Daily News.

⁸Bader, op. cit.: 198, 227; DeVries and Fortmann, op. cit.: 65-66; Mapolu, op. cit.: 163-167; Mbilinyi, op. cit.: 371-376; Swantz, Marja - Liisa. 1974. "The Church and changing Role of Women in Tanzania." Mimeo: 19-22.

they did not have the cash, or because they were not interested.

Women who did participate performed as well as men. The data presented in Table 4 show no significant differences between the good maize practice scores of men and women. The project has succeeded in demonstrating that women are just as capable as men in adopting and implementing modern farming practices.

As can be seen in Table 5, there were no significant differences between knowledge scores of male and female purchasers. The project has succeeded in demonstrating, contrary to local popular belief, that women are just as able as men to learn new technical information.

The extension service did not reach women to the same extent as men. Only 17 percent of the women in Morogoro Region and 32 percent of the women in Arusha Region had been visited by an extension agent during the past year. The difference in contact was statistically significant in Morogoro Region. There extension agents visited 58 percent of the male purchasers but only 20 percent of the female purchasers. (χ^2 significant at the .01 level). One possible explanation for the failure to work with women may be the belief that women are not capable of learning. It is true that women are generally underrepresented in the school population⁹, overrepresented among the illiterates¹⁰, and more likely than men to speak only a tribal language. However, as the data presented above show, given the opportunity, women learn and do as well as men. If women are to receive this opportunity, project supervisors at all levels of the program must make it clear that extension workers associated with the program are to work with women as well as men.

A second factor involved in the failure to work with women is the constraint in some areas on male/female interaction. The most immediate solution to this problem would be the use of female extension agents to work with women. At the moment there are practically none.¹¹ Because female extension agents (Bibi Shamba) would have more in common with female farmers than do male agents, they would be in a better position to communicate. If the extension service is considered important by the NMP, then a concerted effort should be made to find, train and hire female extension agents to work with female farmers.

⁹Dey and McGill, op. cit. : 123-130; DeVries and Fortmann, op. cit. : 13-14.

¹⁰Dey and McGill, op. cit.: 121-122; Kokuhira, Hilda. 1975. "Towards the Social and Economic Promotion of Rural Women in Tanzania". Fikira May.

¹¹Fortmann, L.P. 1976. "The Need for an Expanded Role for Women in Agricultural Extension in Tanzania." East African Journal of Rural Development. Special Issue for XVI International Conference of Agricultural Economists, Nairobi: July 24-4 August 1976: 99-108.

As can be seen in Table 10 women are involved in all aspects of maize production including the heavy work of cultivating.

Table 10. Percent of Households in Which Maize Production Tasks are Done by Women

Task	Households where task is done by woman alone	Households where woman does task with others	Households where women do not do the task	Total	
				N	%
Cultivating	34.9	53.5	11.6	189	100
Planting	42.2	53.9	3.9	180	100
Thinning	40.2	58.5	1.3	159	100
Weeding	40.1	56.5	3.4	177	100
Apply fertilizer	80.4	19.6	0	46	100
Apply insecticide	58.6	38.0	3.4	29	100
Harvesting	41.9	53.1	5.0	160	100
Scaring animals	28.8	45.1	26.1	111	100

Any changes in labor requirements of maize production directly affect women. In theory improved production practices allow less acreage to be used and hence are laborsaving in the long run. However, women are already working very hard - often averaging 10 hour days. Any extra labor, even if it saves in the long run, is a burden at the moment. Proper spacing, applying fertilizer and insecticide all require extra labor. As weeds show an excellent response to fertilizer, regular weeding is essential with fertilizer use. Women do most of the weeding. Of program recommendations only the use of herbicide, not yet a central part of the program, would immediately decrease women's work load. On the whole, the program is adding to women's workload both on ujamaa and private shambas.

Sixty two percent of the women who bought inputs had their own land. Having their own shamba is extremely important for many women because it allows them to develop an independent economic base. Thus the majority of women purchasers had some degree of independence. The program could have the effect of strengthening the position of women if more of them were able to such income benefits as there are either on their own land or through participation in an ujamaa or UWT shamba. (UWT: Umoja wa Wanawake wa Tanzania, the government sponsored organization of women). The UWT or female extension and development workers could be used to mobilize the participation of women.

Conclusions and Recommendations

An evaluation at the end of only one cropping season is a bit premature particularly when long term strengthening of infrastructure is involved. However, some preliminary conclusions can be drawn.

NMP appears to be handling the logistical problem of supplying villages with inputs in a reasonably organized and efficient way. However, the program both in conception and implementation suffers some critical flaws. .

Nmp is a project imposed from above, supported by outside funds. At no point were the farmers whom it effects consulted about or involved in its operation. At no point in the program is serious consideration given to developing a local capacity to continue the project functions. As it is operating now the project reinforces a pattern of passive village dependency on the government. This does not bring about development. It is not enough for a group of farmers or a village or a district to do what it has been told with what it has been given. It must be able to organize itself and take the initiative to achieve its own goals. A system manageable by local people - district Kilimo Staff, 10-cell leaders, village committee persons, farmers - must be evolved in consultation with them to keep project functions in operation after the project ends. At the moment who will order inputs after NMP ends? who will arrange for transport of inputs? who will manage sales? are unanswered questions. These questions must be answered by building local capacity to solve problems.

The use of subsidies seems ill-conceived. If an input is uneconomic at the unsubsidized price, there is no point in enticing the farmer to use it by subsidizing it. Someone must bear the cost. The subsidy also perpetuates the expectation that the government not villages or individuals, will bear any financial costs. When inputs which have been free or subsidized are later sold at market value, farmers are resentful. Why should they pay more (or pay at all) if they did not have to in the past? Such problems are best avoided by selling at market value from the beginning. In addition this allows a realistic economic assessment of the value of the input.

The extension effort is noticeably weak. More Bwana Shambas should be hired in order to reduce work load. All should be better trained. Training should include as large a proportion of practical field demonstrations as possible. In-season follow up sessions would be desirable. Every project village should have a monitored demonstration plot, monitored by supervisory staff if necessary. Extension staff should be instructed to work with women as well as with men. Female extension staff should be hired to work with women.

Recommendations should be evaluated on a local basis to eliminate uneconomic or otherwise inappropriate recommendations. Recommendations should be economically evaluated in terms of unsubsidized prices. Lowland fertilizer recommendations offer a glaring case in point. Adjustment of recommendations to the existing farming system should be undertaken.

In order to maximize project benefit and to keep it on economically sound basis, it should be restricted to areas where a reasonable economic return can be expected. At the same time an effort should be made to include the less developed villages in the better maize growing areas in the project. This would help to close the gap between less and more developed villages.

The problems connected with paying for inputs should be carefully reviewed. This includes the economic return to inputs at unsubsidized prices, the extension of credit, and improving the transport and marketing systems. Farmers must have a source of cash to buy inputs particularly as the subsidy is dropped. This may mean the extension of credit. The advisability of extending credit should be explored and an organized system of credit established if necessary. It certainly means strengthening the transport and marketing system to allow farmers to recover the cost of inputs by selling excess produce. The transport system is also critical for the supply of inputs to the villages. NMP should encourage and assist the regular maintenance and improvement of roads, particularly feeder roads, as well as the establishment of an effective marketing system.

Improving the marketing system is also essential if Tanzania rather than neighboring nations is to reap the benefits of NMP. At the moment it is often easier and more profitable to sell one's maize outside the country than to sell it locally. This does not help Tanzania become self sufficient in maize.

NMP attacks a national problem which must be solved by local action by imposing a blanket solution from above. Local people and local conditions must be included as a central consideration of the project. Recommendations must be locally appropriate. Package sales must be locally evaluated. The local need for credit should be evaluated. The extension effort should be adopted to local conditions. Local people must be involved in the planning and operation of the project. Unless these things are done, NMP will be just another oneshot bandaid project which contributes little or nothing to development.

Appendix A

SAMPLE VILLAGES

MOROGORO REGION

Kilosa District

National Maize Project Supervisor: Mr. H.O.L. Nghelo

Control

Mwandi: rolling upland area - elevation: 3000 feet - rainfall: 600 - 800 mm - crops: maize, cotton, sorghum, beans and sugarcane.

Stage I

Zombo: rolling lowlands - elevation: 1000 feet - rainfall: 1000 - 1400 mm - crops: maize, cotton, bananas, sorghum, paddy rice, pigeon peas and cassava.

Magubike: rolling uplands - elevation: 3000 feet - rainfall: 600 - 800 mm - crops: maize, millet, sunflower and castor bean.

Stage II

Mvumi: lowlands - elevation: 1000 feet - rainfall: 800 - 1000 mm - crops: maize, cotton, sugarcane, millet, sunflower and sisal.

Chakwale: rolling uplands - elevation: 3000 feet - rainfall: 400 - 600 mm (currently suffering from 3rd consecutive year of low rainfall) - crops: maize, bullrush millet and cassava.

Kilombero District

National Maize Project Supervisor: Mr. A. Lusindilo

Control

Senjo: upper plains - elevation: 500 feet - rainfall: 1000 - 1400 mm - crops: maize, sugarcane, paddy rice and oranges.

Stage II

Msolwa: upper plains - elevation: 500 feet - rainfall: 1000 - 1400 mm - crops: maize, sugarcane, paddy rice and oranges.

Morogoro District

National Maize Project Supervisor: Mr. Massey

Control

Luholole: Uluguru Mountain Valley - elevation: 1000 feet - rainfall: 1400 mm - crops: maize, sorghum, paddy rice, beans, cassava and sesame.

Stage I

Wami/Dakawa: Wami River flood plain - elevation: 1000 feet - rainfall: 700 mm - crops: maize, paddy rice, sunflower, cotton and sisal.

Msongozi: plains - elevation: 1000 feet - rainfall: 400 mm - crops: maize, sorghum, sunflower, cotton, cowpeas and bananas.

Mgeta: Uluguru Mountains - elevation: 4000 feet - rainfall: 1000 - 1400 mm - crops: maize, cassava, temperate fruits and vegetables.

Gozo: Uluguru Mountains - elevation: 1200 feet - rainfall: 1400 - 1800 mm - crops: maize, oranges, bananas, pineapples, cassava, taro, soy beans, sorghum, sugarcane and sesame.

ARUSHA REGION

Arumeru District

National Maize Project Supervisor: Mr. Munuo

Control

Samaria: plains - elevation: 3000 - 5000 feet - rainfall: 800 - 1000 mm - crops: maize, millet, beans, pumpkins and peas.

Stage II

Kingori - Kati: rolling hills - elevation: 3000 - 5000 feet - rainfall: 800 - 1000 mm - crops: maize, beans, coffee and bananas.

Kambia - Chai: elevation: 3000 - 5000 feet - rainfall: 800 - 1000 mm - crops: maize, beans, sorghum and coffee.

Kikatiti: village land runs from plain into hill - elevation: 3000 - 5000 feet - rainfall: 800 - 1000 mm - crops: maize, beans, sorghum, peas, finger millet and cattle.

Nshupu: hills - elevation 3000 - 5000 feet - rainfall: 800-1000mm - crops: maize, coffee and bananas.

Hanang District

National Maize Project Supervisor: Mr. Libembembe

Control

Singino: hills - elevation: 1000 - 3000 feet - rainfall: 800 - 1000 mm - crops: maize.

Stage I

Gallapo: plains - elevation: 1000 - 3000 feet - rainfall: 800 - 1000 mm - crops: maize, beans, millet and pigeon peas.

Stage II

Masakta: hills - elevation: 4000 feet - rainfall: 800 - 1000 mm - crops: maize, beans, barley and millet.

Singe: plains along Lake Babati - elevation: 1000 - 3000 feet - rainfall: 800 - 1000 mm - crops: maize and sorghum.

Stage III

Endakiso: uplands along plain - elevation: 1000 - 3000 feet - rainfall: 800 - 1000 mm - crops: maize, beans, peas and millet.

Mbulu District

Control

Mbulumbulu: rolling uplands - elevation: 3000 - 5000 feet - rainfall: 800 - 1000 mm
crops: maize and beans.

Stage II

Hasha: plateau - elevation: 3000 - 5000 feet - rainfall: 800 - 1000 mm - crops:
maize, onions, beans, millet and cattle.

Upper Kitete: rolling uplands - elevation: 3000 - 5000 feet - rainfall: 800 - 1000 mm
crops: maize, wheat, beans and onions.

Stage III

Titiwi: rolling hills - elevation: 3000 - 5000 feet - rainfall: 800 - 1000 mm -
crops: maize, potatoes, millet, wheat and cassava.

Bashay/Karatu: rolling uplands - elevation: 3000 - 5000 feet - rainfall: 800 -
1000 mm - crops: maize, wheat and beans.

APPENDIX B

REPORTED ARRIVAL AND DISTRIBUTION OF NATIONAL MAIZE PROJECT INPUTS 1975/76

Seeds

Fertilizer

Insecticide

Village	Arrival Date	Amount	Seeds			Disposal of Remainder	Arrival Date	Fertilizer			Disposal of Remainder	Arrival Date	Amount	
			Total Sold	Village Farm	Private ^a Farmers			Total Sold	Village Farm	Private ^a Farmers				
Gozo	Nov. 1975	Hybrid 1 ton	54pkts	-	54pkts	None	Nov. 1975	TSP 8 SA 1 tons	4 bags	-	4 bags	stored	Jan. 1976	DDT 5% 75 kg
Meteta	May 1975	Hybrid 8 tons	8 tons	-	8 tons	None	May/June 1975	TSP 220 SA 1bags	5 tons	-	5 tons	stored	Jan. 1976	DDT 5% 172 cartons
Msongozi	Nov. 25 1975	IC 72 bags	511 kgc.	-	511 kg	None	25 Nov. 1975	TSP 30 " SA 100 "	TSP 3bags SA 3 "	50kg TSP 50kg SA given to school dem. plot	TSP 100kg SA 100kg	some sent to Melele, some stored	-	-
Wami	Nov. 20 1975	IC 72 bags	72 bags	-	72bags	None	21 May 1975	TSP 40bags SA 60 "	TSP 18 " SA 32 "	-	TSP 32bags SA 32 "	stored	Jan. 23 1976	DDT 5% 80 bags
Chakwale	1st wk. Dec. 1975	IC 83 bags	83 bags	-	83bags	None	Dec. '75	TSP 250 " SA 700 "	None	-	-	stored	-	-
Magubike	4th wk. Nov. '75	IC 50 bags			2911kg	None	-	TSP 150 SA 1bags	None	-	-	stored	-	-
Mvumi	Dec. '75	IC 80 bags		2210kg	5190kg	None	Dec. '75	TSP 280 " SA 320 "	None	-	-	stored	Jan. '76	DDT 5% 160 cartons
Zombo	Nov. 26 1975	IC 46 bags			3015kg	None	26 Nov. 1975	TSP 6 SA 1bags	None	Used in demonstration plots	-		26 Nov. 1975	DDT 5% 1 pkt.
Msolwa	Sept '75	IC 30 bags	30 bags	15bg	15bg	None	Sept. 1975	TSP 40 " SA 30 "	TSP 40bg SA 30bg	TSP 40bg SA 30bg	-	None	Sept. 1975	DDT 5% 10 boxes
Nshupa	Dec. 22 1975	3750 kg H622 H632		69bg	70bg	11 bg sold neighbors	Dec. 22 1975	TSP 3750kg SA 15000kg	TSP 139bg SA 286bg	TSP 69bg SA 176bg	TSP 70bg SA 110bg	11bg. sold to neighbors	Dec. 21 1975	DDT 5% 275 kg
Kikatiti	Dec. '75	Kotumani H622	16080kg		16080kg	stored	Dec. 1975	-	TSP 28350kg SA 56100 "	-	*TSP 28350 *SA 56100	stored	March 1976	DDT 25%
Kingeri Kati	Nov/Dec 1975	45 tons				stored	Nov/Dec 1975	*TSP 60000 *SA 135000	Unknown	-	-	stored	Jan 1976	DDT 5% 300 kg
Sing'e	Oct. 1975	H622 H511 7500kg	7500kg	1175kg	6050kg	Sold to UWT & Primary Schools	-	*TSP 15000 *SA 30000	*TSP 15000 *SA 30000	TSP 2350 SA 4700	TSP 2100 SA 24200	Sold to UWT & Primary Schools	Jan 1976	DDT 5% DDT 25% 1440 ltrs.

* Kilograms

Gallape	Nov. 1 1975	H511				None	None							
Masakta	Nov. 1975	H622 7500 kg	7500 kg		7500kg	None	Nov. 1975	TSP15000 SA 30000	TSP15000kg SA 30000"	-	-	stored	Nov. 1975	DDT 5% 3000 kg
Endakiso	Dec. 1975	H632 7500 kg	7500 kg			None	Dec. 1975	TSP15000 SA 45000	TSP15000 SA 45000	-	-	None	Nov. 1975	DDT 3000 kg
T i t i w i	Dec. 1975	280 bags					Dec. 1975	TSP 500bg SA 540"	Unknown	-	-	-	Dec. 1975	DDT 760 kg
Upper Kitete	Jan.29 1976	H622 5685 kg	2276 kg	991 kg	1285 kg	stored	Nov.7 1975	TSP)48000 SA) kg	TSP)2580 SA) kg	TSP) 585 SA) kg	TSP)1995 SA) kg	stored	-	- =
Bashay/ Karatu	Dec. 1975	H622 7 tons	5.66 tons	Farmers, shamba, schools	Ujamaa nearby	stored	Oct. 1975	TSP15 tons SA -	TSP9.9tons SA20.95 "	Collective farms, 523 families, 4 primary schools, 1 secondary school		stored	Jan/feb 1976	Didimac 1/2 2.5 tons
H a s h a	Oct. 1975	300 bgs					Nov. 1975	TSP350bgs SA 400 "	-	-	-	-	Nov. 1975	100 bags
Kambi ya Chai	No information available													

Notes to Accompany Appendix B -

- Private Farmer figures include seeds and fertilizer sold to block farm.
- Fertilizer was sold to a sisal estate, primary school and one private farmer.
- Figures refer to Msongozi village only. The seed was sold throughout the Kata (Ward).

APPENDIX C

Acres of Maize intercropped with Various Crops

<u>Crop Combination</u>	<u>Morogoro Region</u>	<u>Arusha Region</u>
Rice	48.93	
Rice, Millet	4	
Millet/Fingermillet	10.32	40.86
Millet/Wheat		2.75
Millet/Beans, Fingermillet/Pumpkins		3
Millet/Beans		33.7
Beans	98.49	195.93
Beans/Bananas		1.36
Beans/Peas		10
Beans/Peas/Sorghum		3
Beans/Sorghum		42
Sorghum		10.5
Peas	3	17.75
Cassava	2.72	.5
Potatoes	3.25	2
Bananas	30.7	
Sunflower	41.75	
Pumpkin	1.4	
Barley		1
Unspecified	8.18	79.65
Subtotal: Intercropped with beans	98.49	288.99
Subtotal: Intercropped with other grain crops	63.25	136.81
TOTAL INTERCROPPED	252.74	444

APPENDIX D

Numbers of Persons Buying Inputs in Sample Villages

Village	Households	Number of Persons Buying Seed Only	Number of Persons Buying Seed and Fertilizer
Zombo	568	300	
Magubike	530	291	
Mvumi	905	199	
Chakwale	724	98	
Msolwa	280	200	
Wami/Dakawa	649	312	1 Sisal estate primary school
Msongozi		38	
Mgeta	524	184	
Gozo	350	24	1
Gallapo	707		803
Masakta	450		155
Singe	250		242
Endakiso		ALL INPUTS ON UJAMA SHAFIKA	
Upper Kitote	126	82	31
Hasha		NO INFORMATION AVAILABLE	
Titiwi	57		99
Bashay/Karatu	523		523
Nshupu	90		44
Kikatiti	480		272
Kingerikati	600	NO INFORMATION AVAILABLE	