Rural Development Strategies through Farmer Groups and Farmer Oriented Research: A case study

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Abstract

Despite several past efforts to increase smallholder production with the objective of reducing both food and basic need poverty in rural Tanzania, majorities of the Tanzanian are still poor. This paper reviews the constraints and past strategies in agriculture/rural development sector. New approach, which is based on farmers oriented research groups, is presented as a case study from two sites in Tanzania. Evidence from the initial finding suggest that farmers oriented research have high possibility of success for imparting the required change towards rural development than the previous approaches.

1 Introduction

After four years of independence Tanzania remains one of the 10 poorest counties in the World. Tanzania’s per capital gross national product of US$ 265 is low and far less than sub-Saharan Africa and East Asia average of US$ 500 and US$970 respectively (World Bank, 2000). Poverty remains wide spread, deep and concentrated in rural areas, where approximately 70% of Tanzanians live. Agriculture which account for 45% of the national production and provide 80% of total employment and hence the sector will, for unforeseeable, remain the backbone of the economy. The World Bank concludes that only a prospering agricultural sector can provide the basis for sustainable poverty reduction and accelerated growth in other sectors.

Various qualitative and quantitative poverty assessments have been made in Tanzania over the last decade. They conclude those 27% of the population (based on 1992 figures) who lives below the food poverty line and 56% below basic need poverty line. The best-off 20% have expenditure levels nearly 10 times that of the poorest. It is estimated that

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the economy will need to grow by 7.5% for 23 years and by 9.7% for 15 years if poverty reduction targets are to be met. Growth throughout 1990s and early 2000s was 3.5% per annum. Many studies on the slow intensification of agriculture in Tanzania identifies reasons that are common in many parts of Africa – that is constrained access to inputs, credit and timely advice based upon sound research (World Bank, 2000).

In Tanzania, for example, the implementation of various rural development strategies depended wholly on the Government. Period between 1961 and the late 1970s the Government was able to expand and strengthen basic social services such as health and education. During the period the country made rapid socio-economic development and registered high social development indicators in primary enrolments, literacy rates, health services, safe and clean water. Similar indicators were recorded in agriculture. However, by the mid 1980s these achievements could not be sustained. The heavy reliance on Government budgetary resources was untenable, and Government was unable to cope with the shocks that affected the economy.

Agriculture being the pillar of economic development, poor performance of the economy was quickly reflected by sharp decline in agriculture production in almost all crops which emanating from a multitude of factors. Later on some evidences revealed that, the problems of agricultural research and development in Tanzania have been related with poor transfer of knowledge from research to farmers. Among immediate remedies for implementing institutional changes involved the decentralization of management of extension services to local government and of research to a network on zonal programs. Furthermore, client oriented research and extension is now adopted as national policy as central to the Government of Tanzania Agricultural Development Strategy. This paper outlines key role played by the agricultural sector in poverty alleviation and the associated problems and finally a case study presenting the user friendly technology to promote smallholder rice productivity in two sites in Tanzania is discussed.
Needs for appropriate rural development strategies

Development of rural areas is a major concern of social and economic development policy in Tanzania. There are seven main reasons the formulation of rural development strategies. These include;

- Past government policies and strategies failed to build up the necessary capacity that was needed to bring about a sustainable development in rural areas.
- The formulation of rural development strategy relates to the fundamental structural reforms that have taken place during the last ten years or so. The broad objectives of these reforms had been to ensure macro-economic stability and improve market efficiency. Despite achievements indicated in inflation rate reduction, exchange rate stabilization, increased balance of payment, but it is increasingly perceived that these achievements have not benefited majority of the Tanzanians, particularly those living in rural area.
- Formulation of rural development strategy arises from unsatisfactory performance of the agricultural sector, the economic base of the rural areas. Performance of most food crops has remained poor, mainly due to extreme rainfall pattern and low technology used. As a result the food security situation has remained one of the major problem in rural areas.
- The absence of a comprehensive rural development strategies
- The need to emphasize economic diversification in the rural areas. This strategy originates from the fact that, even though agriculture in the backbone of the rural economy, diversification opportunities for earning income in the rural areas is crucial for rural development.
- There is a need to recognize the interrelationship between the rural economy and the urban market.

Most of these rural development policies have links or complement agricultural development strategies hence poverty alleviation.

Role of agricultural in rural sector and poverty adoption

In Tanzania, the importance of agriculture cannot be overstated. As indicated above, it accounts for about half of the national income, three quarters of merchandise exports, and
is a source of livelihood for about 80% of Tanzanians. Agriculture has a strong link with the non-farm sector through agro-processing, urban market, and export trade. Trend in poverty reduction is highly dependent on the growth of agriculture and related non-agricultural activities.

The Draft Agricultural Sector Development Strategy has discussed extensively the performance of agricultural sector. From colonial period when production policy was on export crops, there have been several approaches, which intended to increase agricultural production among rural poor in the country. Policies and political strategies such as transformation approaches, *Ujamaa* mode of production, villagization, *Siasa ni Kilimo* (Politics is Agriculture) and *Kilimo cha Kufa na Kupona,* (Agriculture is a matter of life and death) were propagated in the country history. Parallel to these campaign or policies, different extension approaches such as training and visit, progressive farmers approach have been implemented to promote the desired change in smallholder production.

Since 1981 the real agricultural GDP grew at an average of only 3.5% per annum. However, between 1990 and 1993 the annual growth rate of the sector declined drastically from 6.7% to a mere 0.4% before raising to 6.6% by 1995. In 1996 the annual growth rate was down to 4.6% and declined further in 1998 to 2.3%. From 2000s, while the production of major food crops has grown by 3.5% and export crops by 5.4%, other components like livestock and forestry have recorded lower growth rates (TAS, 2000). Considering the overall GDP growth target of halving abject poverty by 2010 is in the range of 6-7%, and current population growth rate of 2.8% (Population census, 2002), this performance falls short of the needed growth.

As such, despite all previous efforts even the aggregate national food availability in Tanzania is still inadequate. Food production has failed to meet its production shortfalls. The constraints and obstacles that have hindered the development of the sector include; a) Inadequate access to and/or delayed delivery of inputs and lack of timely advice; b) Poor transfer of knowledge from researchers to farmers, inadequate access to extension services and over-centralization of the management of the extension services;
c) Decline in the use of improved farm input packages, particularly improved seed, fertilizer and agro-chemicals

d) Very poor infrastructures and lack of comprehensive market information

e) Inadequate credit for agricultural production and marketing

f) Weak management of co-operative and members loss of confidence

g) Unpredictable restrictions on crop movements and multiple taxes and levies

h) An unfavorable Land Act and slow implementation of the revised legislation

i) Dominance of low technology with the majority of the smallholder farmers

j) Dependence on rain, thus subjecting agriculture into the whims of nature.

To tackle these constraints and to strengthen efforts of reducing poverty, in recent years the government has undertaken several measures such as deregulation of the markets and prices, and support private sector and NGOs to undertake production, input supply, and crop market functions. Also, the government is mandated to support national and non-governmental establishments to research and extension to improve its effectiveness, and to promote private sector participation in production, processing, storage, input supply and marketing. It is within this matrix that the following section presents an overview of the strategies used by research establishments to improve productivity of resource-poor rice farmers by using cheap and locally available material in Kyela and Matombo sites in Tanzania. This strategy was instituted to capture the existing situation in the research areas, prevailing macro-economic policies, and the need for sustainability of the technology.

4. **Project for enhancing rice production using green manure**

4.1 **Introduction**

Poor yields of *Striga* infested upland rice are associated with low and declining soil fertility. A context analysis undertaken with farmers in four villages close to Lake Nyasa, in Kyela district (Mbeya Region) has indicated that as infestations by *S. asiatica* have increased rice yields have declined from approximately 20 bags per acre 20 years ago to little more than 2 bags per acre today. A similar situation has been reported by farmer groups in two villages in the Uluguru Mountains of Morogoro Rural District.
(Morogoro Region). Here, *Striga* is also a serious problem in maize, also an important food crop in the district. Although production can increase if artificial fertilizer is used, high prices following macro-economic reforms (due to removal of subsidies) and limited availability due to poor accessibility grossly affects its use among poor households who depend on rice for food and income. Table 1 shows a summary of main problems affecting rice farming in the study sites. Declining soil fertility and weed (including *Striga*) ranks highest in all study sites (Morogoro and Kyela).

**Table 1. Main constraints in rice production**

<table>
<thead>
<tr>
<th>Constraints in production</th>
<th>(%) Response by study sites</th>
<th>Overall score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kyela</td>
<td>Morogoro (R)</td>
</tr>
<tr>
<td>Declined soil fertility</td>
<td>24.6</td>
<td>25.0</td>
</tr>
<tr>
<td><em>Striga</em> infestation</td>
<td>22.8</td>
<td>23.2</td>
</tr>
<tr>
<td>Weed infestation</td>
<td>18.4</td>
<td>21.4</td>
</tr>
<tr>
<td>Rainfall variability</td>
<td>6.1</td>
<td>10.7</td>
</tr>
<tr>
<td>Diseases</td>
<td>7.9</td>
<td>5.4</td>
</tr>
<tr>
<td>Lack of farm implements</td>
<td>5.3</td>
<td>8.9</td>
</tr>
<tr>
<td>High prices for farm inputs</td>
<td>9.6</td>
<td>0.0</td>
</tr>
<tr>
<td>Poor cultural practices</td>
<td>4.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Land problem</td>
<td>0.0</td>
<td>3.6</td>
</tr>
<tr>
<td>Market problems</td>
<td>0.9</td>
<td>0.0</td>
</tr>
<tr>
<td>Bird attack</td>
<td>1.6</td>
<td>0.0</td>
</tr>
</tbody>
</table>

**SOURCE:** Survey results, 2003.

An alternative strategy is to improve the fertility of *Striga* infested fields by growing legumes in rotation with susceptible cereals. From initial trials with the green manure *Marejea* (*Crotalaria ochroleuca*) the farmer research groups in Kyela observed that rice performs in a similar way when planted following a crop of the green manure *Crotalaria* as it does when treated with urea. This practice therefore offers farmers a low cost approach to soil fertility enhancement to improve rice productivity on *Striga* infested soils. Pigeon pea is also known to increase soil nitrogen levels and is a well-known crop in both Kyela and the Uluguru mountains. Locally available varieties are however late maturing and susceptible to the wilt disease *Fusarium udum*. Work by Ilonga Agricultural Research Institute has led to the selection of medium duration, disease resistant lines, which have been favorably evaluated by farmers. The key activity involves a series of on-farm demonstrations, managed by farmers following training and
with support from district extension staff and the project team. On-farm trials undertaken by farmer groups collaborating with CPP funded project R7564 in Kyela demonstrated how rice yields can be increased by 25-50% by application of 25-50 kg Nitrogen ha\(^{-1}\), while the infestation level of *Striga* is decreased. The majority of farmers are not however prepared to invest their limited cash in fertilizer. This report summarizes observations made prior to harvest of demonstrations planted in the 2002/03 crop season.

### 4.2 Methodology

The use of *Crotalaria* or pigeon pea (*Cajanus cajan*) in rotation with rice to combat *Striga* and low soil fertility had been introduced in Kilasilo and Itope villages in Kyela prior to the 2001/02 crop season when farmers were provided with seed for on-farm trials. During discussions with farmers it was subsequently agreed to incorporate these into the demonstration programme in each village. Plots previously planted to *Crotalaria* or pigeon pea in 2001/02 were planted with rice in 2002/03. Four villages, Sinyanga and Konjula, Itope and Kilasilo in Kyela and Kiswira and Kibangile in Morogoro Rural were identified for conducting this promotional project. High incidences of *Striga* weed and marked decline in rice production were main reason for choosing these sites. Initially seminars were conducted in each selected village just before the planting season i.e. in September to November 2002. The main objective was to introduce farmers to the potential benefits of the legume/rice rotations. Farmer groups were then formed within each village to undertake demonstrations at a number of sites. It was agreed that at each site there would be single plots, side by side, of *Crotalaria*, disease resistant pigeon pea and rice. All plots would be planted to rice in the following season.
The farmer group accompanied by a multi-disciplinary project team in their respective villages visited all sites. At each site the host farmer described the demonstration, provided information on dates of field activities. Farmers were encouraged to discuss what they had observed so far during the season. Following the field visit findings were summarized and a group discussion held to confirm aims and objectives of the on-going program and future work. A multidisciplinary project team comprising following members conducted field

4.3 Observations

4.3.1 Kilasilo

This is one of the two villages in which on-farm trials with *Crotalaria* and pigeon pea had previously been undertaken. Seventeen farmers, including six women, participated in the plot monitoring and subsequent group discussion. The performance of rice planted following either *Crotalaria* or pigeon pea was observed at seven sites and new demonstration plots of the legumes have been planted at 10 sites. These will be planted with rice next season. Observations made at each site are presented in Annex 1. A summary of the situation in Kilasilo follows.

- Excellent collaboration between the group and extension staff; the group secretary has maintained good records of activities at all sites. Most group members are clear about the objectives of the demonstrations and can explain the potential roles of the legumes in the cropping system.
- Previous interaction with the project team and extension staff during the on-farm trial phase, frequent discussion and active group leadership has resulted in strong

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3 Dr A M Mbwaga - Plant Pathologist/Striga specialist, ARI Ilonga (Project Leader); Mr C Massawe – Agronomist, ARI Ilonga; Dr G Ley – Soil Scientist, ARI Mlingano; Dr J Hella – Agricultural Economist – Department of Agricultural Economics and Agribusiness; Mr P Lameck – Social scientist – INADES - Formation; Mr J Kayeke – Agronomist and post graduate student, Sokione University of Agriculture; Dr C Riches – weed scientist, Natural Resources Institute, UK; Mr Mwambungu – District Agricultural and Livestock Development Officer (Kyela district); Mrs Masanja - District Agricultural and Livestock Development Officer (Kyela district)
ownership of the demonstrations by group members in Kilasilo. The village chairman is playing an active role in the group, which appears to enhance cohesion.

- Considerable interest is reported from other farmers in the village who have seen the demo plots. This group appears ready to host field days at a few selected sites for other villagers.

- Demonstrations are generally well laid out, were planted on time and have been well managed. In some cases the "lie of the land" had not been considered when deciding plot location and this needs to be emphasized in future.

- Strengths of *Crotalaria* perceived by farmers: increased vigour, colour and tillering of the following rice crop; yields after the green manure are expected to be higher than in continuous rice. Less weed growth is seen in the subsequent rice crop - in a number of cases continuous rice was weeded twice while rice after *Crotalaria* was only weeded once. Weakness of *Crotalaria*: land is taken out of food/cash crop production for one season. However many farmers pointed out that on areas which are infested by *Striga* the rice yield is now so low that little yield is actually foregone.

- Strengths of pigeon pea: new varieties mature earlier than local types; following rice crop grows well. Weakness of pigeon pea: The crop does not suppress weeds.

- There is a shortage of land in Kilasilo and many households rent plots from other farmers. However, rental contracts are limited for two years. Farmers planting *Crotalaria* in the first year of the contract are potentially increasing the fertility of land they must subsequently return to the owner. Pigeon pea may therefore be a better bet on rented land with farmers planting *Crotalaria* on their own land.

- Farmers report an increasing demand for *Crotalaria* seed. Group members wish to increase the areas planted on their fields while other farmers are showing interest in planting the green manure also. A number of group members indicated that they would give some seed to others. All the plots planted in Kilasilo this season used seed harvested from on-farm trials the previous year. As plot size has increased considerably, as farmers gain more confidence, there should be more seed available for harvest this season. It will be interesting to see if seed sales begin.

- Analysis of soil samples taken from demo sites in Kilasilo, and indeed in other participating villages in Kyela, has shown the soils to be very acidic (pH 4.5 to 4.8)
deficient in nitrogen, and very low in phosphorous. While using legumes can increase nitrogen status, acidity and phosphorus will remain a problem.

- As farmers learn more about using *Crotalaria* and the new pigeon pea varieties they are experimenting with other plots beyond the demonstrations and are planting additional areas to multiply seed. This process needs to be documented carefully.

### 4.3.2 Itope village

Some of the farmers participating in the demonstration program in Itope were also members of the farmer research group and have been involved in on-farm trials with urea and *Crotalaria* since 1997. Nine farmers, including one woman, visited the field sites and attended the group discussion to monitor progress with the current demonstrations. The performance of rice planted following either *Crotalaria* or pigeon pea was observed at eight sites and new demonstration plots of the legumes have been planted at six farms. These will be planted with rice next season. Observations made at each site are presented in Annex 1.

- Despite continued interaction with the project team and extension staff, participation by farmers beyond an enthusiastic core of group members in field activities has been disappointing. This seems largely due to poor group leadership and management. The farmer who has been group leader for some time is not committed to the work unlike some of his younger colleagues. It is understood that following this visit by the project team the group held a meeting and persuaded the current chairman to step down to make way for a more enthusiastic leader. Participation by women is particularly poor despite previous assurances from members that they would encourage their wives and other women to become involved.

- A number of sites had been planted later than other crops on the farm and some participants had clearly given the demonstrations low priority. Record keeping has also been incomplete.

- Some of the demonstrations are on small pieces of land away from the main fields. In future all farmers should be encouraged to embed the demonstrations within their main fields and plant the plots at the same time as their main crops.
Despite these problems a number of good demonstrations with large plots of *Crotalaria* and pigeon pea and follow up crops of rice have been established. As in Kilasilo the effect of the legumes in rotation is clear with the subsequent rice crop performing well. Farmers picked out the increased vigour of rice, and reductions in weed and *Striga* infestations in rice following *Crotalaria*.  

Most farmers in Itope own their own fields so *Crotalaria* would appear to be an ideal technology for the village.  

All *Crotalaria* plots have been planted with seed produced in the village in 2002. Farmers indicated an increasing demand for seed. Some participants wish to increase the area they are planting while a number of non-participants have requested seed for next season. One farmer has planted a particularly large area for seed multiplication and intends to sell seed at Tsh. 600 per kg.

### 4.3.3 Sinyanga

The farmer group was formed in Sinyanga following the village seminar in September 2002 held to introduce farmers to the potential advantages of using legume rice rotations on *Striga* infested land. Ten farmers, including one woman, attended the field visit and group meeting. Prior to the season the group had agreed a demonstration layout and seed was provided by the project to farmers. Of these who planted but due to erratic rain, drought and other problems only 2 sites have survived. A reasonable stand of *Crotalaria* although this had been late planted.

- Farmers in Sinyanga have access to a large area of lowland and their priority is to establish rice here by February. Upland rice is a secondary priority for many households.
- A number of farmers who had received seed indicated that they did not have enough knowledge about when and where to plant *Crotalaria*. They were also unclear about the potential benefits despite a number of visits by the extension worker. The men had not discussed the demonstrations with their wives.
- This is a new group, which so far appears to have little ownership of the programme. The plots are seen more as a research activity for the project team than an extension activity for the community.
4.3.4 Konjula
The farmer group in Konjula was also formed following a seminar in the village in December 2002. Unlike Sinyanga there is considerable enthusiasm among group members to undertake the demonstrations and learn about the use of *Crotalaria* and pigeon pea. Although there are extensive lowland fields here farmers are still interested in improving production in upland rice and maize. *S. asiatica* and *S. forbesii* are both problems. Demonstration plots are widely scattered and only 5 members of the group, including one woman, participated in the field visit and subsequent discussion. The project had provided 12 farmers with seed. Six farmers planted and five demonstrations have survived the drought. At one site the *Crotalaria* emerged but was mistaken as a weed and was removed by children sent to clean the field.

- The group is very interested in the demonstration programme and leadership appears strong. Some farmers did not plant because of the drought at the beginning of the season.
- Those who did plant established large plots of *Crotalaria*. Pigeon pea was not planted as fields are often at some distance from houses and farmers indicated that seed would be stolen.
- *Striga* was observed in a number of rice crops during the tour of the plots. Farmers indicated a number of areas, which had been abandoned because of low yields. They were impressed by the weed suppression achieved by *Crotalaria* and suggested that it will be easier to prepare land after *Crotalaria* than after a weedy fallow. Having seen the vigorous growth of the plants they are expecting improved rice yields next season.
- Farmers with demonstrations indicated that their neighbors have asked about the plots and have requested seed for next season. It was agreed that all plots of *Crotalaria* will be retained for seed production and that if possible seed will be given to other farmers for next season.
4.3.5 Kiswira village

This is the first season of work on *Striga* in the district. The farmer group was formed in Kiswira following the seminar held here by the project in September 2002. The Uluguru mountains have a bimodal rainfall pattern. Upland rice, maize and sorghum are planted on the short rains (October to early January). Because it is a long season crop it is important to plant rice early. The crop is also planted on wetland valley bottom sites. The long rains usually begin in mid-February following a few weeks of dry weather. Maize is the major crop on the long rains and rice is not planted. Rice is not therefore the dominant crop. Upland rice is often grown on steep, rocky slopes, which are farmed within a bush fallow rotation. The fallow period is about three years although this is said to be reducing due to population growth. A number of fields with very poor rice and maize crops were seen on steep, eroded fields in both Kiswira and Kibangile. Because rice and maize are both important and are infested by *S. asiatica* farmers were left to choose which crop to plant on demonstration plots.

A total of 16 farmers participated in the field visits and group discussion. The group included nine women. Seed of pigeon pea and *Crotalaria* had been supplied to 18 farmers. Plots were planted at 11 sites but due largely to the drought only six have survived. The short rains failed almost completely with only isolated showers falling in late December and mid-January. The long rains have also been erratic. Farmers pointed out that this has been a most unusual year, and it has been difficult for them to decide when to plant. As a consequence the area planted to rice this season is less than usual and many crops are now drought stressed and will produce low yields. Farmers have planted maize in the long rains but these crops are also poor.

- The demonstration plots have been given low priority. This is partly due to the difficult climatic conditions. Farmers planted pigeon pea first and in general have very good stands. This is an established crop in the area and farmers are very interested to follow the performance of the variety supplied by the project. This matures earlier than local varieties. *Crotalaria* on the other hand was planted later and in most cases failed to establish despite replanting. This crop is not tolerant of drought in the seedling stage. Most farmers planted in January, prior to the dry spell.
ahead of the long rains. The late planting was associated with a lack of knowledge of how *Crotalaria* grows and how it can be used in the cropping system.

- Farmers in the area use a minimum tillage system for crop establishment. Crop residues and weeds are cleared and burnt prior to planting. Deep tillage is not undertaken. Crops are usually planted on the flat so opportunities for incorporation of *Crotalaria* or pigeon pea residues within the current system are limited. The alternative will be to retain a mulch of bio-mass rather than burning crop residue.

- It was agreed that the plots of *Crotalaria* that have survived would be used for seed multiplication. Some participants reported that other farmers are also asking for seed.

- When the demonstrations were planned group members discussed including plots of the cover crop legume "kraka" (*Pureria phaseoloides*). This was introduced as a ground cover for use in tree crops many years ago and has become naturalized in the area. Farmers did not plant any plots as they failed to collect seed. One lady farmer described how she grows maize on a field where kraka has become established. She slashes down the plants and sows maize into the mulch. During the crop season she slashes the re-growth between maize plants. This is said to result in good yields. While this may well be a good system for maize production, kraka is highly competitive and persistent and would be very competitive to young rice.

### 4.3.6 Kibangile

The cropping system here was similar to that in Kiswira. Sixteen farmers, including four women, participated in the field visit and group discussion. Of 14 who had received seed from the project nine planted plots. Of these five have survived the drought. Fields are widely scattered and there was only time to visit four sites.

- This was a well led group and a number of the members have tried hard to establish plots despite the weather. Most farmers gave highest priority to pigeon pea and there are some very good stands on the demonstrations. *Crotalaria* planted in late December or early January was affected by the dry spell preceding the long rains. This is clearly not a good time to plant. The best plot of *Crotalaria* was planted following the onset of the long rains and is now producing seed.
• Farmers estimated that 25% of fields are in bush fallow rotation. It may be difficult to establish *Crotalaria* on the gravel soils of the upper slopes, particularly when rainfall is erratic, as has been the case this season. However a possibility would be to plant the crop as the land is returned to fallow. It was also suggested that *Tephrosia* might be a better green manure crop for improving the fallow. *Crotalaria* is better suited to continuously cultivated fields.

• Most of the demonstration plots are a considerable distance from the main road and major paths. New sites selected for next season should be located along major paths, which lead to markets.

5 Conclusions and Future activities

5.1 Group performance

The ownership of the program by and commitment of the farmer groups to undertake the demonstrations varies considerably between villages. The difficult weather conditions have clearly not helped while in the "new" villages this season has been the first experience the groups have had with *Crotalaria* or with planting what they view as research plots. Good leadership and group management are essential and have been key in the success of the Kilasilo group. It was therefore agreed that the project team should provide more support to the groups in the form of training. It is proposed that this will be undertaken by INADES and will include training on leadership and discussion on the roles and responsibilities of group members. In addition it has been suggested that further groups may be formed for women or younger farmers in some villages e.g. Itope. INADES is to follow up the context analysis by collecting more information on the range of institutions found in each village. Formation of new groups will depend on the outcome of this work and further discussion with farmers. This work will take place after the current season has ended, probably in July.

Some of the groups involve village leaders and this is thought to have a positive influence on activities. Team members need to take more time to visit village leaders when then are undertaking fieldwork with the groups.
5.2 Farmer exchange visits and field days

Arrangements for a series of field days were discussed and agreed with extension staff. Farmers, village extension workers and district staff from Morogoro Rural will visit sites in Kilasilo and Itope in late May. The groups in Kiswira and Kibangile will each select five farmers to make the trip. This will provide an opportunity for them to see a number of sites where farmers are growing both *Crotalaria* and pigeon pea in rotation with rice. Also to learn from farmers in Kyela how they are managing the demonstrations and what they consider to be the advantages and disadvantages of each crop. Farmers from Morogoro Rural will be able to learn the methods used in Kyela for incorporating the bio-mass prior to the next rice crop and how *Crotalaria* seed is harvested and stored. They will then give this information to other members of their groups when they return home.

Similar exchange visits will be arranged for farmers from Sinyanga and Konjula. It is hoped that seeing the performance of rice after the legumes in the field at Kilasilo and Itope will give them more confidence to afford a higher priority to the demonstrations in their villages next year. Extension staff will also organize field days at selected demonstration sites in Kilasilo and Itope to promote the use of rice/legume rotations to farmers who are not members of the farmer groups. It will be important to monitor who attends and requests seed for subsequent follow-up.

5.3 Information sources

As the use of *Crotalaria* increases farmers have been learning how to manage the crop. The issues needing particular attention are:

- Where and when should it be planted? - *Crotalaria* appears most suitable for use on land which is owned rather than rented, unless the rental period is long enough to justify the investment of labour in improving soil fertility. Similarly, for the Uluguru mountains, the green manure may be useful on continuously cultivated fields. The seedlings are not tolerant of drought and planting needs to be at the start of the most reliable periods of rainfall.

- How should the bio-mass be managed? – Farmers in Kyela who have access to draught animals and ploughs can incorporate the whole plants. Others have used hoes
to bury the bio-mass in ridges. Farmers in Kilasilo have observed that rice growth is better after incorporating *Crotalaria* although rice also performs better after using the bio-mass as mulch than where the green manure has not been planted. Farmers in the Uluguru mountains do not undertake deep tillage and may need to rely on using the bio-mass as a mulch.

- How should the seed be harvested? Likely options are to pick pods as they ripen or to cut the top branches with pods. These can then be dried for threshing later. As much bio-mass as possible should be left at the field.

Clear information on these and other aspects of rice/legume rotations for the management of *Striga* infested land needs to be made available to farmers and extension. Leaflets or posters in support of the demonstration program will also be particularly useful for promotion work beyond the core farmer groups and for scaling up to new villages. A farmer leaflet has been drafted and now needs to be finalized prior to pre-testing with farmers. The final draft will be tested by INADES in collaboration with district extension officers. It was also agreed that it would be useful to prepare a training manual for extension officers. This will provide more detail on the technologies. Members agreed to prepare an initial draft, which will be circulated to other members of the project team.

The groups are recording data from each demonstration site with assistance from village extension officers on a standard pro-forma. This includes dates of all operations, how these were undertaken (e.g. incorporation of *Crotalaria*) and *Striga* counts. Yield estimates will be made for all pigeon pea, rice and maize plots. This will include the cereal yield at sites where *Crotalaria* is being grown for the first time in order to assess the grain production foregone by planting the green manure.
List of reference

**Population Census (2002)** Preliminary report, Tanzania bureau of statistics, Dar es Salaam

TAS (2000)
World Bank, 2000