WORKING PAPER

STRIGA RESEARCH ACTIVITIES IN DODOMA REGION: EVALUATION OF ON-FARM RESEARCH TRIALS 1999/ 2000 SEASON

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Cover photo (Malcolm Press): Heads of sorghum under evaluation by farmers and scientists in Mvumi makulu village

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1. INTRODUCTION

On-farm research is being carried out in Dodoma region to develop integrated management options for the control of *Striga asiatica.* Research activities include evaluation of sorghum germplasm for resistance/ tolerance to S*triga,* the use of manure and inter-cropping with legumes. Since 1996, these activities have been funded by the DFID Crop Protection Programme and the government of Tanzania. An initial three year project finished in 1999. In 2000, a follow-up project was initiated, although delays in the start of the project put financial constraints on activities at the start of the 1999/2000 season. As a result, although seed and protocols for on-farm trials were distributed through extension staff to farmers, it was not possible to hold pre-season seminars for participants.

The 1999/ 2000 season on-farm trials were planted by participating farmers and village extension staff. These trials have been monitored by participating farmers, extension staff and researchers from ARI Ilonga. A multi-displinary team carried out an evaluation in Dodoma between May 8th – 12th 2000. The team included:

Dr C. Riches	Weed scientist, Natural Resources Institute (NRI)
Dr A. Mbwaga	Crop Protectionist, ARI Ilonga
Mr J. Hella	Agricultural economist, Sokoine University of Agriculture
Mr R. Lamboll	Socio-economist, NRI
Mr Omari	District Information Officer, Dodoma Rural District Extension Office
Dr G. Ley	Soil scientist, ARI Milingano
Prof. M. Press	Plant physiologist, University of Sheffield
Mrs Ulomi	Extension Officer, Mvumi makulu
Mr Kibaya	Extension Officer, Chipanga

The team visited the two main villages where on-farm *Striga* research is being carried out, Mvumi makulu and Chipanga. In each village we were joined by the respective extension staff for that village, Mrs Ulomi (Mvumi makulu) and Mr Kibaya(Chipanga). Two main sets of activities were carried out, one set related to evaluation of the 1999/ 2000 trials and the other initiated studies of farmers perceptions and management of soil resources. This report focuses on the evaluation of trials and the soils work is documented in a separate report.

Mvumi makuku was visited over a two day period (May 9th-10th) and Chipanga for one day (May 11th) only. In both villages, individual trials were visited by members of the evaluation team and the participating farmers. At each trial site, the owner of the *shamba* explained to other farmers what had been done and what he/ she had observed. Then other farmers asked questions or made comments. In Mvumi makuku on the second day separate groups of women and men carried out a variety preference ranking exercise and the strengths and weaknesses of the inter-cropping and manure trials were discussed.

This report draws mainly on the May evaluation, together with a monitoring report produced by Dr Mbwaga from a visit to Dodoma in early March 2000. Background information on the villages (including soil fertility and inter-cropping) comes mainly

from a RRA[1] carried out under the project in 1997, together with some secondary sources. The background and results for the two villages are presented separately in this working document.

2. MVUMI MAKULU VILLAGE

2.1 Background

2.1.1 Overview of the village and the surrounding area

Mvumi makulu is located in Mvumi division, about 40 km south-east of Dodoma town. Mvumi division has a population density of 76 people/ km^2 and the west of the division (where Mvumi makulu is located) 117 people/km^2. According to Holtland[2] (1994) there has been high population pressure in this area for over one hundred years. An associated feature, is the high level of out-migration (both temporary and permanent), particularly of economically active men. The people are mainly Wagogo and have been described as cultivating pastoralists. Traditionally livestock (rather than land) formed the basis of inherited property. In 1986, the HADO (Hifadhi Ardhi Dodoma) programme implemented a de-stocking programme in response to the high level of soil erosion which was associated with cattle numbers in the division. At this time, the proportion of households owning cattle had already declined to about 15% of households. All cattle within the division are now officially zero-grazed. Pearl millet and sorghum are the staple crops of the area.

2.1.2 Soil fertility and the use of manure

Improving soil fertility can help to control the negative effects of *Striga*. To varying degrees farmers in Mvumi makulu know that animal manure, fallowing and rotation improve fertility (crop yield). However, manure is in short supply, it is expensive and for most the only option for transporting to fields is in baskets on their head. Prior to de-stocking, 19% of households applied manure. In 1997-a survey of 28 households in two villages in Mvumi division reported 9% of households applying ash, 6% organic manure and 3% chemical fertilizer (Mhina[3] 1997). Land is scarce and rarely left completely fallow (12% according to one survey-Holtland 1994). Uncultivated land may reflect labour shortage, rather than deliberate fallowing. Some farmers rotate cereals with legumes where soil is suitable eg bambara nuts after millet. Sorghum and millet are typically dry planted, with farmers using a zero-tillage system.

Very few cattle are kept in the village and there is, therefore, a lack of animal manure. Land scarcity makes green manure fallow unfeasible (Holtland 1994). Relay planting of green manure species into cereals may be an option, but this would be an opportunist strategy, only possible in seasons with well distributed rainfall. Labour may be scarce, particularly in poorer households. Credit is not available for chemical fertilizer, but the returns are also questionable, particularly in such a semi-arid environment.

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[1] Mbwaga, A.M. Lamboll, R. and Riches, C.R. (1998) The Striga problem in Dodoma region and the Lake Zone of Tanzania: Analysis of the problem and research priorities. Ilonga ARI/ NRI project report.

[2] Holtland G. (1994) A farming systems analysis of Mvumi division, Dodoma region, Tanzania: A case study of intensifying agriculture in semi-arid Africa. Mvumi Rural Training Centre, Dodoma.

[3] Mhina E.(1997) Report on research findings on PRA and gender analysis in Mvumi division, Dodoma. FAO and Government of Tanzania.

Soil infertility appears to be perceived as a problem by at least some farmers and therefore there is a perceived need to address the problem. Some farmers, at least, are familiar with benefits of chemical fertilizers. Holtland suggests CAN may be an option depending on the price of the fertilizer and the sorghum market. The project is exploring the options for very specific applications (0, 0.25 kg and 0.5 kg per hill) of animal manure as a means of suppressing *Striga* and increasing sorghum yield.

2.1.3 Inter-cropping

Farmers' strategies needs further research. Mixing of crops takes place, but usually on the basis of many minor crops (eg watermelon, calabash, cowpea, pigeon pea) with one or two main cereal crops. Long duration sorghum and millet are dry planted with zero-tillage. Farmers report that groundnuts and bambara nut require more attention and are planted after rains (also maize). Groundnuts (in particular) and bambara tend to be planted separately (as a cash crop). Cowpea may be mixed with sorghum. Pigeon pea is grown in the village and some farmers have expressed an interest in expanding this crop. Some legumes eg groundnuts perform better on sandy soils, whereas sorghum and maize are more commonly found on sandy loams. Inter-cropping cowpea and pigeon pea with sorghum would seem to offer the most potential in terms of consistency with farmers' current practices. However, the parasitic weed *Alectra vogelii* is very common in the village and local cowpea lines appear highly susceptible.

2.2 Striga Trials in Mvumi makulu 1999/2000 season

2.2.1 Introduction

Erratic rains resulted in farmers planting the trials several times throughout the season (Table 1). Many farmers planted for a third time, following relatively heavy rains at the beginning of March.

Table 1 Rainfall data (mm) for Mvumi: 1999/ 2000 season (up to early March)

	1999		2000											
Date	14/12	16/12	3/1	4/1	8/1	9/1	10/1	11/1	1/2	2/2	9/2	15/2	1/3	4/3
Rainfall	29.0	26.5	2.3	5.8	33.3	9.0	4.5	1.5	7.5	6.0	13.5	5.5	6.5	56.5

Three sets of trials were implemented. Firstly, manure x sorghum varieties/ lines; secondly, sorghum variety / lines and thirdly, sorghum inter-cropped with groundnuts (Table 2). Manure was applied at rates of zero, 1/4 and 1/2 kg (based on volume of container) per hill at planting. There was a shortage of groundnuts (the seed multiplication at Hombolo sub-station failed) and only two farmers planted this trial using Nyota groundnut seed provided by the project from Ilonga ARI.

Farmers were selected by village-based extension staff, with the main criterion that *Striga* should be present in their *shamba*. In total seven men and three women participated in the 1999/2000 trials (Table 2). These farmers were involved in the group evaluations of varieties, manure and inter-cropping, together with three women and a number of men who did not have trials on their *shambas*. In previous years women had hardly been involved in these activities. This was a major omission and a deliberate effort was made to increase their participation this year. This was partially successful with three women involved in the trials and at least four involved in the evaluation.

Table 2 Farmer participating in Striga trials in Mvumi makulu

	Sex	Manure x varieties (P9405, P9406, SRN 39, Weijita, MACIA, PATO)	Varieties/ lines P9405, P9406 and Pato:	Intercrop sorghum with groundnuts
Bangis Mazengo -	M	3		
Dan Zogoro -	M	3		3
Simon Mbwana -	M	3		
David Zogoro	M			3
Ezekiel Myeji	M		3	
Jeniva Ndhalila	F		3	
John Dabaga,	M		3	
Charles Malawiba,	M		3	
Rose Magwe	F		3	
Timatheo Nyakwarea	F		3	

Trials were set up according to researchers' design, with some additional seed also being provided. Monitoring of the trials was carried out by the village extension staff, together with some visits from more senior extension staff and researchers.

2.2.2 Evaluation of Sorghum varieties

Previous studies and current research activities have identified the shortage of alternative sorghum varieties in Dodoma and elsewhere. In particular, farmers in Dodoma appear to have no sorghum varieties which are resistant to *Striga*. As part of the strategy to address the *Striga* problem, a number of varieties are being evaluated on-farm.

Three languages were involved during the evaluation and so it was useful to clarify terms for each of the main cereals (Table 3).

Table 3 Cereal crop names in Cigogo, Swahili and English

English	**Swahili**	**Cigogo**
Maize	Mahindi	Matama
Pearl millet	Uwele	Uhemba
Sorghum	Mtama	Uhemba

Pearl millet and sorghum are the traditional cereal crops in this community and, interestingly, in *cigogo*, the two crops are referred to by the same term-*uhemba*. In an attempt to keep a farmer perspective, this term was used in the evaluation to see how the different types of sorghum and pearl millet were differentiated and prioritized. Separate groups of women and men were asked to bring examples of *uhemba (*sorghum or pearl millet) which are grown in Mvumi makula . Group participants were then asked the names of these types (varieties or landraces) and any others which they knew still to be in the community. Through this process the women identified 13 types (10 sorghum and 3 pearl millet) and the men, 11 types (8 sorghum and 3 pearl millet) (Tables 6 and 7). The women reported 3 sorghum names not mentioned by the men (Lugugu (Arusha), N'gonje and Udo), whereas the men reported one sorghum name (Ndagumo) and one pearl millet name (Serere) not included by the women. Three sorghum names reported by men in a similar exercise in Mvumi makulu in May 1999 were not given by either women or men on this occasion- Sanyaji, Mugali, Chingwala (all red types).

Women identified 15 criteria for assessing varieties, compared to nine identified by men (Table 4). The difference may be partly attributed to the men's exercise being a bit rushed due to constraints on time. Both women and men cited high yield as their most important criterion for assessing a variety. However, there then appears to be some differences in opinion, with women prioritizing drought resistance, early maturity, marketability and palatability, while men emphasised suitability for brewing, plant height, size of head, resistance to pest attack and size of seed. These are perhaps less different than first appears. Plant height was associated with period to maturity (shorter plants mature earlier), as well as ability to withstand wind (shorter plants are less likely to lodge) and susceptibility to theft (shorter, early maturing crop more likely to be stolen). Large head size (and possibly seed size) are associated with yield. It's not clear why the men didn't mention marketability as a criterion (as was the case in the May 1999 preference ranking exercise) although this would at least partially coincide with suitability for brewing.

Table 4 Farmer criteria for assessing types of *uhemba* (sorghum and pearl millet)

Criteria	**Women**	**Men**
Drought resistance	2	
Early maturity	3	
High yielding	1	1
Large head-size	3	4
Large seed		6
Susceptibility to bird damage	3	
Susceptibility to field pests	3	
Short plants		3
Strong stem		8
Not shattering		9
Cooking sorghum breads	3	
Susceptibility to storage pests	3	5
Easily de-hulled	3	7
Suitability for making beer	3	2
Suitability for making pop sorghum	3	
Marketability	5	
Palatability of ugali	4	
Whiteness of ugali	3	

1= most important
3= mentioned, but not given a high priority

Table 5 shows farmers overall ranking of types of *uhemba*. Women ranked Pato (variety of sorghum) the highest, followed by Uwele China (pearl millet) and then the newly introduced (*Striga* tolerant) sorghum types P9405 and P9406 (referred to as P5 and P6 by the farmers). Pato scores relatively highly on all the women's most important criteria, including (in contrast to other preference ranking exercises) palatability. However, this variety is reported as being susceptible to field and storage pests. Uwele china (pearl millet) scores highly in terms of early maturity, drought resistance, marketability and brewing suitability. P5 and P6 score highly according to drought resistance, early maturity and marketability of the seed. During a discussion between researchers and the participating group in the field, some farmers described how P5 and P6 have similar drought tolerance to pearl millet. There was also

consensus that P5 is the most drought tolerant line in the trials and the earliest maturing of the cereals grown to date. P5 and P6 also score well according to head size (and on this basis yield) and the whiteness of the *ugali*. There was no information on taste and a number of other post-harvest criteria during the ranking exercise. However, during the field walk, three farmers reported that *ugali* made from P5 is better than that made from Pato and that unlike Pato it is also good for making *pilau*. Furthermore, some farmers remarked that P5 *ugali* is better than that prepared from any of the local sorghums. When asked about the occurrence of *Striga*, P5 and P6 were reported as having the lowest occurrence of the weed of all the sorghum types.

Men ranked the three pearl millets ahead of any of the sorghum. This appears to be based on brewing suitability, storage qualities and ease of de-hulling. In the May 1999 exercise, pearl millet scored highly in terms of drought resistance, taste and reducing feeling of hunger with men in Mkumi makulu. Pato was the highest scoring sorghum variety, followed by P5 and P6, with yield again apparently the main criterion.

Table 5 Ranking of types of *uhemba* (sorghum and pearl millet) by women and men

Name	**Crop**	**Details**	**Women**	**Men**	**Com-bined****
Pato	Sorghum	Variety released in 1990s	1	4	5
P9405	Sorghum	Striga trial variety/ line	3	5	8
P9406	Sorghum	Striga trial variety/ line	3	6	9
Okoa (Kiboko)	Pearl millet	Variety released in 1991	7	2	9
Uwele (local)	Pearl millet	Local landrace	R	1*	11
Uwele –China	Pearl millet	Landrace	2	NR*	12
(M)bangala	Sorghum	Landrace	6	7	13
Serere	Pearl millet	Variety released in 1970s	NR	3	13
Lugugu (Arusha)	Sorghum	Landrace (orginally from Arusha?)	5	NR	15
Sandala	Sorghum	Landrace	8	9	17
Mhuputa	Sorghum	Landrace	R	8	18

NR= Not reported; R = reported, but not ranked

* Men reported 'Uwele', which may refer to either or both of Uwele (local) and Uwele-china. For indicative ranking it is assumed to refer to Uwele (local).

** Ranking of women and men combined to give an indicative overall ranking. Types which were not ranked, have been given a ranking score of 10.

The results suggest that farmers in Mvumi makulu rank Pato very highly. This is in contrast to the result from the 1999 evaluation with men, but apparently corresponds with a survey of 30 farmers carried out by the project in 1999 where 90% of the farmers had grown Pato at some time in the previous three years (compared to 66% for Tegemeo and 53% for local landraces- see Appendix 3). Very little Tegemeo was observed during this evaluation. Although farmers had Tegemeo seed from the previous season's crop, in common with other sorghum types, much had failed to emerge because of the drought conditions and remaining seed had been eaten due to the hunger associated with the drought. .Both women and men also express a preference for both P9405 and P9406, although a number of the farmers new to the trials (including all the women) have yet to make a full assessment according to post-harvest criteria. Next season it will be important to involve more women, to draw on all the criteria identified by farmers in 1999 and 2000 and to make a complete assessment.

Table 6 *Uhemba* (Sorghum and pearl millet) preference: Women in Mvumi makulu village

Criteria	Mhuputa	Lugugu (Arusha)	Pato	P5	P6	Tegemeo	Sandala	Mbangala	N'gonje	Udo	Okoa	Uwele China)	Uwele (local)
Drought resistance	6	4	3	1	1	4	4	5	7	5	2	2	5
Early maturity	9	9	4	1	1	3	5	6	8	7	2	1	7
High yielding	4	2	1	3	3	3	4	4	5	5	3	3	6
Large headsize	5	2	1	2	2	1	4	3	?	6	B	C	A
More attacked by birds[1]	-	-	-	1	1	4	4	-	-	3	2	1	-
More attacked by field pests[2]	-	-	1	?	?	2	-	-	-	-	-	-	-
Cooking sorghum breads													
Easily attacked by storage pests[3]	5	3	2	-	-	1	2	3	4	4	6	6	6
Easily dehulled	2	2	3	-	-	7	1	2	3	7	5	4	6
Suitability for making beer	3*	3*	2	-	-	3*	3*	3*	?	2	1	1	1
Making pop sorghum	1	1	2	-	-	-	2	2	-	-	-	-	-
Marketability	4	3	2	2	2	7	4	4	6	5	1	1	1
Paltability of ugali	1	1	1	-	-	5	1	1	2	3	4	4	4
Whiteness of ugali	1	1	2	2	2	3	1	1	4	6	5	5	5
Occurrence of Striga[4]	1	2	3	4	4	2	2	2	2	2	5	5	5
Overall ranking		5	1	3	3		8	6			7	2	

Note: *Local brewing-best only when mixed with pearl millet

** Marketability – for P5 and P6 refers to market for seed

? Not sure/ undecided

- No information

A, B, C – head size for pearl millet varieties is compared using letters

1- 1= most susceptible to bird attack

2- 1= most susceptible to field pests

3- 1 = most susceptible to storage pests

4- 1 = most associated with occurrence of *Striga* (Note: This was not a criterion given by farmers)

Table 7 *Uhemba* (Sorgum and pearl millet) preference: Men in Mvumi makulu village

Criteria	Rank	Pato	P5	P6	Bangala	Mhuputa	Tegemeo	Ndagumo	Sandala	Uwele	Okoa (Kiboloo)	Serere
High yielding	1	1	3	2	4	5	6	10	7	9	8	11
Large head size	4	1	6	2	4	3	5	10	7	9	8	11
Large seed	6	1	2	3	4	8	5	7	6	10	9	11
Plant height (short preferred)	3	5	1	2	11	10	4	8	6	9	7	3
Thick/ Strong plant stem	8	1	3	2	8	9	4	5	6	10	7	11
Easy shattering	9	3	4	5	2	1	6	8	7	11	9	10
Easy dehulling	7	6	11	10	5	7	8	9	4	1	3	2
Good for local brew	2	7	10	9	4	5	6	11	8	1	2	3
Resistance to (storage) pests	5	11	10	9	6	4	8	5	7	1	2	3
Overall rank		4	5	6	7	8	9	11	10	1	2	3

2.2.3 Inter-cropping evaluation

The project is assessing the effectiveness of a groundnut/sorghum inter-crop as a means of suppressing *Striga.* In the 1999/2000 season two farmers (both men) participated in this trial. In separate focus groups, men and women were asked to evaluate the strengths and weaknesses of inter-cropping sorghum with groundnuts.

Both women and men reported that inter-cropping of sorghum with groundnuts reduced the *Striga* population. Women reported a number of other advantages including increased returns through two crops on one plot, increasing size of sorghum heads, increasing soil fertility from groundnut leaves and sorghum not wilting during drought.

Both men and women reported the increased care that is needed when weeding cereals with an inter-crop. The men also reported a reduction in sorghum yield, difficulty in planting the inter-crop and hence delays in planting.

Table 8 -Perceptions of strengths and weaknesses of Inter-cropping sorghum with groundnuts for Striga suppression: Women and men in Mvumi Makulu.

	Strengths	**Weaknesses**
Women[4]	• Two crops can be harvested from one plot • Striga population is reduced • Size of sorghum heads is increased • Groundnut leaves which are left on the plot add soil fertility • If there is no rainfall (drought period) sorghum does not wilt	• Care is needed during weeding which is a slow operation in an inter-crop.
Men	• Striga population is reduced	• Sorghum yield is reduced • It is harder to plant an inter-crop • Planting is delayed (takes longer ?) • Care is needed during weeding which is a slow operation in an inter-crop.

In a survey of 30 farmers in Mvumi makulu in 1999, 50% of farmers had inter-cropped sorghum with cowpea at some time in the previous three seasons, but only 13% had inter-cropped with groundnuts. There are a number of other possible factors that may explain why farmers don't currently favour inter-cropping of sorghum with groundnuts. Groundnut is an important cash crop which is usually grown on small plots (*vigundu)* which are ideally, and more frequently, grown on sandy soil, whereas sorghum is more frequently grown on sandy (clay) loams (Holtland 1994). Groundnuts are planted after the first rains (unlike the traditionally dry planted sorghum) and (according to Mantari pers com) require more attention eg deeper cultivation. The increased care in weeding, mentioned above, may be further explained by Holtland's (1994) explanation of the importance of weeding in water conservation. In the first weeding soil is taken away from the plant so water runs towards it, whereas in the second weeding the earth is returned around the bigger plant.

[4] Rosemary Mabwe, Grace Nyakwaka, Margareth Dabaga, Olopa Mazengo

2.2.4 Evaluation of use and effects of manure application

Eight farmers (two women and six men) were involved in manure trials. Women and men reported increases in crop yield with manure application (Table 9). Women spoke of increasing soil fertility and reducing *Striga* and men reported a healthier and faster growing crop. However, the use of manure is also associated with a number of difficulties. Both women and men reported the problem of cutworms and increased weeds, as well as difficulties associated with the use of manure when rainfall is low (manure speeds up wilting (women) and can lead to poor germination (men)). Women also reported increased problems with stalkborers. Men emphasised difficulties in access, cost and application of manure.

Table 9 Perceptions of strengths and weaknesses of using manure on sorghum: Women and men in Mvumi makulu.

	Strengths	**Weaknesses**
Women	• Increased crop yield • Increased soil fertility • Incidence of Striga is reduced	• If rainfall is insufficient the sorghum crop can wilt and die faster • Cutworms are more of a problem in the seedling stage • Stalkborers ("selenje") increase on sorghum • Weed problems increase
Men	• Increased crop yield • Crop plants are healthier • Crop plants grow faster • Increase of other components of crop mix in the same field e.g. melons	• If rainfall is insufficient cutworms are a problem - cut crop roots and plants wilt • When rainfall is poor after planting there will be poor germination of the crop • Those who have no cattle find it difficult to obtain manure • Weed problems increase • Use of manure is difficult (application by holeing out before planting?) • Price of manure is high and hard to afford e.g. Tsh 30,000 per lorry load quoted.

In the 1999 survey of 30 farmers in Mvumi makulu 66% of farmers reported that it would be very easy to apply manure to shambas near their house, but 77% responded that it would be difficult or very difficult far from their house.

Marejea and Pigeonpea

Some farmers planted pigeon pea (eg Ezekiel Myeji) but the crop was planted late and there was not enough moisture for establishment. *Marajea* (Crotalaria) was also planted late and failed to establish. Farmers have requested seed to try pigeon pea and *marajea* next season.

2.2.5 Round-up group discussion

Farmers were asked by Dr Mbwaga what they expect now from the project.

They replied:

- more seed to increase acreage of early maturing sorghum lines in the village. More farmers could then participate;
- sensitise other farmers to encourage them to participate;
- seed of P9405, P9406 and Pato next season.
- Exchange visits to other villages with trials
- Loans to purchase hoes (Tsh 1,500 to 2000 each).

There was also considerable discussion, initiated by the farmers about future supplies of seed of the new sorghum lines. They now have the seed but need assistance with maintaining purity. It emerged that there is growing demand from other farmers for the seed – one participant claims to have sold some to others even before harvesting.

It was then suggested that the group begins to think about having a seed multiplication plot, how to distribute the seed and how to involve other farmers. There was also a request for more groundnut seed and Dr Mbwaga suggested that this could be obtained from fellow farmers who planted the inter-cropping trials.

3. CHIPANGA VILLAGE

3.1 Background

3.1.1 The village and surrounding area

The people of Chipanga are Wagogo, although they consider themselves different from the Wagogo of Mvumi makulu. There is a lower population density than Mvumi division (Dodoma Rural (without Mvumi): 27 persons / km^2 in 1988). Cattle numbers are much higher and they are managed on open pasture, rather than zero grazed.

3.1.2 Soil fertility and use of manure

Soil fertility doesn't appear to be perceived by farmers as a major concern. Farmers differentiate a number of soil types. Striga is associated with sandy/ poor soils (reported by men and elders) and all soils types(women). Women have reported that manure application is useful for the control of *Striga*. Manure is in widespread use only on fields close to homesteads. Fallowing appears to be rare, then for 2-3 years. Sorghum and millet is dry planted following zero-tillage.

Animal manure is not considered to be in short supply, but carrying manure is a burden. There are limited transport options (usually on the head) for taking manure to fields, particularly away from homestead. Labour may be scarce, particularly in poorer households. Green manure is likely to be inconsistent with current cultivation and planting practices for sorghum.

Animal manure appears to be relatively available. Transport problem could be addressed (e.g. wheelbarrows). Land may be available for at least some farmers to grow green manure fallow. The main issue is whether there is sufficient perceived need and incentive to carry out these activities.

3.1.3 Inter-cropping

Farmers perceive legumes as requiring more attention than millet and sorghum. Land is relatively abundant and therefore no need to mix cereals and legumes in the same shamba. Farmer strategy needs further research. Long duration sorghum and millet is dry planted with minimum tillage. Groundnuts and bambara require more attention and are planted after rains. Groundnuts (in particular) and bambara tend to be planted separately (as a cash crop). In a survey of 30 farmers in 1999 90% of respondents had grown groundnuts and 100% bambara nuts in the previous three seasons, but none had inter-cropped with cereals. The reason given was that there was sufficient land available and therefore there was no need to inter-crop.

Some legumes, eg groundnuts, perform better on sandy soils, whereas sorghum and (on a limited scale)maize do well on sandy loams. Farmers don't currently perceive a need or benefit in planting cereals and legumes in the same shamba. Possibly further exploration of farmer rationale/ incentives and an assessment of overall costs/ benefits of mixing v non-mixing of cereals and legumes at inter and intra household level may be useful.

3.2 Striga Trials in Chipanga 1999/ 2000 season

3.2.1 Introduction

Twenty farmers were originally involved in this season's trials, of which four were women. There were two main sets of trials: an evaluation of six promising lines/ varieties and a comparison P9405, Pato and P9406 (with and without manure). The low rainfall and poor distribution resulted in many farmers having to re-plant the trials two or three times (Table 10). This is a common practice in this area and helps to illustrate the difficulties of farming and sustaining livelihoods.

Table 10 Chipanga farmers originally participating in Striga trials 1999/2000

Farmer	Sex	Varieties: P9405, P9406, SRN 39, Weijita, Marcia, Pato with manure	Varieties P9405, P9406 and Pato with manure	Status of trial in early March 2000
John Makasi	M	3		Sorghum just germinated, this is the 3rd sowing, plots are relative small
Dickson Chilanga:	M	3		Planted but crop died, to replant
Jacob Chilanga:	M	3		Good crop it is at flowering stage, Striga has not emerged.
Loti Jackson	M	3		Good crop, but Striga not yet emerged.
Rosa Makasi -	F	3		Crop died, to replant
Magreth Mchewe	F	3		Germinated but poor crop stand
Lazaro Lyingi:	M	3		Still he has to plant, he stored the seed
Agnes Masika:	F	3		Planted but crop died, to replant
Charles Mnyahango	M	3		Still to plant, he has the seed.
Roda Mica	F	3		Still to plant, she has the seed, from last year crop she sold at 500 Tsh/kg.
Zacharia Mkwala	M		3	Crop just germinated
Chalos Zecheni	M		3	Crop died to replant
Richard Msavaya	M		3	Still to plant
Bernard Luseko	M		3	Replanted 3 times crop died
Yohana Mzungu	M		3	Still to plant he has the seed
Steven Mhagwa	M		3	Crop at flowering stage but no Striga
Alex Kamoja	M		3	Crop died no more seed
Mhila Chilobe	M		3	Still to plant
Nolo Chimwagu	M		3	Crop died he has no more seed
Kibaya (Bwana shamba)	M		3	Yet to plant, still he has the seed

Individual trial sites were visited with the farmer group. At each site the owner of the field explained to other farmers what had been done and what he/she had observed. Then other farmers asked questions or made comments. Due to limitations on time, there was no systematic group evaluation of the trials as in Mvumi makulu. Table 11 presents researchers observations and farmers views' on the trials.

3.2.2 Evaluation of sorghum varieties

A number of comments emerged from observations and discussions with farmers regarding sorghum varieties. Weijita was thought not to be suitable in dry conditions and the quality of the *ugali* was questioned. Pato appears to have been affected by the drought. P9405 matures early and is relatively drought resistant. One problem with early maturity is losses to birds. P9406 is similar to P9405. Marcia is also considered early maturing and drought resistant. All lines were attacked by the long smut pathogen this season. Also seen at Mvumi, the disease was particularly severe at Chipanga. P6 appears more susceptible (i.e. a higher proportion of heads carried smutted seed) than other lines tested and this was discussed in detail with farmers. Their view, supported by research knowledge, is that the disease is not common and is only seen in years when there is a severe drought. Farmers were quite clear that long smut is not a serious issue and not a reason for not continuing to grow P6. Overall farmers would like to continue with Pato, P9405 and P9406, indeed they wish to consider arrangements for seed multiplication.

In 2000/ 2001, it is extremely important that a systematic evaluation is carried out. This will require sufficient men and women to be involved in the trials. If at all possible these should be the same farmers that were involved this year.

3.2.3 Evaluation of use and effects of manure application

This year, as a general observation from the participating farmers, manure appears to have had either no effect or a negative influence on crop growth in Chipanga. Farmers reported this as being the effect of the drought and was seen on many fields where manure was spread, not only those with trials. As a group, they think it is because the manure does not decompose, but remains in lumps in the soil. As a result there are large pores in the soil and moisture is lost. However, in years that are less dry, farmers believe that manure is seen to have a beneficial effect on crop growth.

Previous work and this year's trials in Chipanga suggest that in many years, farmers' priority with respect to soil is moisture rather than fertility per se. A better understanding of this issue should emerge from the studies of farmers' perceptions and management of soil resources.

Table 11 Field observations and farmers comments on trials: Chipanga village

Farmer	Researcher observation	Farmer views
Varieties: P9405, P9406, SRN 39, Weijita, MACIA, PATO with manure		
Cholo Myahumu	Variety and manure trial. Ngogomba soil. Late planted in early March, sorghum now flowering. Patchy stands as there has been no rain since 15th March. Some area of plot will yield others totally droughted. Overall impression is that although growth is poor due to drought and plants are short, P9505, P9406 and Marcia are flowering well. No *Striga*. No obvious effect of manure application.	Does not want to grow weijita again, thinks it is no good under dry conditions. His adjacent field has *Striga* infestation, where Pato is particularly badly effected; plants stunted with small heads.
Dixon Chilanga	Cultivar comparison. Sandy red Isanga soil. Some mixing of cultivars on these plots as transplanting was done to fill gaps. P9405 is a poor stand but has large heads; P9406 good heads but lots of smut; Weijita has grown well here but also lots of smut; Pato has good heads and less smut; SRN39 has made excellent growth and has clean even heads with little smut.	
Jacob Chilanga	Cultivar comparison. Isangha soil; a fine grey sand. Farmers say this is good for sorghum as plants tiller well. In comparison a near by field of red soil was described as Nkhuluhi. This is said to be low in fertility and does not give a good yield with out manure. Crop was planted in December so is now ratoonng. Weijita is droughted with few heads, Pato has small heads, P9405 has tillered well with good heads, Marcia has ratooned with good heads, P9406 still green due to patches of wetter soil on plot, excellent heads; SRN39 is excellent here, good growth and heads.	In discussion the group indicated that as it matures early P9405 can be eaten by birds but they want to grow this line and P9406 because of the early maturity. SRN39 also thought to be a good line but farmers are clear that they do not want to grow weijita!
John Makasi	3 rates of manure (0.25, 0.5 kg per planting station or none) with six cultivars. Planted three times. Soil here a Ngogomba (Mfnyanzi) – a clay soil (Press thought it a sandy loam) which is sticky when wet and is very common here and used for sorghum. SRN39, Marcia, P9406 all with good size heads; Pato and Weijita droughted poor, little yield; also P9405 patchy stand here, some good heads (position on plot?). Poorer growth on plots with higher rate of manure but generally little effect. *Striga* scattered across plot but drying, difficult to assess at this visit.	In terms of drought resistance, Weijita is no use; anyway it produces poor ugali. Pato is also poor in the drought, needs more rain. Although we have not eaten it yet P9405, P9406 and Marcia appear to be useful as early maturing and drought resistant. The manure was applied to the dry seedbed into holes where seed was sown. This reduced germination as soil moisture was marginal at best following planting, as initial rains did not continue.
Male farmer (name not noted)	- Cultivars and manure. Soil here said to be Ngogomba, a kichanga, mixture of sands. A very well managed field – farmer had made his own labels for each plot with cultuvar names! For this field day he had harvested each plot so the group could see the size of the pile of heads produced by each manure level x cultivar combination. We did not see much effect of manure. Most yield had been produced by P9405, P9406 and Marcia. SRN39 had done less well here. Pato and Weijita poor	Thought P9405, P9406 and Marcia were the best cultivars tested. There is usually *Striga* on this plot but not during this drought. He maintained that germination and sorghum growth had been better where he applied 0.25 kg manure per sorghum planting station.

	yields.	
Margaret Mchewe	– Variety trial Weijita is droughted with few heads; Pato had been harvested already. P9405 and P9406 also mature with many heads; some ratooning for P9405 and at this suite less smut on P9406 than sees elsewhere. SRN39 again looks excellent with good size heads. Marcia has many small heads.	This is the first season that the farmer has planted a trial. She likes the look of all lines except Weijita.
Rose Makasi	Cultivar trial This farmer is also new to the group and was not familiar with the names of the different cultivars. At this site P9406 had large heads, P9405 also good, SRN39 was still green and flowering. Weijita, Pato and Marcia had failed to yield much due to the drought.	She selected P9406, followed by P9405 as the best lines in the trial. Poor growth where manure was applied; effect of the drought more obvious on plants where manure was used The group pointed out that growth is poor in drought years where manure is used – this is a general observation. They think it is because the manure does not decompose but remains in the soil in lumps – this means there are large pores in the soil and moisture is lost. But will continue to use manure as usually advantages are seen. It is only in a bad drought such as this that growth is poor where manure is used.
Varieties P9405, P9406 and Pato with manure		
Richard Mswaya -	P9405, P9406 and Pato. The farmer was not around due to illness. P9405, P9406 both look good here while Pato is droughted. Despite the long smut, P9406 will produce the best yield.	
Stephen Mhagwa	P9405, P9406 and Pato. Pato looks good here, with bigger heads than the other two lines under test.	Impressed by earliness of P9405 and P9406. He has also joined group to gain access to the seed of these early maturing types. Pointed out that there is more *Striga* on Pato than other two lines. We discussed the occurrence of long smut with the group. This was conspicuous on all sorghum lines, including local types, this season, but particularly obvious on P9406. But farmers and extension officer maintained this is not an issue as long smut is only seen in years of very low rainfall, and is generally not significant. When asked which cultivars they would like to continue with the group replied Pato, P9405 and P9406. Compared to Tegemeo, which they are familiar with, P9405 and P9406 mature early so are good for growing here. Farmers who grew these lines last year said the ugali from P9405 is very good, better than from Pato or Tegemeo.

3.2.4 Sorghum seed production

The group returned via a walk through the DCT (Diocese of the Church of Tanganyika) seed multiplication field where 20 farmers have plots of Pato, each of 1 acre. In the scheme the individual farmers are responsible for crop production but DCT assists with marketing and transport. The seed is labelled as being from the seed farm and germination tested. The farmers were not happy with the situation here – they feel that DCT takes a high levy for selling the seed, said to be Tsh. 200 per kg. They therefore want to open an account of their own and fund one member to find the market. The seed currently sells for about Tsh 700 per kg, which is more than twice the price that farm saved seed sells for.

3.2.5 Round-up discussion:

- Farmers discussed the manure trials and indicated that they normally broadcast, rather than make spot applications as was done on the plots. Broadcasting needs less labour but the manure is not incorporated until weeding. As was discussed in the field, there is a rainfall x manure interaction so poor emergence can result under dry conditions. It was not clear if this was worse with spot applications.
- It was agreed to modify the trial for next season, again using three treatments
  - no manure
  - 0.25 kg applied as spot treatment
  - one tin per m^2, but with manure placed in rows into which sorghum seed is subsequently planted. This is a compromise situation which should reduce labour input, as manure will not be placed in the planting hole, but there will still be some incorporation during planting.
- Farmers requested P9405, P9406, Marcia and SRN39 for continued testing/production next season. They want to ensure seed supply of these in the future and requested Bwana shamba to help them with seed selection and treatment. There was discussion about how to organise seed multiplication in the village. As the project will supply seed again for next season this is an issue which can be followed up in the coming months.
- We asked the farmers again about the long smut issue and wondered if P9406 is too susceptible to continue with. However, the farmers do not rank this as a problem – the consensus is clearly that this disease is not common; in fact it is associate with the on-going drought.
- We also discussed incorporating more legumes into the cropping system with a view to fertility enhancement. Some farmers mentioned that in the past they had seen Sukuma farmers settle in the area who had mixed sorghum and legumes. They indicated an interest in testing pigeon pea and it was agreed that Dr Mbwaga will provide seed for inter-cropping in sorghum next season.

4. SUMMARY OF KEY POINTS

1. **The research environment**-the low and uneven distribution of rainfall in semi-arid Dodoma resulted in farmers planting their trials up to three times. This has been a consistent feature of on-farm *Striga* trials in this region and reflects the risky and difficult environment in which people are farming. Are we taking this sufficiently into account in our research planning?

2. **The research process**- in both Mvumi makulu and Chipanga, farmer participation has improved in terms of the number of people and particularly the involvement of women. Within the limits of the project objectives, there are indications that farmers have some ownership of the process, particularly seed-related activities. It's important that we continue to build on this over the coming seasons.

3. **Variety evaluation**-researchers are gaining a fuller picture of farmers' criteria for evaluating types of sorghum (and pearl millet). In Mvumi makulu, P9405 and P9406 were ranked above all other sorghum types, with the exception of Pato, by both women and men. However, some farmers (particularly women) were not able to fully evaluate against post-harvest criteria. Men in Mvumi makulu ranked three pearl millet types above any sorghum. In Chipanga, farmers expressed a preference for continuing with all sorghum types (Pato, P9405, P9406, Marcia, SRN39), with the exception of Weijita (considered drought-prone and making less paltable *ugali).* In 2000/ 2001 season, it is extremely important that a systematic evaluation is carried out. This will require sufficient men and women to be involved in the trials. If at all possible these should be the same farmers that were involved this year.

4. **Use and effects of manure-** in Mvumi makulu, women and men reported increases in crop yield with manure application. Women spoke of increasing soil fertility and reducing *Striga* and men reported a healthier and faster growing crop. However, the use of manure is also associated with a number of difficulties. Both women and men reported the problem of cutworms and increased weeds, as well as difficulties associated with the use of manure when rainfall is low (manure speeds up wilting (women) and can lead to poor germination (men)). Women also reported increased problems with stalkborers. Men emphasised difficulties in access, cost and application of manure. In Chipanga, this year, as a general observation from the participating farmers, manure appears to have had either no effect or a negative influence on crop growth. Farmers attributed this to the effect of the drought and researchers observed the same effect on many fields where manure was spread, not only those with trials. As a group, they think it is because the manure does not decompose, but remains in lumps in the soil. As a result there are large pores in the soil and moisture is lost. However, in years that are less dry, farmers believe that manure is seen to have a beneficial effect on crop growth. Previous work and this year's trials in Chipanga suggest that in many years, farmers' priority with respect to soil is moisture rather than fertility per se. Holtland (1994) suggests that the utility of soils in Dodoma depend on fertility, workability and the water regime. A better

understanding of these issues should emerge from the qualitative and quantitative studies of farmers' perceptions and management of soil resources.

5. **Intercropping cereals with legumes-** the project is assessing the effectiveness of a groundnut/sorghum inter-crop as a means of suppressing *Striga*. In Mvumi makulu, both women and men reported that inter-cropping of sorghum with groundnuts reduced the *Striga* population. Women reported a number of other advantages including increased returns through two crops on one plot, increasing size of sorghum heads, increasing soil fertility from groundnut leaves and sorghum not wilting during drought. Both men and women reported the increased care that is needed when weeding cereals with an inter-crop. The men also reported a reduction in sorghum yield, difficulty in planting the inter-crop and hence delays in planting. Women appear to be more in favour of this approach than men, something which can be followed-up in the 2000/2001 trials. In Chipanga, farmers do not currently perceive a need or benefit in inter-cropping cereals with legumes and hence, so far, there have been no trials..

6. **The way forward-** in both villages, farmers put a strong emphasis on seed. In Mvumi makulu farmers' suggestions included: more sorghum seed (P9405, P9406 and Pato) to increase acreage of early maturing sorghum lines in the village and more farmers could then participate; sensitise other farmers to encourage them to participate; exchange visits to other villages with trials; loans to purchase hoes (Tsh 1,500 to 2000 each). There was also a request for more groundnut seed. In Chipanga, farmers and researchers reached a compromise regarding manure application, which would require less labour input than last season's trials (although still more than the usual farmer practice) but would still result in some incorporation during planting. This will involve manure being placed in rows into which the sorghum seed is to be planted. Farmers requested to continue with all sorghum types, except *Weijita*. for testing/production next season. Some farmers mentioned that in the past they had seen Sukuma farmers in the area who had mixed sorghum and legumes and indicated an interest in testing pigeon pea and sorghum next season.

APPENDIX 1

Brief Report on the activities undertaken during 1999/2000 season :

Dr. G. Ley has agreed to participate with us on the Striga research activities, he is ready to start any time, we have to discuss on the programme.

The Economist we had earmarked from Mpwapwa has gone for MSc programme at SUA, we have to opt for Mr Hella of SUA who is having some activities at Mvumi.

Output 1: Striga resistant /tolerant cultivars validated by farmers and promoted to uptake pathways:

1.1 Farmers evaluation of promising sorghum lines in Missungwi and Dodoma rural 1999/2000 Varieties x Manure
Mvumi: 2 farmers planted 6 varieties, Saimon Mbwana and Dan Zogoro. The rest (6 farmers) were afraid of bad weather and planted 3 varieties ie P9405, Pato and P9406- these are Bangis, John Dabaga, Charles Malamba, Ezekiel, Jane Vadolila and Rose Mary.
Chipanga: 10 farmers planted promising lines and 10 farmers planted P9405, Pato and P9406
Mwagalla: 3 farmers planted promising lines
Iteja: 3 farmers planted a trial on promising varieties

1.2 Uniformity trial of selected lines which are being advanced for release:
Planted at Hombolo, Makutopora, Mvumi, Melela, Ukiriguru and Naliendele.
At Hombolo, the crop is at knee height, Makutopora (TARP II funding) has just been planted, Melela read for thinning, Ukiriguru it approaches knee height and at Naliendele (TARP II funding)it is being planted.

1.3 Seed multiplication at Ilonga with adequate isolation of plots to provide breeder seed.
This will be carried out towards the year of variety release.
For the on -farm trials seed increase has been planted and germinated and will be thinned soon.

Output 3: Integrated management options for production of Striga resistant cultivars validated by farmers:

3.1 Rates and timing of manure application: on-farm, Dodoma and Lake zone. Sorghum P9405 with manure applied at planting compared to first weeding.
The rates of manure were incorporated into 'Farmers evaluation of promising sorghum variety' trial (Output 1) which were 1/2 and 1/4 kg (based on volume of container) per hill at planting.
A separate timing trial was not planted because we had no seminar this season to introduce to the farmers about the trial and how to apply fertilizer after first weeding. After first weeding there is no manure available if so farmers say it is too heavy to transport.

3.2 Legume inter-crops, central and Lake zone. P9405 in combination with intercrop of cowpea (Lake Zone) and groundnuts (Central Zone)
Variety intercrop with groundnut:
There was a shortage of groundnuts, the seed increase at Hombolo failed.

Mvumi: Two farmers planted (Nyota groundnut seed from Ilonga): David Zogoro and Dan Zogoro
Mwagalla: 4 farmers planted (Fuhari cowpea seed) the trial: Marko Manyanza, Charles Masangwa, Enos Kadikiro and Ruth Nyanghali.
Iteja:4 farmers planted (Fuhari cowpea seed) the trial namely Samuel Malulu, Mama Mashinyali, Nkanyanga Kasmiri and Erasto Lusamila

Output 4: Approaches which facilitate farmer and other stakeholder understanding of Striga management and Striga management options developed and evaluated.
4.1 Literature review of previous and on-going initiatives involving learning by doing in the context of Striga and soil fertility.

Short review on animal and green manure in Tanzania is attached.

Output 5 on maize:

I have received two sets of maize materials from IITA, early and medium maturing; these have shown resistance to Striga in West Africa. They have been planted at Mwele Seed Farm and Melela.

Yield loss trial was planted during the short rains and also planted during long rains at Mwele .
Trial on Fertiliser levels x maize genotype has also been planted at Mwele

Output 6: Striga management for upland rice developed and promoted.

6.1. Evaluation of rice cultivars. We hoped this season to have trials of three replicates per line (10 lines) in each of 2 villages in Kyela. Farmer group to assess the trials.
This was not planted because we had no funds to go to plant the trial and Mr J. Kayeke had left for SUA Morogoro to prepare himself for PhD programme, which he has to start with field work next season, we hope to plant it next season (2000-2001).

6.2 Continue existing trials in Kyela with crotalaria. There were 5 sites with this last year. The plots with Cotalaria last year should have been sown to rice this year to allow evaluation of effect on rice yield and Striga compared with plots under continous rice production. Sites to be used for focus group discussion strengths and weakness of use of green manure. Further trials to be set up to compare rice alone with nitrogen fertilizer use, pigeon pea inter-crops and crotalaria. The plan had been to start these this season.

The trial for fertilizer application was sent to Kyela including that of pigeonpea. Also we instructed the Bwana shamba to plant rice were farmers had pigeonpea and marejea last season respectively. Unfortunately I have not been able to go to Kyela and find out if everything has been planted accordingly. I hope all farmers with the help of Bwana Shamba have planted the trials.

Trial status per individual farmer (based on monitoring visit 6.3.00.):

Dodoma Rural District

I. Mvumi Makulu

Manure x varieties (P9405, P9406, SRN 39, Weijita, MACIA, PATO)
1. Bangis Mazengo - 2nd planting 93 varieties), crop is emerging, needs weeding and thinning.
2. Dan Zogoro - crop suffered drought, during transplanting mixed up the varieties he planted also the 3 varieties, Pato, P9405 and P9406 which are performing well,beyond knee height, Striga not yet emerged.
3. Saimon Mbwana - good crop, plots need clear demarcation, crop at knee height.

Intercrop sorghum with groundnuts
1. David Zogoro - good inter crop, the crop is good, bust Striga has not emerged, crop at knee height.
2. Dan Zogoro - the crop is good, but groundnut rows a bit far from sorghum rows.

Those who planted varieties P9405, P9406 and Pato:
Ezekiel- good crop with few gaps.
Jane Vadolila, John Dabaga, Charles Malamba, Rose Magwe (bird damage), whose crop suffered severe drought and the crop is at milk dough stage.

Marejea - yet to be planted
1. Charles Malamba, 2. John Dabaga and 3. Ulomi (Bwana shamba)

Pigeonpea yet to be planted
Ezekiel and Ulomi.

II.Chipanga

Manure x varieties: (P9405, P9406, SRN 39, Weijita, MACIA, PATO)
1. John Makasi - sorghum just germinated, this is the 3rd sowing, plots are relative small

2. Dickson Chilanga: - planted but crop died, to replant
3. Jacob Chilanga: - good crop it is at flowering stage, striga has not emerged.
4. Loti Jackson (Man) - good crop, but Striga not yet emerged.
5. Rosa Makasi - crop died, to replant
6. Magreth Mchewe - crop germinated but poor crop stand
7. Lazaro Lyingi: - still he has to plant, he stored the seed
8.Agnes Masika: - planted but crop died, to replant
9. Charles Mnyahango - still to plant, he has the seed.
10. Roda Mica - still to plant, she has the seed, from last year crop she sold at 500 Tsh/kg.

Those who planted P9405, P9406 and Pato with manure
1. Zacharia Mkwala- crop just germinated
2. Chalos Zecheni -.crop died to replant
3. Richard Msavaya - still to plant
4. Bernard Luseko - replanted 3 times crop died
5. Yohana Mzungu - still to plant he has the seed
6. Steven Mhagwa - Crop at flowering stage but no Striga
7. Alex Kamoja - crop died no more seed
8. Mhila Chilobe - still to plant
9. Nolo Chimwagu - crop died he no more seed
10. Kibaya (Bwana shamba)- yet to plant, still he has the seed

III. Hombolo (Extension staff- Ms Manyasi-based at Hombola village)

Manure x varieties (P9405, P9406, SRN 39, Weijita, MACIA, PATO)
1. Selina (Woman): The crop still young need thinning
2. Habil (Man): poor germination from P9405, P9406 and SRN 39, replanting affected by chicken.
Intercrop:
1. Agness: poor germination of both crop due to poor tillage, the lady has little interest (involved in trading).
2. Faith Madimo: intercrop good crop but pure stand died due to poor tillage.
3. Habil: crop had good germination but need thinning, the crop is near boot stage (ie pannicle emerging).

Hombolo on Station:
-The multi-location Striga resistant trial has good crop stand approaching knee height.
-Groundnut increase also good

General Observatin for Dodoma:
Rains have been very much erratic that several plantings had to be done with the hope that it will continue.
Example from Mvumi;
Rainfall data for Mvumi:

December		February	
Date	amount (mm)	Date	amount(mm)
14.12.1999	29.0	1.02.2000	7.5
16.12. 1999	26.5	2.02.2000	6.0
January		9.02.2000	13.5
3.01.2000	2.3	15.2.2000	5.5
4.01.2000	5.8		
8.01.2000	33.3	March	
9.01. 2000	9.0	1.03.2000	6.5
10.1.2000	4.5	4.03.2000	56.5*
11.1.2000	1.5		

* That is when farmers had the 3rd replanting
New farmers especially from Chipanga and Hombolo and few from Mpalanga planted the trial without having clear information the aim of the trial because we did not have planning meeting.

MISSUNGWI DISTRICT:

I. Mwagalla:

Manure x Varieties (P9405, P9406, SRN 39, Weijita, MACIA, PATO)

Three farmers planted the trial. Manure treatment was 1/2 and 1/4 kg per hill respectively each treatment had 5 rows. Most of the trials were affected by drought, they had to be replanted more than once.

Names of Farmers, who planted the trial:

Manure x varieties:(P9405, P9406, SRN 39, Weijita, MACIA, PATO)

1. Marko Manyanza: - good crop stand, at booting stage but it was not planted at Striga hot spot. The farmer hasagreed to plant a similar trial at Striga hot spot; he still has the seed.
2. Mr. Masasila - The trial is good but the crop still young
3. Mr. Paul Nyanghali - Poor germination of PATO and MACIA, they need replanting.

Intercrop:

1. Mr Marko Manyanza - good crop but the plot has no Striga
2. Carles Masangwa - poor performance of cowpea due to drought
   - Striga has started germinating on Pato.
3. Enos Kadikiro (Chairman of the group) - sorghum population not optimum, he has promised to plant another bigger plot.
4. Ruth Nyaghali - poor crop stand, very small plots and not well managed; it looks she is not serious with the trial.

II. Iteja

Manure x varieties (P9405, P9406, SRN 39, Weijita, MACIA, PATO):

1. Ramadhani Mashalla - poor crop germination due to drought, need replanting
2. Elias Muhula - crop stand poor need 3rd replanting
3. Nkayanga Kasmir - just planted and the crop is emerging well planed trial

Intercrop:

1. Samwel Malulu - crops are germinating well demacated plots; he has requested seed of Pato, P9405 and P9406 to plant as manure x variety trial to be planted adjacent to the intercrop.
2. Mama Mashinyali - the crops have not germinated, she will be given by Bwana Shamba Pato, P9405 and P9406 to plant where her maize had failed due to drought just adjacent to this trial but without manure application these are mbuga soils.
3. Nkayanga Kasmir - the crops are just germinating; to be given Pato, P9405 and P9406 to be planted where maize had failed also just adjacent to this trial.
4. Erasto Lusamila - due to muddy road we were not able reach the plot, but according to Bwana Shamba the plot has been planted.

Ukiriguru on -station trials:

Only one trial was planted i.e. Multi-location Striga resistant trial, it had good germination but needs a bit of fertilizer - CAN, which Mr Kapinga has promissed to apply immediately after it has rained.

General observations:

Rains have been a problem, many farmers planted maize which at flowering stage suffered drought and now they are looking for sorghum seed (RC wants to provide free sorghum seed).

The DEO from Missungwi has promised to participate fully during the next planning meeting to emphasise the importance of the trial to the farmers and the need to grow sorghum instead of maize.

1. New farmers in the trial planted it without information on the purpose of the trial, seed which remained after planting the 15 rows were taken back to the station.
2. A lot of seed was still lying in Kapingas office although there was high demand of seed by farmers.
3. There was less involvement of extension staff in during planting instead casual labour from the station came to plant with farmers.
4. Participating farmers are only from FRGs who are also involved with other trials from other research programmes eg Root and tubers - hence overloaded with trials.

5. Mr Kapinga has taken up P9405 to on-farm trials in Mara.

Report prepared by Dr A.M. Mbwaga – March 2000

APPENDIX 2

Notes from field walks with trial farmers.

Mvumi – 10th May

Individual trial sites were visited with the farmer group. At each site the owner of the field explained to other farmers what had been done and what he/she had observed. Then other farmers asked questions or made comments.

Dan Zogoro – Groundnut inter-crop in P9405 and Pato. Planted 14/2/00

- Both sorghum cultivars have grain but P9405 looks more drought resistant and has larger heads.

Farmer question(FQ): Why were there three sorghum plants per hill.
Farmer answer (FA): Because it had been too dry to thin.

FQ: Why had not more weeding been done:
FA: As this is a *Striga* trial a later weeding was not done to avoid damaging the parasite, so that the farmer could see emerging *Striga* plants.

FQ: Why did you mix groundnut and sorghum?
FA: Because there are advantages in growing the two together – can get two crops off one piece of land and, the groundnut may suppress the *Striga.*

Farmer also said that less *Striga* emerged where the groundnut was planted.

John Dabaga – P9405, P9406 and Pato planted 13-3-00. Now at dough stage.

- Very patchy stand due to difficulty in establishment. No *Striga* here as land had been in fallow for some time. P9405 larger heads than P9406 which looks more droughted here. Pato also has large heads.

Farmer likes P9405 and Pato due to size of heads. The family had cooked both. P9405 said to be good for ugali and Pilau while Pato only good for ugali.

In adjacent fields farmers pointed out local "lugugu" sorghum, and "mwele" millet and indicated how the new short duration types under test i.e. P9405 and P9406, have similar drought tolerance to millet. But there was agreement that P9405 is the most drought tolerant of all and earliest to mature.

In discussion here the farmers said that sorghums have a lower market price to millet (approx. price per kg – sorghum Tsh 250, millet Tsh 500) because millet is sold for brewing. They maintained that both crops are needed for a drier year. If a household has both they would sell millet and keep sorghum for food.

Dani Mzogolo - P9405 and Pato planted 13-2-00.

- Did not plant P9506 as people planting for him used too much land for other two lines so he ran out of room. Both lines looking good here with good heads. An adjacent stand of local sorghum "Mputa" was heavily infested by *Striga* and plants poor and stunted. A few scattered *Striga* on P9405, but plants still producing grain. More *Striga* on Pato.

Farmer said that P9405 is the best line in the trial. Earliest and most drought resistant. In yield terms he picked out Pato. But P9405 said to produce the best ugali, better even than local sorghum which is letter than Pato.

Also has manure trial with Pato, P9405 and SRN39 but as there was little rain after planting the stand was poor. So an attempt was made to gap fill by transplanting but this led to mixing the sorghum lines so the trial became too difficult to follow; also many gaps remained.

Bangis Mazengo P9405, P9406, Macia, SRN39, Pato and Weijita planted on 16-2 and replanted subsequently.

- *Striga* here confined to one end of the trial on Weijita and Pato only.

FQ: Why has sorghum not been thinned?
FA: Because rain was poor and it got too late. Aim was to see *Striga* and farmer was worried he would destroy the parasite if he thinned.

Also asked why is there little Tegemeo in the area this year – last year there were a number of fields in the village. The group answered that they had saved seed but lost it in early droughted plantings. Other seed was eaten due to hunger. Also pointed out that the market has declined for Tegemeo.

Rosemari Mabwe - P9405, P9406, Macia, Pato planted 17-2-00

- She was a new participant this season so was not fully aware of the objectives but was keen to test new types of sorghum. Little to no *Striga* here as this field is only in sorghum for second year running. Was previously millet and maize. Adjacent local sorghum plots were seen to be heavily infested by the parasite. Long smut was conspicuous on all lines here, particularly P9406, as elsewhere. Also noted here *Alectra vogelii* emerging on Bambara.

FQ: Why did you join the group?
FA: Because last year she obtained Pato and harvested 20 tins of seed so this year asked for more seed types from the Bibi Shamba.

Farmer indicated that she likes P9405 and P9406 as these both produce big heads despite late planting.

Ezekieli Myeji - P9405, P9406, Pato

- Noted an excellent plot of Pato here. Other two lines are also looking excellent but again P9506 had the most long smut. An attempt had been made here to under-sow pigeon pea into the sorghum but the weather had been too dry so the legume was re-planted in March and had grown little. This was the first year of growing these lines so the farmer was unable to comment on their utility.

FQ: You say the short duration lines are good, where will seed come from in future?
FA: Other farmers are requesting seed from me so I will sell it to them

FQ: What if the project does not bring us any seed next year?
FA: I will put enough for myself from this harvest on one side and sell the rest to others.

Researcher question: Did anyone sell seed from last years harvest?
Answer: One lady said she did, and made enough money to buy a sugar cane field. But others certainly exchanged seed of the new lines for local seed by barter. Farmers discussed seed of P9405 and P9406 which they agreed is similar but said the heads are a different shape and so can be identified before harvest.

Charles Malawiba - P9405, P9406, Pato planted on 29th –1-00 and re-planted 7th and again on 21st February. Very patchy stand.

- This is a large field which is droughted. This field, a long walk from the village, was recently cleared from bush, so is free of *Striga*. Farmer said there is *Striga* on a neighbours fields which have been under cultivation for longer. On the walk to this site we passed Pato plots heavily infested and very stunted with only small heads.

FQ: Why did you join the group?
FA: As the rains were approaching I had no source of seed. Someone told me the Bibi Shamba had some for a trial so I decided to have a go. Farmer was surprised but pleased to see how well these lines have performed despite the late planting.

In discussion it emerged that the farmer group has meet a number of times with the Bibi Shamba and has already walked around the plots. They met before land prep, before and after planting.

Timotheo Nyakwarea – Had planted the cultivar trial on 3-1; 7-2 and 6-13-00 but each time the rain had missed her field so the trial failed.

Simon Mbwanh – three rates of manure with P9405, P9406, Marcia, SRN39, Pato and Weijita. Planted 4-1; 15-1 and 13-2-00.

- Stand of Marcia very poor. Pato, P9405, P9406, SRN39 and Weijita all with good size heads and promising yield despite late planting. The plots without manure have been placed on a better piece of soil with higher fertility so this is where best crop is. Possible effect of manure on SRN39 i.e. better heads and less *Striga* at 0.5 kg manure per planting station. No obvious effect of manure for other lines but there was a lot of transplantng here to fill gaps, so many plants will not be growing where manure was placed. However some plants established from seed are looking good.

Jeniva Ndhalila - P9405, P9406, Pato planted 12-12-99.

- The trial was planted three days before 50 mm of rain and so a good stand was established. P9405, P9406 flowered very early and the farmer took a harvest of approx. 70 kg of each cultivar. She then ratooned the plants which tillered well and now have a second crop coming to maturity. Pato is now maturing.
- But the farmer indicated that in her opinion it is not good to plant these early maturing lines early as they mature when it is raining and grain mould is therefore problem. She did however make ugali from clean heads of both lines and found it was very good.

Prepared by C R Riches from translations.

APPENDIX 3 CROP AND SOIL FERTILITY SURVEY 1999

Introduction

In 1999, staff from the Dodoma district extension office carried out a one page questionnaire survey in Mvumi makulu and Chipanga villages (Dodoma Rural division). The survey aimed to indicate the main cereal and legume crops grown, the extent of cereal/ legume inter-cropping and farmers' perceptions of the use of animal manure. The main results of the cropping data are tabulated here. In each village, the questions were asked to 30 randomly selected farmers.

Results

Table 1 Sex of respondents

	No. of respondents	Women	Men
Mvumi makulu	30	14	14
Chipanga	30	7	23

Table 2 Sorghum grown in the previous 3 seasons

	No. of respondents	No. growing sorghum	No. growing Tegemeo	No. growing Pato	No. growing 'local' landraces
Mvumi makulu	30	30	20	27	16
Chipanga	30	30	28	8	19

Table 3 Pearl millet grown in the previous 3 seasons

	No. of respondents	No. growing pearl millet	No. growing Okoa	No. growing Serere	No. growing 'local' landraces
Mvumi makulu	30	29	16	2	18
Chipanga	30	30	NR	NR	NR

NR = not reported

Table 4 Maize grown in the previous 3 seasons

	No. of respondents	No. growing maize	No. growing Staha	No. growing TNV1	No. growing 'local' landraces
Mvumi makulu	30	29	2	7	25
Chipanga	30	NR	NR	NR	NR

NR = not reported

Table 5 Grain legumes grown in the previous 3 seasons

	No. of respondents	No. growing groundnuts	No. growing cowpea	No. growing bambara nut
Mvumi makulu	30	30	27	30
Chipanga	30	27	0	30

Table 6 Mvumi makulu: Intercropping of grain legume with cereals in last 3 seasons

	No. of respondents	No. intercropping with groundnut	No. intercropping with cowpea	No. intercropping with bambara nut
Sorghum	30	4	15	0
Pearl millet	30	3	2	0
Maize	30	0	25	0

Note: No inter-cropping of grain legumes with cereals was reported in Chipanga. The reason given was that land was available and therefore it was not necessary.