

# **CHAPTER 6**

## **THE VERIFICATION PROJECT**

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This chapter presents the verification projects, which have been tried through the dry seasons of year 2003 and year 2004. Following sub-chapters discuss the approach and implementation, project based verification, verification on dissemination, and those evaluation. Lessons learnt from the 2-year implementation were incorporated in the Package and also to the Implementation Arrangement presented in Chapter 7.

### **6.1 Operation Principle**

There are two Operation Principles that the Study Team has been pursuing throughout the implementation of the verification projects; namely, 1) irrigation facilities should be constructed by the farmers in their locality by using locally available materials, and 2) irrigation development should be pursued within the government recurrent extension activities rather than budgeting special account solely for its project. First principle aims at promoting smallholder irrigation as a culture which is sustainable beyond generations. Second principle is meant to institutionalize the wide range of dissemination on the government realistic available budget rather than dependent much on foreign assistances.

Project is by definition a planned undertaking that has a clear target within a timeframe. It means project itself will not last beyond the timeframe and over the target. What is meant here is that unless otherwise activities undertaken under a project are built in the farmers' development process or, simply saying, become a part of their livelihood, the activities will not last, thus sustainability will not be realized either. Promoting irrigation as a culture is a key since "irrigation that has once become a culture never ends up in just one generation but is transmitted from generation to generation, ensuing sustainability yet beyond generation".

Smallholder irrigation development may start as a project. However, upon completion and through the operation and maintenance of the irrigation system, the irrigation should become a part of their livelihood or irrigation cannot be sustainable. This implies that irrigation should not merely be a project but be built in the farmers' development process as a part of their culture. It is therefore stressed that irrigation being a culture, the facilities should be those that are **CONSTRUCTED, OPERATED and MAINTAINED** by the **FARMERS THEMSELVES**; namely, **NO** government physical investment in principal but technical advices only as the first implementation principle.

The irrigation facilities such as diversion weir and canal should be copy-able, maintainable, and renewable by the farmers themselves, enabling the irrigation to be transmitted to the succeeding generations. It is pointed out that to bring the irrigation system into being due in the farmers' locality, **LOCALLY AVAILABLE MATERIALS** should be utilized as much as possible. Also, stressed is that the Government is a **PARTICIPANT** while the farmers are the committed implementers and the **OWNER** of the project since the farmers are the ones who construct the facilities by using available materials in their locality.

What the Study Team has provided are therefore: **TECHNICAL ADVICES, ESSENTIAL TOOLS** required for the construction and opportunities for **STUDY TOUR** which could work as a venue of learning from their peer farmers. The tools are wheelbarrow, pick, hammer, sow, etc., and these were provided to the concerned EPAs and then rented out to the farmers

upon request. No free seed and fertilizer have been provided from the Study Team even as a starter pack though some sites have been given such free goods from HIPC and other programs. The Team has been stressing that physical input from outside, especially free handouts, should always be minimal or preferably nil taking into account the sustainability that can be pursued even under ordinary extension activities. Therefore, the Team has been trying to be unique against handouts throughout the verification projects.

Second principle, that is “irrigation development should be pursued within the government recurrent extension activities rather than budgeting special account solely for its project”, aims at nationwide dissemination of smallholder irrigation development wherever potential with the Government being the prime responsible. Many projects so far may have been implemented heavily dependent on foreign assistances. Such project approach may be better applied when the potential at one place is huge thereby justifying pin-point investment. However, smallholder irrigation development this Study undertakes is small in scale but scattered all over the Country. A program basis approach is required and operating such program on the existing government structure should be the best way in pursuing the wide range of dissemination.

One of the strengths the MOA has in terms of extension services is the structure, ADD, RDP and then EPA, already in place. Especially, at frontline throughout this Country are the 186 EPAs having as many as about 1,500 extension officers. As the average, one extension officer, AEDO, covers about 6,000ha, which is accessible even by bicycle. Those frontline officers must be aware of where the potential areas are. It is therefore hinted that if those frontline officers are well equipped with smallholder irrigation technology and involved in the dissemination, the potential farmers are no longer necessary to wait for someone outsider to come. Relying on the frontline officers can cover wider areas so that public equity, trying to cover as many people as possible rather than just selective people, can also be pursued.

## 6.2 Verification on Project

First generation projects, defined as the ones that the Team started dealing with in 2003 dry season, were carried out at 23 sites clustered in 4 groups. All the sites fall in the 4 RDPs of Lilongwe East, Dedza Hills, Dowa and Ntchisi respectively named as cluster 1, 2, 3 and 4 (see Figure 6.2.1).

### 6.2.1 Profile of the Verification Projects

Table 6.2.1 summarizes the cluster characteristics and Table 6.2.2 shows the profile of the 23 sites. As the verification had been carried over 2 years, there were some changes in membership, developed area, etc., however the tables summarize the achievement of 1<sup>st</sup>

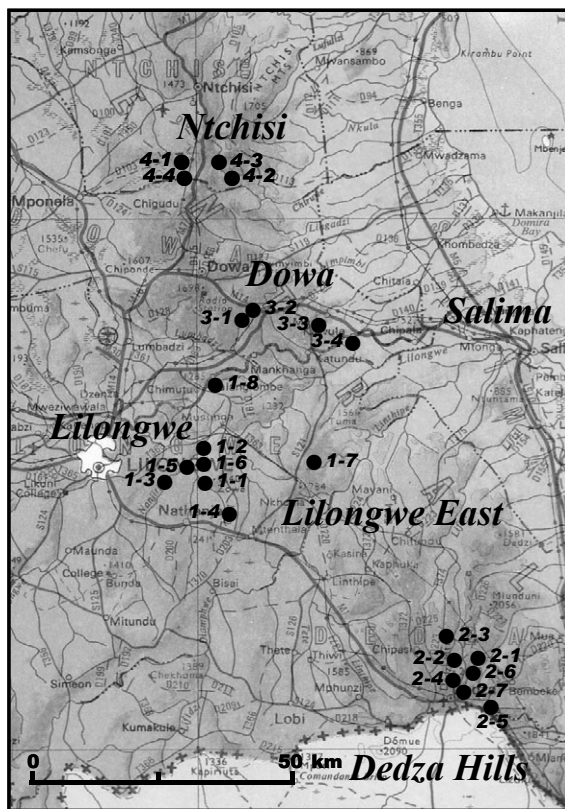


Figure 6.2.1 Location of the 1<sup>st</sup> Verification Projects

year only, that is 2003 dry season (the change is discussed in later sub-chapters).

**Table 6.2.1 Cluster Classification**

Cluster RDP	Cluster 1 LL East	Cluster 2 Dedza Hills	Cluster 3 Dowa	Cluster 4 Ntchisi
Topography	Flat	Hilly	Hilly	Mountainous
Local condition	Scramble for water and land	Little water and dense villages	Sufficient water and land	Ample water and land
Population density	218.6 / sq km	134.3 / sq km	135.3 / sq km	101.4 / sq km
Economic / social condition	Relatively self-sufficient	Literacy rate low	Unit yield of maize very low	Non-farm income very low
Family	About half of the wives and husbands were born in the villages.	Most wives born in the villages/ many husbands from outside. F. LO are majority.	Tendency is different from village to village.	More wives are from outside.
Average irrigated area by scheme	1.95 ha (2.0 – 3.4 ha)	0.55 ha (0.3 – 0.8 ha)	2.0 ha (0.6 – 4.0 ha)	2.8 ha (1.6 - 4.5 ha)
Av. length of canal	534 m	264 m	1,442 m	914 m
Av. irrigated area	0.11 ha / member	0.029 ha / member	0.044 ha / member	0.060 ha / member

**Cluster 1** in Lilongwe East consists of 8 sites under Mpenu and Chiwanba EPAs, and represents flat topography and has higher population density because it is close to the City of Lilongwe. The villagers in the Cluster 1 are also relatively self-sufficient with more varieties of income. Average irrigated area by the smallholder irrigation schemes is 1.95 ha and is significantly large for its average canal length of 534 m. Average irrigated area per member is 0.11 ha and is almost two times or more larger than any other clusters.

**Cluster 2** represents the sites such as Chikhasu, Mchiku, Livizi, Mtsetse, Kadiwa, Mtanda and Namanolo in Dedza Hills RDP. This is a hilly area with little water and many villages are closely located each other. Cluster 2 is unique in several aspects; majority of the landowners are women,

**Table 6.2.2 Profile of the 1<sup>st</sup> generation Verification Sites in 2003**

Club Name (total 23)	L.Owner M, F	Total Membership	Member M, F	Intended Area, ha	Area Actually Irrigated, ha	Canal Length, m	Irrigated Area / Farmer, ha
<b>Lilongwe E. RDP, Mpenu &amp; Chiwanba EPAs</b>							
1-1 Mtuwanjovu	26,0	30	26,4	2,4	2,20	670	0.073
1-2 Duwu	4,0	26	16,10	2,6	1,56	450	0.060
1-3 Ngoni+Miteme	10,0	35	35,0	5,8	3,38	1,200	0.097
1-4 Chimphonongo	16,2	18	16,2	4,8	1,92	240	0.107
1-5 Zakumva	1,0	10	9,1	2,0	0,95	370	0.095
1-7 Mgunda	2,0	11	11,0	2,5	1,10	350	0.100
1-6 Talira (w/ fish pond)	not realized and excluded in averaging						
1-8 Mankhamba+Tigwirizane	4,0	16	16,0	4,5	2,53	460	0.158
Average	9,0	21	18,2	3,51	1,95	534	0.107
<b>Dedza Hills RDP, Kanyama &amp; Bembeke EPAs</b>							
2-1 Chikhasu	1,5	16	10,6	1,0	0,64	165	0.040
2-2 Mchiku	0,1	16	7,9	0,7	0,65	215	0.041
2-3 Livizi	4,7	17	10,7	1,4	0,78	365	0.046
2-4 Mtsetse	2,0	15	10,5	1,2	0,25	190	0.017
2-5 Kadiwa	1,0	7	3,4	0,8	0,50	190	0.071
2-6 Mtanda	0,6	38	7,31	1,5	0,53	320	0.014
2-7 Namanolo	2,6	23	16,7	1,2	0,52	401	0.023
Average	1,4	19	9,10	1,1	0,55	264	0.029
<b>Dowa RDP, Mvera EPA</b>							
3-1 Tikolore	10,0	81	69,12	5,8	3,97	2,154	0.049
3-2 Tilime	5,0	50	40,10	4,1	1,65	1,852	0.033
3-3 Loyi	3,1	36	22,14	3,6	1,80	510	0.050
3-4 Kambware	3,0	15	15,0	2,0	0,55	1,250	0.037
Average	5,0	46	32,9	3,9	2,0	1,442	0.044
<b>Ntchisi RDP, Kalira EPA</b>							
4-1 Msambaimfa	10,3	61	47,14	4,5	4,50	1,500	0.074
4-2 Gontha	3,1	52	43,9	4,9	3,30	600	0.063
4-3 Katema	22,4	33	22,11	2,0	1,65	554	0.050
4-4 Kasangadzi	5,0	36	27,9	4,0	1,55	1,000	0.043
Average	10,2	46	35,8	3,9	2,7	914	0.060
<b>Total</b>	<b>134,36</b>	<b>642</b>	<b>477,165</b>	<b>63,3</b>	<b>36,5</b>	<b>15,006</b>	
<b>per site, ha</b>	<b>6,2</b>	<b>29</b>	<b>22,8</b>	<b>2,88</b>	<b>1,66</b>	<b>682</b>	
<b>per farmer, ha</b>				<b>0,10</b>	<b>0,06</b>	<b>23</b>	

Note: 1-6 Talira is excluded in averaging because it was not realized.

many husbands come from outside and literacy rate is low as compared with other clusters. Average developed area by the schemes of 0.55 ha with 264 m of average canal length results in only 0.029 ha of irrigated area per member which is the smallest service area.

**Cluster 3** consists of the sites such as Tikolore, Tilime, Loyi and Kambware in Dowa RDP. This is also a hilly area but rich in enough water and land. The residents of Cluster 3 belongs to a Ngoni TA, however, more husbands come from outside in some villages while in other villages more wives come from outside as most Ngoni do. The tendency is different from village to village. Average irrigated area by the schemes is 2.0 ha, and the average irrigated area per person is 0.044 ha only. The average length of the canals is 1,442 m which is the longest among the four clusters. Due to outcropped stones, unit yield of maize in this area is very low.

**Cluster 4** represents the sites such as Msambaimfa, Gontha, Katema and Kasangadzi in Ntchisi RDP. The area is mountainous and abundant in water and land. Since the sites are far from the commercial centers, non-farm income is very low. Their major livelihood is agriculture, and some farmers produce Irish potatoes and onions as cash crop. Onions around Msambaimfa area is very famous and traders even from Blantyre often come to purchase. Most of the wives have come from outside except Msambaimfa. Average irrigated area by the schemes is 2.8 ha with 914 m of average canal length and irrigated area per member is 0.060 ha, which is equivalent to overall average of the 23 sites.

**Table 6.2.3 Initiative in Commencing VP**

Club Name (membership, l.owner)	Initiative (more farmer⇒)			
	ST & Officers	Officers & ST	Officers & Farmers	Farmers & Officers
<b>LL East RDP, Mpenu and Chiwanba EPAs</b>				
1-1 Mtuwanjovu(30,26)			○	
1-2 Duwu(26,4)	○			
1-3 Ngoni(20,5)+Miteme(15,5)	○			
1-4 Chimphonongo(18,18)		○		
1-5 Zakumva(10,1)				○
1-6 Talira (w/ fish pond)	○			
1-7 Mgunda(11,2)				○
1-8 Mankhamba(10,2)+Tigwirizane(6,2)			○	
<b>Dedza Hills RDP, Kanyama &amp; Bembeke EPAs</b>				
2-1 Chikhasu(16,6)	○			
2-2 Mchiku(16,1)	○			
2-3 Livizi(17,11)		○		
2-4 Mtsetse(15,2)		○		
2-5 Kadiwa(7,1)		○		
2-6 Mtanda(38,6)				○
2-7 Namanolo(23,8)			○	
<b>Dowa RDP, Mvera EPA</b>				
3-1 Tikolore(81,10)	○			
3-2 Tilime(50,5)				○
3-3 Loyi(36,4)	○			
3-4 Kambware(15,3)				○
<b>Ntchisi RDP, Kalira EPA</b>				
4-1 Msambaimfa(61,13)			○	
4-2 Gontha(52,4)	○			
4-3 Katema(33,26)				○
4-4 Kasangadzi(36,5)		○		
<b>Total</b>	<b>8</b>	<b>5</b>	<b>4</b>	<b>6</b>
<b>Total</b>	<b>23</b>			

irrigated area by the schemes is 2.8 ha with 914 m of average canal length and irrigated area per member is 0.060 ha, which is equivalent to overall average of the 23 sites.

In summary of 2003 dry season, total membership for all the 23 sites was 642 (477M and 165F), of whom actual land owners were 170 (134M and 36F). It means 472, about three quarters of whole members, were renting land from the fellow owners. The total area irrigated in the dry season was 36.5ha although a total of 63 ha development was planned. Canals had actually been excavated to cover the 63 ha. However, faced with water shortage and also refusal by landowners in some cases, the total area actually irrigated was 36.5 ha with Msambaimfa being the biggest of 4.5 ha and Mtsetse being the smallest of 0.25 ha. Average area irrigated per site was 1.66 ha, and the average area allocated to a farmer therefore arrived at 0.06 ha (equivalent to 20x30m for example). As per main canal, a total of 15 km

length has been excavated, giving an average of 682 m per site. The longest main canal, which is 2,154 m, can be seen at Tikolore site. The shortest one is the main canal at Kadiwa site with 190 m.

Not all the verification projects were initiated by the Study Team. Some of the sites were started by the extension officers' initiative with minor technical assistances from the Study Team, and some by the farmers' own initiatives. Table 6.2.3 shows the summary of the sites with whose initiative in commencing the irrigation development, showing the more further the right column the more the farmers' initiative. Though the boundary is not often identical, it can be said that already in 2003 dry season there were several sites that had been initiated by the officers rather than the Study Team and also commenced by the farmers' own initiative by seeing nearby verification sites: those are Zakumva, Mtanda, Tilime, Kambware, and Katema sites (Mgunda, site No.1-7, was an existing site and arranged for receiving study tour).

### 6.2.2 Baseline Survey Results on Selected Sites

A baseline survey was conducted in July and August 2003, after the beneficiaries of the smallholder irrigation development in most of the verification project sites had been identified. Representative three sites from each cluster totaling 12 sites were selected for the survey and 30 sample households in each site were surveyed. Hence the total sample households surveyed were 360 as a whole. Following are the sites selected for the survey.

Cluster 1 (Lilongwe East RDP):	Mtuwanjovu, Duwu, Ngoni
Cluster 2 (Dedza Hills RDP):	Mchiku, Mtanda, Mtsetse
Cluster 3 (Dowa RDP):	Tikolore, Tilime, Loyi
Cluster 4 (Ntchisi RDP):	Msambaimfa, Gontha, Katema

#### 1) Family Status

Family is defined in this survey as the members dwelling together. Table 6.2.4 shows the distribution of the samples by family size. Average family size of all the samples is 4.9 and it varies by site from the minimum of 3.1 in Tikolore to the maximum of 6.3 in Ngoni.

**Table 6.2.4 Distribution of Samples by Family Size**

RDP (Cluster)	Site	Ave.	No. of Sample by Family Size							
			< 3	3	4	5	6	7	8	> 8
Lilongwe East (Cluster 1)	Mtuwanjovu	4.9	2	7	5	3	6	5	2	0
	Duwu	4.3	7	4	5	6	4	2	1	1
	Ngoni	6.3	1	1	5	5	6	5	3	4
Dedza Hills (Cluster 2)	Mchiku	4.7	2	6	8	6	3	3	1	1
	Mtanda	4.6	2	7	8	4	6	0	3	0
	Mtsetse	5.4	1	2	6	7	8	3	1	2
Dowa (Cluster 3)	Tikolore	3.1	18	3	0	1	2	2	4	0
	Tilime	4.1	6	5	5	5	8	1	0	0
	Loyi	4.7	5	4	6	5	5	1	2	2
Ntchisi (Cluster 4)	Msambaimfa	5.0	3	4	4	8	3	4	2	1
	Gontha	6.0	4	2	3	3	4	4	5	5
	Katema	5.3	3	4	5	5	5	2	3	3
Total (Average)		4.9	54	49	60	58	60	32	27	19
%			15	14	17	16	17	9	8	5

All the family members' birthplaces were surveyed and it was found that 43% and 40% of married men and women were born in villages that were different from their current resident villages. Reasons for migration from their birthplace may include the division of villages, but also the migration likely indicates the custom of settlement upon marriage influenced by the matrilineal system, which Achewa traditionally follows. In matrilineal system, when a man marries, he must stay in the village of his wife and work for his father in law for a few years as a kind of offering dowry. After this period, the man and his wife can decide whether to live in her

village or his. As Figure 6.2.2 shows, the number of married males living in different villages from their birthplaces is far more than that of females in the three sites (Mchiku, Mtanda and Mtsetse) of Dedza Hills (Cluster 2). The result implies that a custom that males settle in the villages of their wives is strong in Dedza Hills.

## 2) Literacy

Average literacy rate of the samples of more than six years old is 39% and the rates for male and female are 44% and 34% respectively. Generally the literacy rate of male is higher than female in most of the sites, but the results of Mtanda and Mtsetse in Dedza Hills are against this trend; namely, the literacy of female is higher than that of male. In fact, it was observed that a woman stood up in the assembly of a club and was taking note during the meeting in Mtsetse site. It was also marked that the literacy rates of these two sites are the lowest as 11% and 19% on average of both sexes in Mtanda and Mtsetse respectively.

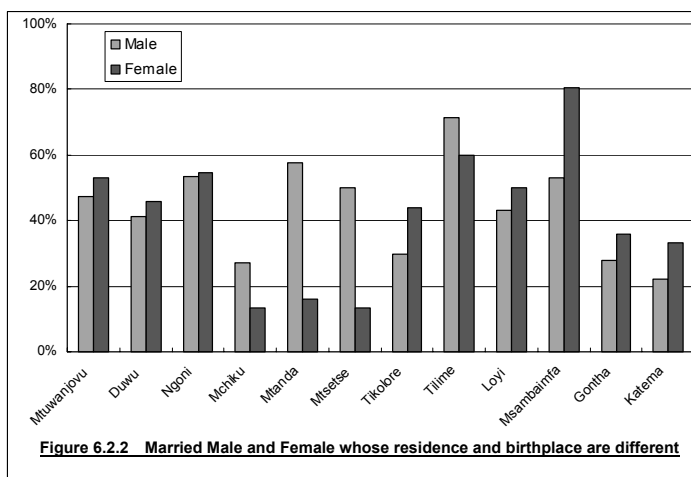


Figure 6.2.2 Married Male and Female whose residence and birthplace are different

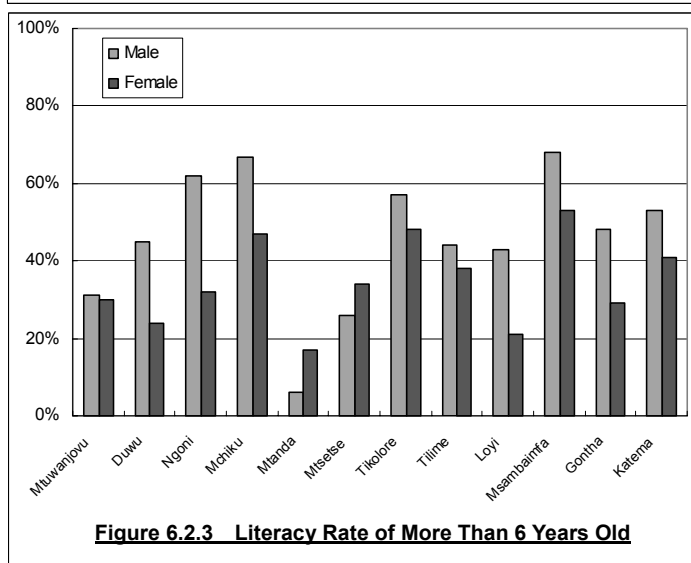


Figure 6.2.3 Literacy Rate of More Than 6 Years Old

## 3) Household Having Non-farm Income

It is counted that 59% of the sample households have non-farm income, especially in the three sites in Lilongwe East (Mtuwanjovu, Duwu and Ngoni) more than 80% of the sample households have non-farm income. Major non-farm income sources are sales of firewood and charcoal, sales of local beer and piece work such as farm labor and casual labor. The average period of earning non-farm income was 3.3 months. There are very few samples who have permanent job as teacher, watchman etc.

In Ngoni site, which is located near Lilongwe city,

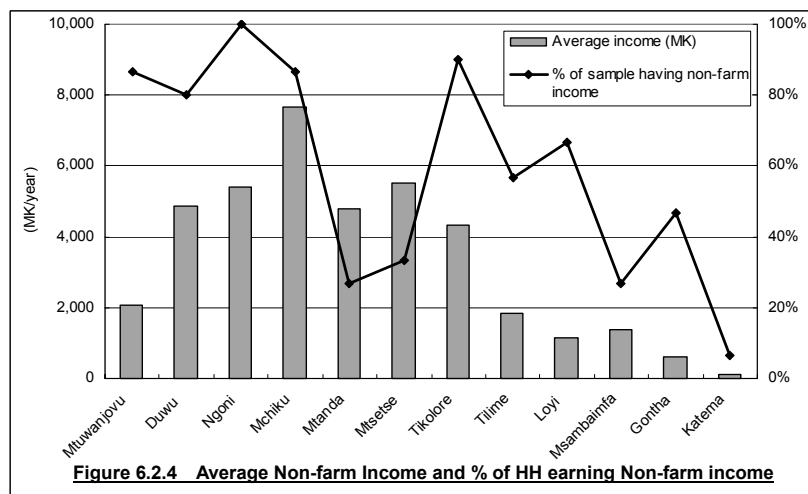


Figure 6.2.4 Average Non-farm Income and % of HH earning Non-farm income

people have been engaged in much more variety of occupations than other sites like kiosk (hawker), bicycle repairing, school teacher, handcraft making, etc., reflecting the location advantage. There is a government-managed forest in Dedza Hills, so that the farmers in Dedza Hills can have job opportunity for working as sawyer. Income of sawyer has come up at high amount raising the average non-farm income per family in Mchiku in Dedza Hills up to MK7,900 marking the highest sum amongst the 12 sites (See Figure 6.2.4).

#### 4) Major Crop: Maize

The major crop in the area is maize, the staple food for most of the Malawians. It is estimated that the unit yields of hybrid maize in year 2002/03 rainy season crop with and without applying of chemical fertilizers are 2.1 t/ha and 1.4 t/ha respectively. It is counted that only 18% of all the samples used hybrid seeds, out of which 31% did not apply chemical fertilizers<sup>1</sup>. As for recycled seeds (local seeds), the unit yield of maize in year 2002/03 rainy season crop was estimated at 0.9 t/ha.

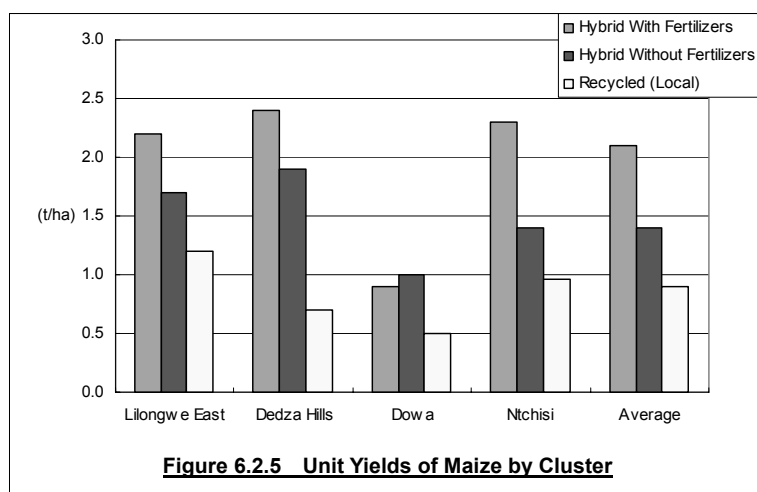
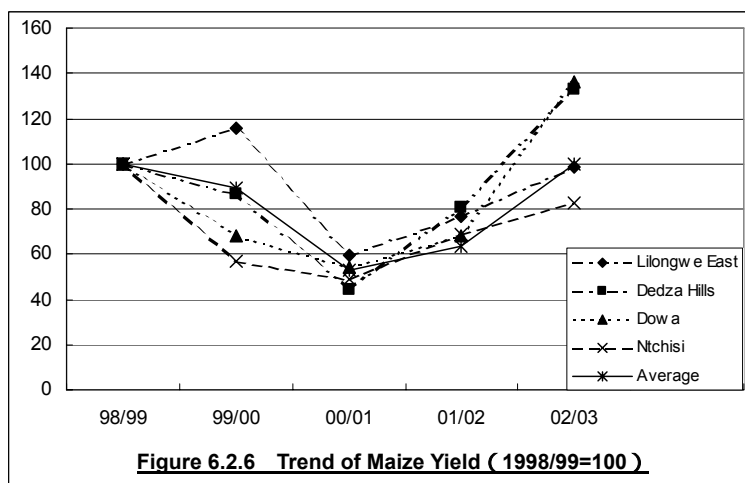


Figure 6.2.5 shows the unit yields of maize by variety and by cluster. The yields of Dow a marked the lowest due to, according to the AEDOs, unfertile lands identical as stone cropped areas.

Yields of maize for recent five years, 98/99 – 02/03, were also questioned to the sample farmers. Taking into error especially with respect to areas planted, analysis of the collected data was focused just to see the trend of the maize yield. Trend of maize yield (hybrid, average of both with and without applying fertilizers) by cluster is shown in Figure 6.2.6.



When the average yield of 1998/99 rainy season maize is set to be 100, the average yields in all the clusters fell into around 60 in year 2000/01. The yields in all the clusters did not still recover in year 2001/02 and as average of the four clusters the yield recovered to the level of year 1998/99 in year 2002/03.

<sup>1</sup> Share of composite in 2002/03 rainy season crop was 6% (20 samples) only and the average unit yield was 1.3 t/ha.



Situation on self-sufficiency of maize for recent five years was also interviewed to the sample farmers. Figure 6.2.7 shows the degree and trend of maize self-sufficiency by cluster. In the figure, 0% means the household could produce maize just enough for the home-consumption. Minus percentage shows the degree of insufficiency of self-produced maize that had to support the required amount of maize for the family. For example, average self-sufficiency in Lilongwe East and Ntchisi areas in 2001/02 marked the deficit of about 60% from the required amount of maize.

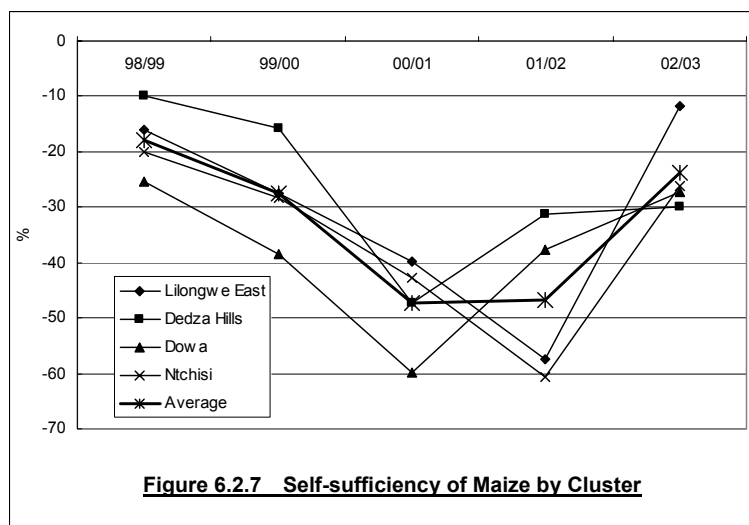


Figure 6.2.7 Self-sufficiency of Maize by Cluster

Figure 6.2.8 shows self-sufficiency of maize per male adult in 2002/03 by site with respect to the average of all the samples in the site and those who could not self-supply in the site again (all the family members were converted to be adult male in terms of consumption capita<sup>2</sup>). “Required amount of 240 kg” shown in the figure is a reference that an adult male requires annually for self-sufficiency<sup>3</sup>. Most of the sites except four produced less amounts than the 240 kg per capita. Overall average maize production among all the sites is calculated at 193 kg per capita.

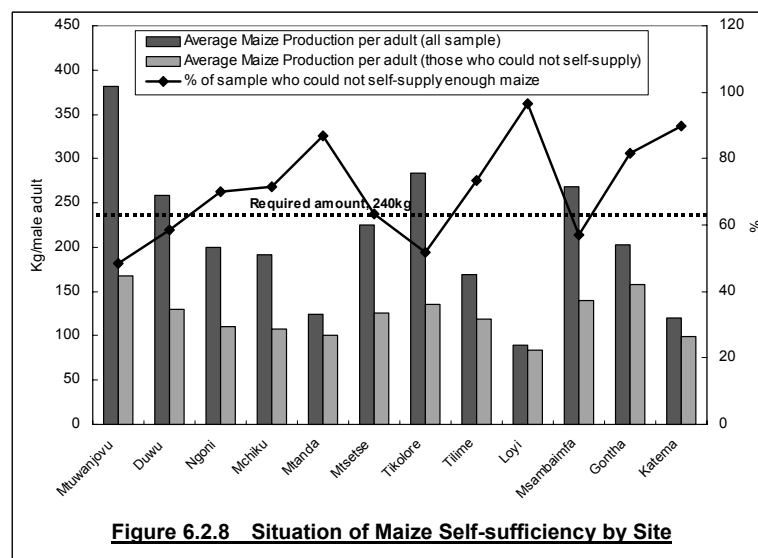


Figure 6.2.8 Situation of Maize Self-sufficiency by Site

It is counted that 70% of the total samples said that they could not produce maize at the level of self-sufficiency in year 2002/03 (shown as the average of the solid line in Figure 6.2.8). This percentage can be confirmed from maize production of the sample households in 2002/03. The share of sample households whose produce was under 240 kg is just about 70% coinciding with the above answer. Average maize production among the sample households who could not produce maize at the level of self-sufficiency is calculated at 119 kg per capita, 74 kg less than the average of whole sample. Maize self-sufficiency is especially low in Mtanda, Loyi and Katema. However, it is noted that farmers are also

<sup>2</sup> No. of family members was adjusted by applying the factors of 1.0 to male over 14 years old, 0.8 to female over 14 years old, 0.7 to both male and female from six to 14 years old, 0.4 to other children and 0.0 to baby (cf. Syuichi OYAMA, Prevailing market economy and the change of shifting cultivation society in Zambia (Japanese research paper).

<sup>3</sup> cf. ditto

growing cash crops and for example there are 19 farmers out of 30 samples who earn from sweet potato in Katema. Therefore, low self-sufficiency of maize does not directly mean the low agriculture productivity of the site.

## 5) Cash Crops

Table 6.2.5 shows the major cash crop, number of sample households growing the cash crops and gross income of the cash crops in each site. Maize and beans are mostly self-consumed (but in Dedza Hills, beans are mostly for sale). Tobacco leaves are mainly grown in Mtuwanjovu, Duwu, Msambaimfa, and Gontha sites and in most cases gain the highest gross income over MK10,000. Cabbage is seen in Tikolore and Tilime. Onions and sweet potatoes are intensively grown in Msambaimfa and Katema respectively. Msambaimfa has been found by middlemen to trade onions. It seems that such links with middlemen have driven the development of particular cash crops.

**Table 6.2.5 Number of Households Growing Cash Crops and their Gross Income**

RDP	Site	Cash Crop	No. of HH	Gross Income (MK)		RDP	Site	Cash Crop	No. of HH	Gross Income (MK)	
				Total	Per HH					Total	Per HH
Lilongwe East	Mtuwanjovu	Tobacco	14	172,349	12,311	Dowa	Tikolore	Ground nuts	7	2,090	299
		Ground nuts	9	10,260	1,140			Cabbage	7	37,050	5,293
	Duwu	Ground nuts	13	11,208	862		Tilime	Ground nuts	7	2,240	320
		Tobacco	5	71,500	14,300			Cabbage	4	13,550	3,388
	Ngoni	Vegetables	5	12,800	2,560			Tomato	3	1,845	615
Dedza Hills	Mchiku	Beans	14	9,180	656	Loyi	Ground nuts	4	3,850	963	
		Beans	10	3,500	350	Msambaimfa	Onion	14	259,900	18,564	
	Mtanda	Soya Bean	7	2,610	373		Soya Bean	12	63,350	5,279	
		Sweet Potato	3	1,500	500		Tobacco	10	119,050	11,905	
		Mtsetse	Beans	6	3,185		531	Sweet Potato	4	7,890	1,973
	Soya Bean		3	4,330	1,443		Irish Potato	4	3,600	900	
	Ntchisi	Gontha	Tobacco	14	224,680	16,049	Tobacco	14	224,680	16,049	
Sweet Potato			7	16,300	2,329	Sweet Potato	7	16,300	2,329		
Ground nuts			4	3,318	830	Ground nuts	4	3,318	830		
Katema		Sweet Potato	19	60,720	3,196	Sweet Potato	19	60,720	3,196		

## 6) Farm Household Income

There are considerable households who scarcely sell their produce unless they grow tobacco leaves or vegetables. Table 6.2.6 shows the average share of income by source. Net income of crop sale is estimated on average deficit in Dedza Hills (Cluster 2) and Dowa (Cluster 3). In overall average, around 40% of the sample households are found that the net cash income from crop production gets in deficit, namely farm inputs were purchased by the income from non-farm job or sales of livestock other than crop sales. It is shown that the share of crop sale is higher in Ntchisi (Cluster 4) and the value of home consumption occupies around 60% in all the clusters.

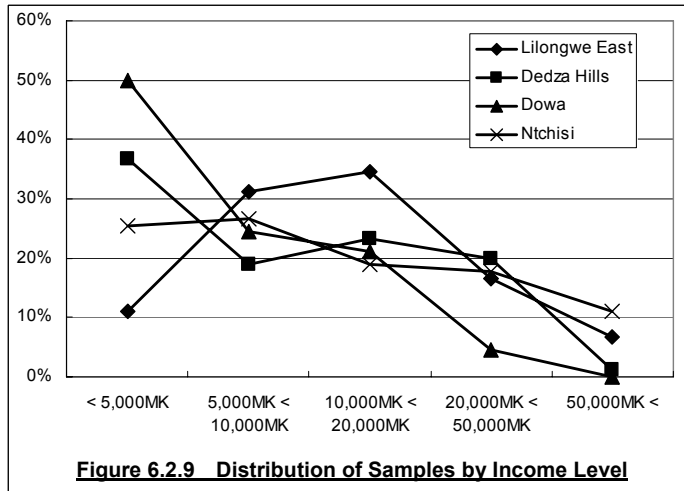
Average annual cash income of the total samples is estimated at MK5,900 per household. When including the value of farm produce for home consumption, the average annual income is calculated at MK15,000. The value of farm produce for home consumption, therefore, consists of 60% of total income value. As for the distribution of households according to their

**Table 6.2.6 Share of Income by Source**

Cluster	Share of Income Sources							Total Cash Income	Total Value
	Non-farm	Crop Sale	Crop Self-consumption Value	Crop Total	Perennial Crop	Livestock			
Lilongwe East	23%	9%	63%	73%	2%	3%	37%	100%	
Dedza Hills	47%	-8%	57%	48%	0%	5%	43%	100%	
Dowa	35%	0%	63%	63%	1%	1%	37%	100%	
Ntchisi	3%	34%	59%	93%	1%	3%	41%	100%	
Total	22%	13%	60%	74%	1%	3%	40%	100%	

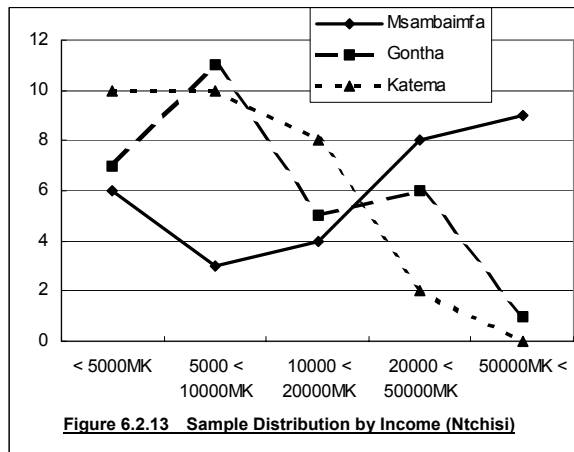
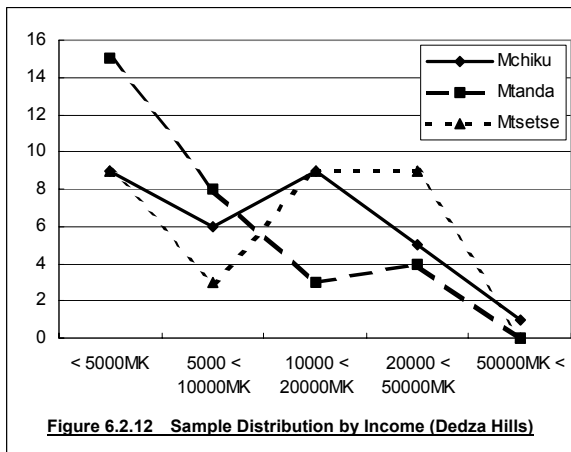
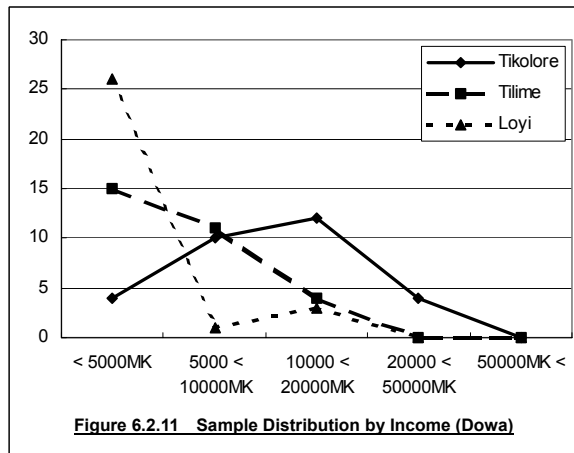
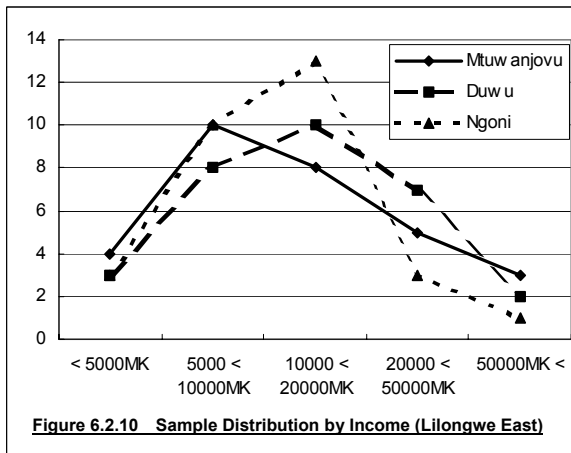
income level, the shares of households whose annual income including home consumption value are less than MK5,000, MK5,000 - 10,000, MK10,000 - 20,000, MK20,000 - 50,000 and over MK50,000, are 31%, 25%, 24%, 15% and 5% respectively.

Figure 6.2.9 shows the distribution of sample households according to income level by cluster. Share of lower income group is higher in three clusters of Dedza Hills, Dowa, and Ntchisi. The nearness to Lilongwe city may have contributed to relatively higher income level of the sample households for Lilongwe East.



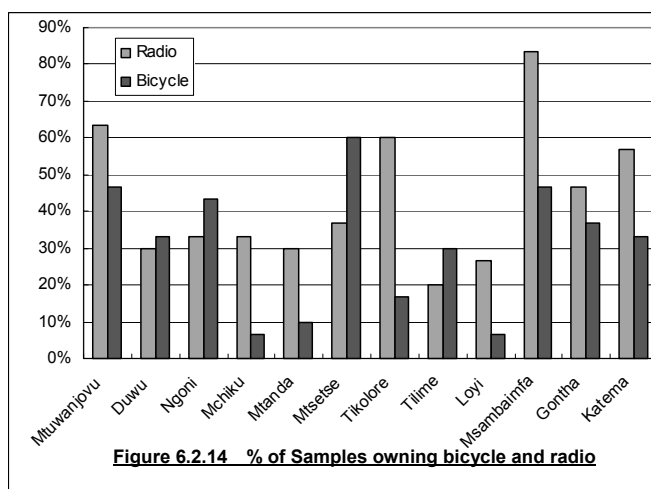
There are some significant differences among sites even in a cluster. Figures 6.2.10 to 6.2.13 show the distribution of the samples according to income level by site.

It is observed that Loyi site consists of more samples belonging to lower income group compared to Tikolore and Tilime in Dowa and the samples of Msambaimfa in Ntchisi shows significant difference from Gontha and Katema, as 57% of the samples falls the income group of more than MK20,000 and the samples are rather polarized between better-off and others.



## 7) Radio & Bicycle as Assets

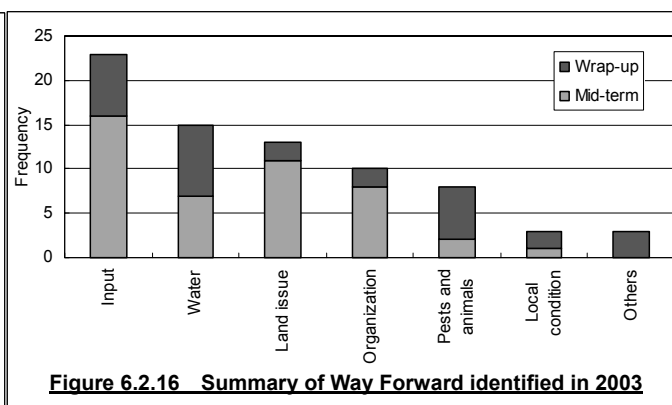
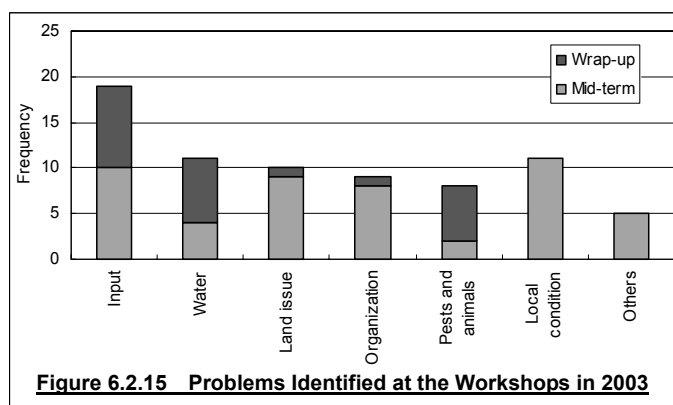
Figure 6.2.14 shows the share of the sample households who own radio and/or bicycle. Sample households who own radio and bicycle are 43% and 31% in total respectively. Sample households owning radio and bicycle are high in Msambaimfa and Mtuwanjovu, and low in Loyi and Tilime somehow corresponding to the income level of the households in the sites. Those who own radio can listen to the radio agriculture program broadcasted 6 days per week by Malawi Broadcasting Cooperation. 39% of the sample households answered that they are listening the program, and the frequency of the listening was three times a week on average.



### 6.2.3 Mid-term and Wrap-up Workshops on Selected Sites

A series of evaluation workshops were carried out during 2003 dry season at selected sites. As the progress proceeded, ten mid-term evaluation workshops were held in August and September 2003 upon construction of the weir and canal, and nine wrap-up workshops were held in November 2003 right before harvesting. During the workshops, problems, countermeasures, way-forward, and what were good/ bad about each project were discussed. In addition to these workshops, a wrap-up evaluation workshop by relevant government officers such as RDP irrigation officer, AEDCs and AEDOs was held in November 2003.

Number one problem pointed out at the mid-term evaluation workshops was local condition such as hardness of soil or steepness of land, and availability of local material such as clay soil and trees. The second one was input such as seeds and fertilizer, followed by land issues and organizational issues such as low cooperation and low attendance to the construction works. At the wrap-up evaluation, the discussion was rather concentrated on three specific issues; input especially fertilizer, shortage of water, and damage caused by pests and animals (Refer to Figure 6.2.15 and Table 6.2.7).



As way forward, input especially seeds and manure, land issues especially extension of service areas and involvement of local leaders, organizational issues regarding constitutions and committees, and countermeasures for shortage of water especially early construction and planting were discussed intensively both at the mid-term workshops and at the wrap-up workshops. Fencing and other preventive measures regarding the damage caused by pests and animals were highlighted at the wrap-up workshops (Refer to Figure 6.2.16 and Table 6.2.8).

**Table 6.2.7 Summary of Problems identified by the Farmers at Workshops in 2003**

Cluster	Category	Input 19(10)		Water 11(4)			Land issue 10(9)		Organiza- tion 9(8)	Pests and animals 8(2)		Local condition / material 11(11)	Others 5(5)					
		Lack of seeds / late planting	Shortage of fertilizers	Shortage of tools	Shortage of water	Distribution of water	Leakage of water	Shortage of land / small service area		Some landowners / outside farmers	Low cooperation / low attendance		Sickness / hunger / funerals	Domestic animals destroy plants / crops	Mice, stalk borer cutworms, maize streak	Harvest less than expected	Water is cold	Pricking thorns
1	Duwu	*							***	***	*							
	Ngoni	**	**	***	**			***						*	*			
	<Chimphonongo>	**	**		**	**					**							
2	Chikhasu/Mchiku (Livizi)	***	**	*	**		*	*		***	**	**	***	*				
	Mtsetse	*					*	*	*	*		*	*			*		
	(Mtanda)				*		*	*			*	*	*			*		
3	Tikolore	*		*				*	***		**	*	*					
	Loyi	**	**				**	***	*	**	**	*	*					
4	Gontha	***	***	**	**	**	*	*	*									
	Katema		**	*							**	***						
Total		8(5)	6(1)	5(4)	6(1)	2(0)	3(3)	5(4)	5(5)	4(3)	5(1)	3(1)	7(7)	4(4)	1(1)	1(1)	1(1)	2(2)

Note (1) : \* means the problem showed up at the midterm evaluation only. \*\* means the problem showed up at the final evaluation only. \*\*\* means the problem showed up both at the midterm and final evaluation.  
 Note (2) : final evaluation was not done at the sites with ( ).  
 Note (3) : midterm evaluation was not done at the site with < > .

**Table 6.2.8 Summary of Way-forward identified by the Farmers at Workshops in 2003**

Cluster	Category	Input 23(16)				Water 15(7)			Land issue 13(11)		Organiza- tion 10(8)				Pests and animals 8(2)		Local condition / material 3(1)		Others 3(0)				
		Make contribution and buy OPV	Seed bank	Make Bocoashi manure and buy fertilizer	Buy tools / treadle pumps etc.	Early planting / construction	Rotation of water / discussion	New weir construction / maintenance	Involve VH / GVH more	Extend service area	Rent land	Make or obey constitution	Reelect the committee members	Leadership training	Help each other / sell at lower price to fellows	Fencing	Involve GVH	Buy or make pesticide		Advice from AEDO	Hire people to scare animals	Recycle the trees	Marker ridges / land conservation
1	Duwu	***		**		***		*			*	**		***	*							**	
	Ngoni	*		***	*	***			***								***						
	<Chimphonongo>	**		**		**	**	*	**										**				
2	Chikhasu/Mchiku (Livizi)	*	*			***	**	**	*	**									**	*			
	Mtsetse			*		*		**	*		*	*					**						
	(Mtanda)				*			*	*														
3	Tikolore	*		*	**			*	**	***				**	**						**		
	Loyi	*	*	***	**	***		*	***	*	*		**	**							**		
4	Gontha	**	***	***	*	***	**		***	*	*		**									**	
	Katema	**		**	*	**							**	**								**	
Total		5(2)	4(4)	8(5)	6(5)	10(7)	3(0)	2(0)	6(6)	6(4)	1(1)	4(4)	3(2)	1(1)	2(1)	4(1)	1(0)	1(1)	1(0)	1(0)	1(1)	2(0)	3(0)

Note (1) : \* means the plan showed up at the midterm evaluation only. \*\* means the plan showed up at the final evaluation only. \*\*\* means the plan showed up both at the midterm and final evaluation.

Note (2) : final evaluation was not done at the sites with ( ).

Note (3) : midterm evaluation was not done at the site with < > .

## 2) Follow-up to the Way-forward

First generation verification projects have experienced 2 years dry season, so that the Team together with AEDOs has followed up how the way-forward made in 2003 proceeded in the following season of 2004. Due to short rainfall of 2003/04, some sites such as Duwu and Chimphonongo have been stranded to continue the irrigation activities in year 2004 and consequently the way-forward in their sites have been shelved. Table 6.2.9 summarizes the implementation of the way-forward:

- For input, Katema and Ngoni have progressed remarkably though few Gontha and Loyi farmers have managed input by themselves. There is a difference between those clubs. For instance, the AEDO in Karila EPA assessed the difference between Katema and Gontha clubs borne by handout. Katema club, which did not receive any handout in 2003, has advanced as self-independent group, while Gontha farmers, all of whom received inputs by HIPC fund, have still somewhat looked reluctant to do so.
- Concerning water, in 2004 all the diversion weirs except Gontha site were constructed earlier than 2003, thereby most of the sites did planting earlier than year 2003. Mchiku site had abandoned the original site due to water scarcity, and constructed a new weir assisted by the AEDO in charge about 200m downstream from the original one.
- Land and organizational issues are often associated with local leadership such as VH and GVH. When they have dispute in the local administration, irrigation club is also affected. This is seen in Tikolore, otherwise service area can be extended as long as there is water and also the committee itself can be consolidated through their activities.

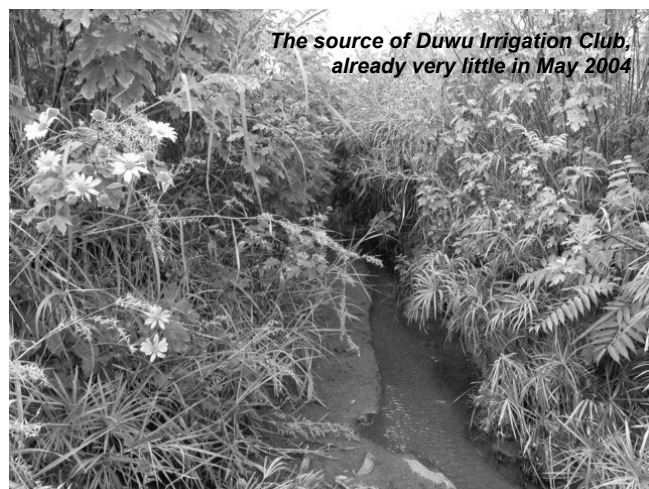
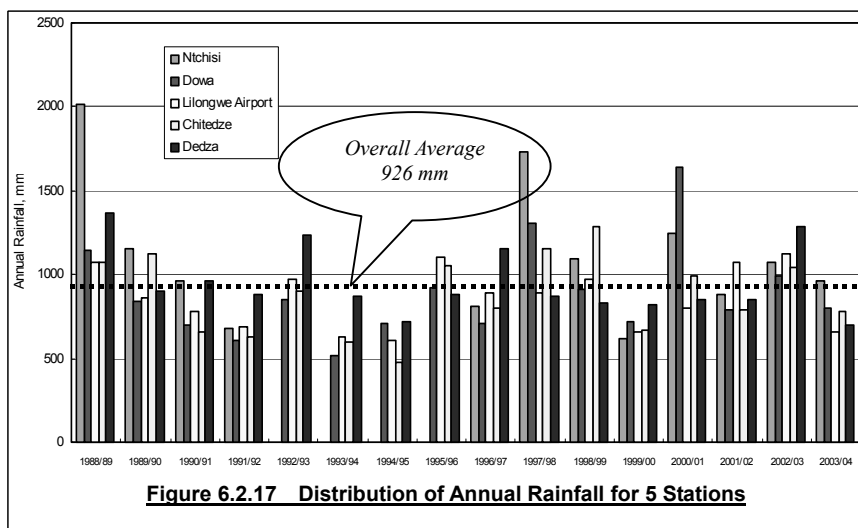
**Table 6.2.9 Way Forward and its Implementation**

Way Forward at '03	Sites Identified	Progress
<b>Input:</b>		
Purchase OPV	Katema, Gontha, <u>Duwu</u> , <u>Chimphonongo</u> .	Katema people bought or recycled OPV. Gontha has been split in two, and few members bought.
Purchase fertilizers	Ngoni, Loyi, Gontha, Katema, <u>Duwu</u> , <u>Chimphonongo</u>	In Ngoni and Katema, most members have bought fertilizers.
Make Bocashi compost	Ngoni, Loyi, Gontha, Katema, <u>Duwu</u> , <u>Chimphonongo</u>	Katema made about 40 heaps of Bocashi compost.
Seed bank	Gontha	Split in small groups, therefore not possible.
<b>Water:</b>		
Start planting early	Ngoni, Chikhasu, Mchiku, Tikolore, Loyi, Gontha, Katema, <u>Duwu</u> , <u>Chimphonongo</u>	Ngoni, Chikhasu, Mchiku, Tikolore, and Katema people started earlier than last year. Only few farmers started irrigation in Loyi. Members in Gontha delayed due to the split of the club.
Irrigation rotation	Chikhasu, Mchiku, <u>Chimph'go</u>	When water becomes scarce, rotation is done.
New weir construction	Chikhasu, Mchiku, Mtsetse	Mchiku people constructed new weir at new location.
<b>Land:</b>		
Extend service area	Chikhasu, Mchiku, Tikolore, Loyi, Gontha	Chikhasu extended canal. Mchiku extended area at new site. Other sites not done due to water shortage, land conflicts, etc.
Rent land	Ngoni	There are new members renting lands and farmers are working together no matter if his farm is benefited from irrigation.
<b>Organization:</b>		
Strengthen constitution	Tikolore	There is some dispute about assignment of village headman, which stagnated community activity.
Reelect committee	<u>Duwu</u>	No irrigation in 2004.
<b>Pests and animals:</b>		
Fencing	Tikolore, Loyi, Katema	Done
Involve GVH	Tikolore	There is dispute between GVH and VH.
Buy or make pesticide	Ngoni	Not done, less disease in 2004.
Hire watchmen	Chikhasu, Mchiku	Not done. Small service areas, therefore no needed.

### 6.2.4 Development Excerpt for the 1<sup>st</sup> Generation Project Sites

The first generation project sites have experienced two seasons of 2003 and 2004 under this Study. What was achieved in 2003 dry season seems to have encouraged the farmers of the sites generally and pro-active behaviors of them have been observed as in many sites farmers have constructed diversion weir without attendance of AEDO than the first year. There are, however, several sites whose irrigation activities have been hindered by poor rainfall during 2003/04 rainy season especially in Lilongwe area.

In the rainy season of 2003/04, there was not much rainfall except for Ntchisi area as shown in the Figure 6.2.17. The rainfall was about 10 - 30% lower than the average by station, and 10 - 45% lower than that of rainy season 2002/03 (in this sense, rain in season 2002/03 was higher than the average). Faced with this situation, farmers needed to scale down their activities in some sites and even give up the development for the dry season 2004.



The stream of Kambware in Mvera EPA, Dowa RDP got little water in the dry season of year 2004, so that the farmers gave up constructing weir. Only one farmer was diverting stream water onto a tiny garden. Another example of water shortage is Duwu. The water level at the source was already too low in May-June 2004 to develop, and actually they gave up developing the irrigation system in year 2004. Same situation took place in Chimphonongo site as well where they used watering

can for their tiny plots.

Table 6.2.10 summarizes the status of the 1<sup>st</sup> generation projects as of December 2004, which is the end of the 2<sup>nd</sup> dry season, as compared with the situation in 2003. Aside from the abandoned sites, sites significantly scaled down due to the water shortage were Mgunda, Mtsetse, Tikolore, Loyi and Kambware. Kasangadzi site in Ntchisi area was not developed because the land owner at the diversion point refused the canal to traverse his land.

Total membership for all the 23 sites to date is around 521 (339 males and 182 females). The number of membership is less than last year, that was 642. The decrease is due to the sites of scale-down and non-development. Also there are sites in Dedza Hills, where landowners are refusing to rent out the lands to keep their benefits. This has also caused the decrease of membership. On the other hand, there are some sites in which the membership considerably increased like Livizi, Mchiku and Tilime. Total length of canals and area developed in 2004 were 12,022m and 30.7ha respectively, both of which were downsized compared to those of 15,006m and 36.5ha in 2003.

**Table 6.2.10 Summary of 1<sup>st</sup> Generation Verification Projects**

Club Name (membership, Lowner)	in 2003	in 2004	Why membership changed?	in 2003	in 2004	in 2003	in 2003	in 2004	in 2003	in 2004	
	Member M, F	Membership M, F		L.Owner M, F	L.Owner M, F	Intended Area, ha	Irrigated Area, ha	Irrigated Area, ha	Canal Length, m	Canal Length, m	
<b>LL East RDP, Mpenu EPA</b>											
1-1	Mtuwanjovu(30,26)	26,4	11,2	Due to low volume of water	26,0	11,2	2,4	2,20	2,11	670	500
1-2	Duwu(26,4)	16,10	17,7	No Water	4,0	N.A.	2,6	1,56	-	450	-
1-3	Ngoni(20,5) Miteme(15,5)	35,0	17,6	The site comprised of 2 clubs. One club on the other stream side withdrawn because of landownership	10,0	10,0	5,8	3,38	4,00	1,200	1,200
1-4	Chimphonongo(18,18)	16,2	11,4	With minor repair of weir 4-5 people could do gravity irrigation	16,2	11,1	4,8	1,92	0,00	240	-
1-5	Zakumba(10,1)	9,1	8,5	Farmers realised the importance of Irrigation. Due to water shortage, all the harvest were failed.	1,0	1,0	2,0	0,95	0,00	370	402
1-6	Talira (w/ fish pond)	-	-		-	-	-	-	-	-	-
1-7	Mgunda(11,2)	11,0	11,0		2,0	2,0	2,5	1,10	0,50	350	350
1-8	Mankhamba(10,2) Tigwirizane(6,2)	16,0	11,2 3,2	3 members who got out of the club started their irrigation downstream since they learned how to irrigate.	4,0	4,0	4,5	2,53	4,00	460	760
<b>Dedza Hills RDP, Kanyama EPA</b>											
2-1	Chikhasu(16,6)	10,6	5,8	Lack of inputs by some members	1,5	1,1	1,0	0,64	0,80	165	386
2-2	Mchiku(16,1)	7,9	13,14	Campaign meetings on winter cultivation	0,1	0,1	0,7	0,65	1,02	215	95
2-3	Livizi(17,11)	10,7	15,18	They extended canal	4,7	13,6	1,4	0,78	1,91	365	700
<b>Dedza Hills RDP, Bembeke EPA</b>											
2-4	Mtsetse(15,2)	10,5	17,8	More farmers want to participate. Farmers want to extend the canal to the other side of the road	2,0	1,2	1,2	0,25	0,15	190	190
2-5	Kadiwa(7,1)	3,4	6,8	More farmers want to participate. Ha to increase	1,0	1,1	0,8	0,50	0,40	190	280
2-6	Mtanda(38,6)	7,31	9,18	Land owners refusing other peoples' participation in order to have bigger land size	0,6	0,6	1,5	0,53	0,53	320	300
2-7	Namanolo(23,8)	16,7	13,9	Land owners refusing other peoples' participation in order to have bigger land size	2,6	10,0	1,2	0,52	1,00	401	425
<b>Dowa RDP, Mvera EPA</b>											
3-1	Tikolore(81,10)	69,12	33,8		10,0	10,0	5,8	3,97	3,10	2,154	1,800
3-2	Tilime(50,5)	40,10	50,11	seeing the benefit	5,0	5,0	4,1	1,65	2,50	1,852	1,900
3-3	Loyi(36,4)	22,14	5,1	Long negotiation with landowner for rent and water shortage hindered dry season irrigation in 2004.	3,1	3,1	3,6	1,80	0,4 (3,6 for rain fed)	510	85
3-4	Kambware(15,3)	15,0	1,0	Stream flow is too small to develop in year 2004, thereby only one farmer carries out irrigation.	3,0	3,0	2,0	0,55	0,10	1,250	150
<b>Ntchisi RDP, Kalira EPA</b>											
4-1	Msambaimfa(61,13)	47,14	47,14		10,3	10,3	4,5	4,50	4,50	1,500	1,500
4-2	Gontha(52,4)	43,9	13,4	Landowner refused to rent out the land and some members shifted to other location	3,1	2,0	4,9	3,30	1,70	600	395
4-3	Katema(33,1)	22,11	23,33	seeing the benefit	1,0	1,0	2,0	1,65	1,95	554	604
4-4	Kasangadzi(36,5)	27,9	N.A.	Landowner refused to construct weir in his land	5,0	N.A.	4,0	1,55	-	1,000	-
Total					145 (113,32)	123 (99,24)	63,30	36,48	30,67	15,006	12,022
Average per site					6 (5,1)	5 (4,1)	2,75	1,59	1,33	652	523

All the sites have been closely monitored by the relevant AEDOs. During 2003 dry season,



working group which was organized in each ADD had met once in every three months and the AEDOs in charge reported and discussed issues and action to be taken. During 2004 dry season, though working group meeting did not take place, AEDOs have continuously supported the sites. Development history was recorded throughout this Study (detail is given in Appendix-7), and some topical sites are described below:

### **1) Mtuwanjovu Site, Mpenu EPA, Lilongwe East RDP**

The village concerned on the site is called Mwase, which is located in the southwest of Mpenu EPA office fairly close to M1 national road, as some villagers commute to Lilongwe everyday. The village is relatively rich with tobacco crop. Tobacco is the major cash crop in this area, but the villagers are trying to grow other vegetables like tomato. A problem analysis was conducted during the phase 1 study, and the villagers voted to “sickness of villagers” as the number one cause of hunger, followed by “Villagers do not have seeds when necessary”, “Theft”, and “Low fertility of land”. The villagers of Mwase village seem to have substantial income from tobacco crop and that is probably why the priority of fertilizer was relatively low as compared with other village.

In February 2003, the Study Team conducted a provisional canal alignment in the area and the farmers who were observing the operation pegged the line and started the canal excavation by their own. In the middle of May 2003 when the Study Team returned to the field, they had already excavated the canal. In 2003, the canal length reached 670 m and they also crossed the road by constructing a road crossing to convey water into the neighbor village Katukumara. The road-crossing was made by PVC pipe, which was provided by RDP. The water source is a dambo area and water was easily diverted by the weir made of 10 sand bags.



Crops grown in 2003 were hybrid maize (MH31), recycled local hybrid maize, beans, sweet potato etc. Farmers were trained; making basin, rotational irrigation, vegetable cropping, and also Bacashi compost making. AEDO in charge carried out a field day in the mid of July 2003 and the villagers in this site went to the Chimphonongo site on foot. They learnt compost manure making from there. The major problems faced in producing crops in 2003 include pests such as maize stalk borer, maize streak virus and cutworms. Cutworms also attacked the beans. A botanical pesticide was demonstrated, which was to use the leaves of Jerejere tree (*Sesbania Sesban*), and it saved some maize from the stalk borer.

In 2004, farmers only in Mwase village developed irrigation due to water shortage. The club members could not make good profit in dry season 2003 mainly because of stalk borer, but had a good harvest in dry season 2004. In 2004, they used hybrid (SC403) instead of recycle seeds. Some of the club members say that their maize was not attacked by insects very much like last year, because they believe that hybrid is more resistant to insects than recycle

seeds.

They also say that they do not have to cut trees for firewood sales since they can get food and income from their irrigated farm. Mr. Bison Kuma, Secretary of Mtuwanjovu Club, sold less than a half of the maize in green and got MK2,800, Mr. Fikilaya Joswa, Chairman of Mtuwanjovu Club, also sold only a part of the maize and got MK2,500. Mr. Nkhokomba Mwatibu said he is expecting to get MK13,000 because he has 1,300 cobs and the price in green can be MK10/cob.

Farmers in the vicinity have visited the site and got motivated to develop irrigation. The club members look confident and they say that they will even try to grow tomato during rainy season after they harvest all the crops in the irrigation farm. During rainy season, tomato price rises high, but due to a lot of insects farmers used to be reluctant to grow tomato during rainy season. The club members are planning to buy pesticides to tackle the pests. It seems that irrigation gave them confidence and source of fund to buy pesticides.

The case of Mtuwanjovu would show how farmers allocate water among villages when volume of water cannot be expected as supposed to be. During the dry season in 2003, Mwase villagers formed the irrigation club and the neighbor villagers of Katukumara asked the club for allowing them to branch the irrigation canal cross the road into their farms. The diversion point was located in Mwase, hence it was a privilege of Mwase villagers to make a priority use of the canal water. Mwase villagers allowed them to branch the canal.

In 2003 farmers agreed with a water distribution rule: three days for the upstream and three days for the tail farm with Sunday being holiday. The upstream area was about as twice as the tail farm. Therefore, three-day allocation for the tail farm seemed quite enough. However, the treadle pump users in the upstream area did not follow the agreed rotation, causing water shortage at the tail farm including the area irrigated through the branch canal. A meeting including the village headmen of Mwase and Katukumara was held on October 26, 2003 and upstream farmers agreed to stop using treadle pumps when it is not their turn and also Sunday was allocated to the upstream farmers.

In 2004 dry season due to scarce water, Mwase villagers told Katukumara villagers that it was not possible to divert water into the branch canal and instead, they were going to lend one of their treadle pumps to Katukumara villagers. Authority of using canal water in this case was still given to Mwase villagers because the diversion point is located within their jurisdiction and actually the irrigation system was firstly developed by Mwase villagers. Katukumara villagers agreed with it and only Mwase villagers practiced irrigation in 2004.

Another incident occurred in Mtuwanjovu. Villagers of Chowa, located on the other side of the dambo, have constructed a fishpond with assistance from district assembly, using the same water source of Mtuwanjovu. Both villagers agreed with a rotation of day use for



irrigation and night use for the fishpond. Because the fishpond does not require much water, water allocation between the fishpond and irrigation went well.

## **2) Ngoni Site, Mpenu EPA, Lilongwe East RDP**

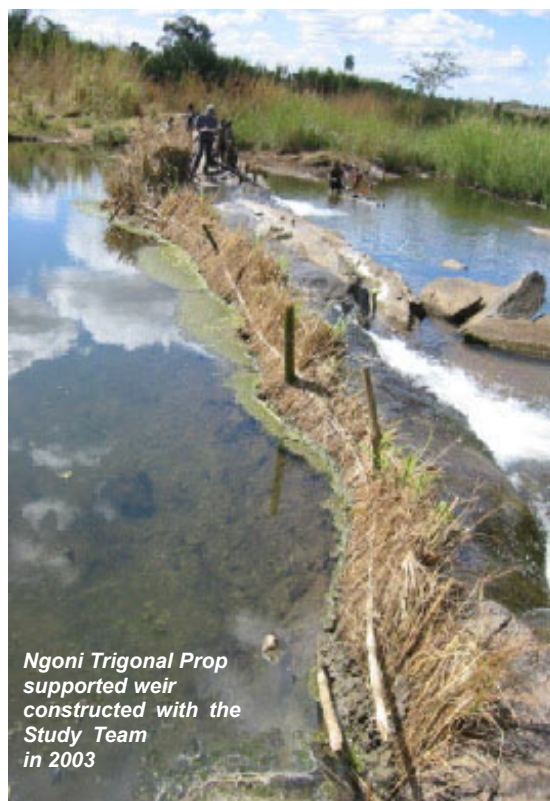
Location of Ngoni, just east side of Lilongwe, is the closest to the Lilongwe town amongst the verification project sites, just 20 minutes travel to the town by car. Probably for this reason, there are people who come from Lilongwe and buy the lands from the villagers. The chief used to distribute the land free of charge, when there were still some fallow lands, but most of the lands have been already allocated. Therefore, borrowing land usually needs certain money in this area. Though this area is close to the town, hunger is a problem as informed by a villager that over five people had died of hunger or hunger related diseases in 2002.

The site has a big river called Nanjiri. There is a person who excavated canal to divert the river water into his farm. Influenced by the person, initially 20 villagers got together and formed a club called Ngoni in 2003. The person became the chairman. To raise the river water level at the diversion point, an RDP officer provided 22 sand bags, but they were not enough to raise the water level, therefore a villager brought 14 sand bags on his own. Aside from the Ngoni club, there is Miteme club which was established in 2001. This club is located in the right bank side, and has been engaged in gardening by watering can. The membership is now composed of the two clubs (no umbrella club has been established).

Ngoni site is the biggest potential area among the verification project sites with the discharge of more than 500 l/s. In 2003 the villagers made a weir with the 36 sand bags. However, some of the sand bags were stolen (especially if they are provided by the government, sense of guilty may be hindered). The Study Team introduced the villagers a type of brush dam using wooden trigonal stand structure, which is a Japanese traditional one. Half of the weir was constructed under the supervision of the Team, and the villagers themselves completed the remaining half.

Canal excavation reached up to 1.3 km in 2003. Due to refusal of a landowner passing the canal through his land, the canal had to be diverted to pass the land at higher altitude. For this reason, the depth of the canal became as deep as 1.1 m. The villagers were also thinking to irrigate the farm upper side of the canal by treadle pump, so that they were convinced of shifting the canal to the higher land despite the tiresome deep excavation.

Because of the closeness to Lilongwe city, the area is much oriented toward market economy. For this circumstance, the one who wants to rent land needs to pay MK1,000 per acre. Marketing opportunity is also high and the farmers here were intending to practice organic



farming to sell their produce at the big super markets in Lilongwe. Due to time constraints, the farmers unfortunately could not proceed to the organic vegetable production in year 2003. Their maize had a stalk borer problem but they used chemical pesticides and controlled it.

In mid June 2004, they constructed new trigonal weir, which they had acknowledged the skill to make, at a bit upper side of the previous point. What needs to be mentioned specially in this site is that many members including V.H. Kufakwanthu only have upland for dry season (11 members out of 17 members interviewed). They are not directly benefited from smallholder gravity irrigation, yet they joined the club and are working together for construction of the weir and canal, and also for preparation of the members' farmland.

By the end of November 2004, most of the farmers harvested their crop. Farmers who used hybrid seeds (SC403) complained that the harvest was not good at all. They considered the seed quality as one reason and then the Study Team coordinated to call for personnel from the seed company to assess the crop in the site. The personnel picked up two issues: timing of top-dressing and moisture retention during pollinating period.



From the evidence of withered maize leaves, it was indicated that top-dressing was carried out later than appropriate time, which is just the beginning of germination. The personnel explained that if the timing of top-dressing were late, the effect would not contribute to growing fruits. Farmers told that they could not prepare fertilizers on time. As for moisture, it was suggested that because the air is dry in winter unlike rainy season, irrigation water should be supplied as double as usual during pollinating time to keep moisture on the top of maize stalk so that pollination would be well done. Farmers in Ngoni learned the difference of how to grow maize in dry season from rainy season.

### **3) Mchiku Site, Kanyam EPA, Dedza Hills RDP**

The site was the first one to have been commenced in the cluster 2. The irrigation service area was allocated to 16 farmers free of charge under the condition that they have to reproduce the ridges that have been left on the farm for rainy season agriculture. The owner of the service area is only one, a female, but she herself did not join the irrigation club. The beneficiaries of the site are from Mphale and Lumiwira2. Mphale village was established in 1992 split from Lumwira2 village due to increase of population. The first Village Headman, Mphale is a nephew of the Village Headman, Lumieira2.

Soon after the completion of the diversion weir, the leakage through around the weir had increased so often while the discharge of the stream was decreasing. The first diversion point became unable to divert water in September 2003 due to the scarcity of water, so that the farmers shifted the diversion point about 20 m upstream. Though the farmer had tried

every effort to tap water, even the upstream diversion point ceased conveying water in late October 2003. Thus, whole area was abandoned very unfortunately in 2003 dry season.



Having the experience of year 2003 in mind, the farmers started irrigation development at further downstream in 2004. The new site is located about 200m downstream from the previous year's diversion point. Membership was eight males and 17 females; one male and eight females more than last year thanks to the campaign meeting organized by the AEDO

in charge. Also a villager who lives more than five km away from Mchiku joined the club. Since he is from different village, he paid rent to the landowner and grew Irish potato in the area of 0.3ha.

Out of total 25 members, 18 members participated in the construction of the diversion weir on June 7, 2004. The diversion weir was, however, breached due to loose soil of the foundation in early July 2004. They shifted the diversion point again a little upstream and finally managed to divert water. Canal was constructed about 150 m and wetted about one ha of service area. The service area is owned by a woman and was divided amongst the members as done last year except for the one who came from different village and paid the rent.



Most of the members grew Irish potato, but those who could not buy potato seeds grew beans. A woman member told that she grew beans and would keep them as seeds for the following crop season. Farmers interviewed told that they did not think of quitting irrigation in spite of the total failure of 2003 as they saw other irrigation site enjoying the dry season crop. They told that they would definitely continue the irrigation next year onward.

Ms. Jene said “I planted Irish potato in dry season 2003, but I lost everything. Since I didn't have any seed potatoes, I planted beans in dry season 2004.” “I was disappointed at the total failure of 2003, but it is just like a thief and it could happen anytime. So we do not quit just by one failure,” she added. Mr. Pesani Kapusa said, “Good thing about the irrigation project is we have more contacts with AEDO. Now more people want to join the club.”

#### **4) Namanolo Site, Bembeke EPA, Dedza Hills RDP**

This site is located fairly close to Dedza town, around five minutes drive by car. The site

was one of being started late in 2003. After the kick-off workshop, some of the villagers were taken to see Mtsetse and Mtanda sites and they were well motivated to dig canals. The villagers learnt how to use the line-level, and used for confirming the gradient of the canal while they were excavating.



The weir was successfully constructed on July 23, 2003, and the villagers started the land preparation at the end of July 2003. The main crops in the site were beans and Irish potato. Farmers sourced their own seed. Though planting was done in mid August 2003, they harvested the crops before rainy season started since these crops need only about three months to mature. This site has been expected to display effectiveness of the brush dam as well as benefit of irrigation, as it is located just beside the trunk road from Dedza town.

In 2004 five landowners constructed the weir together with the AEDO on June 10, more than one month earlier than previous year. The structure is exactly the same as the previous weir, which is a double-line weir. They utilized the wooden logs, which had been used last year. Upon completing the previous year's irrigation, they dismantled the weir and set aside the major material: the wooden logs. Although the weir had diverted the water to both sides of the stream even in year 2003, only left side was irrigated due to time constraint. However, the completion of weir construction more than one month earlier than previous year enabled both sides of irrigation in year 2004.

In 2004, landowners did not rent out their land to the members of the previous year. So far the members of the new club are 10, and are all landowners. Renters had not clear the lands after harvesting of year 2003. Some of the landowners therefore refused to provide their lands to the peer farmers. Also they may have wanted to have larger service area. This is the same reason as Mtanda site located nearby. Five landowners on the left bank and five landowners on the right bank organized a new club and cultivated their lands by using the same weir in dry season 2004.

Mr. Eric Samalani, the landowner of the left bank in dry season 2003, is the only member of the first club remained. He told the V.H. Kamkhudza that the members did not change basins to furrows after harvest as agreed. The V.H. said there is no option if the situation is like that, and a new club was formed. Mr. John Kenith, a landowner of the right bank and a new member said, "I did not join in dry season 2003 because I was not sure if water really comes to the field." The landowners grew mainly Irish potato and Mr. Eric Salamani earned around MK10,000 from his Irish potato. He told that he would start earlier next year so that he can harvest and sell Irish potato by September when the market price of Irish potato is still high. He is so motivated to continue irrigation, but he would not rent out the land to others.

## 5) Tikolore, Mvera EPA, Dowa RDP

This site is the first runner among the sites in the cluster 3. Leadership of the group village headman and the committee were significant in this site. In 2003, canal excavation required in some part two meters depth, but the villagers finished the target length in two weeks time. They had extended the canal and it reached as far as around 2 km, which was the longest among the verification sites. The irrigated area of 3.97ha in 2003 was the 2<sup>nd</sup> largest amongst the verification project sites.



In mid June 2003, Committee members, the group village headman and two ladies were taken for a study tour to Mankhamba site and they learned basin irrigation. The committee members demonstrated what they learnt to the other members of the club soon after they came back from the study tour. They had started land preparation at the end of June, and some of them also started planting simultaneously with feeder canal excavation.

The main crop in 2003 was Masika variety of maize, which was provided by winter TIP. The other crops grown included mixed varieties of beans and all were grown in pure stand of potato and tomato. The major problems faced in producing maize included pests such as maize stalk borer and cutworms. The farmers tried their best in controlling the maize stalk borer by using leave extract from local herbs called *Katupe* and *Dema*, and these worked well.

In 2004 Tikolore club members tried construction of the diversion weir at about 50 m upstream from the previous year's diversion point as early as April 14. This location was the originally intended place even last year. In 2003, however, the landowner who has a land where the intended canal starts refused to let the canal pass by. Therefore, they had constructed the diversion weir at another point, last year. Upon the agreement with the landowner in 2004, they started constructing the diversion weir. As the water level rose up, they faced piping problem of the foundation. Since the foundation is composed of very loose sand, they failed to overcome the problem even with 24 sand bags put in the foundation.

Instead, they sifted the diversion point further upstream deep into the dambo area. New diversion point is located about 90m upstream from the previous year's diversion point where no hard effort was required to raise the water level thanks to the little elevation difference between the stream bed and the land nearby. New diversion is now made of small earthen band, just withdrawing the stream water by gravity into the canal. Club members who participated in the construction were about 20, and according to the new arraignment of the diversion point, those members had excavated new canal of about 200m, which joins the old canal. This new 200m canal included about 1.7m deep excavation for a reach of about 70m.

Tikolore site met land issues as some of the landowners were reluctant to rent the land from

the viewpoint of physical condition such as soil erosion occurred in 2003 dry season. Also new village headman was assigned against the opinion of the esteemed group village headman in March 2004 and that caused the decline of cohesiveness of the villagers. Anyway Tikolore club is still vital continuing the irrigation work.

Mr. Max Zawa said, “The only problem was that the landowner of my plot refused me to use there last season. Therefore, I got a new plot this season. Each two members will buy one bag of fertilizer together.” Mr. & Ms. Nikison also said “We prepared the garden, but the landowner refused us to use the plot because it was too late.” G.V.H. Fandani said “There is no unity in Tikolore Club as before.” The Committee Members of Tikolore Club decided to relocate poor performers to the tail of the canal by assessment of the performance of last dry season. That discouraged some people to join again this season.

#### **6) Tilime Site, Mvera EPA, Dowa RDP**

The site was initiated by two farmers who saw Tikolore. The weir was constructed by the farmers themselves. They diverted the river flow by soil embankment. The Study Team and AEDO assisted for the canal alignment. To extend the canal over a stream, a farmer constructed a canal bridge with 6m in length and 4m in height, which is made of logs, grass and plastic sheets. The farmers further extended the canal reached about 2 km.



Most parts of the irrigation service area were reclaimed from bush, so that the possibility of promoting open pollinated variety of maize was high. Though the Study Team suggested the farmers to promote OPV maize seeds by sourcing on their own, EPA has availed of all the seeds free of charge including cabbage, onion, etc., fertilizers and even chemicals from Food Security Component under EU Public Works Program. Farmers in this site also imported how to make basin on the farm from Tikolore, which was originally brought from Mankhamba. The cluster approach to enable farmer-to-farmer extension has well worked in these sites.

Tilime farmers were somewhat like students with Tikolore being the teacher. However, the Tilime farmers have very advanced in the following year 2004; they constructed the weir in late April just later than Tikolore site, and then started overtaking Tikolore in preparing plots and planting. Land preparation was done in May and early June, and most of the plots were planted at mid July. There are 10 male and one female who were motivated by seeing the 2003 year's harvesting and then joined the club in 2004. The service area of Tilime site is exclusively used for dry season irrigated agriculture, which made the farmers possible in preparing and planting the lands much earlier than Tikolore.





The Study Team held a workshop with the villagers of Tilime site to discuss how to improve irrigation and agriculture in 2004. 53 villagers, of whom only two were not members, participated in the workshop and they identified and prioritized issues to improve the above objective as “make compost manure” as the first priority followed by “crop twice during dry season”, “open group bank account to buy inputs” and “dig shallow well”.

The logic of digging shallow well for improving irrigation and agriculture was explained in such way that they can get cleaner water by shallow well and can be healthier to work harder in the field.

The Study Team suggested making compost manure along the canal so that water can be easily obtained for making the compost manure. Farmers are used to make compost manure near their house to utilize their garbage. Making compost near house has disadvantages of transport and securing water for it. However, if they make compost by the canal, water can be easily obtained and also burden of transport is drastically reduced. By November 2004, farmers in Tilime took action to make compost manure along the irrigation canal and there are around 30 heaps in a row. Apart from making compost, farmers are also utilizing the irrigation canal water to other uses such as tree nursery and fishpond, both of which are practiced along the canal.



Maize in Tilime is growing very well in 2004 as compared to other sites, so that the farmers look so happy to work on the field. Most members of Tilime Club are getting better harvest in dry season 2004. Mr. John Chakana, Vice-chairman of Tilime Club, said “One of the reasons why Tilime Club is working good might be sub-club system. We organize sub-club of 10 members as a family, and select vice-chairman. When there is a problem, the members of sub-club discuss the problem first. If they cannot solve the

problem, it will be discussed at the committee.” Mr. Sixpence Kapondo said, “Foundation of the club is important. We need to have full discussion and to put everything on the table at the beginning.” Tilime members must chase goats if they saw them in the garden, and apply fertilizer. If not, they should leave the club.

## **7) Gontha Site, Kalira EPA, Ntchisi RDP**

This site was the first runner among the sites in the cluster 4 in year 2003. The irrigation

service area was distributed to the villagers fairly by the village headman. The weir, which was constructed, was a small-scale brush dam and diverted the stream water to both left and right banks. The length of the canals reached 300 m each.



Canal Bridge made of tree bark

To complete the canal reach of 300 m, a canal bridge with 2.8 m length using tree bark and two road crossings with a length of 4.5 m each were constructed. The villagers planted maize at early August 2003, sourced by winter TIP. Since most of the lands were located on a gentle slope, they adopted furrow irrigation method. The main crop, maize, had pink coloration in some parts, which is sign of phosphorus deficiency or that the maize was grown during cold season. The major problems faced in producing the main crop in 2003 included pests such as maize stalk borer and maize streak virus and cutworms. The farmers controlled the maize stalk borer by using leaves of *Futsa*.

V.H. Chikware said at the end of 2003 season, “We now have some concrete evidence so more people want to join the club, though no new members have joined yet. Working in a group is powerful. There was some damage by cows and goats, so we need to have discussion with the owners. The biggest problem was some people cheated at applying fertilizer.” Mr. Marisani Aroni who is Chairman of Gontha Club, Ms. Solome Mark and Mr. Gaveni Chindozi also complained about cheating in application of fertilizer. Fertilizer application work was carried out in a group, but some people allocated more fertilizers on their plots than others.



Group work for fertilizer application

There was little participation for Gontha Club in dry season 2004. The landowners did not want the members to cultivate in dry season and the V.H. Chikwawe supported that. A landlady said, “The members left stems in the garden after harvest so that we spent two weeks to prepare the land from December 2003 to January 2004. We planted maize in January, but it did not grow properly. We are facing food shortage now.” She also added “Some members opened water for their gardens and went back home to sleep (causing soil erosion).” In addition, according to her brother, members of Gontha club did not pay MK100 or a pail of maize to her after the harvest of dry season crop in 2003, although it was an agreement amongst the members.

Eventually some members of Gontha found another diversion site at an upstream reach of the Gontha stream and started irrigation for year 2004. This new site succeeded the name of the club, Gontha, and the same chairman and secretary as the original club were chosen. Mr. Marisani Aroni, Chairman of Gontha Club, has a land there and five members are cultivating there as of November 2004. The chairman is expecting 18 members to cultivate in dry season 2005. Another five farmers, who have their lands at downstream reaches of the original site, are practicing dimba cropping in their own lands. Others are just staying idle in this dry season.

### **8) Katema Site, Kalira EPA, Ntchisi RDP**

The villager of the site established an irrigation committee when they saw Gontha and requested AEDO for technical assistance to develop irrigation system for them in late June 2003. They constructed a weir diverting water in the dambo and started excavating the canal. The Study Team together with AEDO realigned the canal line by using line-level since the canal line, which the farmers had identified, was inadequate. In year 2003, the farmers completed 554m of excavation. A demonstration of furrow irrigation was carried out for them together with the villagers from Gontha.



*Canal alignment by line-level*

In 2003, only maize crop was grown and the farmers sourced seeds by themselves. The farmers were once asked by EPA to wait for winter TIP, free handouts, for sometime. However, the farmers decided not to wait for the seeds since it was getting too late to plant. The farmers contributed money, and the Study Team bought Masika (an OPV variety) at Chitedze Research Station on behalf of them and delivered.



*Katema site growing maize twice a season*

In 2003/04 rainy season, the land was left uncultivated, meaning they use the land exclusively for dry season agriculture. The rainy season crop cannot not therefore obstruct the starting period of dry season crop. Hence, they could get started planting maize (mainly recycled Masiaka) in March 22 2004 by using out-leaving rainfall. They constructed weir in early May and started using irrigation water. They harvested the first dry season maize in September 2004 and immediately after the harvest, they planted the second dry season maize on the same farm.

The Study Team, AEDO and the farmers held a workshop to discuss how to improve

irrigation agriculture at mid July 2004. Farmers identified the priority activities as “buying fertilizers”, “crop diversification”, “expanding the service area”, “grow crop twice per dry season” and “making compost manure”. Among them expansion of the area and crop twice per dry season had already been taken action by the farmers. In fact, Katema site is the only site, in which all the farmer members grow twice per dry season. So they focused at the workshop on making compost manure. They made target of making 105hips of pit compost.

After the Study Team demonstrated how to make Bocashi compost manure and lectured the effects of the compost, farmers shift their target of making pit compost to Bocashi. Village headman of the site allowed the club members to take the manure of a cow, which the VH keeps. Enabled the access to cow manure, farmers were able to increase the number of Bocashi. By the mid of November 2004, 16 club members made two to three heaps of Bocashi totaling around 40 heaps.

### 9) Kasangadzi Site, Kalira EPA, Ntchisi RDP

The water source is a wide dambo where the diversion points are found several from upper part to lower part. The villagers together with the Study Team identified two diversion points on June 27, 2003 in the upstream and midstream reaches of the dambo. However, the owner of the land, within which the upstream diversion point is located, complained of the weir construction. The landowner is from a different village. They have, therefore, constructed the weir in the midstream reaches and excavated the canal with the assistance of AEDO.

Farmers applied furrow irrigation since the land is located on a slope. Same as other sites in this cluster 4, the length of furrow is all set at three meters, which is sometimes too short especially for the upstream reach of the canal. Since water is enough in the upstream reach of the canal, the length can be extended to five to even 10 m. The main crop was maize. The only other crop grown was mixed varieties of beans and all is grown as an intercrop of maize. The major problems faced in producing the main crop included pests such as maize stalk borer, cutworms and maize streak virus. Cutworms also attacked the beans. The farmers controlled the maize stalk borer by using botanical pesticide called *Katupe*.



According to Mr. Dagi, a member of Kasangdzi club, 11 farmers out of 33 used fertilizers in the irrigation plots of 2003 dry season and the two-third of the farmers who did not use fertilizers could not get good harvests. Nonetheless, the club members were about to start the second year irrigation in 2004. However, the landowner of the farmland, where the diversion point is located, refused again to construct the diversion weir at the site due to fear of being taken the land. The gravity irrigation in this site eventually did not take place in 2004.

### **6.3 Verification on Dissemination**

Since scale of smallholder irrigation this Study is promoting is very small or rather defined as micro irrigation, wide range of dissemination should be taken into consideration. Smallholder irrigation development should be promoted as program not by individual project by project. To institutionalize the program, 2<sup>nd</sup> year's verification study mostly centered on the dissemination.

#### **6.3.1 Extension Mechanism**

The dissemination was tried out in the 4 RDPs of Ntchisi, Dowa, Lilongwe East and Dedza Hills, for which the entry point was to fully involve frontline extension officers; the AEDOs. Since extension officers are not well equipped with irrigation technology but in general agriculture, the first step for the dissemination should be to equip those extension officers with necessary smallholder irrigation technologies. Under the verification, selected extension officers, 3 AEDOs plus AEDC from each EPA, in all the 26 EPAs under the 4 RDPs had been trained.

Given materials such as draft technical manual, leaflet, etc., they were administered a net 5-day training and then fielded to their sections. They started promoting smallholder irrigation with their farmers, following a procedure established during the 1<sup>st</sup> year's verification; 2003 dry season. One thing noteworthy is that during the training the AEDOs were requested to invite fellow AEDOs, who have not participated in the training course, during the development on the ground, thereby the fellow AEDOs can learn what the participating AEDOs learned during the course. This was purposed that the fellow AEDOs were also to start promoting smallholder irrigation development in their stations, and it worked very well.

The trained AEDOs were once again called back to report their achievement. The training was therefore administered two times; one in May/June which is correspondent to the beginning of irrigation season, and the other in September/October as the follow-up to the first batch training. The AEDOs reported their achievement against the target made during the first training course and also reported what their fellows who were not participating in the course have achieved (for the detail of the trainings, see Appendix-8).

Just before each of the trainings, training of trainers (TOT) was also conducted which worked as management meeting as well. 12 trainers were nominated amongst AEDOs and RDP assistant irrigation officers who have been working with the JICA team since 2003 dry season. They were trained as the trainer of the AEDO trainings and also during the TOT the activities of the AEDO trainings were rehearsed and finalized. Necessary materials for the AEDO trainings that the trainers were to use were also prepared during these TOTs.

#### **6.3.2 First AEDO Training**

##### **1) Objectives**

The 1<sup>st</sup> AEDO training aimed at equipping the participants with skills, knowledge and attitude necessary in discharging their duties and responsibilities of promoting smallholder irrigation development. After the training activities, the participants were expected to be able to:

- 1) Discuss the DOI's objectives, bases, and program direction,
- 2) Discuss smallholder irrigation development being promoted in Malawi,
- 3) Discuss constraints/opportunities to smallholder irrigation development,
- 4) Enumerate and discuss smallholder irrigation facilities and structures,
- 5) Organize farmers in developing smallholder irrigation schemes,
- 6) Facilitate farmers in solving problems to be encountered,
- 7) Prepare EPA and RDP basis entry program for 2004 dry season, and
- 8) Discuss way-forward for smallholder irrigation in Malawi.

## **2) Training Mechanics and Topics Tackled**

The training was a net five-day live-in and out activity held at Nathenje RTC for Lilongwe group of Lilongwe East RDP and Dedza Hills RDP and Mponela RTC for Kasungu group of Ntchisi and Dowa. Methodologies employed were lecture-interactive discussion, brainstorming, field trips and observation, practices on the field such as weir construction and line-leveling, and small group task preparing 2004 dry season entry program. Also, conducted during the course was preparation of picture stories, a dissemination material which can be used during a kick-off meeting of the irrigation development with farmers. Following are the modules undertaken:

- Module 1 Program Orientation
- Module 2 Overview of Smallholder Irrigation Development
  - DOI's Vision, Mission & Objectives
  - Irrigation Development in Malawi
  - Introduction to JICA Smallholder Irrigation Dev. Study
  - Overview of Smallholder Irrigation Facilities and Structures
- Module 3 Smallholder Irrigation Facilities and Structures
  - Identification of Suitable Gravity Diversion Sites
  - Discharge Measurement
  - Weir Type and Construction Method
  - Canal Alignment and Construction
  - Ancillary Facilities
  - On-farm Irrigation Method
- Module 4 Problems to be encountered and Possible Solutions
- Module 5 Entry Planning
  - Entry Planning Orientation and Presentation
  - Preparation of Dissemination Material (picture stories)

## **3) Participants**

This training course invited three AEDOs and AEDC each from all the 26 EPAs under the targeted 4 RDPs. Irrigation officers in those four RDPs were also invited. The numbers of participants were 62 for Lilongwe group and 65 for Kasungu group including the trainers. The criteria for selecting the AEDOs, which were entrusted to their AEDCs, were as follows:

- 1) The AEDOs should have potential areas to develop GRAVITY smallholder irrigation schemes in their sections,
- 2) The AEDOs should have strong will to facilitate the farmers to develop GRAVITY smallholder irrigation schemes, and

3) The AEDOs should have strong will to share the knowledge learnt during the training course with their fellow AEDOs.

Figure 6.3.1 shows the distribution of age and Figure 6.3.2 shows years in the government service for the participants. The mode for the age falls in a range of 36-40 years old and 46-50 years old with averages of 41 years old and 46 years old for the Lilongwe and Kasungu groups respectively. The mode for the service in government is 11-15 years for Lilongwe group while it is in a range of 1-5 years for Kasungu group followed by ranges of 11-15 years and 21-25 years. The average years in the government service is 15.8 for the both groups.

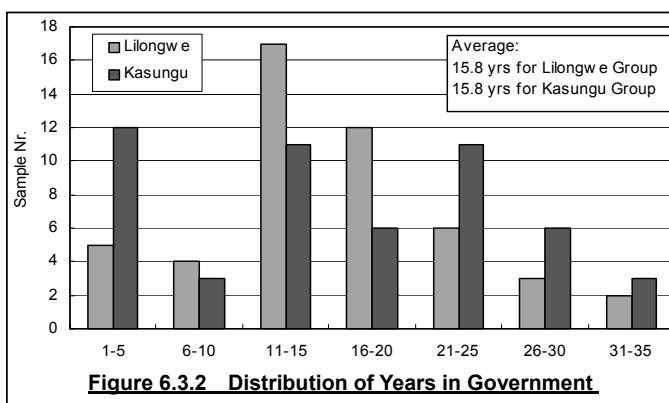
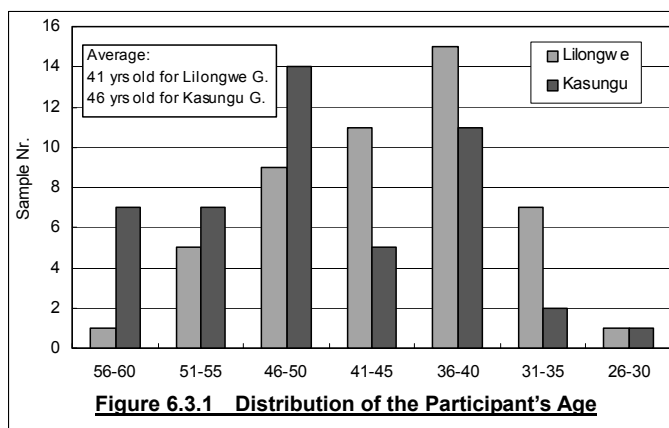


Figure 6.3.3 shows the percentage of the participants who have ever been involved in any smallholder irrigation project. About 60% of the Lilongwe participants responded they have been involved while nearly about 80% of the Kasungu participants responded yes. This reflects more potential of smallholder irrigation development in Dowa and Ntchisi areas than Lilongwe area, hence more projects have been undertaken there.

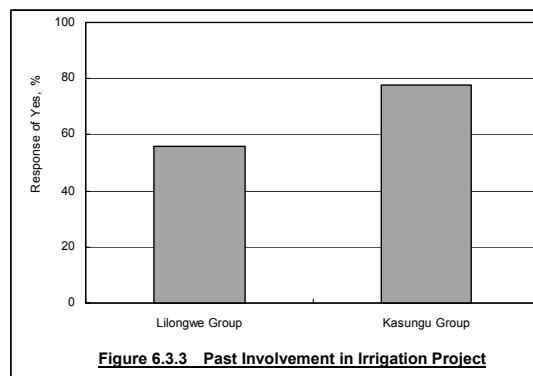
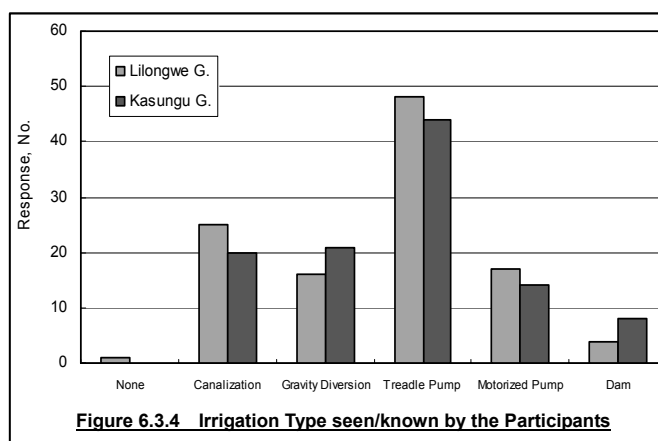


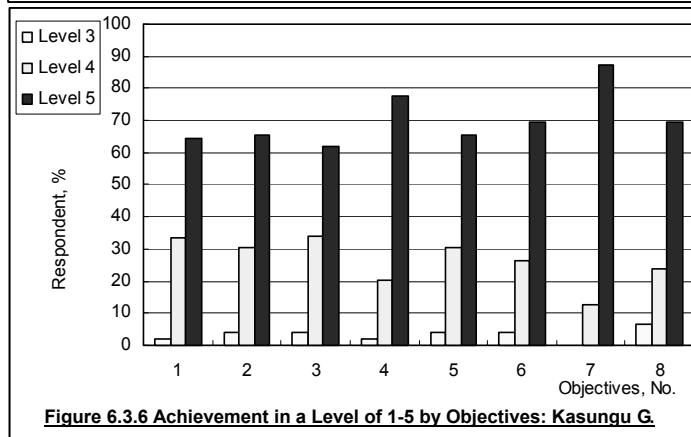
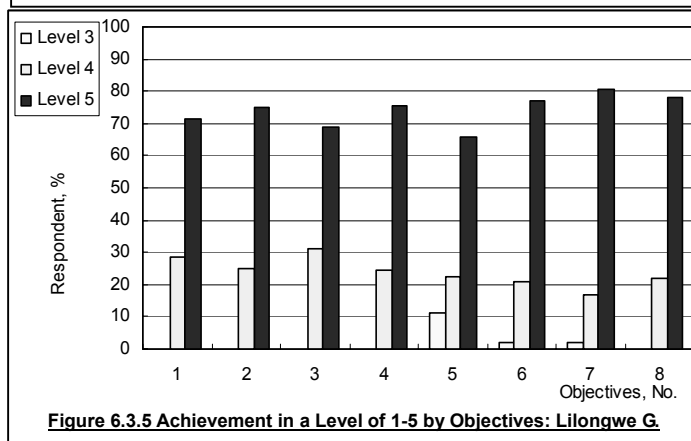
Figure 6.3.4 shows which smallholder irrigation systems the participants have seen or known. Almost all the participants so far have seen or known some kinds of smallholder irrigation system with treadle pump being the most. Gravity irrigation which is now promoted under this JICA study has not so much been familiar to the participants.



#### 4) Achievement of the Objectives

At the end of the training course, the participants were asked how much they have achieved

- Objectives are at the end of the training the participants are able to:
1. Discuss the DOI's objectives, bases, and program direction,
  2. Discuss smallholder irrigation dvlpmnt being promoted in Malawi,
  3. Discuss constraints/opportunities to smallholder irrigation dvlpmnt,
  4. Enumerate and discuss smallholder irrigation facilities and structures,
  5. Organize farmers in developing smallholder irrigation schemes,
  6. Facilitate farmers in solving problems to be encountered,
  7. Prepare EPA and RDP basis entry program for 2004 dry season, and
  8. Discuss way-forward for smallholder irrigation in Malawi.



the objectives of the training in a level of 1 to 5; level-1 is least achieved while level-5 is most-achieved. None of the participants answered level-1 or level-2 achievement. As shown in figures 6.3.5 and 6.3.6 for Lilongwe group and Kasungu group, more than 90% of the participants answered they have attained level-4 or more, and more than 60% of the participants answered they have reached level-5 achievement for all the objectives. The objective No.5, which is “able to organize farmers in developing smallholder irrigation schemes,” may have been somewhat difficult although about 65% of the participants replied they have reached level-5 achievement. This may be due to what they are anxious until they face the real problem on the ground. On the other hand, objective No.7, “prepare EPA and RDP basis entry program for 2004 dry season”, was achieved to the highest level: more than 80% of the participants reached level-5 achievement since this was a group activity carried out during the training.

### 5) Target set for the Year 2004 Dry Season

Given all the necessary trainings, the participants prepared an entry program for the year 2004 dry season. The entry program consists of: 1) identification of potential sites, 2) pre-selection of to-be-developed sites, 2) number of sites to be developed, 4) number of farmers to be organized, 5) area to be developed, and 6) canal length to be constructed. AEDO participants together with their AEDCs were asked to set his/her own target according to the potential of their sections.

285 sites in total were targeted to be developed with targeted 6,073 farmers, a total service area of 334 ha and a total length of 223 km canal. As an average, one site expects 21 members, 1.2 ha service area and 782 m length canal. The average service area per site, 1.2 ha only, looks very small. This may be because trainers/JICA advised the participants not to be ambitious in the first year, given the last year's examples that some sites were abandoned due to critical water shortage.



Table 6.3.1 Summary of Milestone Target by the mid of September 2004

Particular	Lilongwe E.	Dedza Hills	Dowa	Ntchisi	Total	per site
No. of EPAs	7	6	9	4	26	
Identification of potential sites	129	112	169	73	483	
Pre-selection of to-be-developed sites	106	76	121	47	350	
No. of sites to be developed	85	59	99	42	285	
No. of farmers to be organized	2,030	1,133	1,899	1,011	6,073	21
Area to be developed, ha	66.0	44.3	130.7	93.3	334	1.2
Canal length to be constructed, m	73,210	39,960	67,270	42,453	222,893	782
Site per EPA	12	10	11	11	11	
Farmers per EPA	290	189	211	253	234	
Area per EPA, ha	9	7	15	23	13	
Canal length per EPA, ha	10,459	6,660	7,474	10,613	8,573	
Area per site, ha	0.8	0.8	1.3	2.2	1.2	
Canal length per site, m	861	677	679	1,011	782	

### 6) Participants' Satisfaction by Activity

At the end of each day's activities, the participants were asked of what extend he/she was satisfied by each activity: level 1 is the least satisfied while level 5 is the most satisfied. Figure 6.3.7 summarizes the level of satisfaction of Lilongwe group: relatively low satisfaction was observed in such sessions of "1.4 Implementation Procedure" and "3.2 Discharge Measurement", while very high satisfaction observed in sessions of "4.1 Practice on Weir Construction and 4.2 Canal Alignment". In general, the participants tend to give higher satisfaction to practices while less satisfaction to classroom type lectures.

Activities	
1.1	Program orientation
1.2	DOI's vision, mission and irrigation dev. In Malawi
1.3	JICA presentation (introduction & Overview)
1.4	Implementation mechanism
2.1	Field trip in the morning
2.2	Field trip in the afternoon
3.1	Identification of potential gravity diversion
3.2	Discharge measurement
3.3(A)	Weir type & construction ( type A)
3.3(B)	Weir type & construction ( type B)
3.3(C)	Weir type & construction ( type C)
3.3(D)	Weir type & construction ( type D)
3.3(E)	Weir type & construction ( type E)
3.4	Canal alignment and construction
3.5	Ancillary facilities
3.6	On-farm irrigation
4.1	Practice of construction of weirs
4.2	Practice of canal alignment
5.1	Problems and possible solutions
5.2	Entry planning and output presentation
5.3	Preparation of dissemination material

The trainers once sat down after the training for the Lilongwe group had finished and looked through the satisfaction rate together with comments given by the participants. The comments were: more interactive than one-way lecture, more practice, more participation by the participants, etc, which have been incorporated in the Kasungu group training session. Therefore, the training mechanics in Kasungu group must have been improved, which in fact gave the higher satisfaction rate than the Lilongwe group as shown in Figure 6.3.8.

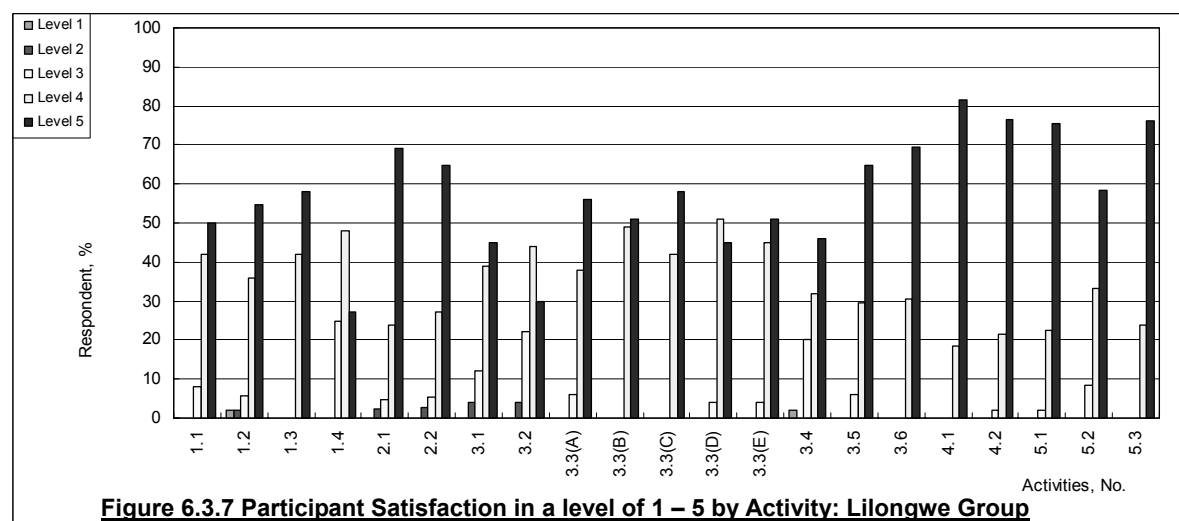


Figure 6.3.7 Participant Satisfaction in a level of 1 – 5 by Activity: Lilongwe Group

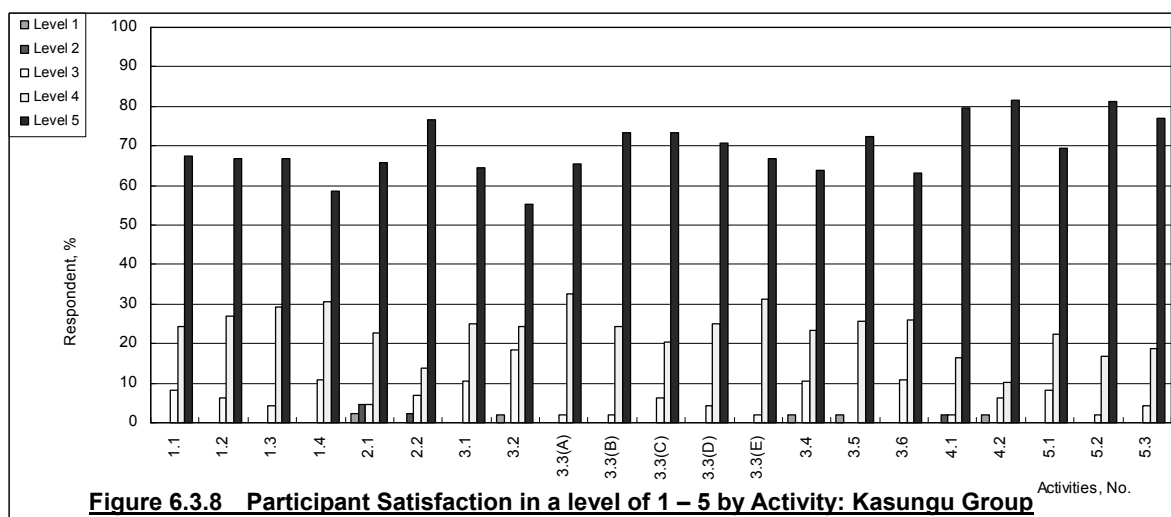


Figure 6.3.8 Participant Satisfaction in a level of 1 – 5 by Activity: Kasungu Group

7) Satisfaction by as a whole, logistics, theory, practice, and own participation

Aside from asking the participants their satisfaction by activity, satisfaction by as a whole, logistics, theory, practice and own participation in a level of 1-5 were also asked. Figure 6.3.9 shows the satisfactions for Lilongwe group and Figure 6.3.10 for Kasungu group.

Most of the participants gave very high level of satisfaction to those issues; namely, more than 50% of the participants gave the highest level of satisfaction to all the issues and participants who gave level 4 or more reached about 90%. Though satisfaction as a whole for Lilongwe group looks a little low, the rate improved very much for Kasungu group probably due to feedback of the comments from the Lilongwe group to the Kasungu group. Logistics was a concern

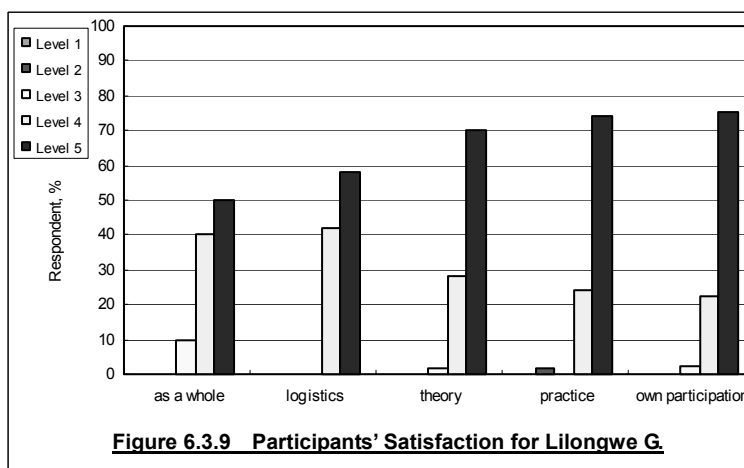


Figure 6.3.9 Participants' Satisfaction for Lilongwe G.

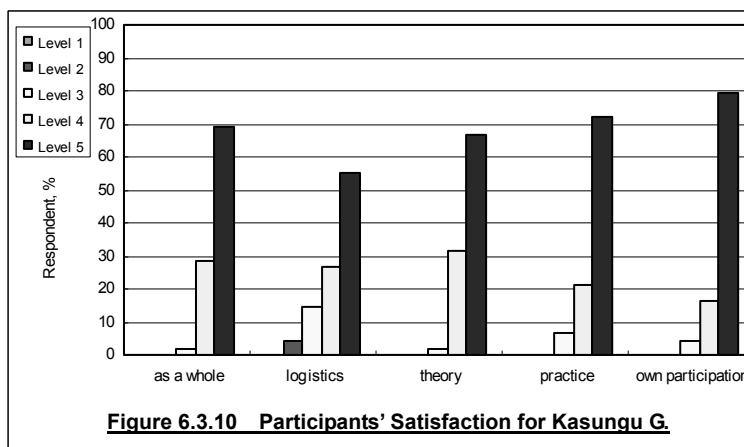


Figure 6.3.10 Participants' Satisfaction for Kasungu G.

for some of the participants especially in terms of lodging in Kasungu group. Since there are many better lodging places in Mponela than the RTC, the participants expected to stay in those hotels. Also sanitation in Nathenje RTC was a problem. These concerns rated the satisfaction of Logistics a little low as compared to others.

## **8) Participants' Comments to Improve**

In addition to rating the satisfactions above, the participants were asked to make comments to improve if any with respect to: 1) as a whole, 2) logistics, 3) theory, 4) practice, 5) own participation, and 6) how to best improve the training course in future. Following are the summary of the comments and probable measures to take for future trainings:

- 1) Training has satisfied most of the participants in terms of all the aspects, for which comment to come first is “well organized, well presented, fully governed, well achieved, so on so forth” in most cases.
- 2) Some participants pointed more practicals than theory since they are the frontline officers who work on the ground. Though this is very important point, the training course had to deal with both theory and practices within a limited duration of net 5 days. An improvement can be done by incorporating model-construction in the classroom during those sessions.
- 3) Some participants emphasized more participatory way of facilitating the sessions. Since all the facilitators were recruited from AEDOs and irrigation officers in RDPs, some of them may have not been used to leading the sessions at the beginning. However, as they have been experienced they have become more confident as shown by few such comments from Kasungu group. Also, pointed out is that recruiting facilitators from government officers is much more sustainable in running training course than dependent on outside facilitators.
- 4) Some participants asked to provide all the handouts to all the participant since some of the materials such as comprehensive guidelines and PowerPoint handouts had been provided to EPAs only due to limited budget for copying. The Study team suggested to share those limited materials at their EPA.
- 5) Some participants pointed that the training centers are not comfortable in lodging due to dilapidated facilities, especially toilet facility in Nathenje RTC. Faced with limited recurrent budget, these RTCs have a difficulty to improve the facilities. This was a background that the team asked the participants to stay in the RTCs so that the RTCs may replenish the recurrent budget out of the lodging fee.

### **6.3.3 Second (follow up) AEDO Training**

#### **1) Objectives**

Prime objective of this 2<sup>nd</sup> AEDO training was to report their achievement they had done since they were trained during the 1<sup>st</sup> AEDO training. Also, this training course aimed at having the participants to acquire the collective knowledge and experiences based upon what and how they have done on the ground, and knowledge, skills, and attitude necessary in promoting local resources based agriculture development as well as catchment area conservation. Specifically, the participants were expected to be able to:

- 1) Sum up experiences of the AEDOs & AEDCs on the smallholder irrigation development,
- 2) Share the skills and attitude to solve the problems encountered during the implementation,
- 3) Gain collective insights on what needs to be improved further relative to implementing

smallholder irrigation development,

- 4) Enumerate and discuss local resources based agriculture development in conjunction with irrigation,
- 5) Acquire knowledge and skill to construct an energy efficient cooking stove, which contributes to conserving catchment area,
- 6) Prepare EPA and RDP basis entry program for year 2004/05, and
- 7) Discuss way-forward for smallholder irrigated agriculture development in Malawi.

## **2) Training Mechanics and Topics Tackled**

The training was a net five-day activity and mechanics was almost same as the ones employed during the 1st AEDO training. As following show the topics tackled, major topic was the reporting on what they had achieved since the 1<sup>st</sup> training together with the problems they faced on the ground as well as the solutions/ actions taken. In addition, agriculture components such as compost making, botanical pesticide, etc. were also the main topics in the training. Though these agriculture topics may have to be undertaken together with irrigation component, the time for the 1<sup>st</sup> training allocated did not allow hence the follow up training undertook these components. Also, pointed out is the incorporation of gender as well as HIV/ AIDS issues to sensitize the participants as well as awareness raising.

- Module 1 Program Orientation
- Module 2 Presentation of Smallholder Irrigation Development
  - Achievement against the targets set during 1<sup>st</sup> AEDO training
  - Problems and actions taken (group discussion)
  - Tools required for implementing smallholder irrigation schemes
- Module 3 Local Resources Based Agriculture Development
  - A quick maturing compost (Bocashi), including practice
  - Liquid fertilizer
  - Botanical pesticide
  - Bamboo liquid
  - Improved grain storage
- Module 4 A Mean of Conserving Catchment Area
  - Energy efficient cooking stove (conserving fuel wood), including practice
- Module 5 Gender, and HIV/ AIDS
- Module 6 Entry Planning and Output Presentation
  - Entry planning orientation
  - Entry plan presentation
  - Dissemination material (posters and leaflets)
- Module 7 Training Evaluation

## **3) Participant Expectation from the Government**

At the beginning of the training, a question of “Based on your experiences on the ground, what assistances do you need from the Government in implementing smallholder irrigation?” was asked. Following are the summaries:

- Both Kasungu and Lilongwe groups listed input as the first requirement of government assistance. Several participants in Lilongwe group voiced that though an officer informed EPAs they would provide free seed and fertilizer out of HIPC with high priority

those have not yet been delivered. In fact some AEDOs have told their farmers the input to come, and this unfulfilling promise made themselves difficult to proceed with the farmers sometime after they commenced. Free Input is always an issue: it may work as starter pack if well prescribed but at the same time may instill dependency in the farmers. At least, unfulfilled arrangement should not be talked to the farmers.

- Transport/ fuel is always a problem. This is listed at No.2 requirement for the both group. Most AEDCs have motorbike but the reimbursable distance is only 250 km per month and the reimbursement often delays. Since availing of fuel is difficult under the curtailed ORT, right after the 1<sup>st</sup> AEDO training, all the participants were provided with bicycle, which have been assisting their mobility.
- For Kasungu area, NGOs and donors' activities are more active than Lilongwe area. When they saw irrigation development taking place and knew JICA would not provide any free handout, some of those approached AEDOs/AEDC, saying they will provide. According to the Kasungu participants, there are about 30% sites which have been approached by those after they commenced with the farmers. Out of the 30%, about half sites have been provided free handout. When neighboring farmers saw the free handout, they started telling the AEDOs to provide the same, but in many cases there was not enough free input. Prescribing free input should always consider equity, otherwise case jealousy.
- An encouragement is that they listed loan for input rather than just asking free input. Lilongwe group listed this loan as No.3 requirement from the government, and as No. 7 for the Kasungu group. Though operationalizing such loan may need sophisticated process, the loan arrangement may keep the farmers away from dependency and also could provide them with more equal opportunity than just issuing handout.

#### **4) Problems and Action Taken during the Implementation of Smallholder Irrigation**

Participant listed and discussed problems they have encountered and actions/ solutions taken during the course of implementing smallholder irrigation. Following are the summaries:

- Problem No.1 was “Water Shortage”, and in some cases streams got dried up. As coming to end of dry season, stream flow reduces by more than half in most cases. Faced with this problem, AEDOs have advised the farmers to use watering can and treadle pump, to carry out water rationing, to start early next year, etc.
- Lilongwe group listed “Conflict on Land for Canal Passing” as No.2 problem while Kasungu group listed this problem as No.5. Land owners located, especially upstream land owners, where canal passes often cannot have access to the water by gravity though the water is running in their fields. Also, some of the landowners fear that the members may occupy the land traversed by the canal forever. These situations made some of the landowners hesitate to cooperate, and the solution taken was to involve local leaders in most of the cases.
- Kasungu group listed “Free Handout Expectation by the Farmers” as No. 2 problem. As aforementioned, there are several NGOs and donors operating in Kasungu area than

Lilongwe. Their program usually accompanies free input of seed and fertilizer. Also, it is said that historically Kasungu area has been provided free input than other areas. Given this situation, AEDOs have faced such expectation from the farmers, and tried farmers to contribute on their own and also in some cases introduced such input.

- No.3 problem for Lilongwe group was “Lack of Input”, “Lack of Interest”, and “Lack of Cooperation among the Farmers”, and for Kasungu group was “Poor Leadership and Weak Group Organization”. AEDOs have made an awareness campaign, encouraged farmers to contribute, made frequent visit, and also arranged opportunities for interaction among the members including the leaders and between sites. Providing such opportunity would work better in a way of letting the farmers learn by themselves.

### 5) Achievement of the Objectives

At the end of the training course, the participants were asked how much they have achieved the objectives of the training in a level of 1 to 5. None of the participants answered level-1 or level-2 achievement. Lilongwe group as shown in Figure 6.3.11 indicated that objectives No.1-4 have been achieved at level-5 by about 40-50% participants and at level-4 by about 40%, which are relatively low as compared to objectives No.5-7 and also to the results of the 1<sup>st</sup> AEDO training course. This may be because objectives No.1-3 are related to collective insight and achievement, which make participants difficult to highly achieve the objectives. Several participants in fact commented some participants were not fully engaged while their colleagues were presenting, though this was improved for Kasungu group. Session relative to objective No.4 included many sub-sessions such as compost manure, botanical pesticide, bamboo liquid, liquid fertilizer, grain storage, etc., and this arrangement may have made the participants a little difficult to understand the whole contents. Also no field practice except for

Objectives are at the end of the training the participants are able to:
1. Sum up experiences of the AEDOs & AEDCs on the smallholder irrigation development,
2. Share the skills and attitude to solve the problems encountered during the implementation,
3. Gain collective insights on what needs to be improved further relative to implementing smallholder irrigation development,
4. Enumerate and discuss local resources based agriculture development in conjunction with irrigation,
5. Acquire knowledge and skill to construct an energy efficient cooking stove, which contributes to conserving catchment area,
6. Prepare EPA and RDP basis entry program for year 2004/05, and
7. Discuss way-forward for smallholder irrigated agriculture development in Malawi.

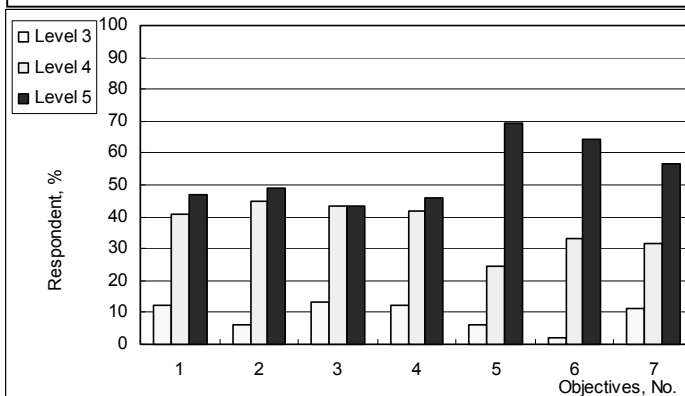


Figure 6.3.11 Achievement in a Level of 1-5 by Objectives: Lilongwe

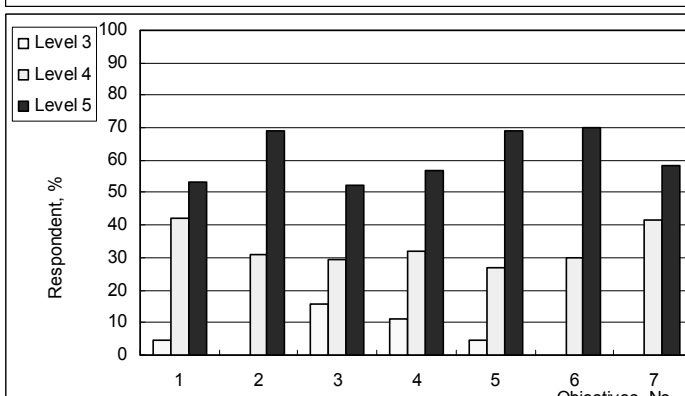


Figure 6.3.12 Achievement in a Level of 1-5 by Objectives: Kasungu G.

compost manure has been done for the session relating to objective No.4, and this may have resulted in the lower achievement.

### 6) Participants' Satisfaction by Activity

Figure 6.3.13 summarizes the level of satisfaction of Lilongwe group: relatively low satisfaction was observed in such sessions of “1.1 Program Orientation”, “1.4 Output Presentation by EPA” and “3.1 Field visit to an Organic Farm”, while very high satisfaction observed in the session of “5.1 Gender and HIV/AIDS”. In the program orientation, the official opening was delayed due to an unforeseen reason. During the output presentation, there were some participants who did not engage themselves while their peers were presenting. These resulted in the relatively low satisfaction level. Kasungu group on the other hand gave higher satisfaction rate as shown in Figure 6.3.14 since most of the issues have been fed back and corrected.

Activities	
1.1	Program orientation
1.2	Feedback from the 1st AEDO training
1.3	Summing up of the 1st Generation Projects
1.4	Output Presentation by EPA
1.5	Problems arisen and Actions taken (G. work)
2.1	Problems arisen and Actions taken (discussion)
2.2	Tools required (Workshop)
2.3	Bocashi, and Liquid Fertilizer
2.4	Botanical Pesticide, and Bamboo Liquid
2.5	An Improved Storage
2.6	An Energy Saving Cooking Stove
3.1	Field visit to Mr. Aybu's field
3.2	Practice on Bocashi
4.1	Field visit to Tikolore and Tilime
4.2	Practice on improved storage
5.1	Gender and HIV/AIDS
5.2	Dissemination Material
5.3	Entry planning and output presentation
5.4	Training Evaluation

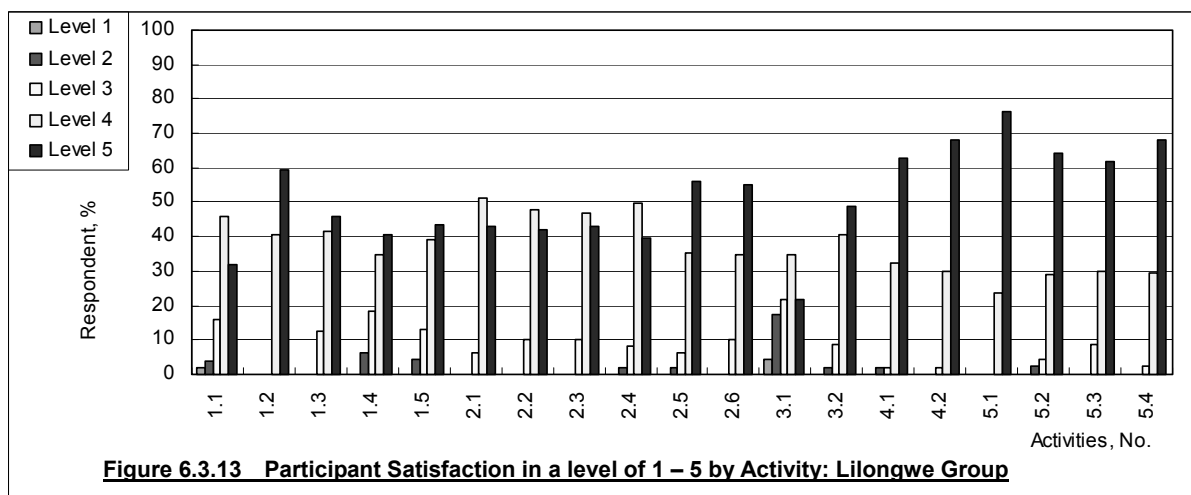


Figure 6.3.13 Participant Satisfaction in a level of 1 – 5 by Activity: Lilongwe Group

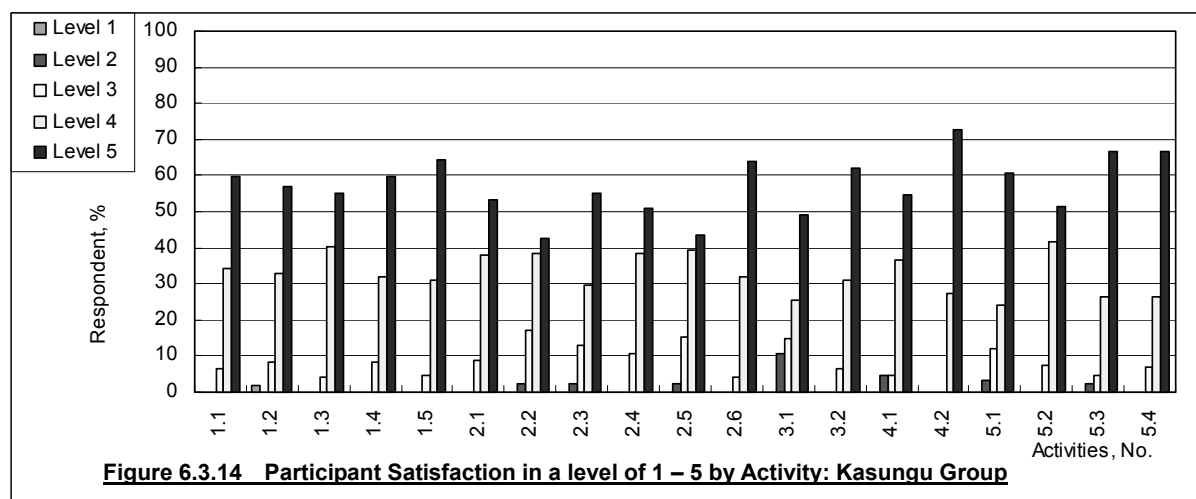


Figure 6.3.14 Participant Satisfaction in a level of 1 – 5 by Activity: Kasungu Group

The organic farmer visited may be very unique though he is actually a very innovative farmer. When he started his farming, he could not receive any extension services because he operated on his own (extension service usually operates on a farmer group). What he has been doing to date is almost try and error basis. There are many things that extension officers can learn but at the same time those things may look a little bit uncomfortable to accept for those who are used to conventional approach. This point must have resulted in the lower satisfaction.

### **7) Participants' Comments to Improve**

In addition to rating the satisfactions above, the participants were asked to make comments to improve if any with respect to: 1) as a whole, 2) logistics, 3) theory, 4) practice, 5) own participation, and 6) how to best improve the training course in future. Following are the summaries and measures:

- 1) Some participants pointed out more practicals than theory. Though this is very important point, the training course had to deal with both theory and practices within a limited duration of net 5 days. Therefore only important components such as Bocashi compost manure and improved cooking stove have incorporated the practice. The other component such as botanical pesticide, liquid fertilizer, etc. which are relatively simpler can be practiced at EPA level.
- 2) Some participants suggested a follow up/ review meeting. Since this training has set targets of such composts as manure making, botanical pesticide, improved grain storage, improved cooking stove, etc., these must be followed up. The irrigation officers together with crop officers in the respective RDPs are requested to make regular visit to follow up, and the AEDCs are expected to report their achievement against the targets to their DADOs. The EPAs were given pro-form to fill the achievement by specific month till the end of June 2005 which is corresponding to the end of Malawian fiscal year. The pro-form is finally to be submitted to their DADOs.
- 3) During 1st AEDO training sessions, some participants emphasized more participatory way of facilitating the sessions. The facilitators this time have hardly heard such comments as they have already acquired enough skills to lead/ facilitate the sessions. They are now confident to be the trainer to promote smallholder irrigation development, and ready to render the services upon request.

### **6.3.4 Achievement through Training**

Table 6.3.2 shows the achievement of the smallholder irrigation development in dry season 2004. Total number of sites developed is 264, of which 61 sites (23%) are rehabilitation and 203 sites (77%) are newly developed area. The 264 sites altogether has developed a total area of 321 ha, giving an average of 1.21 ha per site. Farmers organized are 5,376 in total, and the total canal length excavated is 142km. These achievements are about 90% of the targets set in last May/June except for canal excavation which is 64% achievement of the target.

As an average, one site accommodates 20 farmer members in the 1.21 ha and has 541m length of canal. Overall average area allocated per farmer arrives at 0.06 ha (12x50m, or 20x30m). The average area per farmer by RDP is 0.029ha, 0.066ha, 0.066ha, and 0.092ha for Lilongwe



E., Dedza Hills, Dowa and Ntchisi respectively. Lilongwe E. area has mostly suffered from critical water shortage, resulting in this small area allocation per farmer. Ntchisi area has, on the other hand, not suffered from water shortage blessed with enough rainfall and as a result gives largest area developed per site and per farmer: that are 1.93 ha per site and 0.092 ha per farmer.

**Table 6.3.2 Summary of the Smallholder Irrigation Development in 2004 Dry Season**

Particular	Lilongwe E.	Dedza Hills	Dowa	Ntchisi	Total	Target set in May
No. of EPA	7	6	9	4	26	
Potential sites identified	78	93	147	58	376	
No. of sites pre-selected	69	59	104	46	278	
Sites developed	69	57	94	44	<b>264</b>	<b>285</b>
Site rehabilitated	23	8	18	12	<b>61</b>	
Site newly developed	46	49	76	32	<b>203</b>	
Area developed, ha	45	69	121	85	<b>321</b>	<b>334</b>
Farmers organized	1,588	1,040	1,826	922	<b>5,376</b>	<b>6,073</b>
Canal excavated, m	42,015	19,974	52,685	28,095	<b>142,769</b>	<b>223,893</b>
Site per EPA	10	10	10	11	10	
Farmers per EPA	227	173	203	231	207	
Area per EPA, ha	6	11	13	21	12	
Canal per EPA, m	6,002	3,329	5,854	7,024	5,491	
Farmers per site	23	18	19	21	<b>20</b>	
Area per site, ha	0.66	1.21	1.29	1.93	<b>1.21</b>	
Canal per site, m	609	350	560	639	<b>541</b>	
Area per farmer, ha	0.029	0.066	0.066	0.092	<b>0.060</b>	

Given a net 5-day training course and simple tools such as pick, wheel barrow, panga, etc. which total cost per EPA is about MK200,000, the trained AEDOs/AEDCs, total 104, together with their peers who did not attend the course have developed such a great number of 264 sites with a total area of 321ha. All this achievement was done in just four months upon the trainings. Due to water shortage especially in Lilongwe area<sup>4</sup>, not all the area can harvest. However, at least the skills of developing smallholder irrigation has been already imparted in the relevant extension officers and also farmers. Therefore, whenever they are blessed with rainfall, it is expected that they start smallholder irrigation on their own and can have harvest.

<sup>4</sup> The last rainfall (2003/04) in Lilongwe area was about 20% less than average.

## 6.4 Evaluation of the Verification Project

This sub-chapter evaluates the Verification Project carried out over 2 years of 2003 and 2004 from various point of views. The verification project was aimed at producing workable Package for smallholder irrigation development by feeding back the experiences and lessons as its first objective of this Study and also meant to contribute to the second objective; that is to enhance technical and administrative capacity of the irrigation development. For that purpose, besides estimating the effectiveness and efficiency, this Study puts the emphasis on what the participants learned from the implementation to build up their capacities.

Information for the evaluation was collected by a series of interviews with farmer beneficiaries and AEDCs/AEDOs in charge. Also a questionnaire survey was carried out to estimate crop production, production in monetary value, how smallholder irrigation contributed to improving farmers' livelihood, etc. at 12 sites of the first-generation sites totaling to 360 farmers (30 farmers in each site including both club member and non-member). Those 12 sites are Mtuwanjovu, Zakumva, Ngoni, Mtanda, Chikhasu / Mchiku<sup>5</sup>, Tikolore, Tilime, Loyi, Msambaimfa, Katema and Gontha.

The above sites are the ones at which the baseline survey was conducted in 2003 except for Zakumva and Chikhasu. Zakumva and Chikhasu were surveyed instead of Duwu and Mtsetse respectively, because Duwu had met serious water shortage leading to no irrigation in 2004 and Mtsetse had also drastically reduced the dry season crop area. By this questionnaire survey, some time series information was picked up. Furthermore, to estimate maize yield as well as to double-check the interview information, a spot yield survey for dry season crop in 2004 was conducted in six sites, which are Mtuwanjovu, Ngoni, Mankhamba, Tikolore, Tilime, and Katema.

The evaluation results are at first summarized by outputs, which are what were done and achieved by the verification project. Following the outputs, evaluation is examined from various viewpoints such as food security, impact, sustainability, etc. Project summary presented in the Table 6.4.1 can be referred to in evaluating such aspects. Of the criteria, impact is further discussed in many aspects such as option as income generation, impact to appropriate technologies, impact to environmental conservation, impact to the poorest, impact to the women, equity amongst villagers (a negative impact), etc.

**Table 6.4.1 Summary of the Project**

Narrative Summary	Means of Verification
<b>Overall Goal:</b> Number of poor farmers decreases.	No. of poor farmers under poverty line
<b>Project Purpose:</b> Food security of farmers improves through increase of agriculture production.	<ul style="list-style-type: none"> <li>• Increase of crop production</li> <li>• Increase of farm income</li> </ul>
<b>Outputs:</b> <ul style="list-style-type: none"> <li>• Smallholder Irrigation schemes are developed.</li> <li>• Technical capacity of farmers and AEDO for SHID improves.</li> </ul>	<ul style="list-style-type: none"> <li>• No. of sites and area of the smallholder irrigation schemes</li> <li>• Skills and techniques learned and practiced</li> </ul>
<b>Activities:</b> <ul style="list-style-type: none"> <li>• Development of smallholder irrigation technologies</li> <li>• Extension to farmers</li> <li>• Trainings for AEDOs</li> </ul>	<ul style="list-style-type: none"> <li>• Technologies invented, introduced</li> <li>• Farmers who adopted smallholder irrigation technologies</li> <li>• Number of participant AEDOs</li> </ul>

In addition to the above evaluation, results of interviews with the farmers and officers are

<sup>5</sup> Chikhasu and Mchiku club members come from same villages. Among surveyed 60 samples, Mchiku club members were not actually included since they lost all the harvest in 2003. Hence the sample consists of Chikhasu members and non-members from the villages, to which Chikhasu and Mchiku club members belong.

summarized as qualitative data, for the interview results indicate what happened and in that what they learned elaborating the meaning of irrigation for them. This qualitative data implies how they have developed capacity building in relation to irrigation development. Lastly, presented in this sub-chapter is the evaluation by AEDOs in terms of various aspects as well as the approach the JICA Study Team applied. This last part consists of a so-called participatory evaluation, for which the AEDOs, the main stakeholder in disseminating smallholder irrigation development, carry out their smallholder irrigation development project.

### **6.4.1 Outputs of the Verification Project**

Outputs are presented in three sections as development of smallholder irrigation schemes, activities related to capacity building, and appropriate smallholder irrigation technologies established. The first section summarizes how many sites, how much irrigation area, how long canal, how many farmers, etc. have been developed and involved. Second section lists how many officers have been involved in activities relating to capacity building such as trainings, and the last section presents some appropriate technologies established through the verification project.

#### **1) Development of Smallholder Irrigation Schemes**

Smallholder irrigation sites have been developed at two stages; the first stage carried out in 2003 was the project basis implementation, which was meant to establish appropriate and adaptable technology, and the second stage conducted in 2004 was the dissemination of the established technology through AEDO trainings. As it has been mentioned, total 23 sites were developed during the first stage as the 1<sup>st</sup> generation project and 264 more sites defined as 2<sup>nd</sup> generation project were developed in Lilongwe East, Dedza Hills, Dowa and Ntchisi RDPs through the AEDO trainings.

**Smallholder gravity irrigation does not necessary mean micro irrigation:**

Mr. Bison Kuma, Secretary of Mtuwanjovu Club, said "Gravity irrigation is much better and easier than watering can to irrigate big area. I think this is the best way for us. I will go ahead and never stop as long as there is water." Mr. Fikiyala Joswa, Chairman of Mtuwanjovu Club, said, "I was cultivating dambo before gravity irrigation, but I could have no profit, it was hard work and I was tired. Most people do not cultivate dambo now." Mr. Rasiyamu Filyala, a son of the Chairman, said "Now we have the evidence. Before, we could irrigate only a small place by watering can, but now we are irrigating big land. I think we are going to continue as long as there is water."

Sixpence Kapondo of Tilime Club pointed at the garden, which is something like 0.5 ha, and said "This is very large area. If we, 11 members, use watering cans to irrigate this area, it is extremely hard work. We might ruin our health and die." He also added "I went to see irrigation systems with the G.V.H., but all of them are concrete structures or treadle pumps. I have never seen this kind of smallholder gravity irrigation scheme before. It is new and it is great."

The service area of 1ha or 2ha and the farming households of 20 or 50 are not so big compared with large-scale irrigation schemes, however, they are very big compared with dambo and watering can irrigation.

As of November 2004, total number of farmer beneficiaries for the both 1<sup>st</sup> and 2<sup>nd</sup> generation projects is 5,897 and the aggregated area developed and canal length reached 351ha and 155km respectively. Average area per site is 1.2 ha and the average area per farmer is 0.06ha. Average member per site is 21 (see Table 6.4.2). This scale may look very small but from the viewpoint of many farmers it is not as quoted in the left box.

When the Study Team visited the field during October to November 2004, many more new sites were found around the AEDO assisted sites. Those new sites were developed by so called farmer-to-farmer extension by directly

seeing their fellow farmers' activities. These newly developed sites are not included in the following table. It is therefore considered that actual number of the irrigation sites developed with the effect of the verification project could be more than that number the AEDOs reported to the Study Team.

**Table 6.4.2 Smallholder Irrigation Developed by the Verification Project in 2003-2004**

RDP		Lilongwe E.	Dedza Hills	Dowa	Ntchisi	Total
1 <sup>st</sup> Stage 2003 (as of Nov. 2004)	No. of sites developed	8	7	4	4	23
	Site rehabilitated	2	0	0	0	2
	Site newly developed	6	7	4	4	21
	Area developed (ha)	10.6	5.8	6.1	8.2	31
	No. of farmers	117	161	109	134	521
	Canal length (m)	3,212	2,376	3,935	2,499	12,022
2 <sup>nd</sup> Stage 2004	No. of sites developed	69	57	94	44	264
	Site rehabilitated	23	8	18	12	61
	Site newly developed	46	49	76	32	203
	Area developed (ha)	45	69	121	85	321
	No. of farmers	1,588	1,040	1,826	922	5,376
	Canal length (m)	42,015	19,974	52,685	28,095	142,769
Total	No. of sites developed	77	64	98	48	287
	Site rehabilitated	25	8	18	12	63
	Site newly developed	52	56	80	36	224
	Area developed (ha)	55.6	74.8	127.1	93.2	351
	No. of farmers	1,705	1,201	1,935	1,056	5,897
	Canal length (m)	45,227	22,350	56,620	30,594	154,791
No. of farmers per site		22	19	20	22	21
Area per site (ha)		0.7	1.2	1.3	1.9	1.2
Canal per site (m)		587	349	578	637	539
Area per farmer (ha)		0.03	0.06	0.07	0.09	0.06

## 2) Activities relating to Capacity Building

Capacity building of participants including DOI and RDP irrigation officers, EPA AEDCs /AEDOs and farmer beneficiaries has been practiced through the implementation of the verification project. For the first stage in 2003, the Study Team formed two working groups each in Lilongwe ADD and Kasungu ADD. The working groups consisted of officers in the ADD and concerned RDPs and AEDCs/ AEDOs of concerned EPAs. Total number of the participant officers was 25 in Lilongwe ADD and 21 in Kasungu ADD.

Capacity building for the working groups was done mostly through on-the-job-training working together with the Study Team in respective sites. The working groups held regular meeting every three weeks from May 2003 to November 2003 and joint workshop of the Lilongwe group and the Kasungu group was held twice in 2003; one was at the midst of the 2003 implementation and the other was at the end of the first dry season in 2003. During the working meetings and also the joint workshops, AEDOs had presented their output, problems and actions taken, through which they shared experiences and lessons as well as earned collective insight for smallholder irrigation development.

For the second stage in 2004, to establish an extension mechanism of smallholder irrigation development, an AEDO training was administered in May/June and the follow up training

was carried out in September 2004. Before commencing the AEDO training, the Study Team trained a total of 12 AEDOs and RDP irrigation officers as the trainer of the AEDO training, and in total 103 AEDCs/AEDOs attended the training program. These participants inclusive of the trainers developed their capacity of developing smallholder irrigation through the training. Also they involved their peer AEDOs, who were not given the training, during the course of developing smallholder irrigation projects at their areas. The degree of their capacity can be indicated by how many sites have been developed as in the table above. The table below summarizes the activities relating to capacity building.

**Table 6.4.3 Activities related to Capacity Building for Smallholder Irrigation Development**

Activities	Contents	Participants		
		ADD	No.	Particular
1 <sup>st</sup> Stage 2003  Working Group	On-the-job-training Meeting / Workshops	Lilongwe ADD Group (Lilongwe E. and Dedza Hills RDPs)	25	2 RDP DADOs, 2 ADD IOs, 1 ADD crop officer, 4 RDP IOs, 3 RDP crop officers, 3 AEDCs, 2 Ass. AEDCs, 8 AEDOs
		Kasungu ADD Group (Ntchisi and Dowa RDPs)	21	2 RDP DADOs, 1 RDP Assistant DADOs, 4 ADD officers, 2 RDP IOs, 4 RDP crop officers, 2 AEDCs, 1 Ass. AEDC, 5 AEDOs
2 <sup>nd</sup> Stage 2004  AEDO Trainings	Training of Trainer	Lilongwe / Kasungu	12	1 DOI IO, 3 RDP IOs, 8 AEDOs
	AEDO Training	Lilongwe ADD	50	13 AEDCs, 37 AEDO
		Kasungu ADD	53	1 ADD IO, 3 RDP IOs, 13 AEDCs, 36 AEDOs
		Total	103	
	AEDO Follow Up Training	Lilongwe ADD	50	Same as AEDO training
		Kasungu ADD	53	Same as AEDO training
Total		103		

Note: IO means irrigation officer

### 3) Appropriate Technologies Established

The verification project carried out in 2003 was mainly aimed at establishing appropriate technologies that can be adopted by the farmers in their locality without depending much on foreign materials. As aforementioned, almost all the facilities have been actually constructed by using locally available materials such as tree log, bamboo, grass, clay soil, etc. Weirs, the major irrigation facility, as well as ancillary facilities such as road crossing, canal bridge, etc. have been constructed by those local materials with in some cases plastic paper and plastic bags. Canal alignment was done without dependent on sophisticated survey equipment but on very simple tool that is line level. An alternative usage of the line level was newly invented to give a suitable longitudinal gradient along the canal, which is called off-set line leveling. Besides from these irrigation components, agriculture related technologies have also been newly introduced.

These appropriate technologies established through the verification project are detailed in the comprehensive guideline and technical manual presented separately from this main report. Especially the technical manual explains how to apply such technologies on the ground step by step with illustrations. Following table summarizes the established appropriate technologies by components of irrigation, agriculture and others. The table also indicates that if the technologies were newly introduced to Malawi or already there in Malawi as existing technology, and who invented, etc.

**Table 6.4.4 Summary of Appropriate Technologies Established**

Component	Specification	Newly introduced	Existing tech'gy	Who invented?
Irrigation				
Weir	Standard inclined weir			Farmer(s)
	Standard vertical weir			Study Team
	Trigonal prop supported weir			In Japan
	Double-line weir			Study team
	Rock & clay masonry weir			Study Team
Ancillary	Canal bridge (standard type)			Farmer(s)
	Canal bridge (U-shape, cliff hanger)			Farmer(s)
	Road crossing (stone wall type)			Farmer(s)
Canal	Off-set line leveling			Study Team
Agriculture				
	Bocashi compost manure			In Japan
	Chinese compost manure			
	Liquid fertilizer			
	Botanical natural pesticide			
	Improved grain storage			GTZ/ GOM
Others				
	Improved cooking stove			JICA, in Kenya

Note: Details of above technologies are explained in Technical Manual.

#### 6.4.2 Evaluation from Various Aspects

The first step of evaluation under this Study is to confirm if the smallholder irrigation development has really met the people's need and served to improving their food security. Even in year 2003, many sites had been commenced by farmers' own initiative by just seeing their neighboring farmers' achievement. Those sites are Zakumva, Mtanda, Tilime, Kambware, Katema sites and Mugunda. Then, out of 23 1<sup>st</sup> generation project sites, 19 sites have once again been implemented in 2004. Three sites could not be developed due to water shortage, and one site was not realized due to land conflict. Out of the 19 sites implemented in 2004, the farmers themselves without AEDOs had done 14 sites. These facts show that how in deed farmers need smallholder irrigation, evidencing the relevancy of the smallholder irrigation from the viewpoint of farmers' need.

It was observed through verification project that, smallholder irrigation has bridged the maize shortage gap facing resource poor farmers, thus an immediate short-term objective of food security was reached (detail discussion is made in latter part). On a broader context, the money got from selling green maize was used to buy fertilizer which inadvertently boosted the economic power of the farmers by increasing rain-fed harvest. Thus it can be said that smallholder irrigation can be a good tool of improving food security, thereby contributing to poverty reduction. It is therefore said that smallholder irrigation development is in line with the PRSP, which endorses the relevancy of the smallholder irrigation development to the national goal.

Given above relevancy of the smallholder irrigation development from both farmers' view and national goal, following evaluation is made in terms of: magnitude to food security, input to realizing the food security, several impacts of both positive and negative, and sustainability. In addition, capacity building evidenced from what people said about smallholder irrigation is mentioned, and lastly evaluation by AEDOs involved is presented.

## 1) Food Security

Since the verification was undertaken as a program, consisting of many projects and also institutionalization of the dissemination mechanism, project purpose by its project was not clearly set prior to the implementation.

However, anyone can agree with an idea that improving food

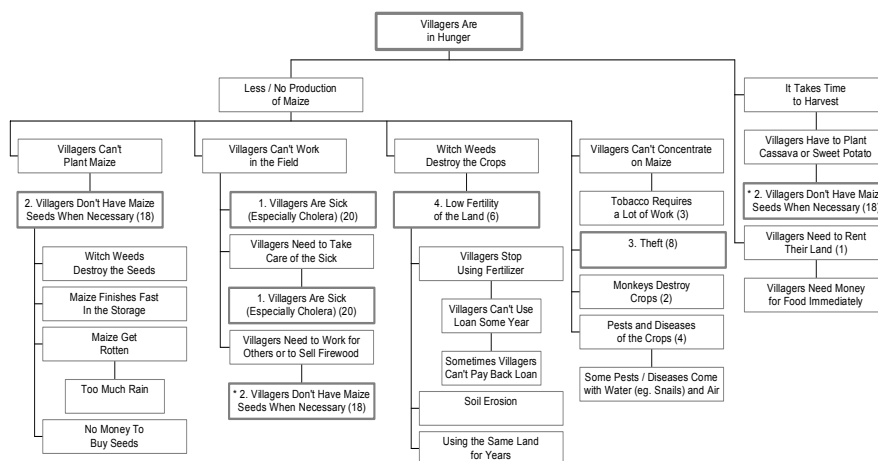
security for the farmers should be the tangible project purpose of smallholder irrigation development. This could be endorsed by a problem analysis done in a village (see Figure 6.4.1). Being same as the village, almost all the other villages engaged in verification project have identified or agreed hunger as their immediate problem.

The evaluation to the food security refers to 1<sup>st</sup> generation projects only since necessary base data such as production, selling and purchase, etc. were collected only from those projects. The food security is evaluated in three steps as: 1) direct production, 2) increase of purchasing power, and 3) re-investment on year-round food security. As a conclusion, smallholder irrigation project can be very effective from the viewpoint of directly producing additional staple food, increasing the purchasing power for dry maize in exchange of green maize harvested under irrigation, and increasing the purchasing power for agriculture input such as seed and fertilizer especially for the following rain-fed agriculture and consequently increasing the rain-fed agriculture production.

### 1.1) Direct Production

Table 6.4.5 shows an estimation of maize production at the 1<sup>st</sup> generation verification project sites in dry season 2004. In the sites of Dedza Hills, farmers grew mostly Irish potatoes and beans, hence these sites are not included in the estimation and also those sites, at which farmers failed to grow crops due to water shortage, are not counted. Total number of the sites included for the estimation was, therefore, 11 sites. The Study Team evaluated the degree of harvest in each site by physical observation and estimated the total production by multiplying the area and relevant unit yield according to the degree of the stand of maize. Unit yield was estimated by reaping sample crops. In six sites the Study Team reaped maize from one to three areas having around five to six square meter each and weighed the maize and estimated the unit yields of the plots.

Total production of maize in the verification project sites in 2004 is estimated at 64.1 tons. Total area and members for this produce are 19.8 ha and 274 members respectively. Average unit yield and average production per member are, therefore, calculated at 3.2t/ha and 234kg



**Figure 6.4.1 Problem Analysis (Mtuwanjovu)  
As of Feb. 2003**

respectively (see Figures 6.4.2 and 6.4.3). It seems that unit yield achieved is fairly low leaving some more potential to improve. It is considered that the lower yield is mainly due to little amount of fertilizer application, recycling seeds, inadequate watering, low temperature, etc. Villagers usually have to supplement dry maize by purchasing if their annual reserve is less than 750 kg per household. The amount of 234 kg constitutes of 31% of the survival line of 750 kg per average household. It means if they consume all the maize as dry maize, they can enhance food security by 31%, thus smallholder irrigation contributes to increasing food security.

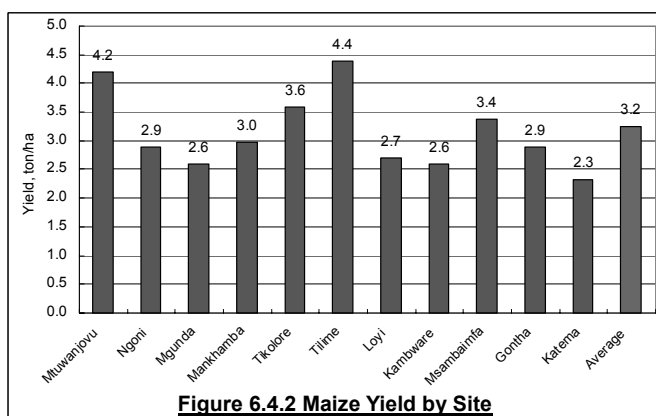
**Table 6.4.5 Maize Production at the First-generation Sites: Dry Season Crop in 2004**

No.	Club	No. of farmers who grew maize (estimate)	Planted Area (ha) (estimate)	% of Area by Yield Grade					Area (ha)					Production (kg)					
				Very High (t/ha)	High (t/ha)	Middle (t/ha)	Low (t/ha)	Very Low (t/ha)	Very High	High	Middle	Low	Very Low	Very High	High	Middle	Low	Very Low	Total
				6.0	4.5	3.6	2.6	1.6	Very High	High	Middle	Low	Very Low	Very High	High	Middle	Low	Very Low	Total
1	Mtuwanjovu	13	0.80	5	65	20	10		0.04	0.52	0.16	0.08	0.00	240	2,340	576	208	0	3,364
2	Ngoni	23	3.70		10	30	40	20	0.00	0.37	1.11	1.48	0.74	0	1,665	3,996	3,848	1,184	10,693
3	Mgunda	11	0.50		10	10	50	30	0.00	0.05	0.05	0.25	0.15	0	225	180	650	240	1,295
4	Mankhamba	18	3.00		20	20	40	20	0.00	0.60	0.60	1.20	0.60	0	2,700	2,160	3,120	960	8,940
5	Tikolore	41	3.00	5	35	20	35	5	0.15	1.05	0.60	1.05	0.15	900	4,725	2,160	2,730	240	10,755
6	Tilime	61	2.40	20	50	20	5	5	0.48	1.20	0.48	0.12	0.12	2,880	5,400	1,728	312	192	10,512
7	Loyi	3	0.20			10	90		0.00	0.00	0.02	0.18	0.00	0	0	72	468	0	540
8	Kambware	1	0.05				100		0.00	0.00	0.00	0.05	0.00	0	0	0	130	0	130
9	Msambaimfa	30	2.50		20	50	20	10	0.00	0.50	1.25	0.50	0.25	0	2,250	4,500	1,300	400	8,450
10	Gontha	17	1.70			30	70		0.00	0.00	0.51	1.19	0.00	0	0	1,836	3,094	0	4,930
11	Katema	56	1.95	5	5	15	5	70	0.10	0.10	0.29	0.10	1.37	585	439	1,053	254	2,184	4,514
	Average	274	19.80	4	22	26	31	17	0.77	4.39	5.07	6.20	3.38						64,123

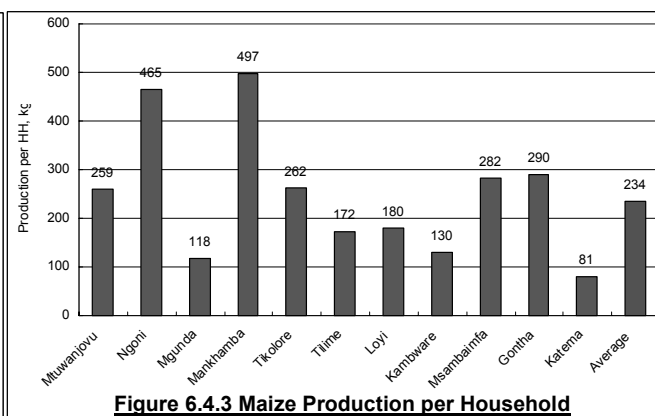
Area/capita (ha): 0.072 ha/capita

Average production per member (kg/capita): 234

Average Yield (kg/ha): 3,239



**Figure 6.4.2 Maize Yield by Site**



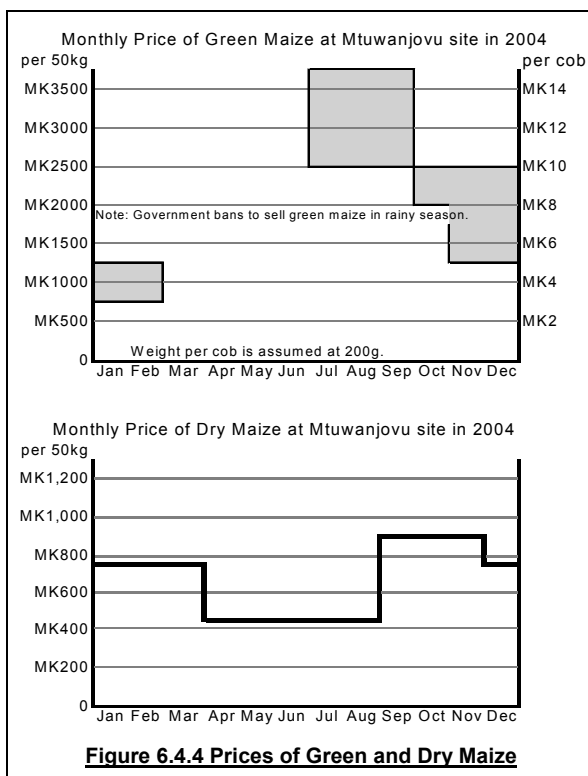
**Figure 6.4.3 Maize Production per Household**

## 1.2) Increase of Purchasing Power

It was found that most of the farmers are selling maize harvested from the irrigation farm as green, and they buy dry maize for their staple food since the price of green maize is so high that they can get more amount of dry maize. An example of the prices of green maize and dry maize is shown in Figure 6.4.4, showing MK500 per 50kg of dry maize and about MK1,000 to as high as over MK3,500 per 50kg of dry-weighted green maize (the price of green maize is basically per cob, and it was converted into 50kg dry-weighted maize by assuming 200g in dry per cob). Hence, the Study Team tries to estimate the monetary value of the maize production in the verification project sites. Table 6.4.6 and Figure 6.4.5 show the result of the estimation.



Total gross product of maize in the 11 sites is estimated at MK2.7 million as shown in Table 6.4.6. Dividing by the area of 19.8ha, gross product per hectare is calculated at MK136,400 (equivalent to MK2,106 per 50kg). As per farmer member, gross income ranges from about MK4,000 to as high as MK20,000 by site (see Figure 6.4.5) with an average of MK9,860 out of the average area of 0.072ha. With this average MK9,860, they can buy about 1,000kg of dry maize. This means if they sell the maize production as green, they can secure about 4 times more of dry maize. Irrigation in dry season gives farmers, even though it is a small plot, not only food directly to supplement their home consumption but also considerable income, thereby they can buy more dry maize.

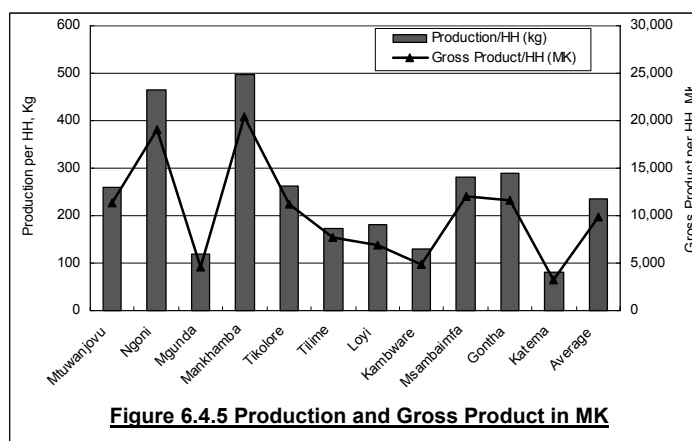


**Table 6.4.6 Estimation of Gross Income from Dry Season Maize at the First-generation Sites in 2004**

No.	Club	No. of farmers who grew maize (estimate)	Planted Area (ha) (estimate)	% of Area by Income Grade					Area (ha)					Gross Site Product (MK)					
				Very High (MK/ha)	High (MK/ha)	Middle (MK/ha)	Low (MK/ha)	Very Low (MK/ha)	Very High	High	Middle	Low	Very Low	Very High	High	Middle	Low	Very Low	Total
				285,016	199,204	158,716	97,568	58,917											
1	Mtuwanjovu	13	0.80	5	65	20	10		0.04	0.52	0.16	0.08	0.00	11,401	103,586	25,395	7,805	0	148,187
2	Ngoni	23	3.70		10	30	40	20	0.00	0.37	1.11	1.48	0.74	0	73,705	176,175	144,401	43,599	437,879
3	Mgunda	11	0.50		10	10	50	30	0.00	0.05	0.05	0.25	0.15	0	9,960	7,936	24,392	8,838	51,126
4	Mankhamba	18	3.00		20	20	40	20	0.00	0.60	0.60	1.20	0.60	0	119,522	95,230	117,082	35,350	367,184
5	Tikolore	41	3.00	5	35	20	35	5	0.15	1.05	0.60	1.05	0.15	42,752	209,164	95,230	102,446	8,838	458,430
6	Tilime	61	2.40	20	50	20	5	5	0.48	1.20	0.48	0.12	0.12	136,808	239,045	76,184	11,708	7,070	470,814
7	Loyi	3	0.20			10	90		0.00	0.00	0.02	0.18	0.00	0	0	3,174	17,562	0	20,737
8	Kambware	1	0.05				100		0.00	0.00	0.00	0.05	0.00	0	0	0	4,878	0	4,878
9	Msamaimfa	30	2.50		20	50	20	10	0.00	0.50	1.25	0.50	0.25	0	99,602	198,395	48,784	14,729	361,510
10	Gontha	17	1.70			30	70		0.00	0.00	0.51	1.19	0.00	0	0	80,945	116,106	0	197,051
11	Katema	56	1.95	5	5	15	5	70	0.10	0.10	0.29	0.10	1.37	27,789	19,422	46,424	9,513	80,422	183,570
Total (Average)		274	19.80	4	22	26	31	17	0.77	4.39	5.07	6.20	3.38						<b>2,701,367</b>

Area/capita (ha): 0.072 ha/capita      Average Gross Income per member (MK/capita): **9,859**  
 Average Gross Income per ha (MK/ha): **136,433**

For those who did not grow maize but other crops in dry season also received benefits from the irrigation. Tables 6.4.7 and 6.4.8 below show net income estimate of Irish potato and cabbage. The samples are farmers in Namanolo and Tilime sites. A farmer in Namanolo site grew Irish potato in a plot of 0.09ha. Though the harvest was not very good, he earned gross income of MK15,600 or net income of MK9,900 (considering family labor, it is MK4,747). As for the farmer in Tilime, she grew cabbage in 0.016ha. The plot was



small and because chemical pesticides were not applied, the produce was eaten by caterpillars, resulting in low price. But she still earned gross income of MK6,220 or net income of MK5,620 (considering family labor, it is MK4,045). This means the smallholder irrigation improves their purchasing power, with which they can buy dry maize to improve their food security.

**Table 6.4.7 A Profit Estimate of Irish Potato**

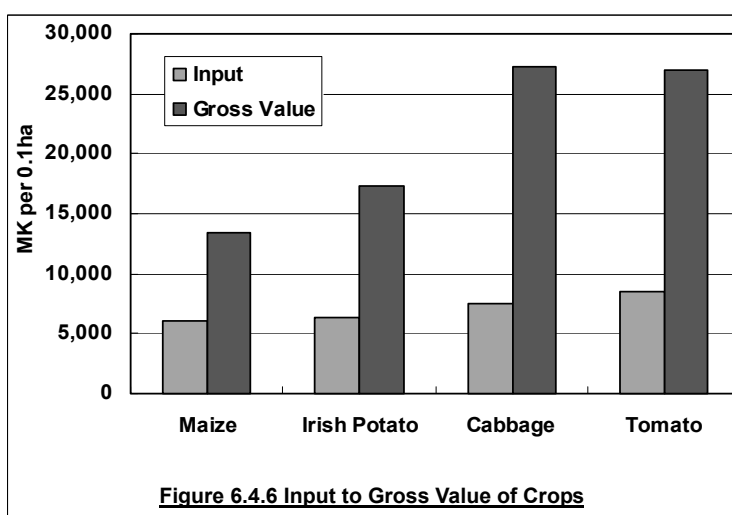
Club Namanolo			
Club	Namanolo		
Crop	Irish Potato (Rosina fumbue)		
Planted / Harvested Area	0.09 ha		
Production	12 bags (50~60kg/bag)		
Unit Price (MK)	1,300		
Gross Income (MK)	15,600		
Cost	Amount	Unit Price (MK)	Total (MK)
Seeds	50kg	12	600
Chemical Fertilizers (Urea)	65Kg	1,675/50kg	2,178
Hired Labor			
Land Clearing	6 men	MK50/(4hrs)	300
Harvesting	6 men	(2bags were given)	2,600
Family Labor	414hrs	MK50/(4hrs)	5,175
Total (Excluding Family Labor)			5,678
Total (Including Family Labor)			10,853
Farm Income (MK)			9,922
Net Income Ratio(%)			63.6
Net Profit (MK)			4,747
Net Profit Ratio (%)			30.4

**Table 6.4.8 A Profit Estimate of Cabbage**

Club Tilime			
Club	Tilime		
Crop	Cabbage		
Planted / Harvested Area	0.016 ha		
Production	622		
Unit Price (MK)	10		
Gross Income (MK)	6,220		
Cost	Amount	Unit Price (MK)	Total (MK)
Seeds	4 pack	50	200
Chemical Fertilizers (Urea)	10 kg	2000/50kg	400
Hired Labor			
Land Clearing			0
Harvesting			0
Family Labor	126 hrs	MK50 (4hrs)	1,575
Total (Excluding Family Labor)			600
Total (Including Family Labor)			2,175
Farm Income (MK)			5,620
Net Income Ratio(%)			90.4
Net Profit (MK)			4,045
Net Profit Ratio (%)			65.0

Figure 6.4.6 shows the profitability of crops including maize to be sold as green. Assuming the price of green maize at MK2,100/50kg (average unit price of 11 sites in Tables 6.4.5 and 6.4.6), net income ratio ((G. Value - Input) / G. Value) of maize is calculated at 55%. As the figure shows, vegetables are more profitable than maize, i.e. net income ratios of Irish potato, cabbage and tomato are estimated at 64%, 72% and 69% respectively. High profitability of vegetables are mainly borne by the degree of yields which are much higher than maize.

On the other hand, maize crop is less labor intensive than vegetables e.g. family labor requirement for maize is 304hrs/0.1ha while that for Irish potato and cabbage are 460hrs/0.1ha and 788hours/0.1ha. Therefore, the profit from vegetables is more constrained by area. Though the profitability of maize is less than vegetables, a farm household can grow maize crop in larger area than vegetables to get significant income.



**Figure 6.4.6 Input to Gross Value of Crops**

### 1.3) Reinvestment on Year-round Food Security

Interviews conducted in May – June 2004 revealed that 21 farmers out of 50 interviewees, about 40%, had to buy dry maize for their staple food in 2003. Those are regarded as staple

food insufficient family<sup>6</sup> or poorer farmer. The average amount of maize consumed by those households in year 2003/04 was about 753kg, composed of 403kg from 2002/03 rainy season agriculture, 126kg from 2003 dry season agriculture with irrigation, 202kg of purchased maize, and the balance of 22kg supplemented by dimba farming (5 farmers out of 21 farmers practiced dimba farming).

Against the 403kg of 2002/03 rainy season production, the average production of rainy season 2003/04 increased to 605kg. Rainfall in 2003/04 was smaller than that of 2002/03. Other agricultural condition was not much different between the two seasons according to the farmers interviewed. The difference between the two seasons is fertilizer application: fertilizer applied in rainy season 2002/03 was 16kg as average per farmer while that of rainy season 2003/04 was 30kg, which is about double. The cultivated area for the two rainy seasons is more or less same: 0.61 ha in rainy season 2002/03 and 0.62 ha in rainy season 2003/04. Farmers said although the production from irrigation was not big, the 126kg<sup>7</sup> of production reduced buying maize thereby allocating the money to buy fertilizer for the next planting which is the 2003/04 rainy season agriculture.

In summary, we may assume as shown in the top of Figure 6.4.7: 1) minimum amount of maize necessary for a household per year can be 750kg, 2) if there is no irrigation, those who are categorized as food insufficient family need to buy about 300kg of dry maize (they produce about 450kg inclusive of dimba production), and 3) with irrigation, more farmers can buy fertilizer for rainy season agriculture so that rainy season 2003/04 production increases to 625kg inclusive of dimba production. 625kg of maize production from rainy season plus 125kg<sup>8</sup> of maize from irrigation amount to the minimum requirement of 750kg, so that those farmers can be self-sufficient for staple food. Smallholder irrigation can raise the food security by not only directly producing maize from irrigation but also availing money for chemical fertilizer to be utilized for the following rainy season.

29 farmers out of 50 interviewees, 58% of the interviewed who are categorized as better-off farmer, had enough harvest from 2002/03 rainy season so that they did not need to buy any dry maize. The average production of the rainy season 2002/03 of these 29 farmers was 937kg, that of dry season 2003 was about 129kg, and that of rainy season 2003/04 increased to 1,139kg. Fertilizer application was 74kg and 150kg for the two rainy seasons respectively. Then, we may again assume as shown in the middle of Figure 6.4.7: 1) they can sell all the production of dry season 2003 over the original about 900kg, 2) with irrigation producing additional 125kg, more farmers can buy fertilizer for rainy season so that rainy season 2003/04 production can increase to 1,100kg, and 3) their production of dry season 2004 can be even doubled if they do two times dry season farming (if the land is used for rainy season

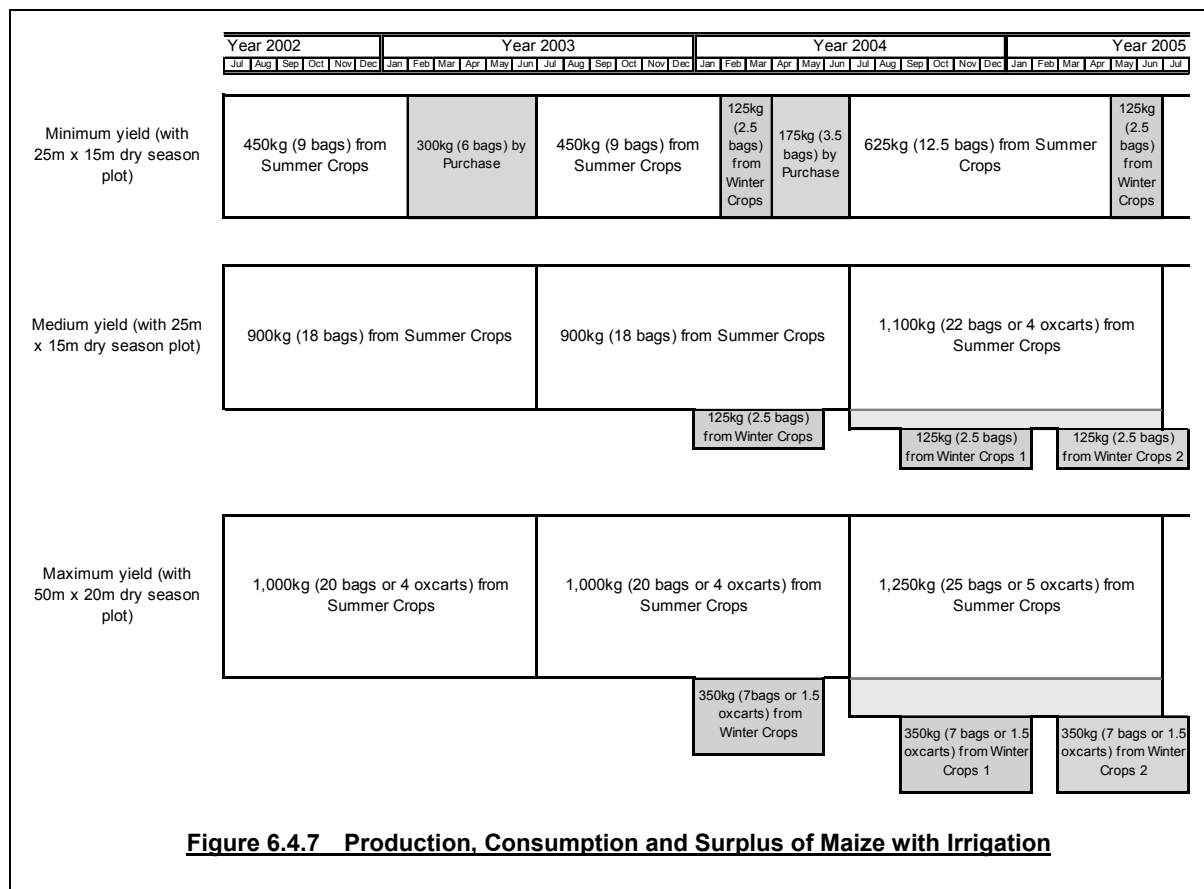
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<sup>6</sup> According to a baseline survey of 360 households carried out in year 2003 under this study, about 70 % farm household replied they could not produce self-sufficient maize from 2002/03 rainy season agriculture. This does not necessary mean that they actually bought maize since some of them must have opted not buying maize but substituting maize by cassava, mangos, etc.

<sup>7</sup> Buying 126kg maize costs about MK1900 though very much dependent on season (Buying 1 kg of dry maize is about MK15 to as high as 20 while farm gate price of dry maize is about MK10-15, milling cost is about MK2.0-2.4 per kg). MK1900 can purchase a 50kg bag of fertilizer.

<sup>8</sup> To produce 125kg of maize, 0.0375ha, say 25x15m plot, is usually required giving a yield of 3.3 t/ha. Average irrigated farm per farmer for the 22 verification projects is 0.06ha, and about two thirds of the members have 0.0375 or more.

as well, double dry cropping is hardly achieved due to time constraint, therefore the double dry season cropping can only be realized on the land exclusively used for dry season).

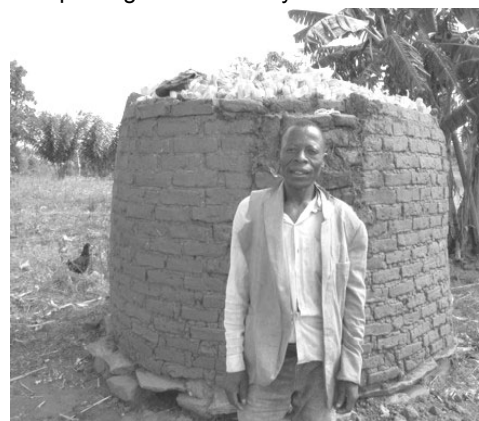


Several farmers, about top 10% of the interviewed, have 0.1ha (50m x 20m) or more for dry season farming and harvested as much as 350kg in dry season 2003. Also 10 farmers in rainy season 2002/03, and 18 farmers in rainy season 2003/04 harvested more than 1,000kg. Therefore, we may expect that probable maximum production and surplus for smallholder farmers with irrigation can be as shown the bottom of Figure 6.4.7: 1) 1000kg for rainy season before irrigation comes in, 2) then irrigation gives additional 350kg, all of which can be sold if they want, 3) these farmers can buy more fertilizer for the following rainy season so that the production of the following rainy season can increase to 1,250kg (an average of 25% increase for rainy season maize after irrigation had come was achieved for all the interviewed farmers).

As indicated in Figure 6.4.7, we can see that the impact of smallholder irrigation not only stands in the dry season supplementing the staple food but also is carried over to the following rainy

**A Happy Man with Smallholder Irrigation:**

Mr. Kang'ono of Ngoni Club harvested only 500kg with no fertilizer in rainy season 2002/03, but he could harvest additional 250kg in dry season 2003 with smallholder irrigation so that he sold 75kg in green at MK4,050, and consumed 175kg. He bought 1 bag (50kg) of fertilizer for rainy season 2003/04 and doubled the harvest to 1,000kg. He does not need to buy any maize this year. He is now very happy and is expecting more from dry season 2004.



season agriculture by enabling the farmers to buy more fertilizer for the following season. Questionnaire survey carried out in November 2004 also shows this trend. At three sites among the 12 sties surveyed<sup>9</sup>, namely Mtanda, Loyi and Tilime, the club members on average increased amount of fertilizers in 2003/04

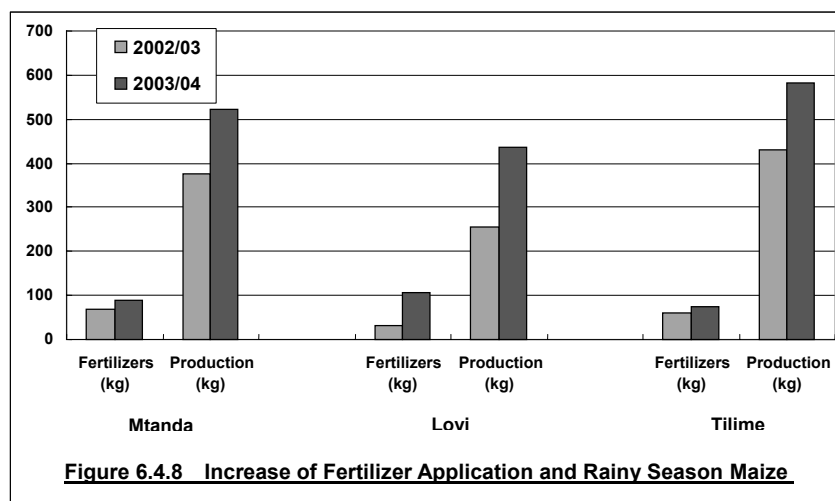


Figure 6.4.8 Increase of Fertilizer Application and Rainy Season Maize

rainy season compared to 2002/03 rainy season and the consequent increases of rainy season maize production are realized (Figure 6.4.8). From 2002/03 rainy season to 2003/04 rainy season, the club members of Mtanda, Loyi and Tilime increased fertilizer application on average from 68kg to 90kg, 31kg to 107kg, and 60kg to 74kg respectively. Consequential increases of maize production in 2004 compared to 2003 are from 377kg to 523kg in Mtanda, from 254kg to 437kg in Loyi, and from 430kg to 583kg in Tilime. Smallholder irrigation increases food security by increasing the production of rain-fed agriculture aside from directly producing dry season crop.

## 2) Input to the Verification Project

The inputs to the verification project were trainings to the AEDOs, tools provision to 21 EPAs<sup>10</sup>, study tour, monitoring and also the consultants (study team members), of which direct costs are trainings and tools provision. Given these input, 264 sites were developed with a total area of 321ha in year 2004. Farmers benefited were over 5,000. One thing, which is quite different from conventional irrigation project, is that no foreign materials such as cement, iron bars, etc. were provided to the verification project. Also, pointed out here is that the direct output e.g. 264 sites and 321ha was created in the dry season 2004 only. Since all the necessary knowledge of developing smallholder irrigation has been already imparted in AEDOs, many more new sites are expected to come in the following year and onward.

In addition, agriculture related technologies such as compost making, botanical pesticide, liquid fertilizer, etc. have also been imparted to the AEDOs through the training courses. These technologies improve the production of not only irrigated agriculture but also rain-fed agriculture. Thus, though it is difficult to exactly evaluate the efficiency as is not sure how many more sites will be developed in the following years and how much rain-fed agriculture production increases, at least it can be concluded that the smallholder irrigation project

<sup>9</sup> Aside from the questionnaire survey, interviews to the farmers of Ngoni Club also revealed that in rainy season 2002/03, five out of eight interviewees in Ngoni Club applied fertilizer and the average was 43.8kg, while in rainy season 2003/04 all of the eight interviewees applied 62.5kg of fertilizer in average because they got more than MK5,000 in average by selling dry season maize in green. Average rainy season production of the eight therefore increased from 703kg to 938kg.

<sup>10</sup> Though the verification project was undertaken at 26 EPAs, 5 EPAs were provided with tools in 2003 for 1<sup>st</sup> generation project, so that the EPAs provided with tools for 2<sup>nd</sup> generation project are 21.

undertaken by the Study has achieved very high efficiency from the view point of input vs. output as compared to conventional irrigation project.

### 3) Impacts from the Verification Project

This section discusses impacts of smallholder irrigation development; how people’s life has been affected in terms of option as income source, impact to the poorest, how and what women have benefited, as well as equity issues, etc.

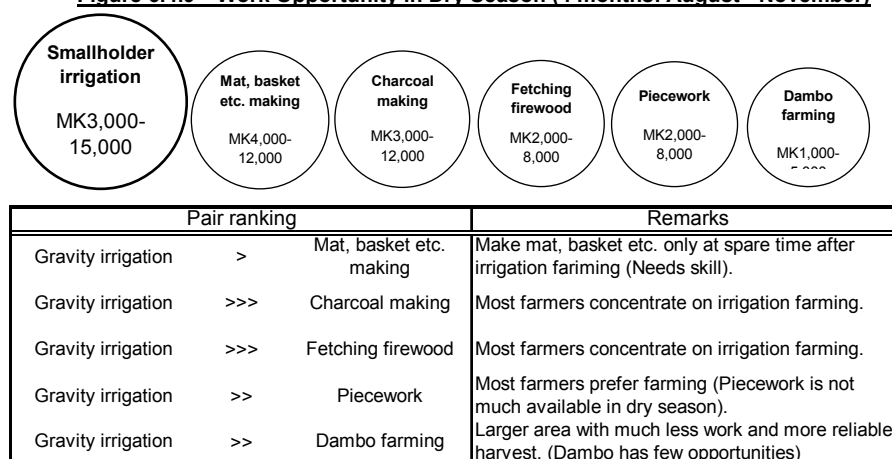
#### 3.1) Option as Income Source: Economic Impact

How can farmers have an income in dry season, if they cannot irrigate? The members of Duwu Club could not do irrigation farming in dry season 2004, because there was not enough water. The members needed to find alternative income sources to survive, which were mostly charcoal and firewood selling<sup>11</sup>. The Study Team found a significant difference in dry season activities, as compared to Duwu for example, at the first-generation sites where members could do gravity irrigation for two years in a row.

At Mtuwanjovu Club, three members said they quit dimba farming and/or watering can irrigation and one member said he quit working for road construction and maintenance. Almost all the interviewees have expressed that gravity irrigation is far much better (easier) than such income generation as charcoal making, firewood fetching, etc. At Tilime Club, four members interviewed said they quit selling firewood or charcoal, and two members said they decreased the numbers of making charcoal after the introduction of smallholder irrigation. All the members who do irrigation are at least reducing the activity of charcoal making and firewood fetching, and about half of them have almost stopped, rather concentrating on irrigation.

Interviews to 34 irrigation members<sup>12</sup> can conclude, as shown in the pair ranking of Figure 6.4.9, that the irrigation is very good working opportunity during dry season from the viewpoint of earning cash.

Figure 6.4.9 Work Opportunity in Dry Season (4 months: August - November)



Questionnaire survey conducted in November 2004 also revealed that in four sites among the

<sup>11</sup> Mr. Takumana Chadika said “I went to Lilongwe to sell firewood twice or three times a week in June and July, and once a week or once in two weeks during September-December. I can make MK150/trip. I also collect and sell grass. It takes four days to collect four bundles, but I can sell them at MK600-700.” He also added “I was concentrating on irrigation in dry season 2003.” V.H. Mnkunda, a member of Duwu Club, also said “I made and sold charcoal twice or three times a week. I can take two bags a trip and can get MK130 x 2.”

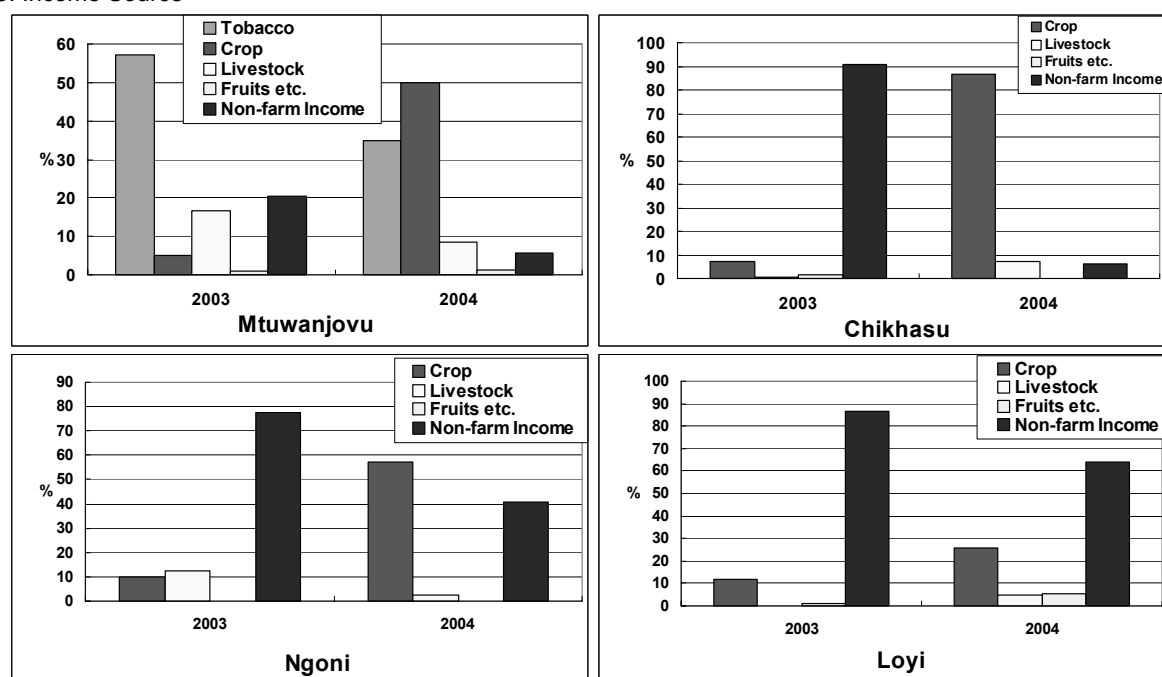
<sup>12</sup> Irrigation clubs interviewed are Mtuwanjovu, Duwu, Ngoni, Namanolo, Mtsetse, Mtanda, Mchiku, Loyi, Tikolore, Tilime, Bunganjati (new site), Gontha, and Katema.

surveyed 12 sites, the club members are shifting their income source of dry season more to farming from non-farm job. Table 6.4.9 summarizes the change of income share by source, for which members of Mtuwanjovu, Ngoni, Chikhasu, and also Mtanda as well as Loyi clubs have considerably shifted their income source from non-farm job to crop that is dry season irrigated agriculture. Figure 6.4.10 shows the share of income by source in the four sites of Mtuwanjovu, Chikhasu Ngoni and Loyi.

**Table 6.4.9 Result of the Questionnaire Survey: Change of Income Share by Source**

Site	Shifting IS	Remark
Mtuwanjovu		
Zakumva	-	They lost all the harvest for dry season 2004 due to water shortage.
Ngoni		
Chikhasu		
Mtanda		
Tikolore	x	Farmers in these sites would sell vegetables even before the gravity irrigation, therefore irrigation might not give significant impact to income share.
Tilime		
Loyi		
Msambaimfa	x	These three sites located in Ntchisi are found less opportunity for non-farm job. Therefore, the income share from crop has been high even before irrigation.
Gontha	x	
Katema	x	

IS: Income Source



**Figure 6.4.10 Change of Income Share by Source in Four Sites**

In Mtuwanjovu, on average of the club members, income from farming (excluding tobacco) before irrigation occupied only 5% of the total income, but it increased to 50% after irrigation while the share of non-farm income decreased from 20% to 6%. In 2003 before harvesting of irrigation, 16 interviewees out of 30 had cut trees and sold firewood, but in 2004 only one out of 16 members sold firewood. Because of irrigation in dry season, they now do not have to cut trees for sale. Drastic change is observed in Chikhasu. The members of Chikhasu club mainly grew Irish potato and beans with irrigation and income share from the farming increased from 7% to 87%, while income share of non-farm job decreased from 91% to 6%.

### 3.2) An Impact to Appropriate Technologies

Operation principle of verification project, which is “irrigation facilities should be constructed by the farmers in their locality by using locally available materials”, instilled farmers and AEDOs a sense of trying their best rather than waiting for someone else who may come to help and a sense of invention by themselves. Though the verification project has invented several types of diversion weirs, some farmers have also invented art-like ancillary facilities by themselves. Examples are canal bridge, especially which runs on steep slope (see photo above), road crossing, dissipaters set in steep sloped canal to prevent soil from being eroded (see photo below).

Inspired by the way of how this verification project tried to invent new ideas, farmers concerned have made their efforts rather than waiting for someone outsider to come, from which new inventions have come up. Smallholder irrigation development has influenced the attitude of the farmers and AEDOs especially in terms of inventing new appropriate technologies.



### 3.3) An Impact to Environmental Conservation

The verification project, aside from smallholder irrigation development, undertook promotion of an energy efficient cooking stove. Though the dissemination has not been so much unless AEDOs were fully engaged in that activity, this cooking stove can save firewood by at least half to as much as three quarters as compared to conventional 3-stone stove. The promotion of the stove has been made in such way of telling the farmers to cook the product from smallholder irrigation on a modern stove, linking up two activities. The cooking stove well inked up with smallholder irrigation can indirectly contribute to catchment area conservation.

A unique collaboration was observed in 2004 dry season at 4 sites out of 19 1<sup>st</sup> generation sites. The 4 sites are Mtuwanjovu, Ngoni, Tilime and Mankhamba at which tree nurseries were established just beside irrigation canal. Though JICA study has not undertaken any forestation component, AEDOs in



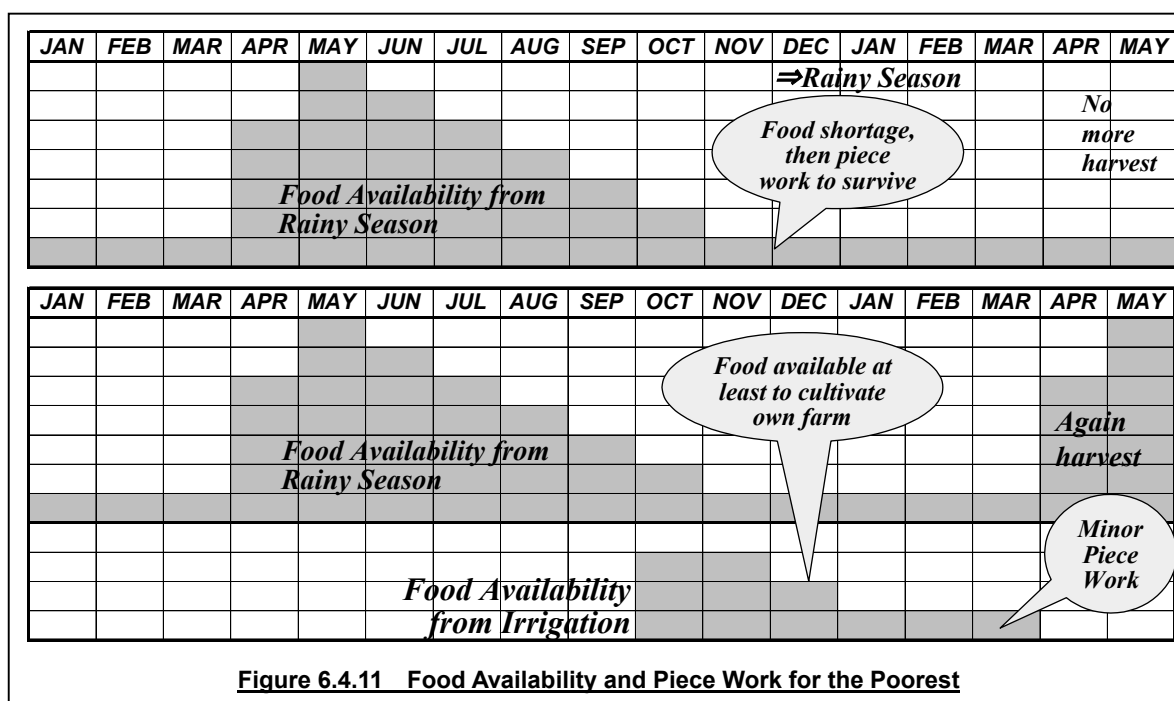


charge have contacted NGOs such as Total Land Care. As is sure, irrigation canal can avail of water in dry season, which can greatly contribute to improving the survival rate of the trees. In a sense, irrigation canal can attract such tree plantation activities, thus smallholder irrigation schemes could indirectly contribute to the vegetation recovering of catchment area. Promotion of smallholder irrigation has a positive impact to environmental conservation.

### 3.4) An Impact to the Poorest

Before introducing gravity irrigation, many farmers who do not have dambo were doing piecework such as charcoal making, fetching firewood, etc. or otherwise working on other farmers' dambo farms to earn cash. Some poor farmers do the piecework or work on other farmers' farms even in rainy season. The poor farmers, who may be the poorest of the poorer, cannot in most cases produce such food which can last at least until the beginning of next rainy season. The food out of the previous rain fed agriculture starts running shortage of stock at around or even before the onset of rainy season.

This situation forces them to do piecework to earn cash buying every day food even at the beginning of rainy season though the onset of rainy season is really important for farmers. There are relatively more work opportunities on farms at the onset of rainy season, so that the poor farmers can at least work to earn petty cash but instead cannot cultivate his/her own farm or have to reduce the farm area. They become unable to cultivate his/her own lands for rainy season agriculture, thus falling into vicious circle of continuing piecework or working on other farmers' farms to make ends meet rather than doing his/her own agriculture although they are farmers (see above chart of Figure 6.4.11).



Irrigation can give food almost at the end of dry season which is also the onset of rainy season. With this own food, though this is not much, even the poorest farmers can cultivate their own rain-fed farms so that they can again harvest their own rain-fed crops (see below chart of Figure 6.4.11). Maize from irrigation can be sold as green which is about as high as

4-5 times more than dry maize. In this case, they can sell the maize as green and buy about 4-5 times more weight of dry maize. Eating the cultivated green maize or dry maize exchanged with the green maize 4-5 times more, they can at least continue rainy season agriculture. Figure 6.4.12 shows two examples of farmers who produced just 125 and 100kg of maize from 2002/03 rainy season and increased to 375 and 250kg in 2003/04 rainy season that is after irrigation of 2003. This has been brought by either increasing the area cultivated or chemical fertilizer out of the irrigation of 2003. Smallholder irrigation therefore has a possibility of making poorer and poorest farmers to be self-reliant by enabling them to cultivate their own rain fed agriculture.

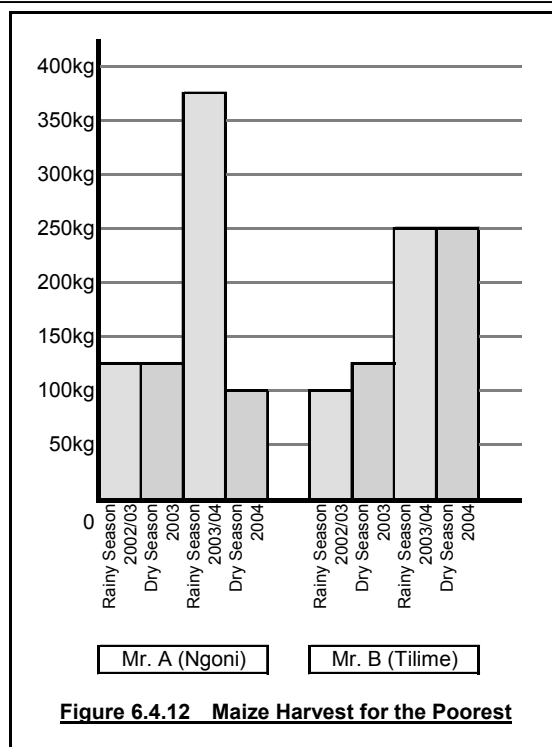


Figure 6.4.12 Maize Harvest for the Poorest

### 3.5) An Impact to Women

An important factor of gravity irrigation is it requires much less tiresome work than irrigation by watering can, fetching firewood or some trade. Mr. Sixpence Kapond, a member of Tilime Club said “Women are now relieved from fetching firewood to earn cash. They now need to fetch firewood only once a week or once in two weeks, much less time than before. They are getting better life. Fetching firewood is a hard job and not easy as working in the village. To fetch firewood, they have to go to forest and then they have to carry the firewood to market to sell. They now do it only when they are desperate.”

Ms. Linese Jentala, 17 years old, single, a member of Bvunganjati Club, said she joined the club because she worried about food problem. “I don’t want to suffer as I did in 2001-2002. I thought it was really hard and so decided to join.” She used to collect and sell firewood daily before irrigation. A bundle of firewood was MK30, and she could collect two or three bundles a day so that she could make about MK75 daily. One 20 l pail<sup>13</sup> of maize, on the other hand, was MK250 and it lasted for a week only. She is now concentrating on gravity irrigation. That means even single woman like her also can cultivate her own plot and harvest in smallholder irrigation.

As explained in **Option as Income Generation**, smallholder irrigation is an attractive option for

#### A Unique Opportunity for a Woman:

In some sites, there are men spending a lot of money in drinking. Especially at Loyi site, men spend thousands of MK in a season to buy local beer. That is a serious problem for equity at household level. Men just spend as long as there is money in the pocket including the money he earned out of irrigation agriculture. Wives and children are suffering and complaining.

However, this problem has another face, which gives an income generating opportunity to women in the village. Men buy local beer in the village, and the producers and sellers are women. Ms. Zerosi Aroni in Loyi club harvested 2 bags (100kg) out of the irrigation in dry season 2003, but that was not enough to bridge up the gap of food shortage from January to March 2004. She processed all the harvest, made local beer and made MK2,500. She bought 3 bags (150kg) of dry maize with the money, meaning she increased the harvest by 50%.

<sup>13</sup> About 17kg per pail. Weight of 3 pails maize is almost equivalent to 50kg.

income generation during dry season. Smallholder gravity irrigation is much less tiresome as compared to other works. The irrigation is even more attractive for women who have less option than men. Smallholder irrigation does not give additional burden only to women since all the farming activities are equally carried out by both sexes in Malawi. Thus women are also benefited from the smallholder irrigation, and in cases irrigation gives confidence in that a female member of Katema Club said, “I will continue buying fertilizer, more work and I can’t be tired. I am doing irrigation farming with managing everything else such as housework, growing relish, so that I am not sacrificing anything.”

Concerning women participation to irrigation club, pre-requisite was a participation to facility construction. Fortunately, most of the construction works were completed in just half day, so that even women could spare their time to participate in the operation. During construction works, many women worked together with men carrying clay soil, collecting local materials, and even carrying out line-leveling. Though most women worked behind men, they provided essential supports to men. Even in cases they were not in the construction site, they were preparing lunch behind the construction site. Thus, women participation was an essential part of smallholder irrigation development.



With regard to 1<sup>st</sup> generation projects, 165 members (26%) out of total 642 were women in 2003 and this has increased to 182 (35%) out of 521 total members in 2004. Not complicated work has actually facilitated women participation. Short construction time has also facilitated women to spare their time. They made an essential contribution, thereby became a part of irrigation club and in cases even chairperson of irrigation club (see photo). Smallholder irrigation has empowered women.



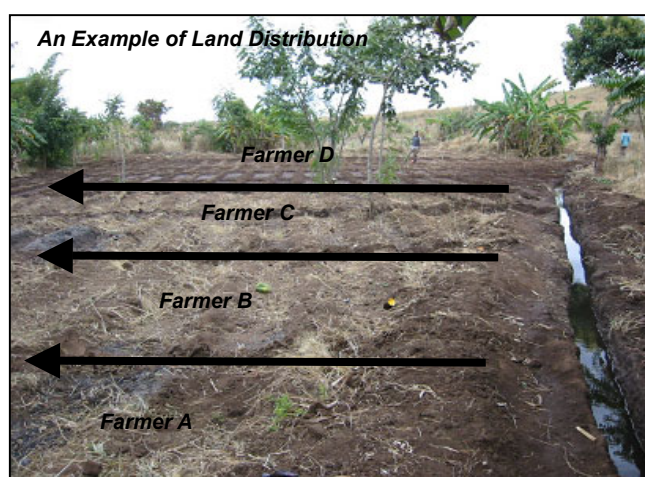
### **3.6) Equity among Villagers: A Negative Impact**

Gravity irrigation obviously cannot serve all the villagers simply because of land location constrained by elevation between farmland and water level. Combined with the limited irrigation water that most potential sites confront, often observed is such situation that only less than one tenth of whole villagers have land within the potential service area. This may

create jealousy to the “Haves” who are the land owners in the irrigation service area.

A mitigation measure taken by the farmers under the supervision of the local authorities as village headman and group V.H. was to divide the irrigation service area into blocks and lend out to the “Not-haves” either free or with a minimal rental fee only during dry season. This measure was observed in Mgunda site in Lilongwe East RDP, which was initiated and implemented by the farmers themselves. Given the strong leadership of the village headman, the landowners in the service area agreed to divide his land into pieces and lend out to the Not-haves free of charge during the dry season.

Same arrangement was done in many verification sites such as Duwu, Tikolore, Tilime, Mtsetse, Mchiku, etc., for the first year 2003. However, in 2004 this arrangement was ruined in some sites of the first generation. Table 6.4.10 below summarizes the land issue by site. As summarized below, 7 sites out of 23 sites faced conflicts over land renting. Major issues related to land renting are: club members did not clear land after harvest, gravity irrigation caused soil erosion, landowners and members did not agree with the rate of rent, and landowners want to monopolize the benefit from irrigation.



**Table 6.4.10 Conflicts over Land Issues Happened in 2004**

Site		Issue and Solution
Dedza Hills	Chikhasu	The farm is very steep and caused soil erosion by irrigation in 2003. Therefore, the landowner refused to rent out his land in 2004. The members extended the canal beyond the land and opened new farm.
	Mtsetse	Members did not clear the land after harvest in 2003, so that the landowner could not cultivate the land in 2004 rainy season. The landowner, therefore, refused to rent out the land to the members. Also leadership problem for the village headman exists.
	Mtanda	Although there is potential to extend canal, the landowner refused to dig canal on his land. Therefore, irrigation service area remains same as in 2003.
	Namanolo	The landowner says that poor maintenance of the land by the members caused soil erosion and he refused to rent out the land in 2004. On the other hand, it was said that he wanted to occupy the benefit alone.
Dowa	Loyi	The landowner asked to pay MK400 for the rent and it was too expensive for the members. After negotiation, they settled with the rent at Mk100. Since water was not enough in the dry season 2004, they are going to rent the land for rainy season crop 2005.
Ntchisi	Gontha	The members did not clear the land after harvest of the 2003 crop and it affected the rainy season crop of 2003/04. Also the members did not pay Mk100 to the landowner although it was agreement. The landowner therefore refused to rent out the land. Part of the members moved to another location for the irrigation.
	Kasangadzi	The landowner refused to construct weir on his land and the members were stranded to develop irrigation in 2004.

There was a lease issue at Mtsetse Club, Namanolo Club, Gontha Club etc. and the most common factors for these clubs are: 1) many members rented the plots from a few landowners, 2) the plots have to be cultivated by the landowners during the following rainy season, and 3) many members did not clear the plots after the harvest of dry season 2003 so that the landowners could not plant rainy season maize in time. The landowners at Gontha Club have faced even food shortage because they failed to plant the following rainy season crop, whereby refused to rent in 2004 dry season.

Ms. Monica Samuel (the landlady) and her husband Mr. Samuel Benson of Mtsetse Club also refused, first of all, by confrontation between V.H. Phulusa One and V.H. Phulusa from the same village. Since the members from Phulusa One have their own plots downstream over a road running at the downstream peripheral of the series area and a PVC pipe was installed across under the road on October 26, 2004, Mtsetse Club is expected to be active again without leasing land from the spouses in dry season 2005.

Namanolo Club was formed again by five landowners only on the left bank and another five landowners again only on the right bank. Only one of the 10 landowners, who is Mr. Eric Samalani, was the original member. Since the members did not put back the basins rendered for irrigation into furrows after the 2003 harvest, he complained to the V.H. Kamkhudza and informed him to organize a new club. V.H., who was also a member of the original club, agreed. Mr. John Kenith, who is a landowner and a new member of the club, said, "I did not join in dry season 2003 because I was not sure if water really comes to the field." The real reason behind could be that landowners just wanted to monopolize the benefit after they had acknowledged the effectiveness of smallholder gravity irrigation.

One of the landowners in Namanolo grew Irish potato and in fact earned around MK10,000 as net income. He hired five farmers for the land preparation and the harvesting, and paid them around MK3,000 in total. If he divides and rents his farm into five farmers free of charge, he as well as renters will not have to hire any labor since each portion becomes one-sixth of original area. Net income in total of all the six members (one owner + five members), therefore, would be MK13,000 (MK10,000 + MK3,000), but the net income per member (including him) would only be MK2,167. On this condition he will lose nearly MK8,000 compared to cultivating the farm by himself with a few employment of pieceworkers.

Figure 6.4.13 shows a case study on the level of rent, which could maintain the income of the landowner growing Irish potato in Namanolo. The figure on left hand (Case 1) shows the analysis without considering opportunity cost of labor (provided no irrigation, they stay idle). The analysis shows that the landowner needs MK1,567 as rent per member to maintain his income of MK10,000 ( $\text{MK1,567} \times \text{five renters} + \text{MK2,167}(\text{income from his shared farm})$ ). In this case, the net income of renters remains merely MK600 as worthy as piecework for 12 days. Figure on the right hand (Case 2) shows the case considering opportunity cost of labor, namely he can earn from piecework by the saved labor. Analysis shows that the landowners still require the rent as high as MK704 and the net income per renter is MK1,463.

The analysis implies that villagers would have difficulty to access to the irrigable land if all were considered in just monetary value. Equity amongst the concerned villagers and individual interest may be a sort of conflicting issue. To cope up with this equity issue, at

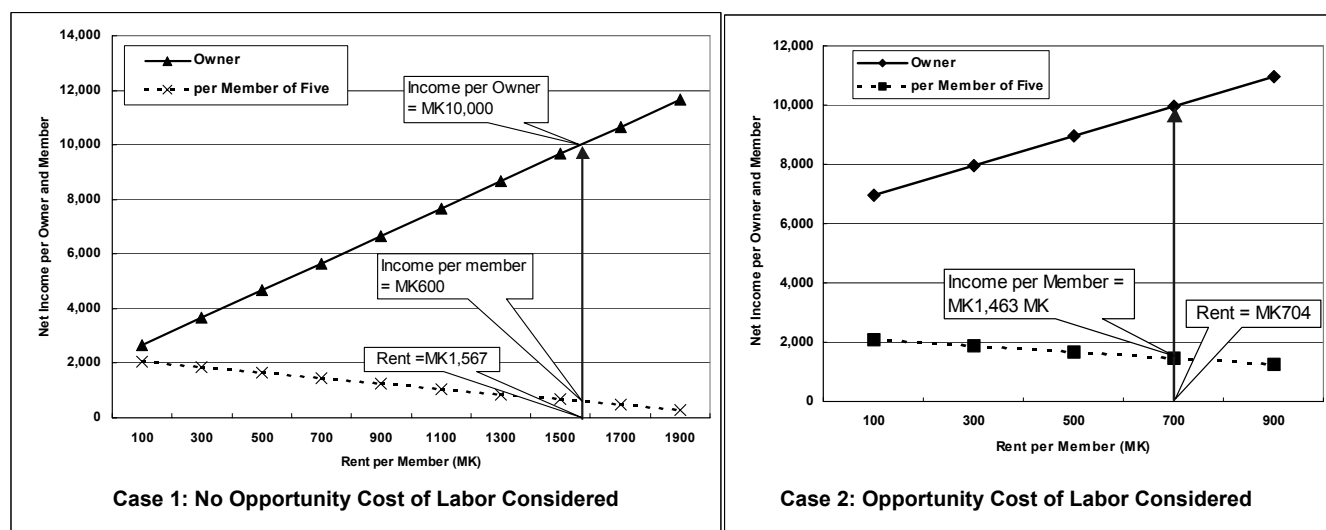


Figure 6.4.13 A Case Study of Potato Grower: Net Income of Landowner and per Renter by the Rate of Rent

least it is necessary for the Have-nots to work as a group for the weir and canal construction. In addition, there may be such arrangements as: allocating larger portion to the landowners, paying reasonable rental fee to the owners, due caring of the land by renters by means of applying more compost manure, etc. Also, local leaders should play a distinguished role to settle. Transparency since the onset of the development should be imparted and in this regard the local leaders should not forget his/her sense of equity is also challenged. Study tour including the land owners and the local leaders to well organized area having sense of equity can also work to improve the situation.

#### 4) Sustainability of the Verification Project

Sustainability is evaluated for the 1<sup>st</sup> generation project from two points of view: farmers own initiative on weir construction in the second year and willingness to carry on irrigation over failure. As a conclusion, smallholder irrigation has high level of sustainability as elaborated below:

##### 4.1) Farmers Own Initiative

This Study has been aiming to make smallholder irrigation be a culture, in another word sustainability of the irrigation development being sought by verifying appropriate technology and adoptability in the livelihood of the villagers. The Study has monitored how farmers in the

Table 6.4.11 Status of Weir Construction in 2004

Club Name (membership, l.owner)	in 2003	Weir Construction in 2004		
	Weir Const'n	Date	How many participated M, F	Was AEDO there? Yes or No
<b>LL East RDP, Mpenu EPA</b>				
1-1 Mtuwanjovu(30,26)	mid June	May 10	10	No
1-2 Duwu(26,4)	June 16	no diversion due to water shortage		
1-3 Ngoni(20,5) Mitemer(15,5)	June 21/24	June 17	21	No
1-4 Chimphonongo(18,18)	June 24	no diversion due to water shortage		
1-5 Zakumva(10,1)	June 27	April 18	2,0	No
1-7 Mgunda(11,2)	Early May	Late April	8,4	No
1-8 Mankhamba(10,2) Tiqwirizane(6,2)	April	Early March	N.A.	No
<b>Dedza Hills RDP, Kanyama EP</b>				
2-1 Chikhasu(16,6)	July 11	May 10	1,0	No
2-2 Mchiku(16,1)	June 24	June 7	6,12	Yes
2-3 Livizi(17,11)	August 4/5	Early June	7,8	Yes
<b>Dedza Hills RDP, Bembeke EP</b>				
2-4 Mtsetse(15,2)	June 18/27	Late June	N.A.	No
2-5 Kadiwa(7,1)	July 15	June 17	5,9	Yes
2-6 Mtanda(38,6)	July 9	June 25	7,13	Yes
2-7 Namanolo(23,8)	July 24	June 10	6,0	Yes
<b>Dowa RDP, Mvera EPA</b>				
3-1 Tikolore(81,10)	June 17	April 14	22	No
3-2 Tilime(50,5)	early June	Late April	N.A.	No
3-3 Loyi(36,4)	July 11	May 3 April 21	15 4 (new)	No No
3-4 Kambware(15,3)	June	Early May	1	No
<b>Ntchisi RDP, Kalira EPA</b>				
4-1 Msambaimfa(61,13)	Early May	Early May	N.A.	No
4-2 Gontha(52,4)	June 16	Late July	N.A.	No
4-3 Katema(33,26)	June 14	Early May	N.A.	No
4-4 Kasangadzi(36,5)	July 14	no diversion due to refusal of landowner		

verification project sites adopted the irrigation technology and built in their livelihood in the 2<sup>nd</sup> round of dry season; that is 2004. The Study Team inquired this aspect from the way of weir construction and evidenced increase of farmers' initiative. Firstly, weir has been constructed by farmers' initiative at more sites than the previous year. It is counted that the sites, at which farmers alone constructed the weir without AEDO attendance, are 14 out of 19 in 2004 (see Table 6.4.11). In 2003, the sites, which were developed by farmers' initiative, were just 6 out of 23.

Duwu and Chimphonongo sites have suffered severe water shortage, so the river diversion itself was impossible in 2004, but they would have constructed weir by themselves if the stream water had been enough. In Dedza Hills, weir construction at most of the sites was attended by AEDO in charge. One reason for this is land issue in that area. Refusal of landowners on his / her lands used for dry season crop had been a hot issue in the area in 2003. To solve the issue in the year 2004, concerned farmers requested AEDO to assist them.

Another evidence of increasing farmers' initiative is early commencement of dry season crop (see Figure 6.4.14). During wrap-up workshops in 2003, in almost all the sites farmers mentioned to start weir construction earlier for the following dry season. Indeed, at 17 sites out of 19 the commencement of weir construction in 2004 was earlier than 2003. At 10 sites, weir construction has been completed by early May, which is more than one month earlier than last year. These facts show farmers own initiative, entailing sustainability of smallholder irrigation development.

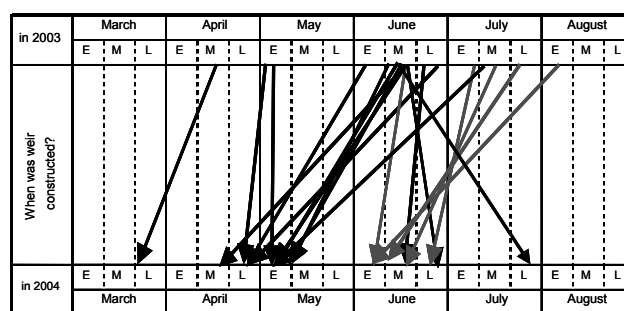


Figure 6.4.14 Weir Construction in 2003 and 2004

#### 4.2) Willingness over Failure

In 2003 dry season, some sites were hit by water shortage as they came to the end of dry season. In the last rainy season of 2003/04, there was not much rain except for Ntchisi area. Given this situation, most of the farmers again in 2004 dry season needed to scale down their activities, and some sites had lost crop. Even though the farmers suffered from water shortage and lost some or even whole of their investment in cases, they had taken the possibility of shortage of water into consideration before they started smallholder irrigation. They do not seem to give up just because they have experienced one drought.

Shortage of water destroyed all the crops such as Irish potato in dry season 2003 at Mchiku Club. The members, however, moved the weir to downstream, did irrigation farming and harvested a certain amount of crops in dry season 2004. Ms. Jene said “I planted Irish potatoes in dry season 2003, but I lost everything because of shortage of water. Since I didn't have any seed potatoes this year, I could not plant Irish potatoes and instead planted beans in this dry season 2004. I was disappointed at that year, but it was just like a thief and it could happen anytime. So we don't quit just by one failure.”

This situation again took place in Zakumba in dry season 2004 where they had tried to convey the little water to their farm by putting plastic paper all along the canals but resulted

in vain. They consequently lost all the maize which was about to be flowering stage. The members however do not seem much disappointed maybe because such vagary has taken place sometimes in their life. The members are willing to construct the diversion weir and carry out irrigation in next year too as far as there is water they can tap.

The members of Duwu Club could not do irrigation farming at all in dry season 2004 due to shortage of water. They are fetching firewood, making charcoal, engaging them in piece work to have a cash income or to just make ends meet during the dry season 2004. V.H. Mnkhunda, however, said, “We will do the same irrigation next dry season. We want to start in April if it rains. I am sure new members will join next season, because we know gravity irrigation is good. We will do two times more serious than last year.”

Above example, though not many, shows those farmers once after experiencing irrigation seem not to give up even if they have lost whole crop due to water shortage. For them, smallholder irrigation is rated much better than piecemeal, making charcoal, and fetching firewood to earn cash. Smallholder irrigation can bridge up the gap of food taking place between two rainy seasons, and also can be a good mean to make money by selling maize as green. Taking into account such opportunities of the smallholder irrigation and also natural vagaries even compatible to just a theft, those farmers will continue irrigation even if hit by failures as long as there is water. Thus, smallholder irrigation has a high level of sustainability.

### **6.4.3 Capacity Building through the Verification Project**

This section enumerates what have been acquired by the farmer beneficiaries and extension officers through the implementation of the verification project. Voices of the farmers and extension officers from the interviews are described as they spoke as exactly as possible, so as to avoid manipulating their individual meaning of what they experienced. These data could be defined as qualitative data. By contrast to the quantitative achievement of the verification project, this section tries to clarify the viewpoint of how people acknowledged the smallholder irrigation and how they felt about it. This qualitative aspect will give understanding of the project in depth<sup>14</sup>. The impact of this viewpoint is here defined as the capacity building for the officers and farmers made by the project.

#### **1) Learning by Irrigation / Extension Officers**

AEDC A: “When JICA came to assist us, I thought they would bring inputs such as cement to build irrigation facilities. But what we have done is to use locally available materials only like wood, grass and clay soil and it is straightforward to divert river water into farm. We like to recommend farmers to not only grow maize but also beans, which contains protein. We like to promote improvement of nutrition in the village with the irrigation (note: He one day confessed when he saw the JICA irrigation engineer started collecting twigs, grasses, etc, he personally thought that guy was mad, unbelieving diversion weir made of local materials).”

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<sup>14</sup> “Statistical data provide a succinct and parsimonious summary of major patterns, while select case studies provide depth, detail, and individual meaning.” Michael Quinn Patton, “Qualitative Research & Evaluation Methods 3 Edition, 2002” P16.



AEDO B: “For the first year when we were working for the smallholder irrigation with JICA, some people were teasing us since we were not receiving any allowance. They said, “Why were you working without allowance?”. But this year no one is talking to me in that way and they appreciate the gravity irrigation method. Now I am happy with promoting smallholder irrigation (note: This AEDO promoted total 11 sites in 2004).”

AEDO C: “When I interviewed farmers in the sites, it was interesting to hear from farmers that they were saying how they can now overcome hunger by supplementing food and income from the irrigation. I am thinking even myself to rent farmland and practice dry season irrigation if possible.”

AEDO D: “Malawian farmers are hard working people who are always willing and are able to undertake any development activities though they have been misled by development agencies. For the Malawian farmer to say the fact, all farmers where the schemes were implemented are very very happy and one already benefiting from their harvests are now assisting some farmers who need to start the new schemes.”

AEDO E: “I take JICA as my own college which has trained me in small-scale irrigation technology because I did not have this chance at school / college. The approach is very good as opposed to others who come in with a lot of inputs where farmers fail to take up or adopt on their own. I am now proposed to work anywhere in the country in extending the technologies. The best way of assisting Malawian farmers is to let them be aware of this program and not to fund them with inputs.”

## **2) Learning by Farmers**

Mr. Bison Khuma in Mtuwanjovu Club: “Gravity irrigation is good because it is not hectic as irrigating by watering can. Before developing gravity irrigation, we had to do piece work such as land preparation in other farms, building house or selling firewood in dry season. Sometimes we could not find piecework either. After the gravity irrigation was developed, we got able to harvest to sell. We used to cut trees to make firewood for sale during dry season, but after irrigation we have not cut trees. “We will continue the irrigation and when there is a good year with ample water, we will shift the canal outer side and expand the irrigated area. Now villagers in the vicinity of the site come to see the site. Last week seven farmers from four villages visited the site and they are thinking to try the irrigation next year. It is encouraging that other people visit us.”

Mr. Shema Masika, “Chairman of Ngoni Club: Many projects look very attractive, but we find nothing in our hands when they finish. Many people jump at free handouts, but nothing remains after they spent them. The only thing they can do is to go back to handouts again. Smallholder irrigation is different because you said you give us nothing except knowledge and technology from the beginning. Nobody had talked that straight before. Now we have knowledge in our heads so that we can make weirs and canals solely by ourselves. Also we do not need to buy maize anymore and we can buy fertilizer without waiting for handouts.” He further continues “We wanted to complete the weir before engineers come (in the second year). We wanted to test what we learned last year and what we have in our heads so that we constructed by ourselves and we waited engineers to come to check and comment.”

V.H. Kufakwanthu in Ngoni Club: “I do not have any land near the canal, but I want everyone to work together and to get something. As a V.H., I want to be a good example. I want everyone to know working together is much better than sitting and seeing people die”. Followed by Mr. Yamikani in the Ngoni Club as saying: “Now, we do not need to buy any food and to ask for any help. That is because you do not develop us but we developed ourselves. That is why we are here now.”

Mr. Lintoni Kangwanda of Tilime Club: “It was the first time for me to cultivate in dry season and I was a little bit tired. So I cultivated only one acre out of two acres this (2003/04) rainy season. Also I spent MK2,000 for local beer in three months and I did not buy any clothes for my wife (out of the benefit from the irrigation in 2003 dry season).” However, he also said, “Smallholder irrigation has improved my life in terms of finance, food security and family. We had nothing to do in dry season before, but now we are busy. Women are busy too, and that is good.”



Mr. Robert Chilipuma of Tilime Club: “I used to cultivate dambo and I made charcoal once or twice in dry season to buy seeds and fertilizer before irrigation came. Now, I don’t make any charcoal at all. I can make good profit from irrigation and it is waste of time to make charcoal.” He further continues: “I have never thought of working in town because I saw so many fellow farmers went town and got nothing but a lot of troubles. Gravity irrigation is a blessing and we don’t need to go to town to work anymore.”

Mr. Marko Kathewela, a Vice-chairman of Tilime Club: “We are not going to buy maize but only going to sell maize. That is a big improvement. We are not waiting for handouts. We are working hand in hand and we have no problems. I, as a landowner, think that rent should be free at the beginning. We need, say, three years of grace period. I would like the irrigation club to be unite and I can see that we are completely different from last year.” His two fellows of Mr. Dzwitsani Laudani and Mr. Giliyamu Chisale are also saying: “I did not do anything in dry season before because I did not have a watering can (for irrigation). We will be OK in two or three years and we will be able to sell maize and buy fertilizer.” “To work harder is much better than just staying and doing nothing.”

Ms. Adinesi Saize, Chairlady of Loyi Club: “For me, there were two major challenges in 2004. First one was to try to convince the landowner of discounting the rent. Landowner raised the rate of the rent at the critical time of the irrigation preparation. So it was hard and one of the landowner family was stubborn to discount the rent. Second challenge was to collect money from individual members. Even after we agreed with the rent at MK100, I could only collect from one member in two weeks. After all I could collect MK600 and paid them to the landowner. I am bit reluctant to be the chairlady after all these challenges, but people are the ones to choose the leader, so if they ask me to continue, I will carry on”.

#### 6.4.4 Evaluation by AEDOs in Charge

On December 10, 2004, the AEDCs and AEDOs who have been working in the 1<sup>st</sup> generation project sites since 2003 were called to a workshop in order to evaluate the verification project. They are the frontline officers who best know what has happened in the sites, how the villagers have been progressing as well as coping up, what negative and positive impacts have taken place, etc. for the last two seasons. The number of participant AEDC/AEDO was 24, and they evaluated verification project in two stages; namely, 1) by several aspects as project, and 2) by approach that the Study Team applied:

##### 1) Evaluation by 10 Aspects

The participant AEDOs/ AEDCs, with suggestion from the Study Team, decided 10 evaluation aspects such as food security, income level, work opportunity, self-reliance, cooperation, equity among villagers, etc. These aspects are scored by a range of 1 – 5 as compared to before-irrigation; namely, score 3 means no difference from before-irrigation, score 1 means the situation became much worse than before-irrigation, and score 5 indicates the situation became much better.

Table 6.4.12 shows the evaluation by EPA. The weighted average according to the site number per EPA is shown in Figure 6.4.15. As indicated in the table and the figure, work opportunity marked the highest point of 4.8 on average, which is very corresponding to the voices from the farmers interviewed. Next to the work opportunity, aspects which marked higher score are food security, technical adaptability, technical capability<sup>15</sup> and sustainability followed by cooperation. It is by the frontline officers concluded that the smallholder irrigation deserves to be implemented in all the aspects but one that is equity among villagers.

**Table 6.4.12 Evaluation in Various Aspects by EPA**

Aspect/ EPA	Mpenu	Kanyama	Bembeke	Mvera	Kalira	Weighted Average
Food Security	4	4	4	5	4	4.2
Income Level	4	4	4	4	3	3.8
Work Opportunity	5	5	4	5	5	4.8
Self-reliance	4	4	3	4	4	3.8
Cooperation	3	4	4	4	5	4.0
Equity amg Villagers	3	2	2	3	3	2.7
Gender Equity	4	4	4	3	4	3.8
Technical Adaptability	4	4	4	5	5	4.4
Technical Capability	4	4	5	5	4	4.4
Sustainability	4	5	4	4	5	4.4
Average	3.9	4.0	3.8	4.2	4.2	4.0

Note: 1: much worse, 2: worse, 3: no change, 4: better, 5: much better as compared to before-irrigation.

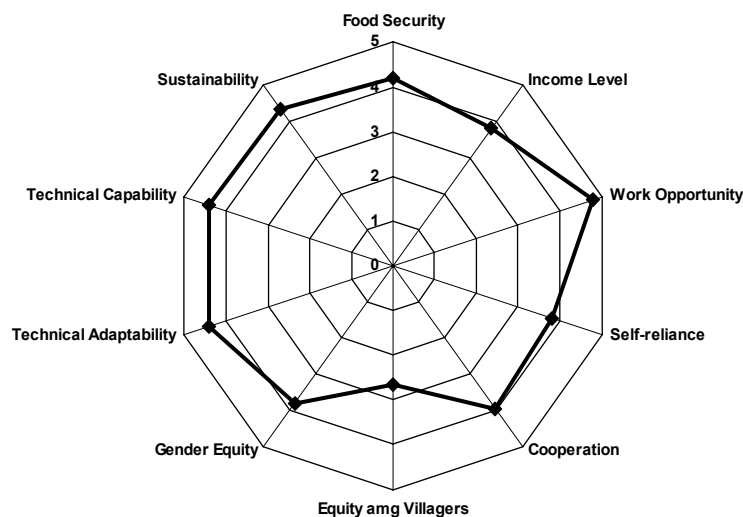
As aforementioned, equity is a critical issue in developing smallholder irrigation. Water is a Public Good but the public good goes to land which is a Private Good. From the viewpoint of water being a public good, no one is allowed to monopolize. However, individual interest very often surpasses the sense of public equity. Kanyama and Bembeke EPAs rated the equity at score 2. Both EPAs are located in Dedza Hills area where there is a problem for

<sup>15</sup> Technical capability indicates how farmers have developed their capacity in terms of constructing weir, aligning canal, carrying out on-farm irrigation. On the other hand, technical adaptability means how well such technologies are instilled in the farmers' locality.

local leadership. There used to be 7 villages only but they have been divided into 28 for the last 20 years due to population growth, migration, etc. This situation in Dedza Hills area may have aggravated local politics, so that any development activities are said very often stranded and irrigation in the area may not be an exception.

Equity amongst the concerned villagers and individual interest are somewhat bipolarized issue for which local leaders should play a distinguished role to settle.

However in such situation like Dedza Hills, that local authoritative structure may not well sort the issue of equity. To establish transparency since the onset of the development, AEDOs should be fully aware of all the concerned villagers being involved at least in the discussion of the development. Taking stranded farmers by study tour inclusive of the land owners and the local leaders to well organized area having sense of equity cannot be disregarded in improving the situation either.



**Figure 6.4.15 Evaluation in Various Aspects**

## 2) Evaluation by Approach

The participants to the workshop on December 10, 2004 were also asked to write down whatever they have felt, thought and touched on through the 2-year implementation of the verification project on anonymity. They have commented many things which are mostly categorized as: to/about the approach, to/about JICA Study Team, to/about the Government, to/about him/herself, to/about farmers, etc. Amongst them following excerpts are the comments relative to the approach this Study has been pursuing, cores of which are to establish irrigation facilities with locally available materials and to provide no free handouts of seed as well as fertilizer:

- JICA's approach has been very excellent and this is the best approach I have ever experienced. I recommend the approach by JICA telling farmers the truth about life and not just pleasing them by short-term assistance i.e. in terms of handouts.
- JICA's approach for smallholder irrigation development has been a very nice one since it didn't involve handouts although there were a lot of complaints from the farmers. The approach has instilled a spirit of self-reliance than ever before where farmers depended on handouts.
- The technology from JICA was very well indeed because when you used to share any handouts to farmers, they will always wait for so people will be lazy. Now farmers are hardworking because they try to work on their own and not waiting from any organizations.
- Malawian farmers are used to be givers of free handout yet they don't improve at all in that after organization goes they no longer implement the activity. My view is JICA

should continue in no free handout but importing technical knowledge only. This will create a sprite of sustainability in Malawian farmers.

- The approach can make irrigation in Malawi sustainable because the materials used are locally found and the technologies used before JICA came in were difficult for the farmers to practice. JICA was using locally available materials like grass for weir construction of which they are so cheap and readily available to smallholder farmers.

All the 29 participants except for one were in line with the approach of not providing free handouts. One thing the Team was surprised is that comment on irrigation facilities to be made of local materials was very few while the comment on free handouts were from almost all. The approach of not providing free seed and fertilizer may have been very unique for the frontline officers. The Team has been thinking that those who can access to the irrigation water which is really a precious natural resource can still be categorized as better-off, yet any sense of equity in giving free issues to those better-off farmers. Though the principle concept the Team has in mind may be unique as compared to conventional approach, this Study at least showed Malawian farmers can move ahead even without free handouts.