JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

DEPARTMENT OF IRRIGATION (DOI)
MINISTRY OF AGRICULTURE (MOA)
REPUBLIC OF MALAWI

THE STUDY ON THE CAPACITY BUILDING AND DEVELOPMENT FOR SMALLHOLDER IRRIGATION SCHEMES IN THE REPUBLIC OF MALAWI

FINAL REPORT MAIN

March 2005

SANYU CONSULTANTS INC., TOKYO, JAPAN

PREFACE

In response to a request from the Government of Malawi, the Government of Japan decided to conduct a study on the Capacity Building and Development for Smallholder Irrigation Schemes in the Republic of Malawi and entrusted to the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. Kosei HASHIGUCHI of Sanyu Consultants Inc. and composed of members from the said consultancy company between January 2003 and February 2005.

The team held discussions with the officials concerned of the Government of Malawi and conducted field surveys at the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the promotion of this project and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Malawi for their close cooperation extended to the study.

March 2005

Etsuo KITAHARA
Vice-President
Japan International Cooperation Agency

March 2005

Mr. Etsuo KITAHARA
Vice-president,
Japan International Cooperation Agency (JICA)
Tokyo, Japan

Dear Mr. KITAHARA,

Letter of Transmittal

We are pleased to submit herewith the Final Report on the Study on the Capacity Building and Development for Smallholder Irrigation Schemes in the Republic of Malawi. This Report presents the Smallholder Irrigation Development formulated with the advices and suggestions of the authorities concerned of the Government of Japan and your Agency. Also included were comments made by the Department of Irrigation (DOI), Ministry of Agriculture, of the Republic of Malawi during the technical discussions on the draft final report which were held at Lilongwe in January 2005.

The overall objective of this Study is to contribute to poverty reduction of the local population in the Study area based primarily upon smallholder irrigation development. The study has been conducted in partnership with and by guidance from the DOI, and incorporated the views of the beneficiaries and other stakeholders such as relevant departments under the ministry, local authorities, international funding agencies, NGOs, etc. The process of this Study centered on the following which themselves were the objectives of the Study:

1) To establish a package of methodologies for self-help smallholder irrigation development, and
2) To enhance technical and administrative capacity in irrigation development.

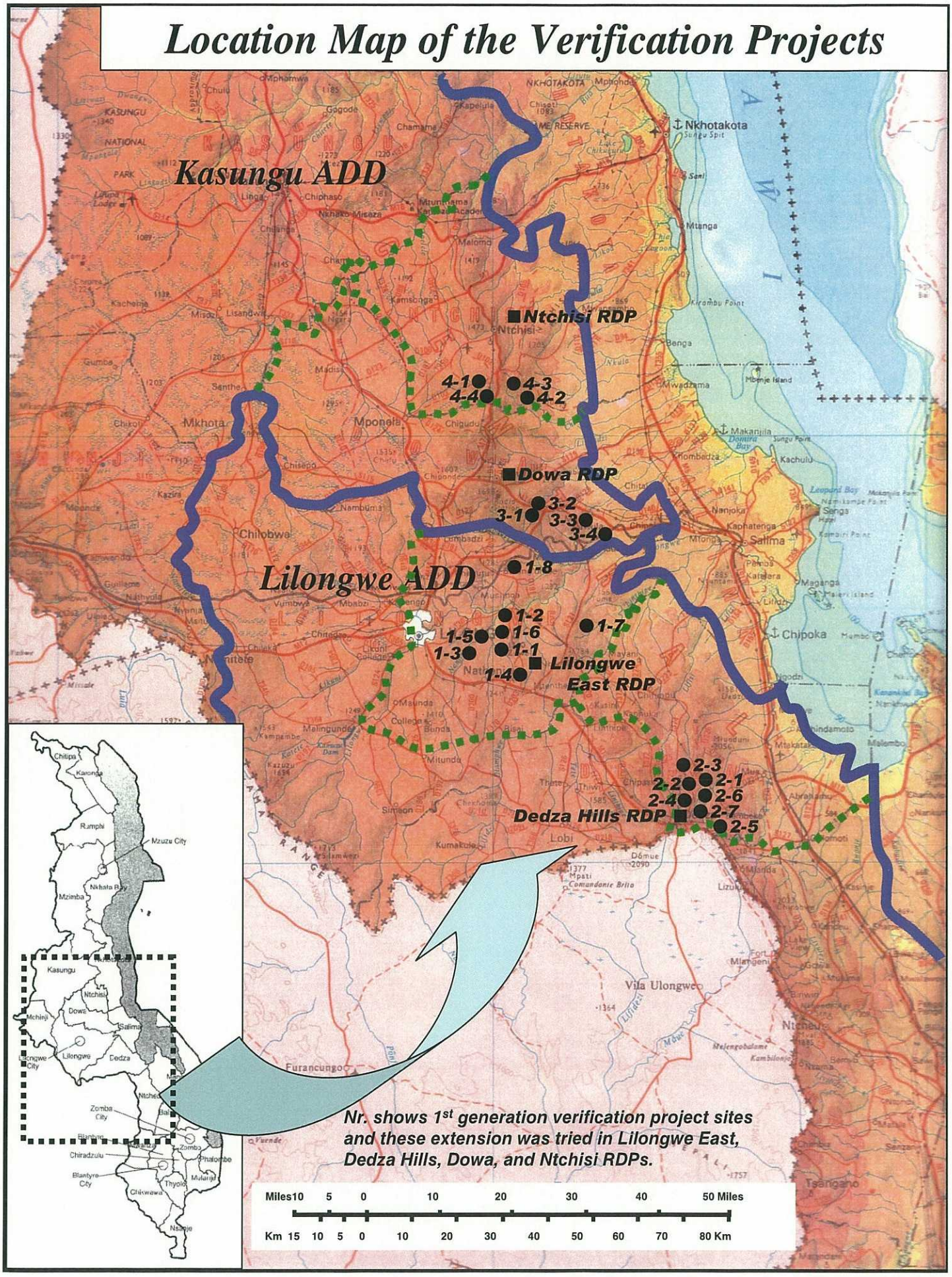
To attain the above objectives, this Study has been carried out in a phasing manner divided into two; namely, Phase 1 dealing mainly with situation analysis, inventory for potential smallholder irrigation development sites, formulation of draft package of the smallholder irrigation development, and selection and preliminary design of prospective verification project, and Phase 2 which is further divided into two; former part of which undertook the implementation of the verification project, and later part of which tried out the establishment of an extension mechanism.

We wish to take this opportunity to express our sincere gratitude to your Agency, the Ministry of Foreign Affairs, Ministry of Agriculture, Forestry and Fisheries of the Government of Japan. We also wish to express our deep gratitude to DOI, the counterpart agency, in the Republic of Malawi for the close cooperation and assistances extended to us during our investigation and study.

Very truly yours,

Kosei HASHIGUCHI
Team Leader of the Study Team

Location Map of the Verification Projects



An example of diversion weir made of locally available materials only: The weir body is supported by trigonal stand structures placed across the river, raising the water level about 70 cm. The height of the weir is about 1.2 m and the width is about 20 m.

An example of constructing a diversion weir: No machinery is employed in constructing smallholder irrigation facilities. Villagers, women as well as men, participate in the construction and they can finish within one day in most cases.

Completion of the diversion weir constructed by the villagers shown in above photo: This weir has double fences, made out of wooden poles and woven grasses, in which clay soil is compacted so that leakage can be minimized while raising the water level.

Canal alignment by using a simple tool that is, line level: Sprit line level is used in aligning canal according to the contour of the topography. Villagers can get used to handling of the line level in half an hour given on-the-job-training.

Gradient checking by using the line level: After excavating the canal aligned with the line level, they check the longitudinal gradient of the canal by using the same line level in order for the water to be assured to run smoothly by gravity.

Maize well growing under irrigation: She is practicing furrow irrigation suitable for lands on sloped topography. Water is led into the furrow, and capillary wets the ridge where the maize is planted. Maize with irrigation can bridge up food shortage.

Compost manures made alongside canal: Compost making needs water which can be provided by irrigation canal. Irrigation makes it easy to make compost manure aside from realizing dry season crop.

A study tour which is a venue of learning from the peers: Women are visiting fellow farmers plots where cabbage is well grown under irrigation. Study tour provides them with venue of learning so that they may embark on the same activities.

A training session of smallholder irrigation development for extension officers (AEDOs): This study administered the training to about 120 extension officers, based on which they have development about 250 sites in dry season 2004.

EXECUTIVE SUMMARY

INTRODUCTION

"The National Irrigation Policy and Development Strategy, 2000" (NIPDS) aims at poverty alleviation by targeting resource poor smallholder farmers for irrigation development to enhance farm income. Furthermore, the Poverty Reduction Strategy Paper (PRSP) says that improvement of the agricultural productivity and an increase of farmers' income by smallholder irrigation development are very important to reduce poverty. Thus, the smallholder irrigation development has become one of the national priorities in Malawi.

The Government of Malawi (GOM) has been feeling a pressing need to establish a measure realizing capacity building and development for smallholder irrigation schemes. The GOM requested in October 2000 to the Government of Japan (GOJ) to carry out a study, titled as the Study on the Capacity Building and Development for Smallholder Irrigation Schemes in the Republic of Malawi (the Study), aiming at realizing the sustainable irrigation development for the smallholder farmers.

In response to the request by the GOM, the GOJ sent the Scope of Work mission of JICA in October 2001. The Minutes of Meetings on the Scope of Work were agreed and signed on November 5, 2001 between the two governments. The overall objective of the Study stated in the Scope of Work is to contribute to poverty alleviation of smallholder farmers through irrigation development. The process of the Study centers on the following which themselves are the objectives of the Study agreed upon in the SW:

- To establish a package of methodologies for self-help smallholder irrigation development, and
- To enhance technical and administrative capacity in irrigation development.

In December 2002, Sanyu Consultants Inc. of Japan was contracted by JICA to carry out the Study. The Study Team first arrived at Lilongwe on January 7, 2003 and proceeded to the phase 1 field survey. The Team has conducted all the necessary surveys and studies agreed in the Scope of Work during years of 2003 and 2004 and now presents this Final Report together with Appendixes and the Package composed of various dissemination materials for promoting smallholder irrigation development.

RURAL SOCIETY IN MALAWI

Rural societies in Malawi maintain a traditional social structure based on the jurisdiction of traditional authorities headed by TA Chief, whose chiefdom is descended down from the previous Chiefs through the lineage system. Traditional leaders are the TA Chief, Group Village Headman/woman and Village Headmen/women. They are entrusted to manage customary land, allocate land to villagers, set social norms and rules, mediate problems within their jurisdiction, etc. Traditionally, their authority is conclusive and their norms and rules over their life are well respected in rural societies of Malawi.

The society is administratively stratified as village, group village and chiefdom of the TA. There are 160 TAs, 2,360 group villages, and 20,721 villages throughout the country (TA number is more or less equivalent to the number of EPAs). TA consists of a number of

group villages ranging in most case from 10 to 20 with the nation wide average of 15. Group village is composed of villages ranging from several number to as many as more than 20 with the national average of 9 villages. Consequently, TA encompasses about 115 villages as the nation wide average.

Population per village varies widely but the population naturally increases as the village gets older. According to the census of 1998, nation wide average farm household per village is 115 and its average population is 410 (3.6 heads per household in average). Some of the villages that the Study Team visited, though, have more than 300 households. On the other hand, villages of immigrants tend to be smaller because of administrational difficulty, especially in terms of distribution of land.

According to the census, about 52 percent of the poor households were female-headed though female headed household consisted of about 25 percent of the total households. National level literacy rate was at 58 percent where female literacy rate was at 44 percent while male literacy rate was at 72 percent. Education attainment, defined as completion of Standard 8, was only 11.2 percent for adults aged 25 years or above, and only 6.2 percent for women.

THE AGRICULTURE IN MALAWI

Total land area of Malawi is 11.8 million ha, composed of 9.4 million ha of land and 2.4 million ha of water. Out of the 9.4 million ha land, an estimated 5.6 million hectares (59%) is considered as suitable for agriculture production. This is mostly composed of rain-fed cultivation area (79% of the 5.6 million ha or 47% against the total). The remaining land area is occupied by natural forest (37.0%), bare and marshes (2.3%), open water (1.6%) and built-up area (0.3%).

Agriculture is the dominant sector in Malawi, accounting for about 38 % of GDP and about 81 % of total domestic exports (mostly tobacco). One thing unique in Malawi's economy is that agricultural contribution to the GDP has increased from 33% in 1991 to 38% in 2002 though most countries in the world have been lowering the agriculture contribution to the GDP. Over 85% of the total population engages themselves to agricultural sector, majority of whom are smallholders who reside in rural areas.

Agricultural production comprises of two distinct sub-sectors: the estate sub-sector and the smallholder sub-sector. The estate sub-sector contributes to 70% of the foreign trade and 15% of the total local food production while the smallholder sub-sector contributes to the remaining 30% of the foreign trade and accounts for over 85% of the total food production in Malawi. 1998 census tells that there are about 2.39 million smallholder farmers throughout the country, accounting to about 90 % of the total farm households. The average farm size of the smallholder farmers is about 1.5 ha.

Main crops for local food are cereals (maize, millet, sorghum, rice, etc.), tubers, legumes vegetables (tomato, onion, cabbage, mustard leaf etc.) and fruits. Maize remains the most dominant crop cultivated by the smallholder sub-sector in Malawi. Maize area planted by both the smallholder sub-sector and the estate sub-sector occupies an average of 1.4 million ha that constitutes of over 50% of total cultivated area. Leguminous crops such as

groundnuts and beans that are commonly intercropped with maize occupy second largest planted area of more than 700,000 ha.

As per maize variety, local ones are still prevalent. Though diffusion of improved variety of maize is now in progress, area planted by local maize still occupies 60% of the total planted area. GOM started promoting the diffusion of composite varieties since 1998; Open Pollinated Varieties (OPV), which can be used for three successive seasons without yield decline. Average yield of local, composite and hybrid maize in the past 14 years (89/90-02/03) is estimated at 0.80 t/ha, 1.28 t/ha and 2.17 t/ha respectively.

The dominant traditional cash crops in Malawi are tobacco, tea, sugar, cotton, coffee and macadamia. Tobacco production in the smallholder sub-sector has increased since the liberalization in 1994. The Government has progressively increased the quota of Burley tobacco, the most dominant variety, for registered smallholders. Accordingly, smallholder tobacco production nowadays marks between 60,000 metric tones and as much as 100,000 metric tones, which consists of 50% to over 70 % of the total production.

Livestock accounts for about 7% to GDP in Malawi and 12% to the total agricultural output. In 1997, per-capita-consumption of animal protein was estimated at 2.3 kg per annum, which was far less than the 12.5 kg average in Africa. Current various livestock population is estimated at 604,000 cattle, 1,650,000 goats, 300,000 swine, 100,000 sheep and 10,365,700 poultry based on the latest livestock census in 1998. During the past decade, livestock production was generally on the decrease for various reasons including cattle theft.

THE IRRIGATION SUB-SECTOR IN MALAWI

Irrigation in Malawi is categorized into two; estate sub-sector and smallholder sub-sector. The latter, smallholder sub-sector, is further divided into: 1) government managed irrigation scheme, 2) farmer managed irrigation scheme (self-help), and 3) co-operative managed irrigation scheme. Despite the considerably large potential irrigable area of over 400,000 ha, the area composed of all the categories currently under irrigation in Malawi is limited to only 56,400 ha.

Out of this 61,107 ha area, 48,135 ha (79%) is under the estate sub-sector and only 12,972 ha (21%) is under the smallholder farmer sub-sector. Estate irrigation schemes produces mainly export crops such as sugar cane, tea and coffee, while most of the smallholder farmers produce maize, the staple food of Malawian, and such vegetables as tomatoes, cabbages, onions, potatoes, etc. for their own consumption and for sale.

Recent erratic climatic condition and its effect on crop production have resulted in increased emphasis on irrigation development. In line with the structural adjustment of the national economy, there was a need for irrigation policy to reflect the shift from public sector irrigation development towards private sector driven development. The Ministry of Agriculture (MOA) has thus established National Irrigation Policy and Development Strategy (NIPADS) in June 2000, stating that the government is no longer allowed to stay as the main entity but as a facilitator of the development.

Pursuing the policy and development strategy, the GOM expects to increase the land put under irrigation based on the existing potential as: up to 15% of irrigable land in the next 5 years (until year 2005), and a further 20% in the subsequent 5 years. Also, flood plains and dambos, which are wet areas where crops dependent on residual moisture are very often grown, with irrigation potential are expected to be fully utilized in the next 15 years.

Authority for irrigation development is with the Department of Irrigation (DOI). Throughout a changing, DOI has become a small organization involved in planning, designing, constructing, and in operating and maintaining the government-managed irrigation systems. The underlying principle for DOI operation is that the government will assume the role of a facilitator in irrigation development and that a beneficiary participation approach has to be pursued.

In terms of regional level operation, the DOI has no regional/district office so that the operation of irrigation development is actually done through the line of Agriculture Development Division (ADD) down to Rural Development Project (RDP) and Extension Planning Area (EPA). ADD has an irrigation section, which is usually furnished with two irrigation officers. RDP has also a section in charge of irrigation development having, in most cases, only one assistant irrigation officer. EPA has no extension officer specialized in irrigation but in general agriculture.

CONSTRAINTS, OPPORTUNITIES AND LESSONS

A national level workshop was held on January 9, 2003 after the presentation of the Inception Report. Stakeholders regarding smallholder irrigation schemes were identified first by all the attendants together, and then Detailed Stakeholder Analysis identified the following:

- As per farmers, major beneficiaries, **Strengths** were “willing to work”, “having land”, “socially responsive”, while **Weaknesses** were “illiteracy”, “late adaptors of technology”, “over-dependency on the hoe”, “generally poor”, “mostly works as an individual”, “culturally bound”, “idling during dry season”, and “lack of self transportation”. **Problems** for the farmers were “frequent illness”, “operation not done timely”, “low productivity”, “narrow food base”, “limited access to media”, and “poor eating habits”.

- For the government, **Strengths** raised were “agro-ecological setting”, “strategic location of extension staff”, “structure already in place”, “offices available”, “government commitment”, “prioritization of activities”, and “data available”, while **Weaknesses** were “low staff/farmer ratio”, “bureaucratic procedures”, “poor institutional memory”, “under-provision of financial resources”, “poor generation of resources”, “limited access to data available”, and “poor institutional capacity”. **Problems** for the government were “lack of motivation”, “staff attrition”, “lack of replacement”, “inadequate specialized/ trained personnel”, “lack of mobility”, “inadequate resources”, “dwindling resources for implementing programs”, “poor quality data”, and “unreliable data”.

From January 27 to June 10 of year 2003, total eight workshops for Problem Analysis were held at all the ADDs of Lilongwe, Kasungu, Machinga, Salima, Mzuzu, Karonga, Blantyre and Shire Valley with the attendance of ADD irrigation officers, RDP irrigation officers and

AEDCs in EPAs. The core problem chosen and other issues are:

- The core problem chosen was "High Malnutritional Diseases of Villagers" at Lilongwe ADD, "Farmers' Low Production" at Kasungu ADD, "Low Crop Production of Villagers" at Machinga ADD, "Poverty of Villagers" at Salima ADD, "Farmers are Facing Low Yield" at Mzuzu ADD, "Low Production of All the Products" at Karonga ADD, and "Low Production" at Blantyre ADD and Shire Valley ADD.

- "Low Crop Yield" was observed in all the ADDs. "Declining Soil Fertility", "Low Input", "Low Adoption of Technical Skills", and "Pests and Diseases" are very frequent problems in most of the ADDs. Drought was identified in two ADDs of Mzuzu and Salima. Lack of irrigation facilities were identified in four ADDs of Mzuzu, Lilongwe, Machinga and Shire Valley. Relative to the potential of irrigation development, two ADDs of Karonga and Shire Valley identified inadequate rainfall as problem.

Problem analysis at village levels has also been carried out during the Study. There are several interesting differences between the problems identified at the ADD level and the ones raised at villages. For example, no farmers quoted "Low Adoption of Technical Skill" as their problem at the villages while five out of 8 ADDs mentioned it was problem. Government officers often pointed out the problem of use of unimproved seeds, but the farmers, on the other hand, specified that the problem is the difficulty of getting the improved seeds and fertilizer and also the high prices of those inputs. Lack of irrigation facilities was identified in four ADDs (Muzuzu, Lilongwe, Machinga and Hire Valley), but not in the villages, implying villagers' felt-difficulty may be more with agricultural input than irrigation.

Development constraints that the Team identified based on literary review, field observations, and interviews to the concerned government officers and farmers are: High Cost of Agricultural Input, Limited Number of Irrigation Officers, Limited Govenemnt Operation Budget, Limited Transportation for the Govenement Officers, Poor Communicaiton between RDP and EPA, and within EPA, Overdependency on Rainfed Agriculture, Would-be Side Effect of Targeted Input Program (TIP), etc.

Development opprtunities, on the other hand, that the Team identified are: Established Government Structure in Place composed of ADD, RDP down to EPAs, Cohesive Rural Society and Norm still in Place, Appropriate Agriculture Technology already in Place, Extensive Existence of Rural Financial Institution (Marawi Rural Financial Compalny Ltd.), Nationwide Agriculture Radio Program Available from Sunday to Friday, Trained Staff Available in Irrigation and Participatry Development, Existence of Association of Smallholder Seed Multiplication Action Group (ASMAG) producing OPV maize seed, etc.

Similar projects to date carried out give us such lessons of: making the land tenure clear before the commencement of the irrigation development or getting the endocement for the land use from local authorities, development should always be with the farmers' pace, consistency in project/program opeartion should always be in place, informed consent with enough lead-time should be established before the commencement, and over-reliance on the Government own funding might fall in a shortfall, implying farmers' self effort to the largest extent. Idea of "pursuing farmer's self-effort to the largest extent rather than expecting

government intervention in terms of physical investment" should be the key for this Study. For example, designing of irrigation system envisaged in this Study shall be done in such way of not engaging any heavy equipment nor engaging local contractor in the construction.

IRRIGATION POTENTIALS IN MALAWI

Malawi is divided into five landform areas such as: 1) the plains, 2) the hill areas, 3) the plateaus, 4) the rift valley scarp, and 5) the rift valley floor. Of the 5 landform areas, irrigation potential areas can be more found in those areas of the plains, the hill areas, and the rift valley floor. The plateaus are endowed with much rainfall, but due to the steepness of the slopes and high altitude, less potential in terms of irrigation development is found. The three landform areas, which have relatively high irrigation potential, are summarized as below:

- Plains are large areas of flat or gently sloping land. The valleys on the plains are wide, and this landform often has dambos. The largest plain covers most of Lilongwe and Kasungu ADDs, and has an altitude of about 1,200 m. This is very rich in agriculture development, and many agriculture related projects have so far been implemented.

- Hill areas rise above the plains to higher altitudes. Most of them are characterized with steep slopes, so that irrigation potential area can mostly be found at almost foot or outskirt areas of those. Along the slopes of hills, also found are stream diversion type irrigation potential.

- Part of the rift valley is filled by Lake Malawi. Along the shore of the lake there are narrow plains. These have been made of soils carried down by the rivers. The lakeshore areas are at altitude of 470 – 550 m. The Sire River flows through the southern part of the rift valley floor. The rift valley floor is another rich farming area but prone to floods and gravity diversion to farmlands is found difficult in most cases.

Rainfall is a prime source drained into rivers/streams that could be developed for irrigation. Plenty of annual rainfall in Malawi is found at Nkhata Bay area, northern tip of Karonga ADD, and high mountain areas. Near Nkhata Bay, winds from south-east are moved up over high ground, producing plenty rain with an annual total of over 1,500 mm. The plateaus and the hill areas are rich in rainfall usually over 1,000 mm. Over most of the plains, the annual rainfall is between 750 and 1,000 mm. The Shire Valley is in a rain shadow area, and it has about 650 mm annual rainfall only.

National Water Resources Master Plan (NWRMP), published in 1986, evaluated water resources in whole Malawi. The NWRMP divided the country into 17 water resources areas according to the main river basin such as Dwangwa, Bua, Shire, etc., and summarized the relationship between catchment area, rainfall and runoff. The overall runoff is shown below, and the runoff ratio as percentage against rainfall is 19% which is relatively high as compared to other part of African countries.

- Total land area: 94.276 sqkm
- Mean annual rainfall (mm): 1,037 mm

- Total runoff (mm): 196 mm
- Total runoff (cum/s): 588 cum/s
- Annual runoff volume: 19 BCM
- Runoff ratio: 19 %

With the same 17 water resources areas over the country, Small Scale Irrigation Development Study funded by ADB estimated dependable flows in the Phase 1 report published in December 2001. The assessment showed that flow available for nation wide irrigation was 207.3 cum/s with a reliability of 10-day 75% exceedence. Given a rough irrigation duty of 1 l/s/ha, it is now estimated that maximum nationwide potential irrigable area could be about 210,000 ha. The study further estimated irrigation water availability by district, showing high dependable irrigation flows in such districts as Nsanje, Chikawawa, Nkhata Bay, Karonga, etc.

During the first and second field surveys of this JICA Study, an inventory survey for the self-help smallholder irrigation scheme was conducted at all the eight ADDs. According to the inventory survey, total 883 potential sites were identified for the eight ADDs, among which 230 sites were existing schemes and 653 were proposed (new) schemes. The total potential area amounts to 11,260 ha as summarized in the table below, however this does not necessary mean that all the potential areas could be irrigated because the areas were identified from the viewpoint of topographic condition but not based on dependable flow. These sites can be considered as potential areas for the self-help smallholder irrigation schemes in the eight ADD, but actual irrigable areas according to the available flows may be much smaller according to the experiences from the verification project carried out under this Study.

Number of Inventory Survey Sites and Potential Area

ADD	Existing Scheme		New Scheme		Total	
	No of sites	Area (ha)	No of Sites	Area (ha)	No of Sites	Area (ha)
Karonga ADD	16	230	36	360	52	590
Mzuzu ADD	22	270	144	1,660	166	1,930
Kasungu ADD	64	900	87	1,210	151	2,110
Salima ADD	6	650	37	290	43	940
Lilongwe ADD	59	800	133	1,320	192	2,120
Machinga ADD	21	400	125	1,790	146	2,190
Blantyre ADD	34	170	50	320	84	490
Shire Valley ADD	8	170	41	720	49	890
Total	**230**	**3,590**	**653**	**7,670**	**883**	**11,260**

SMALLHOLDER IRRIGATION DEVELOPMENT PACKAGE

As one of the objectives of this Study is to establish a package of methodologies for self-help smallholder irrigation development, this Study aims at producing a comprehensive guideline with several dissemination materials which themselves together consist of the package. The package is now composed of: 1) a comprehensive guideline, 2) technical manual, 3) leaflets, 4) posters, and 5) picture stories, which are cascaded with reference to the existing MOA's organizational structure. The MOA is stratified at ADD, RDP and then EPA in order to well disseminate agriculture related extensions, thereby the package has also been stratified.

The comprehensive guideline is mainly for DOI irrigation officers, ADD irrigation officers and RDP irrigation officers, technical manual mainly for RDP irrigation officers and the frontline extension officers called AEDOs, and leaflets chiefly for the AEDOs and farmers. Posters shall be posted in relevant government offices such as EPA, RDP, ADD and local government offices in order to widely disseminate the smallholder irrigation development in a campaign style. Picture stories can be used during kick-off workshop which invites potential farmers, aiming at getting the farmers interested in embarking on the irrigation development.

THE VERIFICATION PROJECT: Operation Principles

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.

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 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. It is therefore pointed out that to bring the irrigation system into being in the farmers' locality, locally available materials should be utilized as much as possible. The Study Team on the other hand provides technical advices, essential tools required for the construction and study tours.

Smallholder irrigation development undertaken by the Study small in scale but to be 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 is the structure; namely, 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. It is therefore hinted that if those frontline officers are well equipped with smallholder irrigation technology and involved in the dissemination, the potential farmers no longer need to wait for someone outsider to come.

THE VERIFICATION PROJECT: 1st Generation 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. In summary of 2003 dry season, total membership for all the 23 sites was 642 (477M and 165F), of whom actual land owners were 145 (113M and 32F). The total area irrigated in the dry season was 36.5ha. Average area irrigated per site was 1.59 ha, and the average area

allocated to a farmer therefore arrived at 0.06 ha (equivalent to 20x30m). As per main canal, a total of 15 km length has been excavated, giving an average of 652 m per site.

The first generation project sites have experienced two dry seasons of 2003 and 2004. What was achieved in 2003 dry season seems to have encouraged the farmers of the sites 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. Total membership for all the 23 sites became down to 521 (339M and 182F). 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. Total length of canals and area developed in 2004 were 12km and 30.7ha respectively.

A series of evaluation workshops were carried in the 1st generation project sites. Number one problem pointed out at mid-term evaluation workshops was local condition like hardness of soil, steepness of land, and little availability of local materials such as clay soil and trees. The second one was lack of 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 wrap-up evaluations, the discussion was rather concentrated on three specific issues; input especially fertilizer, shortage of water, and damage caused by pests and animals.

THE VERIFICATION PROJECT: 2nd Generation Project

To institutionalize the smallholder irrigation development, verification project in year 2004 centered on the dissemination. 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 the 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 have 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 1st year's verification. One thing noteworthy is that 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. Total number of sites developed is 264, of which 61 sites (23%) are rehabilitation and 203 sites (77%) are newly developed ones. The 264 sites altogether has developed a total area of 321 ha, giving an average of 1.22 ha per site. Farmers organized are 5,376 in total, and the total canal length excavated is 143km. As an average, one site accommodates 20 farmer members in the 1.22 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 0.028ha, 0.066ha, 0.066ha, and 0.092ha for Lilongwe E., Dedza Hills, Dowa and Ntchisi respectively.

Given the 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, not all the area could not 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 enough stream flow, it is expected that they start smallholder irrigation on their own and can have harvest.

THE VERIFICATION ON PROJECT: Evaluation

As aforementioned, 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 in 2004 was the dissemination of the established technology through AEDO trainings. Total 23 sites were developed during the first stage and 264 more sites were developed during the second stage, totaling to 287 sites. As of November 2004, total number of farmer beneficiaries for the both 1st and 2nd 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. This scale may look very small but from the viewpoint of many farmers it is not.

Smallholder Irrigation Developed by the Verification Project in 2003-2004

RDP		Lilongwe E.	Dedza Hills	Dowa	Ntchisi	Total
1st 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
2nd 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

At such aspects of evaluation as relevance, effectiveness, efficiency, impact as well as sustainability, the verification project has marked very high performance. Smallholder irrigation development tried under the verification project is very in line with the national goal of poverty alleviation and has met farmers' needs, ensuring relevancy. Food security of smallholder farmers was met by producing dry season maize as well as by increasing rain-fed agriculture production, thus high effectiveness was confirmed. Facilities were constructed by using locally available materials, which automatically ensured efficiency. Many positive impacts appeared in terms of income generating opportunity, getting the poorest out of vicious circle, etc., but land issue may be a negative impact. Sustainability was also confirmed from the experience over 2 years implementation. Topical impacts are summarized below.

Those who are categorized as poorer farmers in the 1st generation project sites had produced an average of about 450kg of maize only from 2002/03 rain fed agriculture that was before irrigation came in. They harvested an average of 125kg of maize out of an area of 0.0375 ha with irrigation in 2003. Though the additional 125kg still could not complement the necessary food for a family year-around, it at least reduced buying maize to survive, thereby allocating the saved money to buy fertilizer for the next rain fed agriculture which is the 2003/04 rainy season. With almost doubled fertilizer, they increased the fain-fed harvest from the 450kg in 2002/03 to 625kg in 2003/04. They can now sustain their family with the 125kg out of irrigation and the increased rain fed harvest of 625kg. Thus, impact of smallholder irrigation not only stands in the dry season supplementing the staple food but also is carried over to the following rainy season agriculture by enabling the farmers to buy more fertilizer for the following rainy season.

Those who may be the poorest cannot in most cases produce such food which can last at least until the beginning of next 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. 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. 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 continue their own rain-fed agriculture. Therefore, there is a possibility for the poorest to get out of the vicious circle with smallholder irrigation.

Smallholder irrigation provides good working opportunity in dry season. Almost all the interviewees have expressed that gravity irrigation is far much better (easier) than such income generation as charcoal making and firewood fetching which are the main cash source during dry season. All the members who do irrigation now are at least reducing the activity of charcoal making and firewood fetching, and about half of them have almost stopped, rather concentrating on irrigation. Most of the irrigation members have shifted their income source of dry season more to irrigated farming from those non-farm jobs. Interviews to 34 irrigation members suggests, by pair ranking, that the smallholder irrigation is very good working opportunity during dry season from the viewpoint of earning cash.

There is a great possibility that those farmers once after experiencing irrigation seem not to

give up even if they lose a part or even whole crop due to water shortage. 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. Similar situation took place at Zakumba site 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. 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, thus smallholder irrigation will continue over failures.

AEDOs/AEDCs who have been working in the 1st generation project sites since 2003 evaluated the verification project at the mid of year 2004. The evaluation was made by 10 aspects each in a range of 1 – 5 with 3 being no-change as compared to before-irrigation. Providing of work opportunity marked the highest point of 4.8, which is very corresponding to the voices from the farmers interviewed. Next to the work opportunity, aspects that marked higher score are food security, technical adaptability, technical capability 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.

Equity is a critical issue, which often turns to be negative impact, 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. Equity amongst the concerned villagers and individual interest are somewhat bipolarized issue for which local leaders should play a distinguished role to settle. However like Dedza Hills area where local leadership is sluggish, the local authoritative power 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 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 can also contribute to improving the situation.

IMPLEMENTATION ARRANGEMENT: Organizational Setting-up

Aside from the DOI, there are 8 ADDs, 30 RDPs (restructuring is underway), and 186 EPAs nationwide in the Country. This extensive government structure is really a good "opportunity" in extending smallholder irrigation development over the Country. This Study therefore maintains such organizational arrangement that centers on the existing organizational structure with EPAs being the frontline facilitating the farmers. Local development committee such as District Development Committee and Area Development Committee should also be involved since they can be a good catalyst. As DOI is not equipped with enough professional staff, there should be a Program Management Unit to be in charge of managing the smallholder irrigation program. Their roles and responsibilities are as follows:

Program Management Unit: Conducting of smallholder irrigation trainings for AEDOs/ AEDCc, irrigation officers in RDPs and ADDs, monitoring and

	evaluation of smallholder irrigation development, developing of appropriate technologies and forwarding to DOI, and coordinating relevant offices,
DOI (central level):	Monitoring and evaluation of smallholder irrigation development at national level, banking of appropriate irrigation technologies/experiences and these dissemination, and facilitating the exchange of the technologies among ADDs,
ADD level:	Technical advices to the RDP irrigation officers, monitoring and evaluation at ADD level, and facilitating the exchange of smallholder irrigation experiences among RDPs,
RDP level:	Technical advices to the EPA officers, monitoring and evaluation at RDP level, facilitating the exchange of smallholder irrigation experiences among EPAs, and facilitating farmer-to-farmer-visit over an EPA, and
EPA level:	Identification of potential areas for smallholder irrigation schemes, facilitation of the farmers including identification of the potential beneficiaries, arrangement of farmer-to-farmer visit in the EPA, organizing them into group/club, facilitation of the construction work, follow-up of operation and maintenance, etc.

IMPLEMENTATION ARRANGEMENT: Schedule

This smallholder irrigation development program should cover the whole Country. Available time for administering necessary trainings at the beginning of dry season may be about one month only. Developing smallholder irrigation project in a participatory way needs enough lead-time with the concerned farmers. Enough time should be allocated to develop the projects on the ground. Therefore it is recommended that trainings should be completed within one month which could accommodate three batches of one-week AEDO trainings plus TOT which should also work as management meeting.

The 2nd year of verification project undertook 26 EPAs which together consisted of 14% of whole EPAs. To train the AEDOs from the 26 EPAs took about 3 weeks; 1 week x 2 batches of AEDO trainings plus one week TOT. Having one month for the trainings and the experience which covered 14% of whole EPAs during the verification, the smallholder irrigation development program should be given 5-year time to cover the whole Country. The program should start at Lilongwe area, proceeding to northward which has higher potential for irrigation and then southward.

IMPLEMENTATION ARRANGEMENT: Requirements

Major requirements necessary for implementing smallholder irrigation program at high performance level are to be: 1) Program Management Unit composed of such four experts of Program Management cum Human Resource Development, Irrigation Development, Agriculture Development, and Project Monitoring cum Logistics, 2) Trainings to the AEDOs/

AEDCs necessary for promoting smallholder irrigation, 3) Provision of tools such as wheel barrow, picks, shovels, bicycles, etc., 4) Study Tour which works as learning venue not only for the farmers but also for the government officers, 5) Production of Dissemination Materials, and 6) Project Monitoring.

The program management unit should have 2 x 4WD for their own mobility, 4 x mini-bus for study tour, office equipment, training equipment, etc. These equipment which total estimated cost is about MK24,450,000 should be procured at the beginning of 1st year. Necessary cost for running the program per year ranges from MK23,000,000 to MK28,000,000, of which MK4,000,000 to MK4,900,000 is for the trainings and MK7,800,000 to MK9,700,000 is for the tools. Estimated grand total for the 5-year implementation inclusive of the 1st year procurement is about MK147,000,000 (excluding experts' remuneration for the program management unit).

As against above high performance implementation, an alternative implementation arrangement should also be considered as minimum cost implementation. Program Management Unit should be maintained with minimum person-month schedule. There will be no program for trainings. No study tours by using mini-bus and no tools will be provided to EPAs either. Study tour will be substituted by on-foot field day. The farmers should arrange construction tools such as hoe and panga. Expecting the potential of the extension officers and farmers in the country, this minimum cost dissemination program centers on publicity activities: provision of leaflet and posters and broadcasting radio program. In summary, the total project cost is estimated at around MK8.8 million or US$80,000.

IMPLEMENTATION DISCIPLINES

The 2-year verification project has produced a lot of lessons that have to be feed-forwarded to the future implementation of the smallholder irrigation development. The lessons were learnt from the actual implementation of the verification project, observation on the field, interviews to the farmers, discussions during workshops, etc., which are defined as implementation disciplines. Being humble for over generalization, it is pointed out that experiences in the verification projects are hereunder summarized corresponding to the general description of the ideas:

1) Irrigation facilities for smallholder farmers can be well constructed by using locally available materials only as were tried through the verification project. Facilities made of locally available materials can also be disseminated from farmer to farmer easily, whereby many farmers can be benefited from such irrigation rather than being waited until someone like outside donor comes. Though foreign materials such as chemical fibered bags are very effective, there is a risk of being stolen and such foreign materials can easily be substituted. Therefore smallholder irrigation should be tried in the farmers' locality by utilizing locally available materials as much as possible. Locally available materials are wooden log, twig, bamboo, reed, clay soil, grasses, etc.

2) One of the constraints of why smallholder irrigation has not much been constructed so far is the difficulty of aligning canal according to the contour of the topography. This Study has devised a simple mean of setting up the canal level by using "line level", which costs

only about US$ 3. Using line level in aligning canal that should have a constant longitudinal gradient is a bit different from conventional way of usage, but still very simple. Interval of the two poles for the line level should preferably be 5 meter, and one side of the tied points should be 0.5 – 1 cm higher than the other (this differs from conventional usage of the line level). Pole with higher tied point should always be placed foreside, not like conventional alternate placing. 0.5 cm difference in 5 meter gives 1:1000 gradient suitable for gentle topography like dambo area, and 1 cm difference gives 1:500 gradient adaptable for sloped topography.

3) Developing smallholder irrigation sites exclusively depends on the natural resource that is water. Though farmers may inform the reduction of flow towards end of the dry season to about half or about one third, there is a tendency for them to always underestimate the retarding ratio, which inevitably causes abandonment of part of irrigated area. This may be caused by too much expectation of the development and in cases there might be an expectation of free input such as seed and fertilizer to come with the irrigation development. Therefore, at first year the development should not be ambitious or rather start with relatively small area; say assuming the flow to reduce to less than one fifth or even to one tenth. In any case, the development in the first year should not be more than half of the potential area.

4) There may be a series of potential sites located nearby along a stream. Sometime after farmers have started irrigation development at a specific site, upstream farmers in the same stream may start irrigation development by seeing their peer's development. This may cause water deficit for the downstream site, creating water dispute among the concerned. Village headman or group VH being involved, they may agree rotational allocation of the water between the sites. However, water flow itself is limited in most of the smallholder irrigation potential sites. An arrangement therefore should be taken into account in case that there are several potential sites located nearby along a stream. The development in this case should always be tried from the upper most reach and then proceed to downstream according to the water availability.

5) Peak water requirement for a crop increases as the planting season becomes late because of temperature increase toward end of dry (winter) season. Stream discharge becomes less and less toward the end of dry season, and marks the lowest in October or early November in most cases. Therefore, late plating faces two difficulties of: 1) more peak water requirement, 2) while less water available in the stream. This case took place in many verification project sites in 2003 and 2004. Taking these facts into account, it is strongly recommended: 1) to start planting as early as possible from the viewpoint of water availability in the stream, 2) do not develop full potential area at the first year; say, limit the development area to less than half of the potential, because no one is sure of how much stream water becomes finally less, and 3) do not depend on the report of stream flow from the farmers since they might exaggerate the stream flow expecting handouts to be brought by project.

6) Facilitating farmers onto the irrigation development should always be planned under minimum level of budgetary allocation. Smallholder irrigation scheme should therefore be implemented with several neighboring potential sites as a cluster. Under the cluster

development, farmers for a site can visit the others even on foot, and vice versa, creating an opportunity of learning from fellow farmers and getting motivated each other. Cluster development will also diminish wait-and-see attitude which is often seen whenever new movement is about to start. Potential irrigator farmers being influenced each other, the cluster development could prime up a momentum of smallholder irrigation development covering a certain area. Therefore whenever starting smallholder irrigation development in an area, potential sites in the area should be all identified and clustered in a group(s), and then the development should start.

7) Study tour proposed in this Study can be categorized into three patterns: 1) within the cluster, 2) beyond the cluster and 3) the ones especially for the local leaders. Since transportation cost is relatively big, study tour should firstly be arranged within the cluster. Though the effectiveness of such study tour is obvious, visitors' expectation sometimes cannot be met since they are usually very eager to see advanced form of development. In this case, study tour beyond the cluster may have to be arranged. Several AEDCs and AEDOs pointed out that local leaders such as TAs, GVHs and Councilors should be given the study tour since they are expected to become the proponents of smallholder irrigation development. These local leaders, taking an opportunity of attending local development committee meetings, can emphasize how smallholder irrigation benefits the people whereby becoming a good catalysis to disseminate especially beyond cluster.

8) As to building an organization, the official registration or officers' setting-up is often made in advance to starting the activities; or start the activities right after the selection of the potential (temporal) leaders in the initial process of the establishing of the organization. This Study proposes the latter approach, for which middle to latter half of the whole process of building the organization will proceed parallel to the implementation of the project. In this case, the potential leaders are given roles of mobilizing the fellow villagers for labor work and arranging the local materials such as wooden poles, twigs, grasses, clay soils, etc., with strong leadership for organizing the members through the whole process. As for the potential leader, so to speak, it is as if taking examinations for becoming a leader in real meaning through the on-the-job-training.

9) Democratic-Centralism is the principle concept wherein utility of democracy and centralism or of freedom and discipline is the basis or guide of the leaders as well as the members of the club in the discharge of their functions and in the accomplishments of assigned tasks. The system of democratic centralism is a distinct feature of irrigation club in its operation. Simply saying, any decisions must be decided democratically by the general assembly composed of all the membership but once the decision is made the decision must be implemented in a centralized way under the supervision of the Management Committee. This mechanism ensures the irrigation club complete or total orientation with the fellow farmers' participation of regulation making process and in carrying out O&M tasks.

CONCLUSION

This Study, taking the points below into account, concludes that the smallholder irrigation development approach, tried out through the Verification Project and fed-back in the Package of dissemination, can be at the core amongst remedial measures in improving food shortage prevalent in the rural areas and thereby reducing poverty the people are facing. The Government of Malawi should therefore embark, at her own cost or together with an assistance from donor country(ies), on implementing and disseminating the smallholder irrigation development program over the Country wherever irrigation potential exists as presented in this Report.

1) The smallholder irrigation development tried out throughout the verification project contributed to improving food security and generating cash income of villagers as well as building capacity of villagers and extension officers for developing irrigation. Positive impacts, for example, were observed in a way that farmers got capital out of the irrigation to invest in fertilizers to increase the production of the following rain fed crop, farmers got a better option, namely dry season crop, than non-farm jobs like firewood sales, and women also got an income source by irrigation.

2) A principle concept of this Study was not to pour external inputs to make the output look nice but to start with whatever farmers can do in their locality so that the activities can be built in a part of their everyday lives, i.e., a culture, which will be transmitted from generation to generation. This approach has been found to help develop smallholder irrigation in Malawi without much requiring outside physical assistance. The Study evidenced that the farmers in the verification project sites have well adopted the appropriate irrigation technology and have been somewhat putting it in their social context; that is culture.

3) One of the strengths that the GOM has is its extension structure already in place; ADD, RDP and EPA covering whole Country. Proceeding hand in hand with the government existing structure was another principle concept especially in disseminating smallholder irrigation development to wider spectrum. Putting the frontline officers, AEDOs, in the forefront of the development assisted by relevant supervisory offices was proved well workable to pursue wide range of dissemination of smallholder irrigation development even under budgetary constraint that the GOM is facing.

RECOMMENDATIONS

There have been a number of issues/ problems that the Study Team encountered during the Study. Through Verification Project which was a part of this Study, a number of solutions or recommendations and methodologies were arrived at. Below are some of these recommendations, which have come out after undertaking this comprehensive study. As is the case with continuous processes, the recommendations made below are by no means exhaustive and may need to be changed or modified, depending on insitu condition. However, it is believed the ones covered here nevertheless constitute a broader spectrum capable of fitting in most conditions:

1) The Study showed that in order for the farmers to fully grasp and appreciate irrigation thereby making irrigation to be a part of their culture, the facilities should be those that are constructed, operated and maintained by the farmers themselves; that is namely, no government intervention in physical sense but the Government should have a role as technical advisor. It is therefore recommended that for irrigation to take root local materials for constructing irrigation facilities should be used as much as possible. One thing recommended for construction of diversion weir is that the height of the weir should not go over our neck in order to prevent the weir from corruption pushed by water pressure. Irrigation facilities made of locally available materials are to be dismantled every time harvesting has finished and major materials such as big tree logs should be set aside for next season's usage.

2) An important issue, which was observed during the implementation of the Verification Project, is the ease of adoption by farmers by just copying after seeing what other farmers were doing. This in short can be called farmer-to-farmer extension. In certain instances, the mode of transmission may not necessarily require training of farmers but rather bringing farmers from other undeveloped area to developed area and let the farmers speak to each other. Experience has shown that farmers easily understand what their fellow farmers are saying and it is easy for them to copy. In fact from our experience, it has shown that farmers who adopt on their own have more potential in consistently sustaining and further developing their irrigation agriculture. In this regard, it is highly recommend that study tours, which provide a venue of learning from peer farmers and also each other, should be arranged on the on-set of the smallholder irrigation development. Women should be given at least equal opportunity for this tour.

3) Irrigation obviously cannot serve all the villagers simply because irrigation cannot serve all the land but only limited areas according to the topography. Also the amount of water available for irrigation in most of the potential sites is limited, so that only less than one tenth of the whole villagers may have land within the potential service area in many cases. This situation may cause other farmers' jealousy to the landowners and create social equity problem amongst concerned villagers. It is therefore recommended to divide the potential service area into small plots and lend out to the have-nots who are the farmers not having any land in the service area, either free or with a minimal rental fee. This measure was observed in many sites of the Verification Project, and contributed to equity amongst the villagers.

4) Another important point worth to be mentioned is also the land issue. Some landowners have refused to lend their lands to other people. While water is a public good, it goes to land that is a private good, causing equity issue amongst concerned villagers. Equity amongst the concerned villagers and individual interest are somewhat bipolarized issue. To amicably settle the land issue, 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. Local leaders should also play a distinguished role to settle. Transparency since the onset of the development should be imparted and in this regard the local leadership in terms of equity is also challenged. Taking stranded farmers by study tour inclusive of the landowners and the

local leaders to well organized area can strongly influence to solve the situation.

5) Irrigation, in most cases, if not all, over-exploits the land by intensively using the same land twice during a single year. This in true sense means that in the near short-time, the land will be greatly affected, both physically and chemically, and in the end will not be able to produce anything. This problem is further exacerbated by the farmers' tendency of applying chemical fertilizer only. Though chemical fertilizer is highly effective, it has a disadvantage of disregarding the need to improve soil physical properties. Therefore, it is highly recommended to encourage farmers to apply more compost manure. Compost manure is good in that it improves soil physical properties which consequently improves the holding capacity of the soil for chemical fertilizer. It means that compost manure is good not only as nutrients but also for improving the physical characteristics of soil so that chemical fertilizer can be well retained in the soil ready to be fully consumed by the plants. In addition, irrigation canal avails of water by nature, which is a prerequisite of making compost manure. Irrigation canal can therefore promote compost making alongside the canal, which automatically solves the problem of transporting the compost manure. Compost should be promoted in these ways.

6) As an opetion of low input agriculture, this Study has tried some botanical pesticides. *Tephrosia vogelii (Katupe) and Sesbania sesban* (Jerejere tree) are well known to control plant pest including popular maize stalk borer. 2 kg of the fresh leaves crashed is soaked in 5-liter water for 12 hours, and then the filtrated extract is sprayed to crops. This is effective to control stem bores, aphids, leaf eaters and fleas. The leaves contain rotenone, tephrosin and deguelin, which work as botanical insecticide. The half-life of these elements dissolved in 20 degree water is usually less than 1-day, and it is decomposed easily under sunshine (ultraviolet ray). However, it is recommended that vegetables applied with the botanical pesticides should be well washed before being eaten, and also irrigation water which contains such natural pesticides should not directory go back to the stream. Also, at stake is "prevention is more important than cure". Farmers usually do not apply agri-chemicals/ natural pesticides until they find certain damage by pest, and in such cases the crops will have difficulty to fully recover due to the late application of pesticides.

7) Generally in Malawi, most potential sites are located in hilly areas which are crisscrossed by rivers and streams. But unfortunately, if there are no proper soil conservation measures, land degradation will undoubtedly occur or even be accelerated which will ultimately make it unfit for cultivation in subsequent years or again, the land owners in irrigation service area will decide not to rent the land to other fellow farmers. Thus extension of smallholder irrigation should go hand in hand with land conservation measures. This may include creating a distance from the rivers to the edge of the field which should always remain under fallow, simple storm drains, vetiver grass planting along the main canal as well as along lower peripheral of service area, contour ridge and hedge, etc. Also, stone pitching as well as simple dissipater, for example made of mere sticks, along highly sloped canal should be introduced in order to prevent the canal from being eroded.

8) Catchments area at which irrigation water is generated should also be well taken care of.

This may include long-term practices that will incorporate tree planting measures like agro-forestry and short-term practices like using improved cooking stove which saves firewood. During this Study, in certain areas which have their catchments almost destroyed like some parts of Lilongwe, the Study Team introduced an improved cooking stove. This stove showed that it could save firewood by half and in some cases even three quarters, thus ensuring less trees being cut from the catchments area. The promotion of the cooking stove should go hand in hand with smallholder irrigation development, and of course the conservation can be augmented by tree planting in catchment areas. Tree nursery can be well promoted just alongside canal which can provides water in dry season.

9) There seems a tendency in conventional way of developing irrigation, which is to somewhat personalize the irrigation sites. This should be discouraged at all cost, as the farmers tend to think of the sites as belonging to a particular donor and not theirs. When this point is reached, transmission of irrigation as culture, where irrigation culture can be defined as the "continuation of transmission of irrigation practice from one generation to another generation" cannot take place. Thus, there is a need for all stakeholders in smallholder irrigation sector to come together and formulate a common modus operandi for the successful replication of smallholder irrigation development all over Malawi. Furthermore, it will reduce disunity among members whose sites are close each other but with different donors as facilitators which apply different methods of developing smallholder irrigation.

10) Participants to a wrap up workshop held on December 10, 2004 commented the approach of not providing any free seed and fertilizer pursued under this Study as: "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.", "The approach has instilled a spirit of self-reliance than ever before what farmers depended on handouts.", and so on so forth. The approach of not providing any free seed and fertilizer may have been very unique for the frontline officers. The Team has been thinking that those who can access the irrigation water which is really a precious natural resource can still be categorized as better-off farmers. Yet, does it make any sense of equity to give free goods to those better-off? Though the principle concept the Team has had in mind may be unique as compared to conventional approaches, this Study at least showed Malawian farmers can move ahead even without free handouts, suggesting self-reliant oriented approach which may look harsh for the farmers may have a value to try.

COMPOSITION OF REPORTS

MAIN REPORT

APPENDIXES

PACKAGE

- Comprehensive Guideline
- Technical Manual
- Posters (5 sheets of A-2 size)
- Leaflets (English and Chichewa versions)
- Picture Stories

CONTENTS

THE PACKAGE: DISSEMINATION MATERIALS (see other volumes):

1. **Comprehensive Guideline**
2. **Technical Manual (Process Description Method)**
3. **Posters (Chichewa version, already submitted in August 2004)**
4. **Leaflets (English and Chichewa versions, already submitted in August 2004)**
5. **Picture Stories (prepared by AEDOs during AEDO training, and kept by them)**

Note: above 1&2 are submitted together with this Main Report.

ACRONYMS AND ABBREVIATIONS

ADB	African Development Bank
ADC	Area Development Committee
ADD	Agricultural Development Division
ADMARC	Agricultural Development Marketing Corporate
AEDC	Agriculture Extension Development Coordinator
AEDO	Agriculture Extension Development Officer
AIO	Assistant Irrigation Officer
ALDSAP	Agriculture and Livestock Development Strategy and Action Plan
DADO	District Agriculture Development Officer
DDC	District Development Committee
DIFT	District Irrigation Task Force
DIO	Divisional Irrigation Officer
DOI	Department of Irrigation
EIRR	Economic Internal Rate of Return
EMA	Environment Management Act
EPA	Extension Planning Area (frontline extension office)
FAO	Food and Agricultural Organization
GOM	Government of Malawi
GVH	Group Village Headman
IFAD	International Fund for Agriculture Development
IFIC	Institute for International Cooperation (under JICA)
IO	Irrigation Officer
IPM	Integrated Pest Management
ISF	Irrigation Service Fee
IWMI	International Water Management Institutes (former IIMI)
JICA	Japan International Cooperation Agency
MASIP	Malawi Agriculture and Investment Program
MOFFEA	Ministry of Forestry, Fisheries and Environmental Affairs
MOA	Ministry of Agriculture
MOWD	Ministry of Water Development
MOLV	Ministry of Lands and Valuation
NEC	National Economic Council
NGO	Non-Government Organization
NIB	National Irrigation Board
NIPADS	National Irrigation Policy and Development Strategy
NRC	Natural Resource College
NSO	National Statistics Office
ORT	Other Recurrent Transaction (government recurrent budget)
O&M	Operation and Maintenance
PCM	Project Cycle Management
PRA	Participatory Rural Appraisal
RDP	Rural Development Project (now restructured to district office)
SHIP	Smallholder Irrigation Project
TA	Traditional Authority
TOT	Training of Trainers

UNDP	United Nations Development Project
USAID	United States Agency for International Development
VH	Village Headman
WFP	World Food Program
WRB	Water Resources Board

CURRENCY EQUIVALENTS (as at December 10, 2004)

1 US$ = 110.00 Malawi Kwach (TTB)
1 US$ = 101.50 Japanese Yen (TTB)
1 MK = 0.0091 US$
1 MK = 0.9227 Japanese Yen
1 JY = 1.0837 MK

MALAWIAN FISCAL YEAR

July 1 to June 30

UNIT CONVERSIONS

1 meter (m) = 3.28 feet
1 kilometer (km) = 0.62 miles
1 hectare (ha) = 2.47 acres
1 acre = 0.405 ha

1 cubic meter per second (m^3/s) = 35.31 cubic feet per second
1 cubic foot per second (cusec) = 28.3 liters per second (l/s)
1 cubic meter per hour (m^3/h) = 0.28 liters per second (l/s)
1 kilowatt (kw) = 1.34 horsepower (hp)
= 1 kilovoltamp (KVA)

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CHAPTER 1

INTRODUCTION AND PURPOSE

CHAPTER 1 INTRODUCTION AND PURPOSE

This Final Report is presented in accordance with the Scope of Work (S/W) and the Minutes of Meetings (M/M) for the Study on the Capacity Building and Development for Smallholder Irrigation Schemes in the Republic of Malawi (the Study) agreed upon between the Ministry of Agriculture of Malawi (MOA) and the Japan International Cooperation Agency (JICA) on November 5, 2001. This Report describes the findings made during a series of field surveys, development framework and strategy, verification projects, a package of methodologies to be used for promoting smallholder irrigation nation-widely, implementation arrangement, and conclusion and recommendations.

1.1 Rationale

Agricultural production in Malawi comprises two distinct sub-sectors: the estate sub-sector and the smallholder sub-sector. The estate sub-sector consists of 70% of the foreign trade and 15% of the total local food production while the smallholder sub-sector contributes to the remaining 30% of the foreign trade and accounts for over 85% of the total food production in Malawi[1]. 1998 census tells that there are about 2.39 million smallholder farmers throughout the country, accounting for 90 % of the total farm households.

Poor smallholder farmers are heavily affected by such natural vagaries as heavy rainfall and drought. As a result of the population growth, the farmland has been divided into small areas and has expanded to low-fertile areas, so that about three quarters of the farmers are now categorized as subsistence farmers owning only less than one hector farmland. The agricultural infrastructure in farms owned by the subsistence farmers and other supporting projects/programs for smallholder farmers have not been sufficiently implemented.

The area currently under irrigation is limited to 57,040 ha, despite the potential of as much as 400,000 ha, of which only 16% (8,904 ha) is under smallholder farmers[2]. In irrigation development of Malawi, the major limiting factors may be lack of the funds and shortage of human resources. Consequently, implementing the smallholder irrigation development due requires the collaboration from the farmers, and the farmers' participation in this regard is the key factor in coping not only with the lack of the government funding but also with shortage of human resources, in order to achieve the sustainability of smallholder irrigation development.

"The National Irrigation Policy and Development Strategy, 2000" (NIPDS) aims at poverty alleviation by targeting resource poor smallholder farmers for irrigation development to enhance farm income. Furthermore, the Poverty Reduction Strategy Paper (PRSP), 2002, says that improvement of the agricultural productivity and increase of farmers' income by smallholder irrigation development are very important to reduce poverty. Thus, the smallholder irrigation development has become one of the national priorities.

The Government of Malawi (GOM) feels a pressing need to establish a measure realizing capacity building and development for smallholder irrigation schemes. The GOM then

[1] Financial and Economic Review, Volume 33 Number 3
[2] Irrigation Sector Programs, Department of Irrigation, February 2002.

requested in October 2000 to the Government of Japan (GOJ) to carry out a study, titled as the Study on the Capacity Building and Development for Smallholder Irrigation Schemes in the Republic of Malawi (the Study), aiming at realizing the sustainable irrigation development for the smallholders.

In response to the request by the GOM, the GOJ sent the Scope of Work mission of JICA in October 2001. The Minutes of Meetings on the Scope of Work were agreed and signed on November 5, 2001 between the two governments, and Sanyu Consultants Inc. of Japan was contracted by JICA in December 2002 to carry out the Study. The Study Team first arrived at Lilongwe on January 7, 2003 and proceeded to the subsequent field survey, and has now completed all the surveys presenting this Final Report.

1.2 Objectives and Scope

The overall objective of this Study is to contribute to poverty alleviation of smallholder farmers through irrigation development. This Study is carried out in partnership with and by guidance from the Department of Irrigation (DOI), MOA, and incorporates the views of the beneficiaries and other stakeholders such as relevant departments under MOA, regional/field offices of MOA, local authorities, international funding agencies, NGOs, etc. The process of this Study centers on the following which themselves are the objectives of the Study agreed upon in the SW:

1) To establish a package of methodologies for self-help smallholder [3] irrigation development, and
2) To enhance technical and administrative capacity in irrigation development.

In line with above objectives, this Study further points out the following specifics as the study strategies:

1) To establish such methodology with which farmers themselves can construct their smallholder irrigation systems by their own self-effort to the largest extent with the Government technical assistances and, if needed, plus minimum level of physical assistance,

2) To establish irrigated farming for the smallholders with special emphasis on dry season's agriculture, inclusive of compost manure making/application, botanical pesticide application, and any other local resource based appropriate technologies,

3) To present a comprehensive guideline together with technical manuals, dissemination leaflets and posters and picture stories making altogether the package, which can be easily referred to by farmers as well as government officers, and

4) To pursue capacity building of both farmers and government officers concerned by means of participating workshop, training and seminar, and through the implementation of the verification projects.

[3] According to "2. Objectives of the Study" of M/M of the S/W, "Smallholder Farmers" are by definition those who hold farms less than two (2) ha on customary land.

This Study, as in the first strategy, stresses that as to the term of "SELF-HELP" the schemes should be those that are constructed by the farmers to the largest extent with government technical assistances[4]. This means physical assistance from outside should be always minimal or even nothing taking into account the present financial situation the GOM is facing. Therefore, irrigation facilities undertaken in this Study are those that could be realized within the farmers' locality by utilizing locally available materials as much as possible, not depending on foreign materials.

Second strategy is the promotion of dry season's agriculture on basis of the smallholder irrigation development. There are many farmers throughout the country whose staple food cannot last until the next harvest. The dry season agriculture on the smallholder irrigation development would bridge up the gap between the seasons, contributing to food security and making those subsistence farmers free from hunger. As well, the irrigation will supplement the rainy season cultivation especially at the beginning of rainy season that is not stable in rain-falling.

The package, mentioned in the third strategy, is composed of comprehensive guideline, technical manuals, leaflets, posters and picture stories with lots of illustrations that can be of great help for the users to understand at their jurisdiction. The guideline will be mainly for DOI, ADD and RDP irrigation officers, manuals mainly for RDP and EPA irrigation related officers, and leaflets, posters and picture stories chiefly for the front line officers, called Agriculture Extension Development Officers (AEDOs), and farmers. This cascaded dissemination materials will contribute to promoting smallholder irrigation development throughout the country.

As to capacity building, the forth strategy above and also stressed in the second objective in the S/W, training courses for such extension officers as AEDOs and Agriculture Extension Development Coordinators (AEDCs) were administered. The training course aims at equipping the frontline officers with necessary knowledge, skills and attitude to promote smallholder irrigation in their jurisdiction. This Study tries to establish functional extension mechanism within the government current framework and not on project basis exclusively budgeted. This means the Study Team believes that an extension mechanism operated on a special account entailing exclusive budget for its own may not be sustainable once the extension program has finished.

Aside from the training, capacity building should be pursued throughout the implementation of this Study. The basic concept of the capacity building here is to understand doing-targeted-something as a tool of capacity building. The process, for example doing this Study and implementing verification projects, itself is called capacity building. This concept comes up with the idea of "learning by implementing and building capacity by learning". Therefore, the capacity building stressed in this Study will not be achieved only by attending training courses but by joining and implementing this Study especially the verification projects together with the Study Team.

[4] With respect to "construction stage", the M/M of the S/W mentions that the irrigation schemes are constructed by the "Government" with full participation of the farmers. This Study, however, stresses the "Self-help" even in the construction stage, and this was agreed amongst the participants including the director of DOI on the Inception Report presentation held on January 9, 2003.

To attain the above objectives, this Study is carried out in a phasing manner divided into two; namely, Phase 1 carried out in the first quarter of year 2003 and Phase II from mid second quarter of year 2003 to the end of this Study. Following are the scope of the Study, which were agreed in the S/W:

Table 1.2.1 Overall Study Schedule

Year	2003				2004				2005
Quarter	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st
Phase I									
Phase II									
DFR submission									
Report	Ic/R PR1	It/R	PR2	PR3			PR4	PR5	DRF FR

Phase I:

1) Identification of potential areas for self-help smallholder irrigation development, and
2) Formulation of draft methodologies for self-help smallholder irrigation development

Phase II:

1) Establishment of a package of methodologies for self-help smallholder irrigation development,

- Conduct the verification studies for typical projects on such items as formation of farmers' organization, planning and designing, implementation, and operation, maintenance and management,
- Conduct an extension program starting with trainings for AEDOs and AEDCs, based on which institutionalize effective extension mechanism,
- Verify the rationality and effectiveness of the draft methodologies for self-help smallholder irrigation development inclusive of extension mechanism, and
- Finalize the package of methodologies for self-help smallholder irrigation development.

2) Capacity building

- Conduct on-the-job-training though the verification studies,
- Produce training materials and field manuals as feeding back the users' suggestions, and
- Conduct trainings, workshops and seminars.

1.3 The Study Approach

The package this Study is to produce includes interventions such as participatory development, formation of farmers organization, planning and design inclusive of grass root technology, self-help construction, operation and maintenance by the smallholders, agriculture extension to be required, implementation arrangement and dissemination procedure, etc. To produce a workable and adaptable package, this Study pursues a participatory approach and has a unique trial, which is the implementation of verification project.

Phase I study produces a draft package of methodologies for smallholder irrigation

development, and the draft is finalized at the end of the Phase II study. Before finalizing the package, several of the most important hypotheses of the draft package are verified through the actual implementation of certain pilot projects including extension, which are defined as verification projects. Phase II of the Study puts the verification projects into practice and tries to extend from one village to another, and the draft package is finalized by feeding back the experiences and lessons coming up through the implementation process. The study approach is illustrated in Figure 1.3.1:

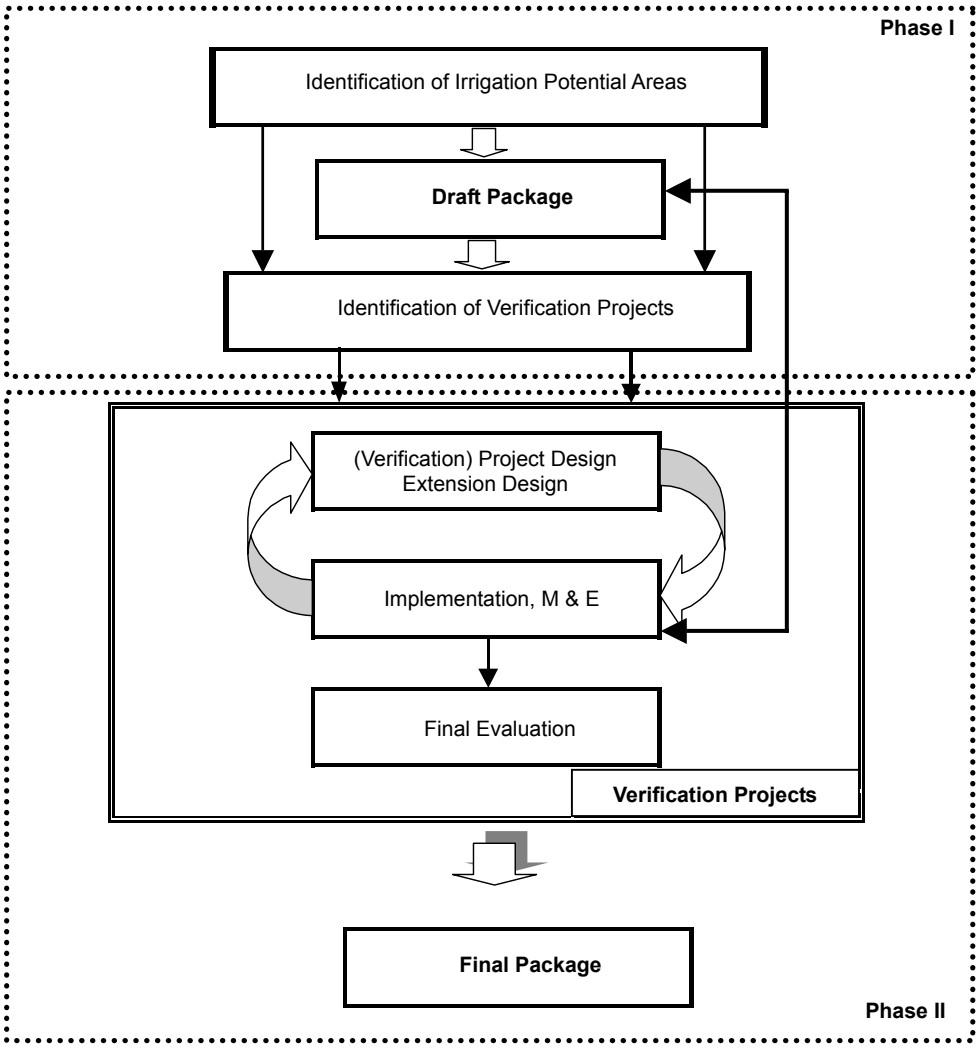

Figure 1.3.1 Overall Study Approach

1.4 The Study Area and the Verification Project Sites

The Study covers sites having irrigation development potential in whole country of Malawi. Potential irrigation areas in Malawi are estimated to be more than 400,000 ha inclusive of lakeshore areas of Lake Malawi[5]. Literature review, information collection from different sources have been carried out throughout Phase I study to assess the nationwide potential sites. Also conducted was a nation-wide smallholder irrigation potential inventory survey. The survey had been carried out during Phase I and early part of Phase II studies.

[5] Irrigation Sector Programs, Department of Irrigation, February 2002.

Identified during Phase I study were potential verification project sites. The Study Team together with counterparts had visited more than 40 potential verification sites during the Phase I study, from which four potential verification sites were identified as the first group. With the four being the cores, the verification projects which had been carried out in 2003 dry season were 23 in total inclusive of ones that had been started by the farmers' own initiative. The 23 projects are called 1st verification projects (see the Location Map).

The 23 sites are located in four RDPs of Lilongwe East, Dedza Hills, Dowa and Ntchisi under two ADDs of Lilongwe and Kasungu. These 4 RDPs were once again focused on verification of extension mechanism. There are 26 EPAs under the 4 RDPs, from each of which three AEDOs and AEDC had been invited to training courses in order for them to acquire necessary knowledge, skills and attitude to promote smallholder irrigation development. They have promoted smallholder irrigation projects in their sections in 2004 dry season.

CHAPTER 2

THE RURAL SOCIETY AND AGRICULTURE IN MALAWI

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This chapter explains characteristics and system of rural society and agriculture in Malawi. Sections at beginning present overview of Malawi and then describe Malawian rural society still maintaining a certain traditional norm. Following sections describe broad information of the agriculture sector, and further mentions about government institutions as well as policies related to the agricultural development.

2.1 Overview of Malawi

Malawi is a long and narrow land-rocked country bounded by Tanzania in the north and northwest, Zambia in the west, and Mozambique in the east, south and southeast. Total land area is 11.8 million ha, of which 9.4 million ha is land and 2.4 million ha is water. The total population of Malawi was 9.9 million in 1998[1]. About 1.2 million (12.4 %) live in Northern Region, 4.1 million (40.9 %) in Central Region and 4.6 million (46.6 %) in Southern Region. Since the population was 7,988,507 in 1987, the population growth rate is 24.4 % over 1987-1998 or 2.0% annually[2].

The population of Northern Region grew by 35 %, Central Region grew by 31 %, and Southern Regions grew by 17 % from 1987 to 1998. The most rapid growth was seen in Kasungu District with 48.6 % increase from 323,000 in 1987 to 481,000 in 1998. Nsanje District of the southern end of the country and Likoma District (islands) are the only districts that experienced minus growth from 204,000 to 195,000 and 8,192 to 8,074 respectively (See Table 2.1.1)

Out of the 9.9 million population, about 14.4 % live in urban areas while the majority, 85.6 % or 8.5 million, live in rural areas. Since the total land area of Malawi is 94,276 sqkm, the average population density is 105.4/sqkm, which is relatively high as compared to other African countries. The most densely populated ADD is Blantyre (224.9/sqkm) and then Lilongwe (166.9/sqkm). The least densely populated ADD is Karonga (42.0/sqkm) and then Mzuzu (47.3/sqkm) in the Northern Region. At district level, Likoma (448.6/sqkm), Blantyre (402.3/sqkm) and Lilongwe (307.8/sqkm) are the highest group, and Rumphi (26.9/sqkm) and Chitipa (29.6/sqkm) are the lowest group.

Achewa people mainly live on the plains of Kasungu and Lilongwe ADDs and on the rift valley escarpment of Blantyre ADD. Angoni people mainly live on the hill areas of Lilongwe, Kasungu and Mzuzu ADDs. Ayao people occupy the rift valley floor along the lake. Atumbuka and Atonga people are the main ethnic groups in the Northern Region and many ethnic groups such as Angonde, Nyakyusha and Alambya originally from Tanzania live in Karonga ADD (Chitipa and Karonga Districts). These ethnic groups understand Chitumbuka[3]. Asena people are the major ethnic group in Nsanje District of Shire Valley ADD, which is the southern end of the country.

[1] Report of Final Census Results 1998

[2] This is much lower than the annual growth rate of 3.7 % over 1977-1987.

[3] In the Northern Region, the most popular language is Chitumbuka (64.3 %) then Chitonga (10.4 %). In the Central Region, 90.9 % of the population use Chichewa and about 3 % each for Chitumbuka and Chiyao. In the Southern Region, 41.3 % use Chichewa, 26.5 % use Chinyanja and 18.9 % use Chiyao

The Census results also revealed 79.9 % were Christians and 12.8 % were Moslems. Christians are more than 95 % in all of the districts in the Northern Region and about 80 to 90 % in the other ADDs except Machinga ADD and Salima ADD where Christians are 49.8 % and 68.7 % respectively. Moslems population is 46.7 % in Machinga ADD and 27.0 % in Salima ADD. 70.3 % of the population of Mangochi District and 62.7 % of Machinga District are Moslems.

Literacy and education level is higher in the Northern Region. Male literacy rates are higher in Karonga ADD (76.5 %), Mzuzu ADD (75.4 %) and Blantyre ADD (70.7 %), but 54.9 % in Shire Valley ADD and 58.8 % in Machinga ADD. Female literacy rates are 68.3 % in Karonga ADD and 67.9 % in Mzuzu ADD, but only 31.5 % in Shire Valley ADD. Machinga ADD (44.0 %) and Salima ADD (45.4 %) are not high either.

Infant mortality rates (0-4 of age) are higher in Blantyre ADD (70/1,000), Machinga ADD (66/1,000) and Lilongwe ADD (65/1,000), and lower in Karonga ADD (49/1,000) and Mzuzu ADD (52/1,000). Number of persons died in the 12-month period prior to the census shows that the mortality rate of 20-29 age group is high in Machinga ADD (22/1,000) and Blantyre ADD (16/1,000) whereas the figure is less than 10 in all the other ADDs.

Table 2.1.1 Comparison of the Eight ADDs

Region	Northern		Central			Southern		
ADD	Karonga	Mzuzu	Kasungu	Salima	Lilongwe	Machinga	Blantyre	Shire Valley
Districts	◇Chitipa	◇Nkhata Bay	◎Kasungu	○Nkhotakota	●Lilongwe	◎Mangochi	○Chiradzulu	○Chikwawa
(Population 1998)	◇Karonga	◇Rumphi	◇Ntchisi	○Salima	◎Dezda	○Machinga	◎Blantyre	◇Nsanje
●: >1M		◎Mzimba	◎Dowa		○Ntcheu	○Balaka	◇Mwanza	
◎: >0.4M		◇Likoma	○Mchinji			◎Zomba	◎Thyolo	
0.4M>○>0.2M							◎Mulanje	
◇: <0.2M							○Phalombe	
Population 1998	◇321,371	912,189	◎1,384,867	◇477674	●2,203,799	◎1,779,612	●2,302,750	551,606
Population Density (/ sq. Km)	◇42	◇47	87	74	◆167	120	◆225	82
Pop. Growth (1998/1987)	▲131.3%	▲136.8%	▲136.2%	▲137.6%	126.1%	122.4%	115.6%	△105.9%
Average Household Size	◆4.9	◆5.1	4.7	4.4	4.3	◇4.0	◇4.1	4.5
Major crops	Rice, Cotton, Coffee, Groundnuts	Groundnuts, Tobacco, Tung, Tea, Cassava	Tobacco, Groundnuts, Maize	Cotton, Cassava, Semi-annual Crops	Tobacco, Groundnuts, Potatoes, Wheat	Tobacco, Sunflowers, Rice	Tobacco, Tea, Bananas	Cotton, Rice, Semi-annual Crops
Others	Cross-border trading, Fishing	Business, Cattle		Fishing, Gaots	Business, Factories	Fishing	Industrial center, Leaders	Cattle
Natural Conditions								
Landform, Rainfall	1.Hill Areas 750mm 2.Plains 3.R.V.Scarp 4.R.V.Floor >1,500	1.Plains 500mm 2.Hill Areas 3.Plateaus 4.R.V.Scarp 5.R.V.Floor >1,500	1.Plains 750mm ~1,000 2.Hill Areas	1.R.V.Floor 750mm 2.R.V.Scarp ~1,500	1.Plains 750m ~1,250 2.Hill Areas 3.R.V.Scarp 4.R.V.Floor	1.R.V.Scarp 500mm 2.R.V.Floor 3.Plains 4.Hill Areas 5.Plateaus >1,500	3.R.V.Scarp 500mm >1,500 1.Plains 2.Hill Areas	1.R.V.Floor 500mm 2.R.V.Scarp 3.Plains 4.Hill Areas 5.Plateaus >1,500
Soils	**Stony**,Yellowish-red, Red, Grey	**Yellowish-red**, **Red**, **Stony**, Plateau, Dambo	**Yellowish-red**, Stony, Grey	**Yellowish-red**, **Grey**, **Stony**, Dambo	**Red**, Yellowish-red, Stony, Plateau	**Stony**, **Grey**, Red, Dambo	**Red**, **Stony**, Yellowish-red, Grey, Plateau, Dambo	**Stony**, **Grey**, Dambo,
Social Conditions (Macro)								
Ethnic Groups	1. Angonde 2. Alambya 3. Nyakyusya	1. Atumbuka 2. Angoni 3. Atonga	1. Achewa 2. Angoni 3. Asenga	1. Achewa 2. Ayao	1. Achewa 2. Angoni	1. Ayao 2. Alomwe	1. Alomwe 2. Achewa	1. Asena 2. Achewa
Religion (Christian, Islam)	◆96.4% 1.0%	◆96.3% 1.6%	92.2% 2.3%	68.7% ●27.0%	80.9% 5.6%	49.8% ●46.7%	88.3% 5.7%	79.5% 1.5%
Literate aged 5 and Over (M, F)	○76.5% ○68.3%	○75.4% ○67.9%	60.5% 48.6%	57.7% ◆45.4%	62.6% 48.8%	58.8% ◆44.0%	◇70.7% 57.1%	◆54.1% ◆31.5%
Not Attending School at 5-29 (M, F)	○34.5% ○48.2%	○39.8% ○49.5%	54.9% 58.9%	53.6% 61.4%	56.6% 61.8%	56.0% ◆64.5%	51.2% 59.2%	◆59.5% ◆71.6%
Infant Mortality Rate (Less than 1)	○86.8/1,000	100.7/1,000	94.6/1,000	95.1/1,000	99.4/1,000	◆122.3/1,000	◆123.5/1,000	◆113.7/1,000
Mortality Rate at Age 1-4	○36.7/1,000	○34.1/1,000	◆47.1/1,000	41.6/1,000	◆48.9/1,000	43.2/1,000	◆46.2/1,000	39.9/1,000
Mortality Rate at Age 20-29	9.0/1,000	8.7/1,000	○4.8/1,000	8.2/1,000	7.5/1,000	◆21.2/1,000	◆15.8/1,000	7.9/1,000
One or Both Parents Dead (<20)	◆10.7%	9.4%	○6.7%	○7.6%	8.6%	◆10.5%	◆13.1%	9.6%

Source: Report of Final Census Results, 1998 Malawi Population and Housing Census by National Statistical Office, Dec. 2000
Statistical Year Book 2002, National Statistical Office, June 2003

The poverty headcount (IHS 1998) shows that 65.3 % of the population is under the poverty line. In detail, it is 68.1 % in the Southern Region, 62.8 % in the Central Region, and 62.5 % in the Northern Region. The poorest area is Ntcheu (84.0 %), and then Phalombe (83.9 %), Zomba Municipality (78.0 %), Thyolo (76.8 %) and Ntchisi (76.3 %).

In summary, northern part of the country is less populated as compared to the central and southern areas. Population density in the northern area is about from one-third to half of that of the central and southern areas. On contrary to the population density, poverty prevails more in the southern areas, and illiteracy rate and infant mortality rate in the central and southern areas are high as well.

2.2 Rural Society in Malawi

2.2.1 Society in Transition

Rural societies in Malawi maintain a traditional social structure based on the jurisdiction of traditional authority headed by the TA Chief, whose chiefdom is descended down from the previous Chiefs through the lineage system. Traditional leaders are TA Chiefs, Group Village Headmen/women and Village Headmen/women. They are entrusted to manage customary land, allocate land to villagers, set social norms and rules, mediate problems within their jurisdiction, etc. Traditionally, their authority is conclusive and their norms and rules over their life are well respected.

The society is stratified administratively as village, group village and chiefdom of the TA. There are 160 TAs, 2,360 group villages, and 20,721 villages throughout the country[4] (TA number is more or less equivalent to the number of EPAs). TA consists of a number of group villages ranging in most case from 10 to 20 with the nation wide average of 15. Group village is composed of villages ranging from several to as many as more than 20 with the national average of 9 villages. Consequently, TA encompasses about 115 villages as the nation wide average.

Figure 2.2.1 Rural Administrative Structure

Population per village ranges widely, but the population naturally increases as the village gets older. According to the census of 1998, nation wide average farm household per village is 115 and its average population is 410 (3.6 heads per household in average). Some of the villages that the Study Team visited, though, have more than 300 households. On the other hand, villages of immigrants tend to be smaller because of its difficulty in administration, especially in distribution of land.

[4] Ministry of Local Government, February, 2003

An example of immigrants is a village in Ntchisi RDP of Kasungu ADD that was separated into two in 2002. The numbers of the households of the two new villages are less than 30. There are also several villages made of traditional clans plus immigrants. A village in Ntchisi RDP is made of 70 households of one clan plus seven immigrant households. Another village in Dowa RDP of Kasungu ADD is made of 195 households of one clan plus 175 immigrant households who were relocated due to the construction of new international airport. In both cases, the village headmen provided the land to the immigrants responding to their request.

The rural societies are now experiencing a transition from strong social norm to democracy including liberalization and multi-party system. In many villages, cash crops including tobacco, which was not allowed to grow for smallholder farmers before 1995, are major income sources. At the same time, increasing prices of seeds and fertilizers are serious problems in many villages. Loan through clubs have become difficult and subsidies for seeds and fertilizers have become unavailable. Because of those changes, villagers need much more cash than ever before.

Theft of livestock and crops has become a major problem in many villages. The problem prevails more in central and southern areas of the country. There are no cattle anymore in some villages because of theft[5], consequently cattle drafting is no longer seen in most of the central and southern areas. The roads in the villages are not well maintained as compared to before and the roadside is sometimes covered by weed. Villagers say those things started since strong social norm had become eroded.

Traditionally, Achewa, Ayao, Alomwe and Anyanja people follow the matrilineal system, on the other hand, Angoni, Atumbuka and Asena people follow the patrilineal system. In the matrilineal system, the inheritance of headmanship follows the linkage of woman to the son of his (eldest) sister. Uncle cares his sister's children equally as same as his own children. When a man's wife dies, he has to leave the village. Decisions for the woman are made by her maternal uncle or by her eldest brother. In the patrilineal system, the inheritance of headmanship is from the father to the son.

Recently, however, the inheritance of headmanship from father to son is practiced in some Achewa villages and it is free to choose with whom to get married and also to choose to stay in the bride's village or not. When the groom-to-be visits the village of the bride-to-be, they decide to stay if they see enough land or enough support in the family. Thus, the rural people in Malawi are now experiencing transition from once strong social norm binding society to individual or nuclear family basis society.

2.2.2 Land Tenure

Rural population lives in customary land. Customary land is vested in the President who, under the Chiefs Act, delegates power to allocate land to traditional Chiefs for use by the rural population. Village headman distributes the land to his clan and it is theirs as long as it is cultivated. If they stop cultivating, they have to return the land to the village headman.

[5] 3 villages out of 13 villages in Lilongwe and Kasungu ADDs, the Team visited in January and February 2003, had lost all the cattle for the theft problem according to the village headman.

Availability of land is now decreasing by rapid population growth, early marriages, large families, etc. Some villages in remote areas still have large bush areas to distribute to new families, but the villages near town do have little space so that the land area per family is decreasing.

In the past, land under customary tenure has been treated as a subset of public land, vested in the President under the Land Act, and in some cases has been taken by the state without adequate compensation and allocated as leasehold estates from the state. Also, the absence of any distinction between Government Land and Public Land caused a lot of confusion. As the public land designation was used to effectively expropriate customary land without compensation, it remained at the root of most of Malawi's land problems.

Recognizing the above problems, GOM has prepared a Malawi National Land Policy (Ministry of Lands and Housing, 17 January 2002). Though there are no comprehensive maps showing the boundaries of traditional land areas, the Land Policy calls for a return of land administration to the TAs by requiring the actions of that[6]:

- With the exception of land expressly registered as private land, or gazetted as "government land", all remaining land in Malawi shall be classified as customary land.
- To ensure cultural cohesiveness, and to make titles more certain (secure) and more static, a deliberate course of action will be taken to demarcate and formally register all customary land interests of TAs in recognition of communal land areas.
- The entire land area demarcated and registered as falling under the jurisdiction of each TA will be known officially as a "Traditional Land Management Area." This designation will be used to disclose the root of title and allocating jurisdiction of legally recognized Traditional Authorities.
- The administrative capacity and resources required by the Surveyor General to survey and prepare maps showing the boundaries of TA areas should be provided as a precondition to the registration of customary estates required to formalize customary tenure.

The policy makes the government's acquisition plans more transparent, and at the same time it gives more security on land to the concerned local population. As extended families are replaced with nuclear ones, conflict and competition for property rights and access to land also increases. The new policy, likewise, would contribute to avoiding the inequities often associated with land inheritance.

2.2.3 Gender Issues

Gender Development Index of Malawi is 0.374 and is ranked at 163th out of 174 countries in the world[7]. In 1998, about 52 percent of the poor households were female-headed, though female headed household consisted of about 25 percent of the total households. Female literacy rate was only 44 percent while male literacy rate was 72 percent. Education attainment, defined as completion of Standard 8, was only 11.2 percent for adults aged 25

[6] Malawi National Land Policy, January 17, 2002. Chapter 4.6.1 referred.
[7] Source: Malawi Poverty Reduction Strategy Paper (April 2002)

years or above, and only 6.2 percent for women. Full-time female farmers make up 70 percent of the agricultural labor force, however, women continue to have limited access to agricultural extension, training and inputs.

Building the hut, weaving the bamboo strips, helping in the field and tinsmith are man's work, while taking care of babies, fetching water, cooking, cleaning, pounding maize, collecting firewood, smearing the floor of the hut are woman's work. Hoeing, sowing, and harvesting are for both in most cases. Small domestic animals like poultry are usually the property of women but sometimes of men. A daily calendar of women in a village in Lilongwe East RDP, Lilongwe ADD is as follows. For women as full-time farmers, taking care of small children, fetching water and firewood, cooking etc. are some like extra work as compared to male farmers.

Table 2.2.1 Daily Calendar of the Women in Mwase Village

Time	Harvest Season	Dry Season
6AM	Wake up, sweeping the house and fetching water	Wake up and straight to the farm
8AM	Go to the farm for harvesting	Continue working in the farm
12AM	Come back home with firewood, boil water (Husband takes bath) and cook porridge, which means either real porridge or nsima, for husband and children	Come back home with firewood, boil water and sweeping the house (Husband comes back and takes bath)
2PM	Take bath and look for relish	Cook nshima and relish if they have flour and lunch
3PM	Chatting, relax with friends under-shed or pay visits, plays games like bawo	Some go back to the farm again. Some take rest
5PM	Cook supper	Cook supper
7PM	Supper	Supper and go to bed early
8-9PM	Go to bed	

2.3 Salient Features of the Agricultural Sector

2.3.1 Positioning of the Agriculture Sector

Total land area of Malawi is 11.8 million ha, composed of 9.4 million ha of land and 2.4 million ha of water. Out of the 9.4 million ha land, an estimated 5.6 million hectares (59%) is considered as suitable for agriculture production (see in Table 2.3.1). This is mostly composed of rain-fed cultivation area (79% of the 5.6 million ha or 47% against the total). The remaining land area is occupied by natural forest (37.0%), bare and marshes (2.3%), open water (1.6%) and built-up area (0.3%).

Table 2.3.1 Land Use and Vegetation in Hectares in 1998

Land Use Category	Land Area (ha)
(1) Agricultural Land	5,585,750 (58.8%)
Rain-fed Cultivation	4,436,950 (46.7%)
Dimba	39,550 (0.4%)
Wetland Cultivation	78,200 (0.8%)
Irrigation Agriculture	25,550 (0.3%)
Grassland	893,850 (9.4%)
Plantations	111,650 (1.2%)
(2) Natural Forests	3,514,850 (37.0%)
(3) Bare and Marshes	215,800 (2.3%)
(4) Open Water	152,850 (1.6%)
(5) Built-up Area	26,700 (0.3%)
Total	**9,495,950 (100.0%)**

Source: Malawi Agricultural Statistical Bulletin (1998)

Agriculture is the dominant sector in Malawi, accounting for about 38 % of GDP and about 81 % of total domestic exports (see in Table 2.3.2). One thing unique in Malawi's economy is that agricultural contribution to the GDP has increased from 33% in 1991 to 38% in 2002

though most countries in the world have been lowering the agriculture contribution to the GDP. Over 85% of the total population engages themselves to agricultural sector, the majority of whom are smallholders who reside in rural area.

Table 2.3.2 Position of Agriculture Sector in the Economy of Malawi

Description	Fiscal Year	
	1991	2002
1) GDP at current market price	Million MK 6,106	MMK 147,581 (MUS$*1,691)
- Agricultural sector**	33.3%	38.4%
2) GDP per capita	MK 712	MK 12,900 (US$*148)
3) Domestic exports by main commodities	Million MK 1,299	MMK 29,110 (MUS$*334)
- Agricultural sector***	92.5%	81.3%

Source: Statistical Yearbook, 2003, national Statistical Office

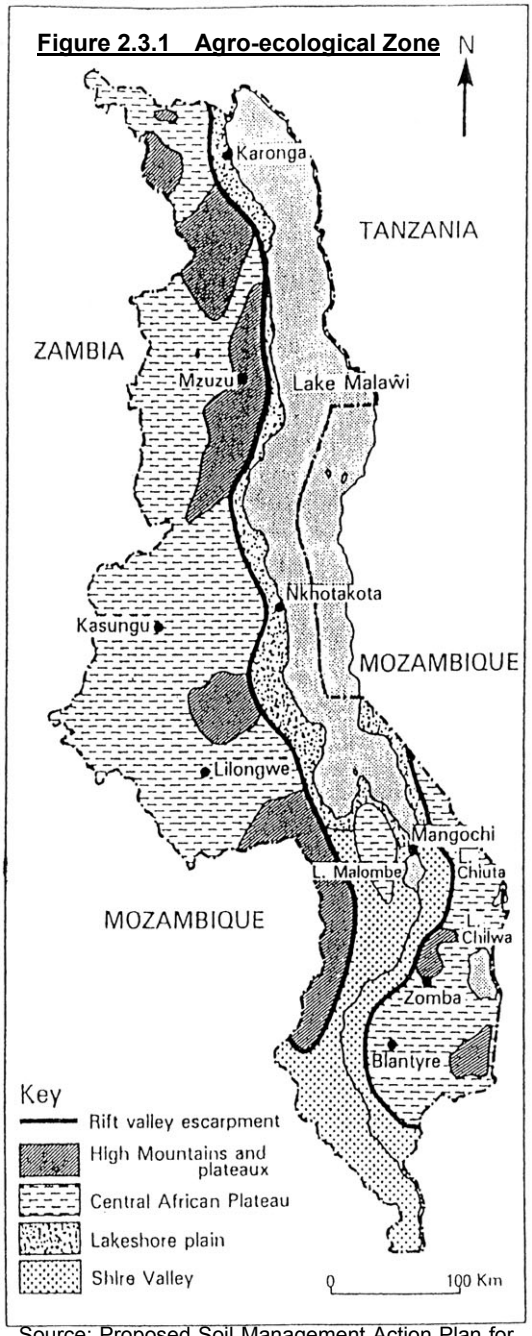
*: Exchange rate; 87.28 MK/US$ ('02), Res. Bank of Malawi

**: Inclusive of forestry and fishery

***: Tobacco, tea, cotton and sugar

Agricultural production comprises of two distinct sub-sectors: the estate sub-sector and the smallholder sub-sector. The estate sub-sector consists of 70% of the foreign trade and 15% of the total local food production while the smallholder sub-sector contributes to the remaining 30% of the foreign trade and accounts for over 85% of the total food production in Malawi. 1998 census tells that there are about 2.39 million smallholder farmers throughout the country, accounting to 90 % of the total farm households. The average farm size of the smallholder farmers is about 1.5 ha.

Figure 2.3.1 Agro-ecological Zone



Source: Proposed Soil Management Action Plan for Malawi, June 1995

2.3.2 Agro-ecologies and Soils

The country can be divided into five major agro-ecological zones on the basis of altitude, landforms, soils, vegetation and climate. The features of major agro-ecological zones are indicated as follows:

- High Mountain and Plateau: This zone consists of areas 1,200 to 2,400 m above sea level with slopes ranging from 5% to 15%. Rocky hills rise above the surface. The vegetation is predominantly grassland or forest.

- The Central African Plateau: This zone consists of plains at an altitude mainly between 1,000 and 1,300 m above sea level with moderate to steep slope. Natural vegetation consists of

various kinds of woodland (*Brachystegia* and *Acacia* families) and grassland, however, most of the areas have been cleared for cultivation. This zone is the most agriculturally productive area, and the major crops are maize, groundnut, tobacco, etc.

- The Lakeshore Plain: This zone lies at an elevation of 450 to 550 m above sea level. The vegetation is mainly characterized by savanna with shrub or Acacia woodland. The plain constitutes the largest proportion of arable land and has a good agricultural potential in the country. Major crops in this zone are maize and rice.

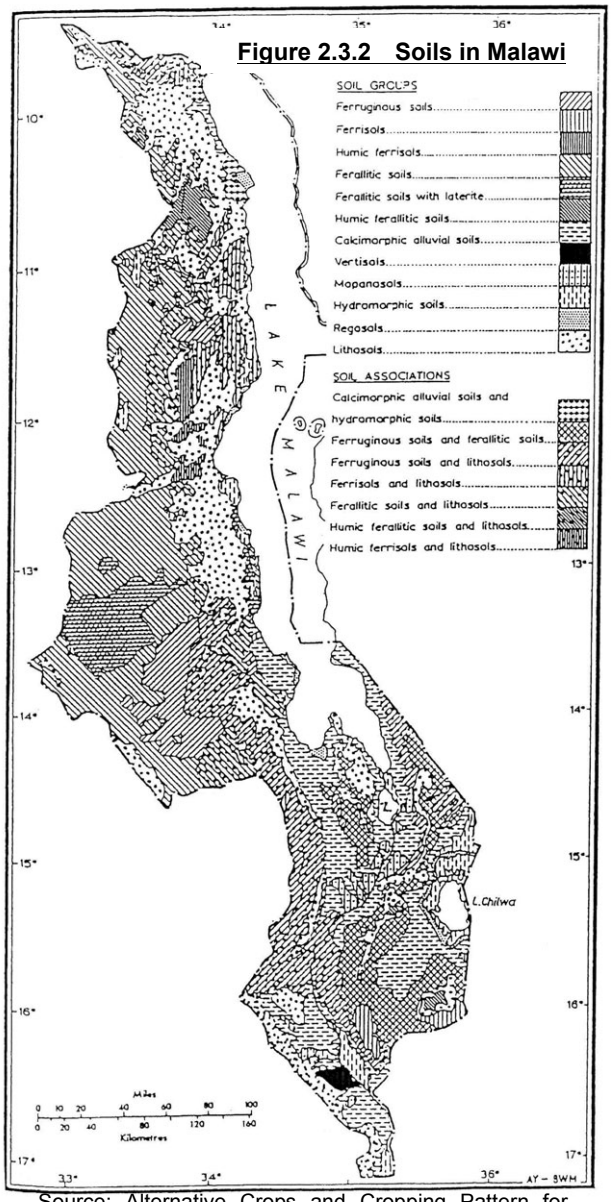
- The Rift Valley Escarpment: This zone consists of hilly areas at an altitude of between 500 and 1,200 m above sea level, forming the escarpment of the Rift Valley on both its western and eastern sides. The escarpment has a predominance of steep slope and stony soil. Its vegetation is dominant with woodland and savanna.

- The Shire Valley: This zone comprises mostly the shores of Lake Malawi through Bwanje Valley and Shire Valley at an altitude of between 40 and 150 m above sea level. Natural vegetation is mainly savanna similar to the Lakeshore Plain. Although this zone is suitable for rain-fed agriculture, the short duration of rains and high temperature necessitate the use of supplementary irrigation for suitable crop production. Major crops are maize, cotton, tea and sugarcane, etc.

There are five major soil types over the five ecological zones classified using the Malawi Classification system that was correlated with Food and Agriculture Organization (FAO). These can be distinguished as follows, and among them calcimorphic alluvial soils and vertisols fertile soils are the most fertile:

- Latosol: Latosol comprises of all the freely drained soil types in Malawi. These are characterized by red to yellow colors, have a moderate to strongly acidity (pH 4.0 to 6.0), and are moderately to be strongly leached. The topsoil texture is from sandy clay to clay loam. These soils are of low fertility. Latosol occur commonly on the Central African Plateau and some parts of the High Mountain and Plateau.

Figure 2.3.2 Soils in Malawi



Source: Alternative Crops and Cropping Pattern for Irrigation Schemes in Malawi, April 1998

- Calcimorphic alluvial soils: the soils are gray to dark brown in color. The soil reaction is weakly acid to strongly alkaline (pH 6.0 to 8.0). They have variable texture characterized by high silt content. These soils are classified as fertile, however, the areas that are dominant with this soils has poor and erratic rainfall during the growing season. These are common in the Lakeshore Plain and the Lower Shire Valley.

- Hydromorphic soils: Hydromorphic soils are black, gray or mottled in color and waterlogged soils found in Dambo. Although the water tables are high during the rainy season, it lowers in the dry season to permit Dimba cultivation that is of importance for smallholder farmers.

- Lithosols: these are the shallow and stony soils mostly found in hilly areas and some parts of the High Mountain and Plateau. Because of their stoniness, these soils are of limited agricultural potential except for the growth of trees.

- Vertisols: Vertisols are dark brown to black in color mostly found in the Lower Shire Valley around Ngabu. The soils pH ranges from 7.0 to 8.5 (neutral to alkaline). These soils are generally fertile, but crop production is constrained by an erratic and unevenly distributed rainfall pattern.

2.3.3 Food Crop Production

Main crops for local food are cereals (maize, millet, sorghum, rice, etc.), tubers (cassava, sweet potato, Irish potato, etc.), legumes (groundnut, beans, soybean, pigeon peas, etc.), vegetables (tomato, onion, cabbage, mustard leaf etc.) and fruits (mango, papaya, banana, and guava, etc.). Tobacco, tea, coffee, cotton and sugar are also cultivated for foreign exchange earnings.

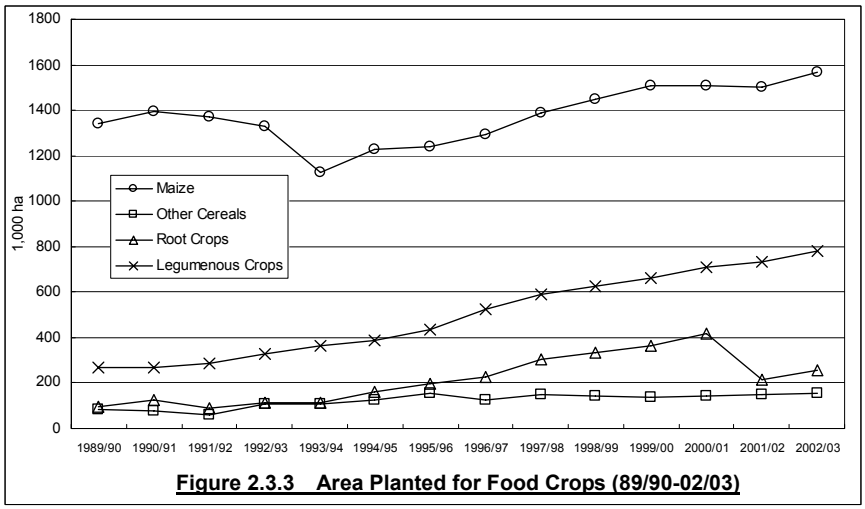


Figure 2.3.3 Area Planted for Food Crops (89/90-02/03)

Maize remains the most dominant crop cultivated by the smallholder sub-sector in Malawi. Maize area planted by both the smallholder sub-sector and the estate sub-sector occupies an average of 1.4 million hectares that constitutes of over 50% of total cultivated area (see in Figure 2.3.3). Leguminous crops such as groundnuts and beans that are commonly intercropped with maize occupy the second largest planted area of more than 700,000 ha.

As per maize variety, local ones are still prevalent (see Figure 2.3.4). Though diffusion of improved variety of maize is now in progress, area planted of local maize still occupies 60% of the total planted area. GOM started promoting the diffusion of composite varieties since 1998, Open Pollinated Varieties (OPV), which can be used for three successive seasons

without yield decline. Average yields of local, composite and hybrid maize in the past 14 years (89/90-02/03) are estimated at 0.80 t/ha, 1.28 t/ha and 2.17 t/ha respectively. Although composite maize doesn't amount to high yield of hybrid genetically, if harvested a 50% boost in yield can be gotten as compared to local maize.

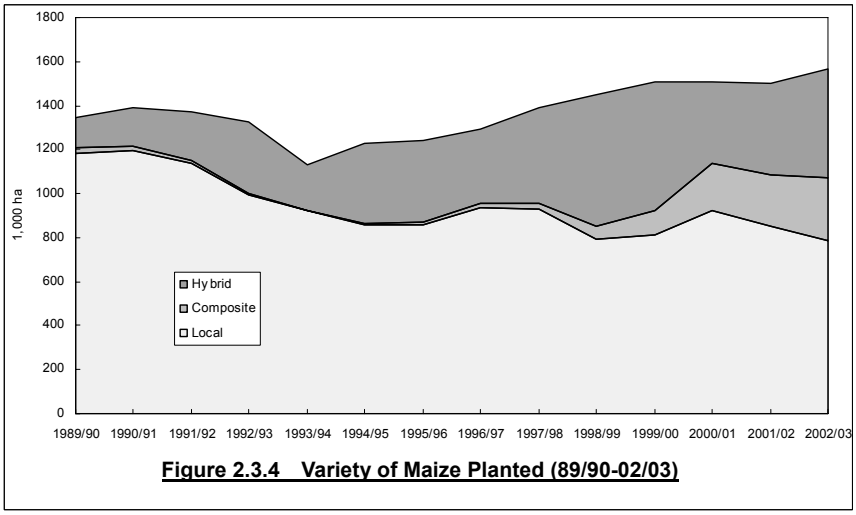


Figure 2.3.4 Variety of Maize Planted (89/90-02/03)

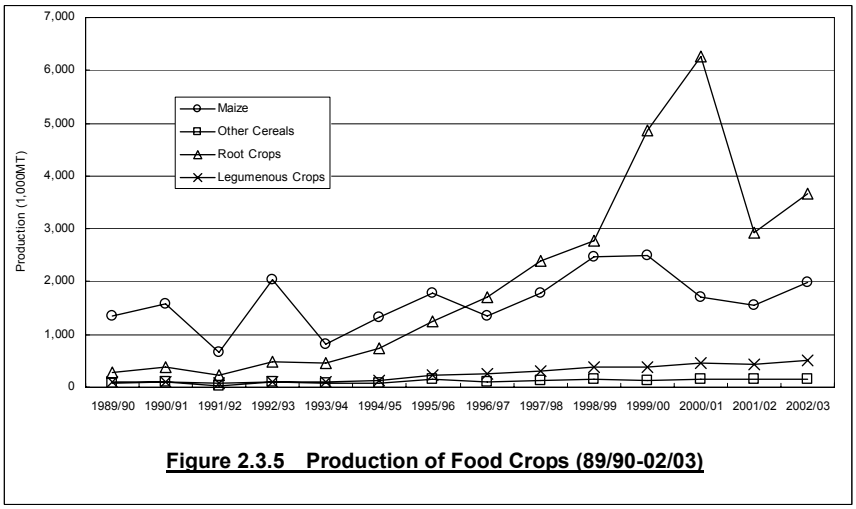


Figure 2.3.5 Production of Food Crops (89/90-02/03)

Maize production has a tendency to increase slightly over the last decade as the improved variety diffuses (see Figure 2.3.5). In years of 1998/99 and 1999/2000, maize production had reached to 2.5 million metric tones. This good harvest realized the distribution of more than 200 kg of maize for each person. Then, it has dropped significantly in 2000/01 and 2001/02[8].

During the years, significant food shortage took place, leading to a famine. The GOM is now putting more emphasis than ever before on root crops such as cassava which is drought tolerant in order to cope with erratic climate. Cassava, sweet potato and Irish potato production have increased from 1999/00 to 2000/2001 by 20%, 35% and 100% respectively to 3.4 million metric tones, 2.6 million metric tones and 0.3 million metric tones (In year 2001/02, root crop had dropped significantly maybe because previous year's hunger had consumed even the following year's plantation).

2.3.4 Traditional Cash Crop

The dominant traditional cash crops in Malawi are tobacco, tea, sugar, cotton, coffee and macadamia. These crops were historically produced by the estate sub-sector. However, tobacco production in the smallholder sub-sector has increased since the liberalization in 1994. The Government has progressively increased the quota of Burley tobacco, the most dominant

[8] The cause is commonly attributed to erratic rainfall (mostly late rainfall), but also there may be relationship with reduced beneficiary number of Targeted Input Program (TIP). The beneficiary number of TIP was: 2.3 million FFs in 1998/99, 2.3 million FFs in 1999/00, and 1.5 million FFs in 2000/01 and 1.0 million FFs in 2001/02.

variety, for registered smallholders. Accordingly, smallholder tobacco production nowadays marks between 60,000 metric tones and as much as 100,000 metric tones recently, which consists of 50% to over 70 % of the total production (see Figure 2.3.6).

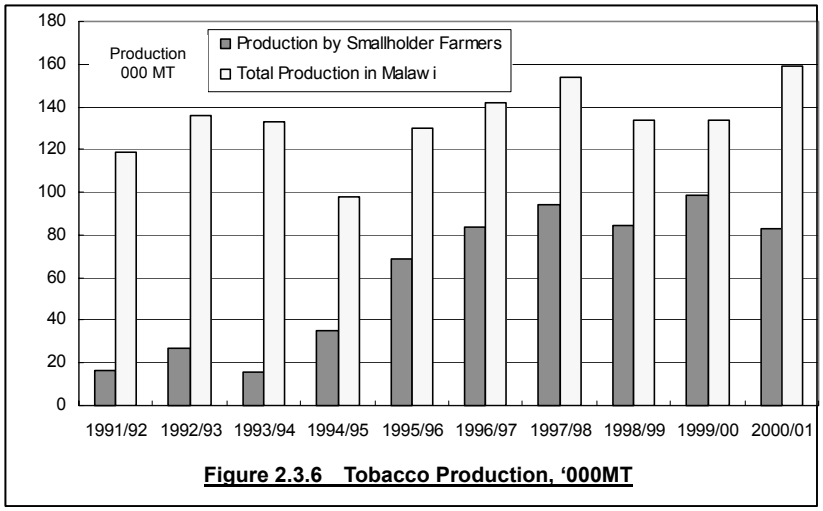


Figure 2.3.6 Tobacco Production, '000MT

Productions of other traditional cash crops by the smallholder sub-sector have been low. Cotton production, for example, is exposed to unstable conditions relevant to economic circumstances. Production of traditional cash crops is unevenly distributed according to the locality. The central region is the center of tobacco production while cotton and tea production are specialized in the southern region.

2.3.5 Livestock Production

Livestock accounts for about 7% of GDP in Malawi and 12% of the total agricultural output. In 1997, per capita consumption of animal protein was estimated at 2.3 kg per annum, which was far less than the 12.5 kg average in Africa. Current various livestock populations are estimated at 604,000 cattle, 1,650,000 goats, 300,000 swine, 100,000 sheep and 10,365,700 poultry based on the latest livestock census in 1998.

About agricultural mechanization in Malawi, human power with hand hoe dominates in the smallholder sub-sector, however, draft animal power for land preparation, processing and transportation is also popular, especially in the northern parts of the country because of the social background and the size of landholding. The number of oxen and related equipments in the country is shown in the table below, indicating more than ten work oxen per one hundred farm families in the northern area while only less than one in the southern regions.

Table 2.3.3 Number of Work Oxen and Related Equipments in 1995

ADD	Work Oxen*	Equipments			
		Ploughs	Ridger	Cultivator	Ox-cart
Karonga	8,899 (13.3)	4,365	471	50	504
Mzuzu	18,494 (10.2)	8,698	6,037	151	1,881
Kasungu	11,862 (4.2)	3,903	5,624	48	5,352
Lilongwe	12,661 (2.8)	1,739	1,545	291	7,436
Salima	1,880 (1.0)	968	875	82	816
Machinga	788 (0.2)	641	430	74	561
Blantyre	414 (0.1)	148	123	22	239
Shire Valley	1,260 (0.6)	458	189	16	631
TOTAL	**56,258**	**20,920**	**15,297**	**734**	**17,420**

Source: "Agricultural Mechanization Services By ADMARC, Final Report (Oct., 2000)"
Note: * Figures in parenthesis indicates the number of work oxen per 100 farm families.

During the past decade, livestock production was generally on the decrease for various

reasons including inadequate number of improved breed and high incidence rate of diseases and parasites due to leaving off providing multiplication, vaccinating and training services by the Government. Cattle theft is another cause of decreasing in the number of livestock. This problem, which is getting worse after democratization in 1994, leads farmers into a disincentive to rear cattle.

2.4 Government Policy in the Agriculture Sector

The Government gives the highest priority to rural poverty alleviation among its policy and the overwhelming importance of agriculture to the economy. The Government tackles poverty alleviation through accelerating agricultural and rural development as a major element of its challenges. The policy and strategy in the sector is described below:

2.4.1 Malawi Vision 2020

Malawi Vision 2020, which is the national long-term development perspective, was drawn up in 1997. The Vision declares, *"By the year 2020, Malawi, as a God-fearing nation, will be secure, democratically mature, environmentally sustainable, self-reliant with equal opportunities for and active participation by all, having social services, vibrant cultural and religious values and a technologically driven middle-income economy"*, at the beginning of the statement. According to the statement, the Vision provides a framework for national development goals, the policies and the strategies required for the people.

The scope of the Vision comprises of nine issues: 1) Good Governance, 2) Sustainable Economic Growth and Development, 3) Vibrant Culture, 4) Economic Infrastructure, 5) Social Sector Development, 6) Science and Technology-led Development, 7) Fair and Equitable Distribution of Income and Wealth, 8) Food Security, and 9) Sustainable Natural Resource and Environmental Management.

Out of these issues, "2) Sustainable Economic Growth and Development" and "8) Food Security" refer to the agricultural sector. The Vision states that the most important task to be accomplished towards the year 2020 is to make provision for access to adequate and year-round food supply through agricultural development. As a strategy for establishing food security at both national level and household level, increasing food crop production is the distinguished issue, and enhancing irrigation development is placed at the very close second. This Study directly supports the enhancement of the irrigation development, thereby contributing to the increasing of the food crop production.

2.4.2 Agricultural and Livestock Development Strategy and Action Plan (ALDSAP)

The Ministry of Agriculture (MOA) plays a major role in formulating agricultural policy and delivering services. In 1995, MOA (Ministry of Agriculture and Livestock Development at that time) produced Agricultural and Livestock Development Strategy and Action Program (ALDSAP), which articulates its aspiration and also outlines a framework for the attainment of the sector development objectives. The strategy is characterized by five major features:

- The consistent objective of the strategy is rural poverty alleviation that is the core of the development philosophy of the Government.

- One of the key concepts that guided the goal of the strategy is "Participation". Participatory approach emphasizes the importance of linkages between research, extension and farmers and encourages all members of the society to make effective contributions in the decision-making processes.
- The strategy assumes that the Government will maintain microeconomic stability through prudent fiscal, monetary and exchange rate policies as a basis for accelerating agricultural growth and promoting diversification consistent with Malawi's competitive advantage.
- The Government should intervene in the market mechanism for resource allocation. The strategy proposes a favorable policy, legislative and institutional environment for sustainable agriculture production and improvement in food security.
- A consultative process through a series of meeting and workshops involving all major stakeholders was used in the preparation of the strategy document, thus it reflect aspirations of Malawians.

In ALDSAP, the Government gives priority to improving agricultural productivity with the aim of: 1) improving and maintaining food self-sufficiency, 2) expanding and diversifying agricultural exports, 3) improving rural incomes, and 4) improving social welfare. This Study is directly related to the first aim of improving and maintaining food self-sufficiency especially by dealing with smallholder farmers. The ALDSAP also outlines the product-related strategy that puts an emphasis on food security and smallholder farmers among others (see Table 2.4.1).

Table 2.4.1 Product-related Strategy of ALDSAP

Product Strategy	Policy Objective
(1) Food Products Strategy	- A more rational maize production and marketing strategy consistent with **improved food security** and poverty alleviation. - Promotion of other cereals (sorghum, wheat and rice) to **diversify the food security base** and **improve smallholder incomes**. - An expected grain legume program to improve human nutrition, soil fertility and **smallholders' incomes**. - Expanding oil seed production for domestic consumption and export. - Improved food security & increased cash incomes through expanded root crops production & storage. - Widening dietary choice through expanding banana, vegetables and fruit production.
(2) Traditional Cash Crop Strategy	- **Encouraging smallholder**/estate tobacco production to broaden income-generating activities for smallholders and increase foreign exchange warnings. - Revitalize traditional cash crops as a source of income, employment and foreign exchanging earnings.
(3) Horticultural Crop Strategy	- Develop high quality products in adequate quantities to maintain a regular flow to export markets and for domestic requirements.
(4) Livestock Development Strategy	- An upgraded and expanded dairy herd and increased milk production to **achieve self-sufficiency**. - An improved beef industry to **achieve self-sufficiency**. - An expanded and more efficient poultry industry to supply more eggs and meat at lower prices. - An expansion of the pig industry **to achieve self-sufficiency**. - Upgrading and expansion of the sheep and goat industry to increase meat supplies. - Promotion of aquaculture to improve protein supply. - An expanded livestock feed industry to meet the need of the sector.

2.5 Agricultural Institutions

2.5.1 The Ministry of Agriculture (MOA)

MOA has a mission to promote and accelerate broad based sustainable agriculture and livestock development so as to facilitate the economic growth and to contribute to poverty

alleviation. The core functions of MOA are; 1) to attain and sustain household food self-sufficiency and to improve nutritional status of the population, 2) to expand agricultural and livestock production and exports, 3) to diversify agriculture and livestock production and exports, 4) to increase farm incomes, and 5) to conserve the natural resources base on farms.

The headquarters of MOA comprises of 7 departments including Department of Irrigation (DOI), the counterpart organization of this Study. Of the 7 department, the Department of Agricultural Research and Technical Services allocates several research institutions throughout the country according to different ecological zones to generate improved technologies and new knowledge that will have impact on crop and livestock productivity. There are four major research stations in the country (Chitedze, Bvumbwe, Lunyangwa and Makoka), six experimental research stations (Kasinthula, Mbawa, Chitala, Lifuwu, Mkondezi and Baka) and several trial sites. Chitedze Research Center is involved in this Study in promoting improved grain storage.

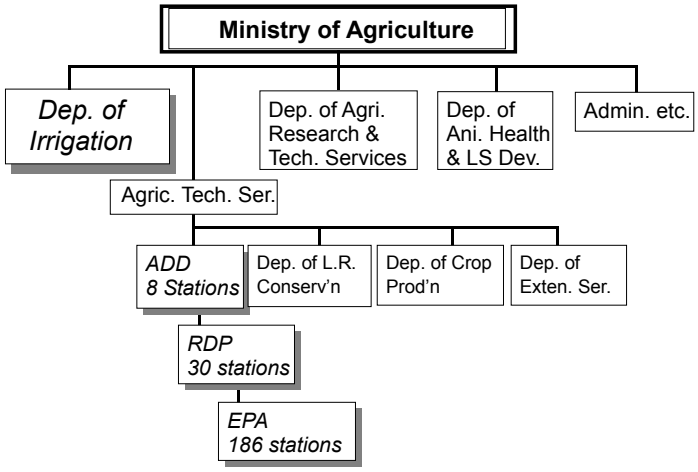


Figure 2.5.1 Organization Structure of MOA

In addition to the departments located at the headquarters, MOA operates through eight Agricultural Development Divisions (ADDs) that are headed by Program Managers (PM). The ADDs are subdivided into 30 Rural Development Projects (RDP) that are now undergoing a restructuring program coinciding with the administrative structure of 27 districts. The RDP is headed by District Agriculture Development Officer (DADO, formerly called as Project Officer, PJO). The RDPs are further subdivided into 186 Extension Planning Areas (EPAs) that are headed by AEDC with over 2,000 sanctioned posts, but about 800 being vacant, of AEDOs as the front-line extension workers.

Table 2.5.1 Local Branches Organization of MOA

Region	ADD	RDP (Nr.)	EPA (Nr.)	AEDO	
				Nr.	Vacant
North	Karonga	2	12	136	(38)
	Mzuzu	4	34	319	(40)
Central	Kasungu	4	24	253	(70)
	Salima	2	8	82	(16)
	Lilongwe	5	36	414	(112)
South	Machinga	5	33	560	(341)
	Blantyre	6	28	334	(133)
	Shire Valley	2	11	184	(75)
Nation -wide		**30**	**186**	**2,282**	**(825)**

Source: Ministry of Agriculture and Irrigation, Mar 2004

Activities at EPA level are financed through budgetary allocation from the RDPs that in turn receive their allocation from the ADD concerned. While the ADD operations are financed through MOA's recurrent budget, project based budgets are usually from foreign donors.

The activities undertaken at different levels of MOA structure are shown below:

Table 2.5.2 Activities Undertaken at Different Levels of MOA

Level	Activities
(1) Headquarters	- Policy formulation and regulation, - Co-ordination of both local and offshore training, and - Collaboration with other stakeholders in the agricultural sector
(2) ADDs	- Interpretation of policies from the headquarters, - Co-ordination of subject matter specialists (SMSs), - Supervision of programs, - Development of technical messages based on problem areas, and - Undertaking training for all SMSs
(3) RDPs	- Message dissemination, - Training of EPA staff and farmers, - Provision of technical advise to EPA staff, - Collaboration with other stakeholders operating in the RDP, and - Supervision of EPA staff
(4) EPAs	- Massage dissemination to farmers, - Formation of farmers groups, - Data collection on crops and livestock, and produce two-weeks and monthly reports, - Linking farmers to credit institutions, - Conduct on farm demonstrations, and training of staff and farmers

This Study undertakes smallholder irrigation development so that the EPAs will be the front line of identifying and developing prospective irrigation sites. RDP should be in charge of assisting EPA front line officers by giving irrigation related technical advices. ADD will be the technical back-support to RDP irrigation officers as well as be in charge of RDP-wise irrigation extension.

2.5.2 Agricultural Institutions

There are several parastatal institutions within the agricultural sector, namely Agricultural Development and Marketing Corporation (ADMARC), National Food Reserve Agency, Smallholder Farmers Fertilizer Revolving Fund of Malawi (SFFRFM), and Tobacco Control Commission (TCC), etc. ADMARC had traditionally been the major supplier of farm inputs in the country. However, after liberalization in 1994, its share in the market has decreased substantially. In 2003/04, ADMARC accounted for only 1% of the fertilizers market. Several private dealers such as Norsk Hydro, Farmers World and Optichem etc. have gained power proving about 90% in the market recently (see in Table 2.5.3).

Table 2.5.3 National Fertilizer Sales

Dealer	1995/96		1996/97		1997/98		1998/99		1999/00	
ADMARC	43,042	(22%)	29,414	(19%)	13,962	(7%)	12,571	(7%)	19,794	(10%)
SFFRFM	12,554	(6%)	15,100	(10%)	25,000	(13%)	26,160	(14%)	13,640	(7%)
Private Sector	140,437	(72%)	106,960	(71%)	147,964	(79%)	144,045	(79%)	158,218	(83%)
Total Sales	196,033	(100%)	151,474	(100%)	186,926	(100%)	182,776	(100%)	191,652	(100%)
Dealer	**2000/01**		**2001/02**		**2002/03**		**2003/04**			
ADMARC	37,104	(22%)	3,260	(2%)	3,405	(2%)	2,150	(1%)		
SFFRFM	18,340	(11%)	31,560	(18%)	9,619	(5%)	17,200	(8%)		
Private Sector	111,534	(67%)	140,137	(80%)	188,774	(94%)	195,650	(91%)		
Total Sales	166,978	(100%)	174,957	(100%)	201,798	(100%)	215,000	(100%)		

Source: IFDC (International Center for Soil Fertility and Agricultural Development)
Unit: Metric Ton

ADMARC has, however, still an important role as a purchaser of smallholder output such as maize, tobacco, groundnut, potato, soybean and sunflower except perishables. There are 400 to 500 outlets including temporary ones in rural areas throughout the country where the private sector finds it unprofitable to operate. They still have the largest market share of purchasing agricultural products, estimated at around 50%.