

*UNITED NATIONS DEVELOPMENT PROGRAMME
SUSTAINABLE LIVELIHOOD PROGRAMME*

TECHNOLOGY STRATEGY FOR SUSTAINABLE LIVELIHOOD

.....00000.....

A Paper on Enterprise Development

Consultant:

Malawi Industrial Research and Technology
Development Centre
P.O. Box 357
Blantyre

Tel: 265- 623805/953 Fax: 265 - 6233831
E-mail: mirtdc@malawi.net

CONTENTS

I. TABLE OF CONTENTS

II. ACKNOWLEDGEMENT

III. LIST OF ACRONYMS

IV. LIST OF FIGURES AND TABLES

V. PREAMBLE

1. INTRODUCTION

1.1 A General Overview

1.2 Enterprise Development in Malawi: Past and Current Efforts

1.3 The Sustainable Programming Framework

2. ENTERPRISE DEVELOPMENT: EXISTING COMMON ASSETS AND THEIR TECHNOLOGICAL CHARACTERISTICS

2.1 Public Common Assets

2.1.1 Land

2.1.2 Renewable Energy Resources

2.1.3 Labour

2.1.4 Water Resources

2.1.5 Forestry and Wildlife

2.2 Private Common Assets

2.2.1 Food Processing

2.2.2 Poultry Production

2.2.3 Mining

2.2.4 Handicrafts and Garments

2.2.5 Woodwork

2.2.6 Metalwork

2.2.7 Services

3. PRODUCTIVITY IMPROVEMENT: S&T INTERVENTIONS

3.1 Concepts and Definitions

- 3.1.1 *Definition of Terms*
- 3.1.2 *Factors Affecting Productivity of an Enterprise*
- 3.2 *Public Common Asset Utilization: Past and Present Efforts*
 - 3.2.1 *Land*
 - 3.2.2 *Renewable Energy Resources*
 - 3.2.3 *Labour*
 - 3.2.4 *Water Resources*
 - 3.2.5 *Forestry and Wildlife*
- 3.3 *Private Common Asset Utilization: Past and Present Efforts*
 - 3.3.1 *Food Processing*
 - 3.3.2 *Poultry Production*
 - 3.3.3 *Mining*
 - 3.3.4 *Handicrafts and Garments*
 - 3.3.5 *Woodwork*
 - 3.3.6 *Metalwork*
 - 3.3.7 *Services*

4. HIGH POTENTIAL TECHNOLOGIES AND KNOWLEDGE SYSTEMS: A REVIEW

- 4.1 *Introduction*
- 4.2 *High Potential Public Common Assets*
 - 4.2.1 *Renewable Energy Technologies*
 - 4.2.2 *Labour*
 - 4.2.3 *Water Technologies*
 - 4.2.4 *Forestry and Wildlife Technologies*
- 4.3 *High Potential Private Common Assets*
 - 4.3.1 *Food Processing Technologies*
 - 4.3.2 *Poultry Production Technologies*
 - 4.3.3 *Mining Technologies*
 - 4.3.4 *Handicrafts and Garments Technologies*
 - 4.3.5 *Metalworking Technologies*
 - 4.3.6 *Services*
- 4.4 *Key Technologies and Their Development Issues*

5. CONSTRAINTS FOR DEVELOPMENT AND TRANSFER OF TECHNOLOGIES

5.1 General Constraints

- 5.1.1 Lack of Political Patronage*
- 5.1.2 Lack of Coordination and Cooperation*
- 5.1.3 S&T Manpower Development and Management*
- 5.1.4 Lack of Funding*
- 5.1.5 Inadequate R&D Infrastructure*
- 5.1.6 Commercialization of Research Results*
- 5.1.7 Lack of Information Systems*

5.2 Specific Constraints for the Identified Key Technologies

6. POLICY, STRATEGY AND INVESTMENT FRAMEWORK

7. CAPACITY ASSESSMENT

8. CASE STUDIES

- 8.1 Salt Production Chikwawa*
- 8.2 Ndawambi Village Revisited*

II. ACKNOWLEDGMENT

The preparation of this paper on Technology Strategy for Sustainable Livelihoods: The Case of Enterprise Development was a highly collaborative effort of a Consultancy Team the Malawi Industrial Research and Technology Development Centre put together for this task. The consultancy team, under the overall leadership of the Director General comprised of Messrs K J Gondwe, Director of Industrial Research; S Kachale, Director of Technology Assessment and Transfer; F R K Nkhoma, Research Officer, Electrotechnology; Doreen Chanje, Research Officer, Food Technology; and R W Mkandawire, Research Officer, Technology Transfer. The tireless efforts of the members of the team who were prepared to work outside normal working hours are, therefore, highly commended.

The Centre would also like to acknowledge the assistance it received from Messrs Chiuta and Sikwese, District Community Services Officer and District Development Officer (Mchinji) respectively for mobilising the communities of Ndawambi and Nyamawende for the verification of the common assets in these communities which participated in the PAPSL study conducted in Mchinji in 1997. Equally deserving of our gratitude are, on behalf of the people in Ndawambi and Nyamawende, Village Headmen Ndawambi and Nyamawende.

Last but not least Mrs Margaret Chipofya who typed the manuscripts from the team members deserves our commendation.

III. LIST OF ACRONYMS

ADMARC	Agricultural Development and Marketing Corporation
ATTIGA	Appropriate Technology and Training for Income Generating Activities
BAM	Beekeepers Association of Malawi
B&C	Brown and Clapperton
BUPAD	Bulk Purchasing and Distribution
CARMATEC	Centre for Agricultural Mechanisation and Rural Technologies
COWI	Consultants name
DARTS	Department of Agricultural Research and Technical Services
DANIDA	Danish International Development Agency
DEMAT	Development of Malawian Enterprises Trust
DFID	Department for International Development
DoE	Department of Energy
DoF	Department of Forestry
EDEP	Enterprise Development and Employment Creation Programme
ESCOM	Electricity Supply Commission of Malawi
GEF	Global Environment Facility
GPPP	Government Preferential Purchasing Programme
GTZ	German Technical Agency
HAM	Herbalists Association of Malawi
HEP	Hydro electric power
ICRAF	International Centre for Research in Agro-Forestry
IFS	
ILO	International Labour Organisation
ITDG	Intermediate Technology Development Group
kWh	Kilowatt, hour
MACOHA	Malawi Council for the Handicapped
MEDI	Malawian Entrepreneurs Development Institute
MEPC	Malawi Export Promotion Council
MIM	Malawi Institute of Management
MIRTDC	Malawi Industrial Research and Technology Development Centre
MJ/m ²	Megajoules per square metre
MoAI	Ministry of Agriculture and Irrigation
MSME	Micro, Small and Medium Enterprises
MW	Mega watts
NEC	National Electricity Council
NGOs	Non-Governmental Organisations
NRI	National Research Institute (UK)
NSREP	National Sustainable and Renewable Energy Programme
PAPSL	Participatory Assessment and Planning for Sustainable Livelihood
PEW	Plumbing and Engineering Works

PV	Photo-voltaic
R&D	Research and Development
S&T	Science and Technology
SADC	Southern Africa Development Community
SADC-FINESSE	Southern Africa Development Community- Financing Energy Services for Small-Scale Energy Users
SEDP	Small Enterprise Development Programme
SSEs	Small Scale Enterprises
SUCOMA	Sugar Corporation of Malawi
TEVET	Technical Entrepreneurial and Vocational Education and Training
TQM	Total Quality Management
UNDP	United Nations Development Programme
UNESCO	United Nations Educational Scientific, and Cultural Organisation
UNDAF	United Nations Development Assistance Framework
US\$	United States Dollar
WICO	Wood Industries Corporation
ZIPAM	Zipatso Association of Malawi

IV. LIST OF FIGURES AND TABLES

Figure 1 -	Solar Insolation
Figure 2 -	The TQM Cycle
Figure 3 -	Productivity Model for an Enterprise
Table 1 -	Malawi 1996 - Estimated Final Energy Demand by Sector and Fuel
Table 2 -	Distribution of Biogas Potential by Species and District
Table 3 -	Forest Reserves Distribution by Region
Table 4 -	Gemstone Producing Districts and Prevailing Sale Prices
Table 5 -	Productivity Improvement Framework
Table 6 -	Mineral Resources in Malawi
Table 7 -	Key Technologies and their Development Issues
Table 8 -	Specific Constraints for the Identified Key Technologies
Table 9 -	Numbers of staff and their qualifications in various research institutions
Table 10 -	NGOs supporting Sustainable Livelihood Systems

V. PREAMBLE

The Sustainable Livelihoods Programming approach has been adopted as a development strategy by the Government of Malawi in its partnership with the UNDP and, indeed, the United Nations System within the United Nations Development Assistance Framework, UNDAF.

The Programme Wide Support Document of the Sustainable Livelihoods Programme has a Component of Technology for Sustainable Livelihoods and under this component, a Technology Strategy for Sustainable Livelihood is to be developed. The strategy will build on the practice and experience in three livelihood systems of smallholder farming systems, fisheries and enterprise development as sample livelihood systems.

The Malawi Industrial Research and Technology Development Centre hereinafter referred to as "the Consultant" was contracted to produce this paper on Enterprise Development as a basis for identifying how technology has supported micro and small enterprises as livelihood systems in Malawi. In developing this paper, the Consultant based his work on the terms of reference presented in Annex 1 of this paper. As required by the terms of reference, two of the five communities that were pilot areas for the PAPSL approach namely; Ndawambi and Nyamawende, were visited to establish the common asset base which form the basis of the technology strategy. Using these assets as examples, past and existing efforts to improve their productivity through scientific and technological interventions have been identified as well as an analysis of the potential for productivity improvement of the assets. This has been followed with a review of existing technologies and knowledge systems that show high potential for adoption and the processes of further developing these technologies and knowledge systems in order to increase the productivity of enterprises as a livelihood system in Malawi.

The central output of the work conducted is a strategy framework for facilitating the adoption and effective utilization of the high potential technologies in order to improve productivity of micro and small enterprises. The Consultant has also identified and reviewed the constraints for the development and transfer of technologies that would support enterprise development and the determination of the capacity of national institutions, through both field and desk research, to implement the strategy framework played a pivotal role in the identification and review of the constraints.

Salt production at micro-enterprise level has been a tradition in some communities in Malawi. This has formed the basis of a case study presented in this paper.

The common asset base of Ndawambi were analysed further in order to identify opportunities for productivity improvement in the context of the technology strategy for sustainable livelihoods framework.

Finally, the Consultant presented the findings and observations under this work at a one-day Roundtable Meeting of selected participants from Ndawambi and Nyamawende communities which were selected as case study areas.

1. INTRODUCTION

1.1 A General Overview

Enterprises and entrepreneurial activities form an important livelihood system in Malawi. In 1992 an estimated one million people out of a total labor force of about four million were engaged in micro, small and medium-scale enterprises. Over 80% of the workers were engaged in about 550,000 micro enterprises of fewer than five workers, mostly self-employed people sometimes assisted by a family members; underscoring the importance micro-enterprise subsector as a livelihood system. In contrast with this statistic, only 13% of the one million people engaged in enterprises were in the small scale and 6% were in the medium scale subsectors. Trading has, traditionally, been the dominant entrepreneurial activity with 52% of the enterprises in the 1992 study being in this subsector. Manufacturing enterprises constituted 43% of the enterprises studied and most of these were involved in traditional beer brewing (kachasu, a local rum and masese, a local opaque beer) and in handicrafts (cane and bamboo products). 90% of the enterprises were in the rural areas and over half of these were home-based. Women owned 46% of the enterprises and accounted for 39% of all those employed.

Many significant changes have taken place since 1992 arising from the democratization processes that have characterized the five year period from 1994. These changes have impacted on the available statistics but the extent of impact has not been publicized yet as the nation still awaits the results of the 1998 Population and Housing Census which traditionally publishes important economic characteristics.

Manufacturing accounts for 13% of Gross Domestic Products with agro-processing as the dominant subsector and the main source of growth.

1.2 *Enterprise Development in Malawi: Past and Current Efforts*

The Government of Malawi has supported a liberal system of private enterprise as a basis for commercial and industrial activity in Malawi. The general strategy for enterprise development has been the emphasis of Government policy on promotion rather than regulation. Consequently, Government has been concerned with the promotion of growth, efficiency, a stability and equity by means of a range of instruments including the provision of infrastructure, the utilization of a range of domestic and international institutional arrangements, and a mixture of incentives and, in the past, controls.

The Ministry of Commerce and Industry is the focal point for enterprise development in Malawi and, in consonance with the strategy of promotion rather than regulation, the Ministry is supported by a diverse range of quasi-government institutions providing specific industrial extension services. These have, through the years, included support institutions dealing with standardization, metrology and quality management, export promotion, entrepreneurship training and skills development, investment finance; and industrial research and technology development. In the recent past, Non-Governmental Organizations have

played a key role especially as advocacy groups as well as in providing specialized services such as credit.

The development of enterprises in Malawi is beset by a wide range of constraints. These constraints have, over the years, impacted negatively on the survival of enterprises especially micro and small enterprises. They include limited access to credit; limited access to raw materials and other inputs; limited access to markets, lack of business entrepreneurship, technical and managerial skills, limited access to and lack of information on technologies; and the lack of clear policies for the development of the micro and small enterprise sector. Government has, in view of these constraints, made specific initiatives to support the development of enterprises in Malawi.

A more relevant past initiative in enterprise development is the Small Enterprise Development Programme (SEDP) which was implemented within the framework of the Government of Malawi/UNDP 5th Country Programme. The programme, whose principal objective was to create alternative non-farm income opportunities in order to reduce poverty, supported enterprise development through five components of policy, promotion and coordination; entrepreneurship development and training; credit; appropriate technology and marketing. A current initiative which builds on the strengths of the Small Enterprise Development Programme is the Enterprise Development and Employment Creation Programme (EDECP) which has retained in a different format all the five components of SEDP. This new programme (EDECP) is being implemented within the Sustainable Livelihoods Programme and is funded by the United Nations Development Programme, UNDP.

In contrast with the Small Enterprise Development Programme the EDECP has adopted a more focussed approach to micro and small enterprise development. This has resulted in the selection of seven enterprise subsectors which will receive support. They, therefore, represent enterprise fields towards which any technology development efforts should be directed.

1.3 *The Sustainable Livelihoods Programming Framework*

Malawians have, limited access to alternative and sustainable livelihood systems. It is widely accepted that over 80% of the population depend on agriculture, especially smallholder agriculture; making it the dominant livelihood system. Malawi is endowed with fresh water bodies, making them common assets along the lakes and river systems which people use as a source of fishery. The sustainability of this asset has been threatened over the years due to a mixture of both natural and anthropological factors.

The Sustainable Livelihood Programming approach, which has been adopted by Government, is an integrated package of policy, technology and investment strategies together with appropriate decision making tools which are used together to promote sustainable livelihoods by building on local adaptive strategies. Its stepwise approach to socio-economic has, generally, been used in this work although emphasis has been laid on

the assessment of the key technologies contributing to enterprise development as a livelihood system and on determining the technologies that would help to improve the productivity of private and public common assets in a sustainable manner.

2.0 ENTERPRISE DEVELOPMENT: EXISTING COMMON ASSETS AND TECHNOLOGICAL CHARACTERISTICS

Malawi has various common assets that can be used for purposes of enterprise development.

The common assets may be classified by definition into two categories; namely **public common assets and private common assets**. Public common assets are, in this document, defined as naturally occurring assets that man inherited by virtue of inhabiting the earth. They are common because nearly anyone has access to them. Private common assets are a result of man's ingenuity. They are common because anyone with the means has access to them at cost.

2.1 Public Common Assets

Public common assets and their technological characteristics with relevance to enterprise development in Malawi are as follows:-

2.1.1 *Land*

Malawi has a total area of 118,484 square kilometers of which 94276 square kilometres is land. 56% of the land area is arable¹. Of the total land area, 26,870 sq km is in the Northern Region (of which 12,360 sq km is arable), 35,520 sq km in the Central Region (of which 22,490sq km is arable) and 31,690 sq km is in the South (of which 18,220 sq km is arable). The development thereon include farming, housing, public markets and business buildings.

Even though land forms a very important economic asset for Malawi, only 27% of the total arable land was under cultivation as at 1984 cropping season. The major crop for cultivation in Malawi is maize which occupied 78% of all cultivated land². This crop is mainly cultivated for consumption, under subsistence farming methods.

Major cash crops for Malawi are tobacco, tea and sugar. In 1997 Malawi produced a total of 159.2 million kilogrammes of tobacco that sold at an average price of K24.68/kg bringing in a total income of K3.93 billion. In the same year from January to September, it produced 31.9 million kilogrammes of tea whose price averaged K17.15, thus bringing in an income of K416.2 million. For the same period, January to September, 1997, 155,431 tonnes of sugar was produced. Of the sugar produced, 29,805 tonnes were exported at an average price of K9,906.7/tonne. Other crops produced by the smallholder farmers are were rice and cotton, which together with maize recorded a decline over the previous year's production, while

¹ Demographic and Health Survey, 1992.

² Statistical Year Book 1995.

tobacco, groundnuts, pulses, cassava and potatoes showed an increase over 1996 production. Smallholder burley tobacco increased significantly over the previous year's production due to liberalisation of burley growing which became effective that year. The increase in burley affected adversely the growing of maize, groundnuts and other crops.

In 1997 ADMARC bought the following quantities of crops from smallholder farmers: tobacco, 10,616 tonnes at K93,37 million; groundnuts, 8,929 tonnes at K56.68 million; cotton, 15,474 tonnes at K75.18 million; rice, 6,316 tonnes at K22.01 million, pulses, 4,869 tonnes at K15.02 million and maize, 13,546 tonnes at K24.13 million. The qualities purchased were 36.1% less than ADMARC purchased the previous year over the same period³. This was mainly due to the shift towards tobacco production by smallholder farmers. Tobacco produced by smallholder farmers is, besides ADMARC, also bought by middle men who in turn sell it straight at the Auction Floors in Limbe, Lilongwe and Mzuzu.

2.1.2 *Renewable Energy Resources*

Malawi, with about 85% of its population living in the rural areas, heavily depends on the biomass fuel resources (DoE/ DoF/ NRI, 1997). Biomass contributes to a resounding 93% of the total energy requirement, the rest combined contribute a meagre 7%. The estimated energy demand by sector and fuel type is presented in the Table 1 below.

Table 1: Malawi 1996- Estimated final Energy Demand by Sector and Fuel.

Fuel / Sector	Biomass	Coal	Petroleum	Electricity	Total
Household	97,309	2	544	614	98,469
Service	1355	99	511	405	2,370
Industry	8960	1,990	2,622	1,652	15,224
Transport	283	9	4,700	30	5,022
Total	107,907	2,100	8,377	2,701	121,085

Source: Malawi Biomass Strategy Study, December 1997.

2.1.2.1 Solar

Malawi, like most of the tropical countries, experiences potentially high level of insolation throughout the year as shown in the Figure 1 below. What most tropical development countries lack is indigenous technical knowledge to use the full potential of this immense energy system.

³ Financial and Economic Review, Reserve Bank of Malawi, pp31-34.

Malawi lies within the Great East African Rift Valley, between latitudes of 9° 11' and 17° 30', a region that enjoys good sunshine throughout the year. The average insolation in Malawi is 21.1 MJ/m²/day. Since Malawi lies South of the equator, the maximum insolation is experienced during the summer months of October /November, and minimum insolation during the months of June/July as shown in Figure 2.

Solar energy has been in use in this part of Africa for many years. The solar energy has been the major source of energy for crop drying, fish drying and drying of semi-processed or processed foods for ages despite the fact that there has been no special devices that have been locally developed to harness the solar energy. Now, a number of devices, both thermal and photo-voltaic (PV) have been introduced in the market place. There are several players in the market place including Sollatek Malawi, Ecoelectric and Eco-systems. MIRTDC has the capacity to size and install PV systems⁴ (Nkhoma, 1997).

Figure 1: Solar Insolation

2.1.2.2 Biogas

Biogas technology is a modern, ecologically-oriented form of appropriate technology based on the anaerobic decomposition of organic materials by putrefactive bacteria at suitable operating conditions. A combustible mixture of methane and carbon dioxide, *biogas*, is produced.

Based on assessment studies by Kræmar (1996) and Wasser (1997), the potential for biogas in Malawi is estimated as 317, 000 cubic metres of gas per day based on the animal

⁴ Nkhoma F.R.K. ; Makanjira Solar Demonstration Village: A Status Report.

population (1995 data from Ministry of Agriculture). The report from the Ministry of Agriculture estimated 750 000 cattle, 998 000 goats, 92 000 sheep, 263 000 pigs and 3 million chickens. The total potential is likely to be higher if the report had considered the potential of utilising sewer wastes in the cities and also use of other bio-wastes from farms and industries. The assessment conducted by Kræmar confirms this assumption as indicated by the Table 2 below:

Table 2: Distribution of Biogas Potential by Species and District								
		Cattle	Gnats	Sheep	Pigs	Poultry	Total	
Northern Region	Karonga	26,506	864	543	1,752	907	30,572	9.6%
	Mzuzu	38,684	4,279	1,227	3,604	1,318	49,112	15.5%
Central Region	Kasungu	39,666	8,191	912	8,181	1,516	58,466	18.4%
	Lilongwe	37,280	11,154	831	10,946	4,558	64,769	20.4%
	Salima	11,605	4,900	583	1,224	694	19,006	6.0%
Southern region	Blantyre	19,237	7,864	524	5,754	2,739	36,118	11.4%
	Machinga	15,470	5,420	1,562	1,402	2,202	26,056	8.2%
	Shire Valley	26,182	3,909	284	2,656	442	33,473	10.5%
Total		214,630 67.6%	46,581 14.7%	6,466 2.0%	35,519 11.2%	14,376 4.5%	317,572	

2.1.2.3 Briquettes

Briquetting technology has been in existence in Malawi for a number of years. Wood Industries Corporation (WICO), then a parastatal organisations, used to produce and market briquettes from saw dust. This was stopped when WICO was eventually privatised probably because it was no longer considered a viable business.

Stanlinks Organisation, under the UNDP sponsorship, working closely with MIRTDC (Mchinji antenna), developed a manual briquetting machine that utilises any organic waste as raw material for briquette production. The technology is gaining popularity following several training programmes that have been conducted in Lilongwe and Blantyre. The briquettes are an attractive option because of ease of manufacturing and low cost of raw materials. Most of the materials used in briquetting are biomass residues that are collected by the manufacturers (mostly women) free of charge. The materials used include fallen and dry leaves, waste paper, bran, rice husks, saw dust and many other organic materials. This activity is proving popular also among the women because the extra briquettes produced can be sold thereby economically empowering the women.

2.1.2.4 Hydro Electric Power(HEP)

Malawi has a surface water system dominated by Lake Malawi along the eastern border and river flowing into it from the west. The outlet from the lake is the Shire River which has most of the hydro-electric potential sites for the country. Hydro-electricity contributes 95% of the total electricity produced and used in Malawi. There are a number of perennial rivers in Malawi which can qualify for HEP development. Other rivers qualify for the mini and micro power generation.⁵

Electricity in Malawi is generated, transmitted and distributed by Electricity Supply Corporation of Malawi Limited, a government parastatal, at their sites on the Shire River in the Southern Region and Wovwe River in the Northern Region. The total installed HEP is 218.5 MW of which 4.5 MW is from the recently commissioned Wovwe mini-hydro. There are other independent power producers such as SUCOMA which generates electricity from bagasse and Lujeri Tea Estates and Matandani Mission, near Neno from micro hydro electric power. Apparently, the independent power producers were once introduced into the country through the missionaries but the technological know-how had not been localised. The Matandani micro-hydro power is struggling due to lack of spares. MIRTDC in association with Intermediate Technology Development Group (ITDG) of Zimbabwe are working together to develop local capacity to assess, design and instal micro hydro power systems and intends to use the Matandani Mission as the project site.

ESCOM's interest is in the mini and full scale hydro electric power plants, leaving the micro-hydro open. MIRTDC believes it will be able to provide some service in this market niche.

2.1.2.5 Wind Potential in Malawi

Since the ancient civilisation, wind energy has been utilised to power water pumps and other machines. Eventually, this technology got to Malawi, probably brought by early missionaries and settlers but became obsolete when, what were considered more convenient forms of energy sources such as diesel engines, came into the market.

There are very few sites which still use wind power in Malawi. During the study, the team visited one such site located at Magomero Catholic Mission near Zomba. The mill is used for pumping water from a well to a header tank. Near Makanjira in Mangochi, another windmill is being used to power small scale irrigation pump. The second case is quite interesting in the sense that the technology was developed and fabricated locally with the technical input from the mill owner and MIRTDC staff in Mangochi.

Unprocessed wind data has been recorded for many years. Weather related data falls under the jurisdiction of Department of Meteorology. There are hardly any extensive studies undertaken in the wind energy area. The work undertaken by D R Kamdonyo (1988) is one of such rare studies. Other institutions involved in the measurement of wind data for various reasons include Ministry of

⁵ Definitions micro hydro 200W to 3 MW, mini hydro 3MW to 10MW, full scale hydro greater than 10 MW. Source: HARVEY, A et al, " Micro-hydro Design Manual", IT Publications.

Agriculture, and Department of National Parks and Wildlife. There have been no deliberate measurements undertaken to study the wind energy. In fact, most of the available wind data are taken from either 2 or 10 metre wind masts. For energy assessment wind measurements need to be taken at 20 or 30 metre height.

A DANIDA-sponsored project on **Assessment of Alternative Energy Sources in Malawi** in which COWI Consult together with a team of local experts⁶ have installed mast with automatic data loggers to measure wind and solar potential at various sites. This study will contribute greatly towards establishing wind and insolation databases which are necessary for sizing and specifying or designing the energy converting devices.

2.1.3 Labour

Labour is the resource that adds value to other assets for the improvement of livelihood systems. Labour is utilised in all enterprise set ups to produce goods and services. In Malawi, most labour is utilised in the rural areas. The 1987 census put the urban population at 11%, thus leaving the rural population at 89%. Projected figures were that by the year 2000, the urban population would reach 30%. This population would concentrate in the major towns of Blantyre, Lilongwe, Mzuzu and Zomba⁷. Should such a situation arise, there would be a shift in the populations' dependence in terms of livelihood source, from the current 90% which depends on agriculture to about 70% and the rest would be from employment and enterprises.

46% of the Malawi Population is under 15 years and about 9% is over 60 years. If the two categories of people were considered dependent, only 45% labour force if available to support them. Thus every working adult has to support more than one dependent. The situation is worsened by poor education, since people go to school when well over fifteen. For example, in 1995, with a projected population of about 12 million, 18% were under the age of five, about three million (30%) were, however, at schools and colleges. This implies a total dependent population of about 57%⁸.

Malawi's industrial employment has a seasonal pattern. The pattern follows the agricultural cycle. The labour force is at its minimum in the quarter October to December. At this time, most agricultural produce that most industries process is still in gardens. Employment opportunities pick up in the quarter January to March when some harvests start and/or companies start preparing to receiving harvested commodities for processing. It then peaks in the quarter April to June when most crops are harvested and sold. The pattern then gradually falls in the quarter July to September. Despite the seasonal pattern, employment opportunities have been growing over time. In 1986 the total paid employees in Malawi were 412,700 and by 1990, the figure had reached 468,200 while in 1995 the number of employees averaged 564,100. This represents an average paid up labour increase of 3.67% per year.

⁶ Gondwe, K J (MIRTDC) -Biomass , Kamdonyo, D R (Meteorology)- Wind, Masangwi, S (Polytechnic)- Solar and Chima, T (DoE)- Microhydro, Chitenje, H- DoE-Project Coordinator .

⁷ Situation Analysis of Poverty in Malawi, 1993.

⁸ Basic Education Statistics, 1996; Situation Analysis on Poverty, 1992.

In 1995 there were an average of 564,064 employees in the industrial services who earned an average of K187.96 monthly. The average number of employees and earnings per month by sector were as follows:-

- Agriculture, Fisheries and Fishing: 289,442 earning K67.87
- Mining and Quarrying: 688 earning K270.79;
- Manufacturing: 78,713 earning K195.79;
- Electricity and Water: 5,689 earning K217.99;
- Building and Construction: 41,010 earning K260.95
- Wholesale/Retail, Trade, Hotels and Restaurants: 28,004 earning K387.12;
- Storage and Communications: 20,336 earning K386.32;
- Financing, Insurance and Business Services: 22,038 earning K1160.40;
- Community, Social and Personal Services: 78,144 earning K221.00⁹.

In Ndawambi, a village of 1112 persons, only 230 adults can read and write while 317 boys and girls go to school. There is no pre-school playgroup in the village. Assuming all the 317 school going boys and girls can read and write, then the village has a literacy level of 60.8%. This implies that the remaining 40% can only contribute with difficulty to economic development of the village and the country. In contrast to this Tunisia has, since 1987, developed so fast that its economic planners hope to attain the status of a developed country in less than a decade. Its per capita income of \$2226 is certainly one of the highest in Africa¹⁰. Tunisia, like Malawi doesn't have notable valuable natural resources. Its secret to success has been the making of education compulsory for children up to the age of sixteen. Tunisia has a large number of institutions of higher learning and training. From these institutions has emerged a quality labour force.

2.1.4 Water

There are two sources of water namely groundwater and surface water. Malawi is endowed by Africa's third largest lake and the World's eighth. The Lake Malawi actually covers a fifth of the country's total surface area. Other smaller lakes are Chilwa, Malombe and Chiuta. In addition to the lakes, Malawi also has other sources of surface water in form of rivers/streams, ponds, dambos and dams. Notable of the rivers are Shire, Ruo, Bwanje,

⁹ Monthly Statistical Bulletin, December, 1997.

¹⁰ D.D. Phiri, Nation Newspaper, 27 April, 1999.

Lithipe, Bua, Dwangwa, Luweya, South Rukuru, North Rukuru and Songwe rivers. At household level, fishing is the major livelihood activity gained from surface water bodies. In 1995, together with agriculture and forestry, fishing employed an average of 289,442 persons per month¹¹. On a national scale, fishing records are only kept for Lakes Malawi Malombe, Chilwa, Chiuta and Shire River. In 1993, 68,200 tonnes of fish were produced, and these were split as follows:- Lake Malawi 44,800, Lake Malombe 6,000, Lake Chilwa 11,100, Lake Chiuta 3,400 and middle and lower Shire 2,900 tonnes¹².

Another activity benefiting from surface water is irrigation. By the 1990/91 cropping season, 6354 hectares had been developed for irrigation countrywide mainly for the growing of rice by smallholder farmers. In the estate sector, the major user of irrigation is the sugar industry. By the 1993/94 season, 15,125 hectares of sugar plantations were under irrigation¹³.

The third use for surface water is that of transportation. In Malawi, not much use is made of rivers as an inland means of transport. However, Lake Malawi which spans 640 km along the length of the country, is a major transport route for populations living on the south eastern side of the lake such as Makanjira and Fort Maguire. Populations on Likoma and Chizumulu islands and those from Nkhatabay to the north, up to Chirumba, in Karonga also depend on lake transport services. In 1997 a total of 328,000 passengers were handled by the Lake Service ferries that make a weekly trip around the lake.

As of 1992, 82% of the urban households had access to piped water, but most of those, 49%, got their water from public taps. 64% of the rural households depended on shallow wells {23% from protected wells (covered) and 41% from unprotected wells}. At national level, 53% got their water from unprotected wells and other undeveloped natural resources that were considered unsafe.

As stated, ground water is the one most needed resource for daily use at rural level; the water requires simple and affordable pumps to assist in lifting it to the ground for utilisation. For domestic use, the department of water has recommended the use of Afridev pumps. These pumps have received technical support in the form of training village servicemen and stocking spareparts by Chipiku Stores throughout the country. In 1994 there were 8794 boreholes in the country serving a population of 2.2 million people¹⁴.

For irrigation purposes, diesel and electric pumps are preferred. In addition to the traditional pumps, however, other simple pumps like the treadle pump and rope and washer have started receiving recognition. In the past the Department of Irrigation together with Malawi Industrial Research and Technology Development Centre trained artisans countrywide in the

¹¹ On a national scale, fishing records are only kept for Lakes Malawi, Malombe, Chirwa, Chiuta and Shire River.

¹² Malawi statistical year book, 1995 pp 75.

¹³ Malawi Statistical year book, 1995.

¹⁴ Malawi Statistical Year Book 1995.

fabrication of Rope and Washer pumps. Later the Centre together with Department of Irrigation trained a further 15 artisans in the fabrication of treadle pumps. Recently, the Department of Irrigation invited tenders for the supply of 5000 treadle pumps to be used in small scale irrigation in a drive to improve land productivity.

2.1.5 Forestry and Wildlife

Malawi total forest resource is estimated to be between 3.51 and 3.7 million hectares, or over 37% of the total land area (IFS- 1986, Abell/ Forestry 1992). The distribution of the forest reserves is quite skewed. The Northern Region with 11% of the population has 40% of the reserves, and the remaining regions which account for 89% of the population share the remaining 60%. The distribution of forest reserves in the three regions of Malawi as shown in the table below:

Table 3: Forest Reserves Distribution by Region.

REGION	AREA (SQ. KM)	% POPULATION	% FOREST
Northern	26, 931	11	40
Central	35, 595	39	30
Southern	31, 753	50	30

Source: Forestry Department, 1996

Malawi has designated a number of forests as national parks and game reserves. These are Nyika National Park and Vwaza Game Reserve in the North, Kasungu National Park and Nkhota-Kota Game Reserve in the Central, and Lake Malawi National Park, Liwonde National Park, Majete Game Reserve and Lengwe Game Reserve in the South.

The Forestry Development Strategy for 1997-2000 outlines a number of strategies for the forestry sector. The strategies include enabling and promoting the participation of local communities and the private sector in the forest conservation and management; empowering the rural communities to manage forest resources; improving access to all government-controlled plantation resources by small scale enterprises and processors, among others¹⁵.

Malawi's forestry and wildlife keeps dwindling as it gives way to the growing human population. Customary forest reserves are however the most affected. In these reserves, the chief or headman authorises the cutting down of trees or opening up part of the forest for gardening and housing. About 2% of customary land is deforested annually¹⁶.

Malawi derives 94% of its primary energy supply from renewable biomass fuels (wood,

¹⁵ Forestry Development Strategy, 1997 - 2000.

¹⁶ Mchinji Baseline report.

charcoal, biogas and molasses) and an additional 2% of primary energy from renewable hydroelectric resources¹⁷. This scenario calls for efficient use of the resource to make it more sustainable. Forestry resources are mainly used for domestic woodfuel (firewood, charcoal), industrial wood-fuel (for tobacco curing, brick burning, and steam generation). In view of the use the woodfuel is subjected to, high energy efficiency cookstoves (both wood and charcoal), charcoal kilns, brick kilns and tobacco curing kilns need to be developed, introduced and their use encouraged. Currently the most popular cookstove in the country is the open three stones fireplace. Ndawambi, a village of 195 households, has only one household utilising a form of a constructed cookstove. The three stone cookstoves, at energy efficiency of 10 - 15%, is the most inefficient cooking method. Improved wood stoves have achieved energy efficiency of up to 30-40%. Pressure stoves have reached 53% efficiency levels while gas stoves have an efficiency of 57%. The highest efficiency is achieved by the spirit burners that have reached 61%¹⁸.

Viphya plantation was established in the early 1950s and, as of now, 54,000 hectares of pine and eucalyptus species have been planted in the northern Viphya Plateau initially with the intention to supply a pulp and paper industry project. However, due to pricing, environmental and political constraints, this pulp and paper project has never been realised. Alternative uses have been sought one of which was charcoal production. This venture, however, did not prove very successful due to high transport costs of the charcoal. 9000 hectares of the forest have since been concessioned to Viphya Plywood and Allied Industries Limited which used the resource for the production of plywood, blockboards and timber.

In addition to the Viphya forests being harvested for timber products, the wood resources have the potential to be used to fuel electric power generation. An area of 45000 hectares of the Viphya plantation would support a 25MW power plant in a sustainable manner. Such a powerplant would use 30 tonne fuelwood per hour (at 40% moisture content)¹⁹.

Forestry resources and wildlife are also used for bee-keeping, indigenous fruit collection, tourism and hunting. Another notable use of forestry resources is the utilisation of its products as sources of raw materials for various enterprises. The uses include medicinal herbs, reeds and palm leaves for mat making, dry wood for carvings, bamboos for basketry, tree trunks for mortar and pestle making and traditional drums. Some of these products are ideal for the export market.

¹⁷ National Energy plan, 1988 -97

¹⁸ Renewable Energy Technologies, Their Application in Developing Countries. L.A. Kristoferson and V. Bokalders.

¹⁹ Malawi Power Production with Biomass; a Feasibility Study, 1996

2.2 Private Common Assets

Private common assets have been categorized as such largely due to their uses. As the definition for private assets presupposes, the common assets referred to are in fact technologies and knowledge systems necessary for various enterprise activities. In rural Malawi, land provides the most important economic asset for farming. Over 80% of the rural population derive their livelihood from agriculture. The PAPSLS reports support this notion in that they recognise farming as the most important economic activity in Nyamawende²⁰ and that there are only a few people with non-agricultural occupation.

The private common assets are characterised by their industrial nature. The output from Malawi industry sector falls into four categories. The first category is of consumer goods for the domestic market. This category includes food, beverages and tobacco and commands 13% of the market and, clothing, footwear and textiles that commands 9% of the market. Manufacturing of domestic consumer goods together constitutes 45% of the industry in Malawi. The second category is that of products for building and construction which are also produced largely for the domestic market and accounts for 18% of the industrial production in Malawi. The third category is that of export goods which accounts for 23% of the total industrial goods produced in Malawi. The fourth category is that of industrial services consisting mainly of supply of electricity and water.

2.2.1 Food Processing

Food processing is the dominant enterprise among the small scale industry in Malawi. In 1996, food processing accounted for 62% of the number of enterprises registered amongst the SSEs and 51% of the employment generated by the sector.

Most processed food is consumed locally, however, some finds its way to the export market. In 1995, various processed food items were exported. The items were as follows:-

➤ fish	-	K3.93 million
➤ dairy produce, birds's eggs, natural honey	-	K1.14 million
➤ edible vegetables, roots and tubers	-	K126.2 million
➤ fruits and nuts; peel of citrus fruits	-	K38.2 million

²⁰ Participatory Assessment and Planning for Sustainable Livelihood Report Nyamawende Village, December, 1997.

➤	coffee tea mate and spices	-	K675.6 million
➤	cereals	-	K52.4 million
➤	products of the mill industry, malt, starches, inulin, wheat gluten	-	K3.1 million
➤	oil seeds, oleaginous fruits, miscellaneous grains	-	K28.1 million
➤	animal/vegetable fats/oils	-	K1.3 million
➤	sugars and sugar confectionery	-	K396.8 million
➤	preparations of cereals, flour, starch or milk	-	K7.6 million
➤	Beverages, spirits and vinegar	-	K65.8 million

Food for export is mainly processed in factories while the majority of the food eaten locally is processed by households themselves or local businessmen. The key technology assets utilised in the processing are maize mills, fruit juice extractors, solar driers, distillation stills, fermentation (masese and chambiko), smokers, bakery ovens, oil expellers and presses, gnawers (mphero), mortar and pestle, air drying, storage pits and cookstoves.

2.2.2 Poultry Production

In Malawi there are three breeds of poultry being kept. These are the local-breed chickens, reknown for their free range lifestyle; the mixed-breed, (the black australops), reknown for their free range and moderate egg and meat production and the hybrid types specially bred for meat or eggs. Recently; there has been an upsurge in the rearing of guinea fowls in areas like Karonga, Chitipa, Mchinji, Mwanza and Blantyre. These have gained popularity due to their high yields in both eggs and meat.

Recent statistics also show an upsurge in imports of poultry and its products. In 1994 imports for birds, eggs, honey and animal products totalled K53 million against an export figure of K1 million; the following year, the imports reached K60.8 million while the exports dropped to K0.35 million. This year (1999) has seen the closing of Press Poultry, which was the largest poultry producer in the country. The closing of Press Poultry was preceded by the shutting and scaling down of operations in government run poultry farms of Mikolongwe, Bwemba and Choma poultry farms. The commercial farms have closed down due to expensive inputs, such as feeds and medicines, that made competition favour imported products. The imported products have benefitted from the trade liberalisation policies being implemented by the country. The public farms have suffered from the privatisation policies

being implemented by the Government.

In a bid to rescue the poultry enterprise, the Ministry of Commerce and Industry, with assistance from UNDP through the Enterprise Development and Employment Creation Programme, identified the enterprise as one of the priority areas that needed promoting. Through the programme the Malawi Industrial Research and Technology Development Centre, in collaboration with DEMAT, has conducted five feed mixing training programmes; one each in Mzimba, Mzuzu, Lilongwe, Mchinji and Blantyre and one hatchery management training at MEDI. DEMAT is also conducting training programmes in poultry management while MEDI is covering training in business management.

Technologies utilised in poultry keeping are feed mixers and accessory equipment, cages, laying boxes, incubators and brooders.

2.2.3 Mining

Mineral resources are another form of common assets that are being used for income generation. The technologies required include those needed for limestone mining for the production of both industrial and agricultural lime; vermiculite mining for the production of industrial insulation material, gemstone mining for the production of valuable ornaments, clay mining for the production of ceramic products and brick making; and silica sands mining for the production of scouring powders and sodium silicate used in soap making.

Precious and semi precious stones have been reported to be mined on small scale in fourteen districts of Malawi with production reaching as much as 700,000 grams per annum. Unofficial estimates show that Malawi is producing about 200,000 grams per annum of gem quality stones, the most abundant being aquamarine. Overall estimates of monthly production per miner are in the range of 1,000 - 5,000 grams. Aquamarine is mostly mined in Mzimba, Kasungu, Rumphi, Nkhatabay, Mangochi and Mchinji. Rhodolite is mined in Mzimba, Nsanje, Nkhota-kota and Mangochi. While amethyst is commonly available in Chitipa and Mzimba. Ruby and sapphire are being prospected in Ntcheu, Mwanza and Nsanje with monthly production estimated for each at 100 grams.

Officially Malawi has 59 holders of non-exclusive prospecting licenses, 24 holders of mining licenses and 36 reserved mineral licence holders. 21 of the miners in the country are women.

Prospecting for gemstone is mostly done when gemstone deposits are discovered as float in gardens. Local people then pair up to start mining, sometimes even without licenses. After exhausting the gemstones in loose earth (alluvium) they abandon the pits to open new ones in other areas, due to several reasons including the following that the pits may be deep and unsafe to work in, the miners might have reached the water table and the pits have become water logged; and due to lack of appropriate tools to break the hard quartz rock in which most quality gem stones penetrate. This practice creates environmental degradation due to lack of rehabilitation of the environment once the pits have been abandoned. Mining

equipment and accessories required include picks, shovels, hammers, combing hammers, sieves, generators, water pumps, excavators; and compressors.

Trends show that gemstone production is seasonal and erratic reaching its peak during summer. The reasons for this state of affairs include the lack of finance, technical expertise, mining tools and the effects of the rainy season. Consequently, any gemstone that is found is immediately sold to pay for labour. Buyers have capitalised on this constraint and often offer very low prices for the gemstones.

One other major constraints facing miners is the lack of capacity to grade, evaluate and negotiate for the right price for their stones. In order to buy, sell and appraise coloured gemstones appropriately and profitably, dealers need a systematic approach to their description and evaluation. Gemological coloured stones grading system presents a repeatable, consistent method for evaluating the factors of colour, clarity and cut based on carat (or gram) weight of the gemstone. Gemologists are the most competent experts in undertaking gem valuation and in Malawi there is only one known Malawian gemologist.

Malawi also lacks capacity to process the stones into jewels and jewellery. There is only one processing enterprise, Gem and Jewellery Lanka Limited, a foreign company based in Lilongwe. Due to lack of a well coordinated system of buying and marketing gemstones from the miners, the sector suffers from smugglers from neighbouring countries and beyond. Table 4 below shows producing districts and estimated selling prices for common Malawi precious and semi-precious stones.

Table 4 : Gemstone Producing Districts and Prevailing Sale Prices

Product	Producing District	Price Estimates in US\$
Aquamarine(beryl)	Mzimba, Rumphi, Kasungu, Mchinji, Nkhatabay	3 - 50/g
Ruby(corundum)	Ntcheu, Mwanza, Nsanje	250-1000/g
Rhodolite(garnet)	Ntcheu, Nsanje, Nkhota -kota, Mzimba, Mangochi	5-10/g
Amethyst(Quartz)	Chitipa, Mzimba	1-2/g
Sodalite	Chitipa, Rumphi, Mzimba, Machinga, Mwanza	3000-5000/tonne
Sunstone	Ntcheu	1.5-2/kg
Rose quartz	Machinga, Mzimba	5000-10000/tonne
Agate	Chikwawa	5-10/kg

2.2.4 Handicrafts and Garments

Clothing, leather and footwear enterprises make significant contribution to employment in Malawi. There have been several efforts such as those by the Ministry of Women, Youth and Children's Affairs, Community Services and Social Welfare; ATTIGA; Magomero Community College, Malawi Chamber of Commerce; Malawi Export Promotion Council; to promote handicrafts in Malawi. Technologies used in handicraft production are sewing machines, knitting machines, handlooms, cane furniture skills, leathercraft tools, batik (tie and dye).

The major thrust has been to promote the exploitation of the export market for the products. MEPC has tried to penetrate the Germany market, while Magomero targeted the South African market.

In 1996, handicrafts and garments were exported included articles of leather, K559,600; straw esparto (basketware, wickerwork, K90,500; special woven fabrics, K54,700, knitted and crocheted fabrics, K8,300; apparel and clothing accessories knitted and crocheted K68,900 and ceramic products at K94,500²¹.

2.2.5 Woodwork

Woodworking is one of the major sources of income in rural Malawi. Some of the products from woodwork are carpentry products (chairs, beds, tables), carvings mortars, drums and jewellery. Wood and articles of wood fetched K27.8 million in export earnings in 1996.

In 1985, there were 123 registered small enterprises in sawmill and wood products, employing 9% of the workers in the small-scale manufacturing sector.

2.2.6 Metalwork

Metal working, like woodworking, is also well established in both rural and urban Malawi. Metal working covers such trades as tinsmithing, blacksmithing, casting, lathe turning, welding and assembly.

2.2.7 Services

The small-scale services industry in Malawi include repair works (radios, watches, tyres, shoes, garages, umbrellas) and traditional healers. For purposes of this paper, services include transport (hiring of bicycles, canoes, buses) vending, hawkers, restaurants, resthouses, groceries, the selling of secondhand clothing.

²¹ Monthly Statistical Bulletin December, 1997.

3.0 PRODUCTIVITY IMPROVEMENT: S & T INTERVENTION

3.1 Concept and Definitions

3.1.1 Definition of Terms

Productivity is generally defined²² as the relationship between the output generated by a production or service system and the input required to create this output. It is a measure of performance that incorporates both efficiency and effectiveness.

Mathematically, productivity may be represented as :

$$\text{Productivity (P)} = \frac{\text{output}(O)}{\text{input}(I)}$$

Generally, higher productivity means accomplishing more with the same or reduced input both in terms of volume (quantity) and quality. Literature demonstrates that positive productivity changes affect many social and economic phenomenon including economic growth, competitiveness of a country's products, employment and, indeed, the quality of life of citizens.

Science may be defined as mankind's organised attempt, through objective study of empirical phenomena, to discover how things work as casual system (*know-why*), while technology denotes the whole or organic part of knowledge that relates directly to the production or improvement of goods and services (*know-how*).²³

Technology may be embodied in the following four components:²⁴

- facilities - such as equipment, machinery and factories;
- person - in form of skill and education;
- document - such as patents and engineering drawings; and
- institution - in form of organisational structures, management and marketing.

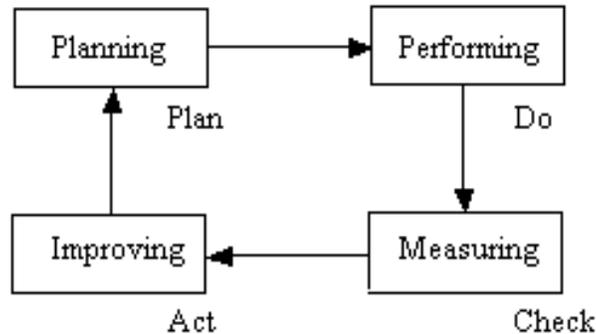
There are several approaches that may be used to bring about productivity improvement. The

²² Prokopenko J, "Productivity Management: a practical approach" ILO Population

²³ Guta,C, "Situation Report on Science and Technology in Malawi; 1998".

²⁴ Guta, C and Gondwe K, "Productivity Management", a special paper presented at MCCI - International Trade Fair in June 1996

approach advocated in this paper is the total quality management approach which assures continuous improvement. This is summarised through the Total Quality Management Cycle or Plan-Do-Check-Act cycle as shown below. Also presented below are short descriptions of the key components of the TQM cycle namely planning, performance, measurement and improvement.



Source: “Quality Audits for Improved Performance” by D.R. Arter

3.1.1.1 Planning

The activities performed should be planned before they happen. Major issues need to be identified and prioritisation done. A lot of consultations are expected to ensure that inputs of all stakeholders are put on board.

3.1.1.2 Performance

The action should proceed as planned. Those performing the tasks should be given proper tools and training to enable them achieve the tasks. Records of performance should be maintained.

3.1.1.3 Measurements

The success or failure of an activity needs to be measured against some accepted standard. Techniques used here may include inspection, audits, appraisals and reviews. This is an important stage since it is where areas for improvements are identified.

3.1.1.4 Improvement

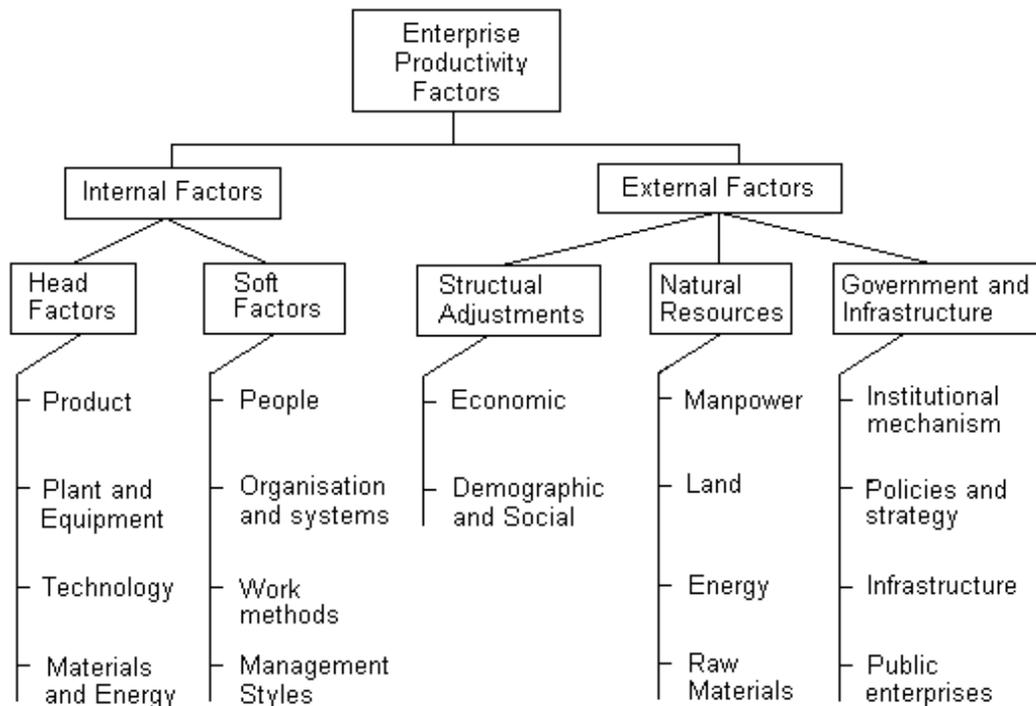
Problems must be corrected and the process improved. The activities of this stage feedback to planning.

The above building blocks are fundamental to any productivity improvement approach, and should be considered a must to any productivity improvement task.

3.1.2 Factors Affecting Productivity of an Enterprise

The productivity improvement efforts depend upon how successful major factors are identified and acted on within the context of various socio-production systems. Two types of factors have been described in the literature namely: external (uncontrollable) and internal (controllable) factors. The model indicates the complexity of the factors involved, but also sets a benchmark for further work. This model may be used as the basis for productivity assessment of various common assets. It is worth noting that what may be considered as an uncontrollable factor at an enterprise level may be controllable at the government level such as issues of policy and infrastructural development.

3.1.2.1 Productivity Model for an Enterprise



Source : “ Productivity Management: a practical approach” by J Prokopenko.

Table 5: Productivity Improvement Framework

No	FACTORS	S & T ISSUES	INTERVENTIONS
1.	Products & markets	-“User Value”- acceptable price/quality - Customer needs	- Product design - Product specification - Quality Control - Market Research
2.	Plant & Equipment	Equipment utilisation, reliability and availability.	- Maintenance Management - Production Planing and Control - Optimum processing conditions
3.	Science & Technology	Innovation Least cost production	- R & D - Quality/ System audits - Commercialisation of R&D results
4.	Materials and Energy	- Waste control & reduction - Alternative raw materials - Yields	- Material management - Local raw materials - Process Optimization
5.	Manpower	- Educational level and quality - Technical skills - Motivation	- Education policy - Vocational training - Management training
6.	Organisation & System	- Organisational dynamism & flexibility	- Management training - Organisational development
7.	Work Methods	- Reduction of unproductive movements	- Industrial engineering/ management training
8.	Management Style	- Management approach	- Management training
9.	Economic	- Employment pattern - Technology - Economy of scale - Industrial Competitiveness	- Value-adding/ production promotion - Innovation - Production management
10.	Demographic & Social	- Workforce diversity - Attitude to work	- Education & training - Gender sensitivity - Organisational behaviour
11.	Land	- Management - Development - Policy	- Land-use planning - Environmental Management - Intensive agriculture - Industrial expansion
12.	Energy	- Availability - Efficiency - Cost of production	- R&D on alternative sources - Energy efficient devices - Industrial energy management
13	Government & Infrastructure	- Policies and regulation - Government agencies - Provision of essential services	- Supportive to S & T - Management training- efficiency - Modern telecommunication, roads, power

The Pareto²⁵ principle may be used to narrow down the number of factors to be considered for a specific productivity improvement assignment. It states that 80% of the given results may be due to 20% of the effort and requires the identification of the vital few factors from the important many. The identification and prioritisation exercise may, in the Sustainable Livelihood Programming Framework, be achieved through a participatory approach that involves the relevant stakeholders.

3.2 Public Common Asset Utilization: Past and Present Efforts

A nation's ability to generate, mobilise and use the common assets productively and sustainably is crucially important for its short and long term development. Unfortunately, this is often neglected or overlooked. The following subsections describe the past and present efforts to improve the productivity of public common assets identified in Section 2 of this paper.

3.2.1 Land

Land requires proper management and development at national level. This is even more important to Malawi which is dependent on agriculture for its foreign exchange earnings. Land shortage is experienced in some parts of the country largely to its high population density. Efforts to improve farm productivity in a manner that does not accelerate land degradation are important. This is often achieved by the application of such technologies as fertilisers and the use of agricultural machinery. Improving productivity should also be looked at in terms of the long-term ability of the land to sustain human activities.

3.2.1.1 Past Efforts

Past efforts to improve productivity of land as a public common asset have included promotion of smallholder agriculture through extension services of the Ministry of Agriculture and Irrigation. Good land husbandry practices have been among the major issues covered in the extension services. The farmers have had access to subsidized farm inputs and assured market for their produce through ADMARC. The government also used to run agricultural settlement schemes, including irrigated farms which also functioned as training grounds for the smallholder farmers. At the commercial level, tobacco estates were established throughout the country.

Mineral prospecting has not been a major government preoccupation although mapping of various mineral potential areas has been done through the Department of Mines and Department of Geological Services. The major mineral products now being exploited include cement, coal and lime. Some micro-scale gemstone mining is also being

²⁵

Prokopenko, J "Productivity Management: a practical approach

undertaken in various parts of the country.

3.2.1.2 Present Efforts

There is a marked drop in the extension services offered by MoAI. This has, probably, been due to closure of Natural Resources College, the main producer of agricultural extension staff. There has also been an increase of tobacco farming at estate and smallholder levels, at the detriment of production of food crops. Some small irrigation farms are being established. Currently the government is in process of procuring treadle pumps for that purpose. This will be very important as the rainfall pattern in the past few years has not been very encouraging. Government has privatised most of its farms. Privately owned farms, being commercially oriented are likely to be more productive. The removal of subsidies on farm inputs has had a negative effect on food situation in the country. Thus research on alternative farm inputs such as bio-fertilisers should be encouraged.

Major productivity issues should include making idle land productive through introduction of farming, mining or manufacturing activities; promoting irrigation farming; training small scale miners on the issues of production management, quality and environment; and the implementation of better policies on land tenure.

3.2.2 Renewable Energy Sources

Renewable energy resources are important not only because they are environmentally friendly technologies, but also are self-sustaining if properly managed and applied. The government through its various ministries and departments, NGOs and research institutions have played various roles to promote this sector.

3.2.2.1 Solar: Past Efforts

Solar energy has been in use in this part of Africa for many years. Solar energy has been the major source of energy for crop drying, fish drying and drying of semi-processed or processed foods for ages despite the fact that there has been no special devices that have been locally developed to harness the solar energy.

The Meteorological Department has kept solar insolation data for a number of areas throughout the country. The database is an important source of information for potential users of solar energy. In early 80's, Malawi Polytechnic undertook various research studies to assess the potential of solar water heaters in Malawi. Ecosystems, a private company based in Blantyre, also undertook some work to develop solar water heaters and pumps.

To promote the sector, the Government procured solar water heaters which were installed in a number of institutions.

3.2.2.2 Solar : Present Efforts

The Department of Energy with donor support, managed to send a number of Malawians to attend specialized training programmes in renewable energy, including solar-energy. The Department also played a role in the development of the National Renewable and Sustainable Energy Programme (NRSEP) document which will lead to the creation of a financial mechanism for use of solar energy technologies by end-users including the SADC-FINESSE programme.

In addition to Ecosystem, other companies have been established such as Sollatek and Eco-electric. MIRTDC, with technical backup from Sollatek, established the first solar demonstration village at Makanjira funded by UNESCO. UNESCO also funded the Solar Energy chair at Chancellor College.

At micro and rural enterprise level, MIRTDC is promoting solar driers which can be used for production of dried vegetables and fruit products.

3.2.2.3 Biomass : Past Efforts

Biomass is the most common fuel source in Malawi contributing to over 93% of the total energy consumed. Fuelwood, charcoal, briquettes and biogas form the biomass energy source. The Government, through Department of Energy, undertook a number of programmes to promote the use of energy efficient ceramic stoves. This work was also undertaken by the Blantyre Fuelwood Project. Improved stoves were disseminated especially during the Mocambican civil war when Malawi hosted over 1 million refugees.

Noting an increased demand in charcoal, some efforts were undertaken to produce charcoal from pine trees at Chikangawa. Industrial production of briquettes by WI CO, then a government parastatal, was introduced utilising saw dust as raw materials. The concept was timely but the product did not receive customer's acceptance. The production was stopped permanently when WICO was privatised.

Department of Community Services, through its programmes on Health and Population, and with the financial support from India constructed a number of biogas plants some of which are still in use today.

3.2.2.4 Biomass : Present Efforts

Several institutions namely; DoE, MIRTDC and GTZ are promoting energy efficient end-use devices such as community stoves, ceramic stoves and biogas stoves. MIRTDC in collaboration with CARMATEC, have constructed a 50m³ digester to be used as source of energy for salt production micro enterprises in Chikwawa. This will certainly help to improve the productivity of the salt enterprises in the area where fuelwood is scarce. Under UNDP funded project, Stanlinks International and MIRTDC produced a biomass briquette

press which utilises biodegradable raw materials. The technology was transferred to a number of women groups in Mchinji, Lilongwe and Blantyre. The women were selling the extra briquettes for cash.

3.2.2.5 Hydro Electric Power(HEP) : Past Efforts

Malawi's hydro electric power is concentrated along the Shire River. There are only three other hydro electric power generation outside this river system. There are a number of potential perennial rivers which can qualify for HEP development. The Government of Malawi through ESCOM has developed a total of 214MW on the Shire River and 4.5MW on the Wovwe. Other privately constructed micro hydro sites include Lujeri Tea Estate in Mulanje district and Matandani Mission in Mwanza district. ESCOM also undertook HEP assessment studies for most of the major rivers in the country.

3.2.2.6 Hydro Electric Power(HEP) : Present Efforts

The major electric power producer, ESCOM, is now a fully commercialised entity. The regulatory issues relating to electricity generation and distribution have been entrusted to the National Electricity Council. The new Electricity Act will promote the participation of independent power producers thereby removed the monopoly that ESCOM has had for a long time. The Department of Energy is working on rural electrification programme which aims at funding the extension of the electricity grid to selected rural communities. This will be financed from the Energy Fund set up by the department. At the technological front, MIRTDC has established internal capacity to assess, size, instal and maintain micro-hydro-electric power systems. MIRTDC has submitted a proposal to Intermediate Technology Group (ITDG) of Zimbabwe to rehabilitate the Matandani Mission micro-hydro power site as a case study. At national level, there is general interest to promote micro-hydro power generation as shown in various government support energy sector development plans²⁶.

3.2.2.7 Wind Energy Potential in Malawi : Past Efforts

Wind energy technologies were used to power water pumps and other machines since the ancient civilization and some of the technologies were principally introduced into Malawi by early missionaries and settlers but got obsolete when diesel engines entered the market. There are very few sites in Malawi where wind technology is being applied such as wind pumps at Magomero Catholic Mission and Mangochi. The wind pump in Mangochi was designed by a Malawian artisan and was fabricated by the MIRTDC.

²⁶ Microhydro interests have been expressed in NRSEP, Finese Document and DANIDA. "Assessment of Alternative Energy Sources in Malawi " Phase 1 .

The main source of information as far as wind energy assessment is concerned is based on the work done by D.R. Kamdonyo for a Masters degree in 1988²⁷. In his work, he demonstrated that wind energy technologies could work very well in some parts of Malawi. In general, raw data on wind speed and direction is maintained by several institutions including MoAI, Meteorological Department and the Department of National Park and Wildlife.

3.2.2.8 Wind Energy : Present Efforts

Present efforts include the DANIDA sponsored "Assessment of Alternative Energy Sources in Malawi." Several Malawian experts worked with COWI consultants to prepare status report on biomass, solar, micro-hydro and wind energy sources. Wind masts equipped with automatic data logging devices have been installed at three sites. The information will contribute towards establishing wind and insolation databases which will contribute toward accurate and efficient sizing and equipment specification for the energy converting devices. Like solar and micro-hydro, wind energy technologies are also being promoted nationally through the NSREP and other programmes.

3.2.3 Labour

People, who may be the most difficult to influence in order to make them more productive, are the most important asset in the entire productivity improvement programme. Their skills, training and education, attitude, motivation and development are all important ingredients of a successful productivity drive. Productive systems have two major subsystems, technical and human. The two subsystems must be balanced and coordinated in order to function efficiently and effectively. In their report, Makoko and Makoza²⁸, considered level of education, managerial skills, technical skills, ability to assimilate new knowledge, low motivation and lack of incentives as the major human factors that affect productivity in Malawi.

3.2.3.1 Past Efforts

Over the past years the efforts have revolved around formal education at the primary, secondary and tertiary levels. To that end the government, religious and private organisations set up the necessary infrastructure and offered financial support to run the institutions. Secondary school leavers could either proceed to universities or technical and vocational colleges. In collaboration with ILO, institutions like MEDI offered training for both technical and entrepreneurial skills to enable graduates start up businesses. Although the above efforts satisfied the needs, they were not adequate to accelerate enterprise

²⁷ Gondwe K.J. (MIRTDC) - Biomass, Kamdonyo, D.R. (Meteorology) - Wind, Masangwi, S (Polytechnic) - Solar, Chima, T (DoE) - micro-hydro, Chitenje, H (DoE) - Project Coordinator

²⁸ Makoko, M S and Makoza, F " Integrated Strategies for the Development of the Micro, Small and Medium Enterprises in Malawi", *UNDP/ILO Employment Opportunity Study*, June 1998.

development in Malawi.

3.2.3.2 Present Efforts

Current efforts include the free primary education , promotion of the girl-child education, the establishment of the Mzuzu University, provision of specialised courses at MIM and Staff Development Institute (Mpemba), and the establishment of the TEVET programme. Under the EDEC programme, MIRTDC, MEDI, and DEMAT are conducting training programmes in technical and business/entrepreneurship skills to potential entrepreneurs. Courses offered included hatchery management, feed mix production, bakery, oil processing and fruit juice production. The trainees will be monitored to determine the number of businesses established.

3.2.4 Water Resources

As stated earlier, water bodies form about one-third of Malawi's total area. In the recent past, most of the sub-saharan countries have experienced erratic weather patterns including the El Nino effect during the 1997/98 crop season which resulted in uneven rainfall. There was either too much rain or severe droughts in some areas. The 1997/98 rainfall pattern almost drove Malawian industries to a halt as a result of lowering of level of Lake Malawi resulting in reduced flow of Shire River and thus reduced power generation. Water is also important for household consumption and industrial usage.

3.2.4.1 Past Efforts

The government undertook various projects to make safe drinking water available to many Malawians. Past efforts have included sinking of boreholes in many parts of the country and the establishment of gravity-fed piped water services where this was viable such as at Nkhamanga in Rumphi district. Another notable effort was the Mpira dam in Ntcheu. The government also continued to supply water in cities and municipalities through the water boards and the Water Department.

3.2.4.2 Present Efforts

Current efforts have included the establishment of regional waterboards (Northern, Central and Southern) to oversee the water supply and sanitation in the regions and thereby enable Blantyre and Lilongwe waterboards to concentrate their efforts and better serve the cities of Blantyre and Lilongwe respectively. MASAF and some NGOs like Africare have also been involved in borehole drilling all over Malawi.

3.2.5 Forestry and Wildlife

As stated earlier, the regional distribution of forest resources is highly skewed. This calls for efficient utilisation and strict management of forest resources to ensure long term

sustainability. National parks and game reserves provide sanctuary for the Malawian wildlife. If properly managed, they have potential to attract tourists and directly contribute to the development of the communities surrounding the parks and the country as a whole. Infrastructural development and provision of essential services such as roads, water, electricity, and telecommunication services are key to tourism development.

3.2.5.1 Past Efforts

The government designated a number of forestry areas as reserves for the fauna and flora resources. This resulted in establishment of game reserves, national parks and forest reserves in the three regions. Although this worked well, there were some problems. Some rural communities considered this as deprivation of rights to their resources, causing some resentments and confrontation to the extent that forest and game rangers were treated with contempt. On the regulatory side, the surrounding communities were only allowed to harvest resources after paying a fee and, for some protected tree species, citizens were not allowed to cut them down even if the tree was in their backyard. Poaching remained a major problem for a long time despite the penalties imposed.

The over-dependency on fuelwood has put undue pressure on forestry resources. Energy conservation programmes at Blantyre Fuelwood Project and Energy Studies Unit positively contributed toward awareness creation and resulted into some savings. Government and private initiatives to promote afforestation such as National Tree Planting Day and Carlsberg Green seedling programme are some of the past efforts worthy of commendation.

In terms of private enterprise, beekeeping was introduced in some forest reserves and Muluguzi Winery used some wild fruits for wine production.

3.2.5.2 Present Efforts

The most notable achievement has been the launching of a new Forest Act. This, among other issues, has promoted the empowerment of the communities to manage their own resources on customary land and participate in the management of the resources. Beekeeping activities are being supported by donors and private companies and although production has increased, the demand for apiary products by far exceeds the supply. MIRTDC has developed and disseminated improved beehive technology. Although the wine production has since discontinued, the drive to commercialise the use of wild fruits has continued as demonstrated by the GTZ-funded *malambe* juice production in Mwanza. Guinea fowl domestication is becoming increasingly popular in Mwanza, Blantyre, Mchinji and Karonga. MIRTDC has successfully hatched guinea fowl eggs using the locally developed egg incubator.

33.3 Private Common Assets Utilization: Past and Current Efforts

Private common assets offer the greatest potential for enterprise development and are, by their nature, controllable by the individual. This section of the paper deals with some of the private common assets and enterprises that seem to offer the greatest potential for productivity improvement.

As individuals move from subsistence driven activities to entrepreneurial activities, their earning power and productivity greatly improve. The activities below may be thought of as production processes, thereby enabling the utilisation of one productivity improvement model. Any production process consists of three main components: the inputs (raw material, energy, labour), the conversion process (machinery, equipment) and the product(s) and by-product(s) in form of goods and services.

3.3.1 Food Processing

Since ancient times, man has processed foods for consumption in the home, for preservation and for sale. As food is processed, it changes its characteristics and gains value and/or shelf life.

3.3.1.1 Past Efforts

Sun drying of foods is one of the techniques used to extend the shelf life of most of the agricultural produce, fruits and vegetables, fish and even meat and meat-products. The method is weather-dependent and the operator has little or no control on its efficiency. Other techniques include boiling, salting and baking.

Improved technologies introduced in the past include mechanised mills, solar driers and improved bakery ovens through local fabrication of some of the named technologies. The availability of these technologies has enabled Malawians to set up businesses. These businesses have included commercialisation of some of the traditional formulations such *thobwa*²⁹ and *likuni phala*.

Industrial production of food products was largely in the hands of multinationals or non-Malawian shareholders and research in food processing has largely been minimal.

3.3.1.2 Present Efforts

Recent years have seen an increase in cottage based food processing enterprises offering such products like packed roasted nuts, cooked foods, bakery products, and edible oils. The sector is flourishing despite the problems related to hygiene and quality control. The Polytechnic, a constituent college of the University of Malawi, is offering courses in food science, and MIRTDC has increased its research activities in food processing and the examples include pigeon-pea based weaning food formulations, fruit juice production and

²⁹

Thobwa is sweet beer brewed using millet flour and maize flour.

oil extraction. Local development and manufacturing of food processing equipment has also been considerable and recent technology developments have include the rice thresher, juice extractor, and oil expellers.

Development of new products such as *mahewu*³⁰ and *malambe*³¹ juice have been well received by the market. Government has privatised its dairy operations throughout the three regions. This will hopefully bring productivity improvement and offer the customers better quality products at competitive prices.

3.3.2 Poultry Production

3.3.2.1 Past Efforts

Malawians have for a long time been rearing local breeds of chickens on free range. The local varieties did not compete well as layers or broilers with the hybrid varieties. To improve the situation, hybrid varieties (black australops) which could survive the free range environment were introduced. The day-old chicks were produced at Mikolongwe for sale through the Veterinary Department. These were not easily available to farmers, resulting in long waiting periods after payments had already been made.

Commercial hatcheries producing hybrid broiler and layer varieties were established in Blantyre and Lilongwe. This still did not improve the situation as the access by potential rural farmers remained difficult.

3.3.2.2 Present Efforts

MIRTDC developed a number of technologies to support the small scale poultry industry. The technologies include low cost electric egg incubator, feed mixing technologies, cages and brooders. Under the EDEC programme, MIRTDC, DEMAT and MEDI are offering training programmes in hatchery management, layer and broiler production and feed mixing. It is hoped that in the long term this will at least reduce Malawi's dependency on imported chickens and eggs. The Nation Newspaper of 19 March, 1999 carried an article which portrayed a gloomy picture for the future as far as the poultry industry in Malawi is concerned. On the other hand, this may be a potential business opportunity for the productive performers within the MSME sector. The Ministry of Agriculture and Irrigation is also promoting the rearing of guinea fowls.

3.3.3 Mining Industry

³⁰ A thick paste made of unfermented cereals and other additives.

³¹ A juice made from the fruits of *adinsonia digitata* tree species

The mining industry in Malawi is still highly underdeveloped. Current commercial mineral products include cement, lime, sodium silicate, coal, vermiculite and quarry stone. Small scale gemstone mining is also being done.

Table 6: Mineral Resources in Malawi

No.	Mineral	Where Available	Potential Quantities (million tonnes)	Remarks
1	Bauxite	Mulanje	29	Average bauxite composition is 44%. Minor occurrences in Zomba and Nyika
2	Coal	Livingstonia Karonga West Lifua Kibwe	24 7.1 1.2 2.7	Livingstonia coal mines and operational
3	Iron	Mindawe Hill Ntcheu South	0.16 0.05	None
4	Uranium	Livingstonia Karonga West Thambani (Mwanza)	not known " "	None
5	Gold	Lisungwe Valley and Unga River	traces	None
6	Limestone Dolomite	Changalume and Mayeka	over 800 (total)	For production of cement and lime
7	Kaoline Ceramic Clay	Linthipe (Dedza) Nkhande (Ntcheu) Senzani (Ntcheu) Chitipa	14 0.1 not known not known	Used for production of ceramic ware and refractory products
8	Glass Sands (Silica Sands)	Mchinji Lake Chilwa and Lake Chiuta	25 (total)	Used for production of sodium silicate and glassware
9	Nepheline Syenite	Zomba Rumphu Mulanje Chikangawa	extensive quantities	Used as industrial filler in plastics, rubber, fertilisers, etc

10	Brick clays	Bangwe (Limbe) Nathenje (Lilongwe)	33.9 2.6	Widespread
11	Pyrite and pyrrhotite	Lilongwe Dowa Mchinji	not known	Used as source of sulfur in fertilisers and paper/pulp production
12	Talc	Ntcheu Mzimba	not known	Used as carving stone, ceramics, talcum powder and other uses too
13	Salt	Widespread Kasungu, Mchinji, Rumphi, Chikwawa, Nsanje, Phalombe, etc	not known	Occurs as salt in clays or efflorescence
14	Gemstone	Widespread especially Mzimba, Ntcheu, Chitipa	not known	Jewellery
15	Gypsum	Dowa and Lilongwe	0.0065	Used in chalk production, plastering, plaster of Paris (POP) and ceiling boards etc
16	Vermiculite	Mpatamanga (Mwanza)	5	Used in insulation materials, filler in fertilisers and paint industry

3.3.3.1 Past Effort

The Government of Malawi undertook mineral resource mapping the results of which is that quantities of various mineral deposits are now documented and these include bauxite on Mulanje Mountain and coal at Kaziwiziwi and Mchenga in Rumphi. Only coal was assessed as financially and technically viable for exploitation and this led to the opening of Kaziwiziwi and Mchenga coal mines. The improvement of lime production at Chenkumbi was undertaken by ITDG of Zimbabwe. Portland Cement Company has continued producing cement at its Changalume site in Zomba.

The Government has continue to offer various stakeholders information and technical advice on mining through Department of Mines and Geological Survey Department.

3.3.3.2 Present Effort

Gemstone Association of Malawi was formed to support various gemstone miners throughout Malawi. Recent development in the gemstone area includes the opening of the first stone cutting and jewellery shop in Lilongwe. Production of sodium silicate at Maone Industrial Park is another milestone. Development of ceramics processing in Dedza and small scale lime works in Lirangwe and Balaka are also encouraging developments. The opening of a new cement factory in Kasungu is also note-worthy.

Under the EDEC programme, the Malawi Industrial Research and Technology Development Centre and Gemstone Association of Malawi are offering training programmes for small scale gemstone miners from all the three regions of Malawi.

3.3.4 Handcrafts and Garments

Hand-crafted high quality products normally fetch good prices on the export markets. Although there is no deliberate national programme to promote this enterprise, a few individuals have successfully secured export orders.

3.3.4.1 Past Efforts

A number of organisations have been involved in the skills development for producers of hand-crafted goods. DEMAT has promoted batik production, MACOHA has promoted hand woven rags and wall hangings, Magomero has promoted sisal basket making, cane furniture making, woven products and others, and MIRTDC and Craft Training Centre have promoted leather goods. In addition, there have been a number of individuals who are involved in wood curving and oil painting of fine art products. Most of the wood carvings are bought by middlemen who export them to regional and overseas markets.

3.3.4.2 Present Efforts

The EDEC programme has identified handcraft as one of the potential areas that need support. MIRTDC, DEMAT and MEDI have planned for a number of training programmes to support the subsector. It is strongly believed that what is lacking most in the sector is organisational mechanisms such as management, marketing, product design and technology.

Wood carvers who normally go for hardwoods have continued to disregard the issue of environment. This will, in the long run have a negative impact on their productivity as they will have to cover longer distances to source raw materials.

3.3.4 Woodwork

Wood products, and in particular furniture, are taken for granted both in the rural and urban

homes and institutions. It is one of the most common trades scattered throughout the country.

3.3.4.1 Past Efforts

Most of these carpenters or woodworkers, especially in the rural areas, have not attended formal education but have learnt the skills from master craftsmen who were mostly missionaries. These in turn passed the knowledge to the next generation. The government and missionaries opened a number of technical schools offering carpentry and joinery as one of their core trades. Through the defunct Malawi Young Pioneers training bases, a number of tradesmen were trained and encouraged to set up businesses in the rural areas. In addition, some selected secondary schools were offering woodwork as a course examinable at junior and school certificate levels.

3.3.4.2 Present Efforts

Apart from the TEVET programme there are no new initiatives targeting the sector as such. It has been observed that there are many more medium sized carpentry shops offering quite good quality products. But most shops offer products of poor quality. It is unfortunate that there are no official standards to ensure uniformity and consistency in the quality of products.

Potential to offer high quality products does exist both for local and international markets. Greatest potential in improving productivity lies in adding value to every product since customers are willing to pay extra for products of high quality.

3.3.5 Metalwork

The issues raised under woodwork also apply under metalwork. With the major exception that the raw material for metal products are not readily available. Most of metalworking skill such as forging were passed from master craftsmen to trainees.

3.3.5.1 Past Efforts

The government and missionaries opened a number of technical schools offering metalworking as one of its core trades. In addition, some selected secondary schools were offering metalwork as a course examinable at junior and school certificate levels.

There are a number of private companies in metalworking businesses such as B&C, PEW, ENCOR Products, Agrimal, and Petroleum Services.

3.3.5.2 Present Efforts

The sector is a bit more specialised and has seen experienced technicians and engineers leave their jobs to start up their own enterprises. The ability to compete in the sector very much depends on quality/price combination. Services offered include sheet-metal working,

welding, fencing, forging, casting and machining.

There are very few enterprises which are involved in technology design and fabrication. This is one of the most promising area as far as technology development and transfer is concerned.

3.3.6 Services

In the productivity ladder, there is marked increase in productivity as enterprises graduate from agricultural based activities into manufacturing and eventually into services.³² As was mentioned earlier, the service sector contributed a mere 2.8% of the business activities. Nonetheless, it is becoming an increasingly important growth sector.

3.3.6.1 Past Efforts

There have been little deliberate efforts by the government to promote micro and small enterprises in the services sector. Most of the services being offered often have been as a result of individual training background or work experience. Individual services offered included repair of household and industrial appliances and technical trades like building, carpentry, motor mechanics and electrical and electronics.

Associations offering various services were established such as the Herbalist Association of Malawi offering traditional medical services and the National Association of Business Women offering business advice to women. The hotel and catering services has remained rather static. Trainees from the Hotel Training School were mainly prepared for employment rather than setting up their own enterprises.

3.3.6.2 Present Efforts

Following the economic liberalisation programmes, the country has seen a marked increase in the number of service based enterprises such as private schools and colleges, engineering services, security services, law firms and NGOs offering a range of services. Probably the biggest success has been the liberalisation of the transport sector. The small bus operators have literally overwhelmed the major (then monopolistic) bus companies. This could be considered to be a positive move. However, to be productive, there is need to equip the sector with the necessary skills and resources and establish regulatory mechanisms to ensure adherence to quality and standards and its contribution of the overall economy through taxes and other fees.

3.3.7 Trading

Trading is the most common service-based business activity constituting over 52% of the total business activities in Malawi in 1992.

³² "Productivity Management: A practical handbook", J Prokopeko,

3.3.7.1 Past Efforts

The main trading activities included wholesale and retail shops scattered throughout the country. In addition, there have specialised agricultural and hardware trading enterprises. DEMAT run two programmes BUPAD and GPPP in support of the MSME sector.

3.3.7.2 Present efforts

Following the easing of foreign exchange regulations, the conventional wholesale and retail dealers are facing heavy competition from individual traders and vendors scattered all over in major towns and cities. Secondhand clothing is one of the most common commodity offered for sale in markets throughout the country. Under the EDEC programme, DEMAT is reintroducing the GPPP and BUPAD activities in support of the sector.

4.0 HIGH POTENTIAL TECHNOLOGIES AND KNOWLEDGE SYSTEMS: A REVIEW

4.1 Introduction

Notwithstanding the diversity of existing livelihood systems, a more focussed approach on those systems that seem to have more potential cannot be overemphasized. Emanating from such an exercise would, therefore, be a list of those systems that could either be replicated to other areas, or indeed studied in more detail with a view to having them adopted.

In narrowing down the diverse systems identified in the preceding chapters, within the context of technologies that would impact on enterprise development, an analysis was made of those systems that are already on the ground as well as those that could be adopted into the country. Within such a context, the technologies and knowledge systems outlined below, whether already existing or yet to be adopted, were mostly chosen for a combination of the following reasons:

1. Simplicity of fabrication and operation and therefore of adoption;
2. Level of existing and inexpensive technical expertise;
3. Ease of maintenance;
4. Raw materials availability;
5. Availability of market for technologies and products;
6. Availability of backup technical services;

7. Availability of local skills; and
8. Enhancing existing indigenous technical knowledge.

4.2 **High Potential Public Common Assets**

4.2.1 *Renewable Energy Technologies*

Within this grouping, the following technologies show greatest potential:

4.2.1.1 *Solar Energy*

Previous attempts have shown that as long as the solar technology is properly sized and installed, its efficiency is quite impressive. In the areas where there is no alternative energy source, the benefits accruing from increased utilisation of solar energy impact a great deal on enterprise development, in addition to provision of lighting. Thus more solar installations at strategic localities within the country would enable more enterprises to be established through utilization of other solar powered technologies such as solar pumps, solar and lighting system, solar produce driers.

4.2.1.2 *Biogas Technology*

This technology already exists within the country. Smaller sized household plants, although few, are already showing the ease with which household operations such as cooking, cooling and lighting could be carried out. This is in addition to the complementary role of recycling wastes which would otherwise be an environmental hazard.

Easy accessibility to raw materials, including the relatively low running costs make this technology attractive for replication in rural areas where its likely impact on enterprise development would be immense. Wastes from the digester have very high fertiliser value.

4.2.1.3 *Micro -hydro*

Hitherto, hydro power generation within Malawi has been limited to large-scale power plants. The adaptation of hydro power generation on a small scale has not been fully exploit. The liberalisation of power generation within the country through the establishment of the National Electricity Council, as well as the fact that natural sites that could enable installation of micro hydro schemes already exist, make this technology very attractive for further exploitation, especially where natural waterfalls are located.

4.2.1.4 *Windmill Technology*

The exploitation and utilisation of wind energy has also not been adequately covered. Studies³³ have established the big potential that exists and the benefits that accrue from such technology would have far-reaching impact. Translation of the studies done into practice would thus seem the next logical step to take.

4.2.2 Labour

Development of the existing big labour pool is yet another high potential area that could be exploited. The recently launched technical human resource development initiative, referred to as TEVET, offers greater potential of imparting much needed skills to scores of deserving people within the population. Since this initiative has just been launched, it is hoped that its activities will translate into a bigger pool of technically skilled human resources.

4.2.3 Water Technologies

As a natural asset, water is available in abundance in the country. However, to be utilized for greater productivity, the water has to be properly harnessed using various technologies as discussed below:

4.2.3.1 Water Pumps

Pumps that are already available in the country include the treadle pump, rope and washer, and afridev. Their use, so far, has shown their great potential in irrigation including ordinary household chores. Promotion of these pumps for irrigation purposes would boost agricultural production which would also open up more alternatives for enterprise development.

4.2.3.2 Purification Technologies

The most common purification method of water for household use involves either use of chemicals or boiling. The dwindling tree population, traditionally used as firewood has resulted into fewer and fewer communities boiling their water as a purification technique.

³³ D.R. Kamdonyo (1988), MSc Thesis.

Research³⁴ has shown that the use of locally available plants, such as *moringa olifera*, can be just as effective as conventional purification processes. However, use of moringa is more attractive because of its relative low cost.

The continuous availability and use of potable water in enterprises especially those in food processing, restaurants or resthouses is a basic prerequisite. It is proposed that the use of *moringa olifera* for water purification be promoted and decentralized to all levels of society.

4.2.4 *Forestry and Wildlife Technologies*

Malawi has a lot of forests, game reserves and national parks whose products could be put to much more use than is currently the case. Areas that show greater potential are discussed below:

4.2.4.1 *Beekeeping*

Bee-keeping has been promoted by agencies such as GTZ, World Vision International, Bee-keeping Association of Malawi and MIRTDC and the successes have also been recorded. However, the demand for honey and its products is still unfilled, suggesting the existence of opportunities for new enterprises to be developed.

4.2.4.2 *Utilisation of Wild Fruits*

Currently, some products from wild fruits are being commercialised. These include baobab and tamarind drinks being promoted by the wildlife society. ICRAF has also registered its interest in developing further products from wild fruits such as marula.

Realizing that the potential of these forest reserves is very high, it is clear that aspiring entrepreneurs can only benefit. However, for entrepreneurs to engage in these initiatives, there must be collaboration with researchers to ensure that only good quality products are promoted.

4.2.4.3 *Domestication of Guinea Fowls*

Traditionally, guinea fowls have been regarded as wild birds and recent efforts on their domestication have shown that they could be a reliable income source to keen entrepreneurs. To obtain maximum benefits from guinea fowl farming, however, there is need to support further the efforts in improving hatchability of the eggs

³⁴

Polytechnic Civil Engineering Department undertook some research in this area

through such technologies as egg incubator which are already being promoted.

4.3 High Potential Private Common Assets

4.3.1 Food Processing Technologies

Food processing, particularly that which utilizes locally available raw materials, has already been identified as one of the high potential areas for enterprise development. The rich diversity of raw materials that exist in the country could support a wide range of micro and small food processing enterprises. The following technologies provide the opportunities for the establishment of food processing enterprises.

4.3.1.1 Improved Bakery Ovens

Bakery ovens suitable for household and small scale enterprises have already been developed and are being promoted. These have successfully been used for baking various products such as bread and confectionery. However, a need exists to improve their fuel efficiency which would further impact on the turnover of specific enterprises and improve their environmental soundness.

There is also the need to research and develop formulations and recipes that could reduce the dependency on imported wheat flour. Potential alternative materials include maize, cassava, and millet.

4.3.1.2 Kachasu³⁵ Stills

This technology has already been developed and successfully shown that it can improve efficiency in alcohol distillation compared to existing traditional distillation methods.

4.3.1.3 Juice Extractor

This technology has also been fabricated and initial trials have shown that it greatly reduced time spent in extracting juices. So far up to 75% extraction efficiency, on weight basis of raw fruit, has been achieved. Considering that this is the first prototype, it is envisaged that further improvements on the design could contribute to even higher efficiency.

4.3.1.4 Maize Dehuller

This technology already exists and where it is used, it has greatly reduced the amount

³⁵

Kachasu: A local rum distilled from a fermented mixture of cereals and sugar.

of time spent dehulling cereals. Particular impact has been noticeable in maize processing, which is traditionally a time consuming exercise³⁶. These dehullers have however not widely proliferated into most areas of the country where their impact would be even greater. As an enterprise, a lot of potential thus exists in more fabrication and distribution of such technology. Potential exists to improve the yield of dehulled maize by using an alternative dehulling mechanism.

4.3.1.5 Oil Expeller

This technology also already exists and has already demonstrated the high oil yield that could be achieved. However, this has also not proliferated into most of the countryside where raw materials exist in abundance. Efforts to promote the use of this technology would thus offer aspiring entrepreneurs a choice to engage in oil expelling as a business.

4.3.1.6 Improved Produce Driers

Currently, solar driers have been developed and are used in some parts of the country. However, reliance on solar energy alone could be a deterrent especially during times of inadequate sunshine. The availability of other high efficiency produce driers, utilizing alternative energy sources, would greatly improve the efficiency in dehydration of most agricultural produce. With such an abundance of agricultural raw materials within the country, the availability and use of such driers would offer varying entrepreneurial choices to may an aspiring entrepreneur. MIRTDC designed and commissioned a heat exchanger/drier for an agro-processing firm which utilises agro wastes as fuel source. This technology could be adapted and replicated elsewhere.

4.3.2 Poultry Production Technologies

Current developments within poultry industry are becoming both bizarre and interesting. Due to various reasons, the country is becoming a net importer of poultry products such as poultry meat and eggs. Local production is declining significantly. While this trend may not be reversed by investment into technology alone, technology can nonetheless contribute positively. The following technologies show potential in this regard.

4.3.2.1 Egg Incubator

³⁶ Traditionally maize is dehulled using pestle and mortar, an activity that is both straining and time consuming for women.

This technology has been developed locally and is demonstrating some level of success. However, further refinements are underway which should improve its efficiency. It is envisaged that the egg incubator would contribute towards availability of more day-old chicks for either meat or egg production.

4.3.2.2 *Feed Mixer*

One undisputable fact in poultry production is the importance of good quality feed. While feed production offers great potential as an enterprise, extra care should be exercised to produce good quality feed. The feed mixer, which has already been developed, offers entrepreneurs the opportunity to engage in quality feed production while saving time, compared to existing procedures.

4.3.2.3 *Brooders, Laying Boxes and Cages*

The above technologies would also contribute to greater ease in poultry production. However, they are not widely used and their promotion would offer more opportunities for business development, either in their production, or in the increased poultry productivity which would accrue from their use.

4.3.3 Mining Technologies

4.3.3.1 *Brickmaking*

The increased use of bricks within the country has resulted into substantial environmental degradation through wanton cutting of trees and uncontrolled opening of new pits. Designs for energy efficient kilns and those that could utilise industrial wastes exist. Promotion of such technologies would offer attractive business options for aspiring entrepreneurs and is an area that should be pursued further.

4.3.3.2 *Salt Production*

Currently, in some parts of the country, notably the Lower Shire (Chigweshe Village) and parts of Kasungu, people have traditionally engaged in small scale salt production from saline soils. Efforts to improve the productivity from these saline soils through use of efficient evaporation technologies have been made by the MIRTDC. Encouraging results have been obtained, but require further refinements.

The efficient salt production from these areas offers very attractive business opportunities for people within these areas. MIRTDC has constructed a biogas plant at Chigweshe Village which will provide the alternative energy required for the crystallization process. Firewood, though very scarce in the area, is currently being

used as the main energy source. Biogas is attractive alternative energy source because there are plenty of cattle in the area.

4.3.3.3 Lime Production

There are a number of sites in Malawi with limestone deposits which offer great business opportunities for small scale operators as has been highlighted earlier. MIRTDC, through EDEP, is currently working on ways to improve productivity of the enterprise through better plant layout design and use of more efficient kilns.

4.3.3.4 Ceramics and Clay Roofing Tiles

Product quality and design improvements by Dedza Ceramics have been commendable. Efforts should be made to disseminate the technology to other areas where raw materials are available. This could be an attractive small scale enterprise.

4.3.4 Handicrafts and Garments Technology

Great entrepreneurial potential also exists in this area. For example, fabrication of leather handtools would offer aspiring entrepreneurs to engage in leather tanning with reasonably affordable tools. Another area showing great potential is manufacturing of cane furniture. In addition to the fact that evidence of success is available, the abundant supply of the raw materials suggests that more people could be engaged in this business. It would seem that more skills training is required to impart the necessary technical skills and the TEVET programme offers the best option for skills development.

4.3.5 *Metalwork Technology*

There is limited availability of rural foundries where tools such as hand hoes or could be fabricated. Establishment and support, in terms of skills training, to those involved in this trade would offer greater business success and employment creation. There is also potential for large scale companies to subcontract work to the micro and small enterprises sector.

4.3.6 *Services*

Great potential is envisaged in the multiplication and growing of medicinal plants, both for local use and export. Special essential oil extraction technologies are also required. Development of this sector would offer many an aspiring entrepreneur the chance to engage in what appears to be a lucrative business. The research³⁷ undertaken by MIRTDC to propagate medicinal and aromatic plants has shown great export potential for some of the plants.

4.4 Key Technologies and Their Development Issues

The above listed technologies have been identified as the key technologies that could be instrumental in increasing the productivity of enterprises in Malawi. Table 7 below outlines the development issues related to these technologies and identifies the key players and sources for the technologies. It has not been possible to determine the cost implications of implementing the technology development issues as required by the terms of reference of this consultancy.

Table 7

³⁷ Kambewankako, Y.E. , "Research on Propagation Technologies of Medicinal and Aromatic Plants" , Final Consultancy Report, January 1999

5. CONSTRAINTS FOR DEVELOPMENT AND TRANSFER OF TECHNOLOGIES

5.1 General Constraints

The development and transfer of technologies in Malawi has been derailed due to several constraints which include: lack of political patronage, lack of coordination/cooperation in technology development, inadequate S&T manpower development and management, lack of finances for R&D activities and lack of information systems.

5.1.1 Lack of Political Patronage

For a scientific and technological culture to develop and flourish, political patronage is essential. African leaders have recognised the importance of science and technology as an essential tool for development but have, in most cases, paid lip service to the development and application of the same science and technology. Scientific and technological institutions have been created, but have not received the necessary tools to enable them to function properly. In those countries where science and technology have been integrated into the local culture of the people, the heads of state and government have personally taken up stewardship of science and technology programmes. This is the case in newly industrialising countries of the East.

Unless science and technology receive the patronage of the politicians and policy makers, their development and application will always trail behind and any approach for integrating modern science technology into traditional African culture will be futile. Consequently, development in all its aspects will not be possible and Malawi, just like most of the African states, will remain for centuries a least developed country.

5.1.2 Lack of Coordination/Cooperation

One of the main features of an science and technology policy is the need for cooperation with a view to make optimal use of available resources and with a view to enhancing the development and application of science and technology.

Inter-ministerial cooperation at the national level is enhanced by the existence of structures and mechanisms that can enable the science and technology community to mix and share experiences in their different fields. The existence of national unions for science and technology can go a long way in fostering such cooperation. Scientists, technologists, and engineers can join hands and cooperate for the national good through national unions for science and technology.

5.1.3 S&T Manpower Development and Management

Statistics for S&T manpower in Malawi reveal the low stock of S&T manpower resources at

an estimated figure of 42 R&D scientists and engineers per million of population in 1991³⁸. Assuming a population of 5 million in 1970, the corresponding figure for 1970 was about 28 R&D scientists and engineers per million of population indicating a 50% increase over 21 years. The recommended target for African countries was a minimum of 200 per million of population by the year 1980.

This shows that Malawi has not made significant strides in improving her stock of S&T manpower.

It is not only enough to have adequately trained manpower in S&T, but it is equally important to retain such manpower. The best trained people are attracted by better salaries, better prospects for personal professional improvements in the more developed countries such as South Africa and Botswana. Hence, it is essential to have policies that can offer the incentives necessary to keep the trained manpower.

5.1.4 Lack of Funding

Most of the R&D activities in Malawi are funded by donors either resident in Malawi or outside Malawi. The general situation in Malawi in such areas as research is that Government funds cover operating cost and not actual research. Researchers obtain large amounts of their research funds from donors which include World Bank and the Department for International Development (DFID).

This inadequate funding of S&T activities leads to a weak S&T base and which, in Malawi, has led to inadequate application of S&T to exploit natural resources.

5.1.5 Inadequate R&D Infrastructure

Most of the research institutions in Malawi lack an enabling environment for conducting meaningful research. It was observed during the study conducted by C.W. Guta³⁹ that most of the laboratories in the research Centres are deprived of equipment which could be used for research. Another observation made was that some research Centres including Malawi Industrial Research and Technology Development Centre, in spite of having well trained personnel, lack buildings for conducting research.

The lack of or poor R&D infrastructure has impeded the development and transfer of technologies in Malawi.

5.1.6 Commercialisation of Research Results

³⁸

.....

³⁹

C.W. Guta, Science and Technology in Malawi: Situation Report, 1988.

In spite of the many limitations to research and development, there is definitely scope for enhancing its role in coping with the development problems. Scientists and engineers have to make best use of the limited resources by channeling them to key sectors that can contribute rapidly in solving pressing problems. There is also need to develop effective linkage between R&D institutions and industry at all stages of technology generation. Researchers should have commitment to commercialisation of their R&D activities.

Specific strategies for strengthening linkages between industry and R&D are:-

1. Encourage contract research whether fully or partially funded by industry;
2. Promoting tripartite research designed to bring research efforts of R&D institutions, industry and Government together, and
3. Providing assistance for project feasibility studies, engineering consultancy and design services.

5.1.7 Lack of Information Systems

Information Systems are the lifeline that provides the personnel engaged in technology transfer and development with the raw data out of which they extract knowledge of what is being done in the country and abroad, of the existence of new technological opportunities and of the possibilities available for solving specific problems. Information systems also enable the monitoring of the international technology market, the technologies available, alternative sources and the range of conditions under which they may be obtained.

Malawi lacks such an information system that would enable its researchers enhance their efficiency in the development and transfer of technologies.

5.2 Specific Constraints for the Identified Key Technologies

Technology has become an increasingly important dimension of economic growth and its role in the development of small-scale industry has become an increasingly important issue. A significant relationship exists between enterprise development and technology development. Without technologies capable of making enterprises technically efficient and competitive, there will be little hope of translating into practical projects the widespread interest in the development of enterprises as a strategy for higher income and increased employment generation in Malawi.

Table 8 next page outlines the specific constraints for the development and transfer of the key technologies identified and listed in section 4 of this paper.

Table 8 - Specific Constraints for the Identified Key Technologies

Introduce the table which we developed on Sunday and insert the matrix prepared.....
5 pages

Table 8

Table 8

Table 8

Table 8

6.0 POLICY, STRATEGY AND INVESTMENT FRAMEWORK

6.1 Introduction

The success of a Technology Strategy for Sustainable Livelihoods that focusses on enterprise development will depend on an appropriate mix of policies, strategies and investments. This section of the paper makes proposals on policies, strategies and investments as they relate to the public and private common assets that have been identified as having the highest potential for adoption and effective utilisation.

6.2 Public Common Assets

6.2.1 Land

Although land is principally used for agricultural economic activities, the strong linkages between agricultural production and entrepreneurship in Malawi makes it necessary for this paper to propose an appropriate policy, strategy and investment framework. The constraints on the basis of which the proposed framework is made include diminishing land fertility, limited access to technology and limited community participation in the planning and implementation of relevant projects and/or programmes.

1. Policy Objectives

- 1.1 Increase agricultural productivity;
- 1.2 Increase production of high-value crops in addition to food crops;
- 1.3 Increase food security at household level.

2. Strategies

- 2.1 Increase access to farm inputs such as seeds, fertilizers and chemicals;
- 2.2 Increase access to appropriate technologies;
- 2.3 Promote community based/small scale irrigation projects;
- 2.4 Promote cultivation of alternative high value crops such as paprika in addition to, not in place of, food crops;
- 2.5 Promote the use of bio-fertilizers/manures; and
- 2.6 Introduce drought resistant food crops in drought prone areas.

3. Operational Framework

Regulatory	Investment Proposals	Institutional
1. Land policies should be reviewed as recommended by the Land Reform Commission to ensure equality	Other commercial banks, in addition to MRFB, should be encourage to extend their services to the rural communities. The loans should be made available for both inputs and technologies (i.e Capital items).	These activities are within the mandate of MoAI. Other institutions that could contribute are: <ul style="list-style-type: none"> ➤ Chitedze ➤ Bunda College of Agriculture ➤ NGO's ➤ Donors ➤ MIRTDC

6.2.2 Water Resources

Water resources are essential for productivity improvement of land. Many entrepreneurial activities depend on the availability of suitable water resources. The policy, strategy and investment framework proposal below is made in relation to the constraints in the sector which include limited access to technology, inadequate human resources to support the sector, especially irrigation, and poor maintenance culture.

1. Policy objectives

- 1.1 Improve access to safe drinking water, in terms of water quality and reduced distance; and
- 1.2 Facilitate the communities to use irrigation potentials of their resources.

2. Strategies

- 2.1 Develop human resource capacity to provide irrigation services;
- 2.2 Promote the use of small scale irrigation technologies such as treadle pumps and animal drawn pumps;
- 2.3 Provide conducive environment to encourage and support NGO's and private companies participate in water supply services;
- 2.4 Promote community based water resources management; and
- 2.5 Promote research in water and irrigation technologies.

3. Operational framework

Regulatory	Investment Proposal(s)	Institutional
1. Portable water standards 2. Control of watershed areas	1 Malawi Social Action Fund (MASAF) should continue funding for construction of boreholes, but in addition should consider gravity piped water scheme where feasible; and 2. Move undertaken by the Government to procure 5,000 treadle pumps for smallholder farmers will go along way to promote small scale irrigation and should continue.	Key institutions include: Water boards MASAF NGO's MIRTDC Bunda College

6.2.4 Renewable Energy Sources

Renewable energy sources offer great potential to improve productivity in Malawi. There has been noticeable increase in the interest and use of alternative energy sources as well as energy efficiency end-use devices despite a number of constrains such as limited accessibility of appropriate technology, limited access to finance for procurement of the expensive renewable energy technologies; and inefficient institutional support. The policy, strategy and investment framework below should support the development of the sector.

1. Policy Objectives

- 1.1 Provide alternative energy sources to woodfuel to majority of Malawian;
- 1.2 Promote environmental consciousness; and
- 1.3 Increase accessibility of alternative.

2. Strategies

- 2.1 Provide human resources capacity to design, manufacture, install and maintain RET's;
- 2.2 Increase financial and technical resources to support R&D in RES's and RET's;
- 2.3 Provide incentives to promote the adoption and use RET's through tax rebates and other costs; and
- 2.4 Environmental awareness campaigns at community level should be promoted.

3. Operational Framework

Regulatory	Investment	Institutional
<p>1. Energy Policy is not yet in place; and</p> <p>2. <i>Electricity Act</i>: Liberalization of generation and distribution of electricity is a very encouraging development.</p>	<p>1. Government should provide incentives to prospective investors;</p> <p>2. SADC-FINESSE and GEF programmes are likely to benefit the poor communities.;</p> <p>3. Energy Fund should be operationalised; and</p> <p>4. Commercial Banks should be encouraged to invest in RET's.</p>	<p>The following institutions would contribute:</p> <p>1. DoE</p> <p>2. MIRTDC</p> <p>3. Commercial Banks</p> <p>4. University of Malawi</p> <p>5. Private companies</p>

6.2.5 Forestry and Wildlife

Pressure on forest resources is rather high due to overdependency on fuelwood and charcoal as fuel source, in addition to demand for building poles and hardwood for furniture and joinery. Poaching has remained a perpetual problem, especially in boarder parks and reserves such as Kasungu and Vwaza, thereby threatening the ecosystem and consequently the tourism industry.

Proper management of these natural resources through popular participation is key for their sustainability. Management improvement should address the constraints in the sector which include high rate of deforestation and poaching due to high demand of forestry and wildlife

resources, encroachment into forest/game reserves and limited extension services.

1. Policy Objective

1. Promote sustainable utilization of products of the forest game reserves in partnership with communities and other stakeholders.

2. Strategies

1. Promote the use of alternative energy sources for domestic and industrial uses;
2. Involve communities in the management and exploitation of forest/game resources;
3. Intensify environmental awareness campaign;
4. Reinforce the requirement for commercial farmers to resource for forestry;
5. Provide alternative income activities to high risk areas e.g charcoal makers in peri-urbans;
6. Improve the quality of extension services;
7. Provide strict legal penalties to poachers and encroachers; and
8. Equip forest/game rangers to combat poaching and forest encroachments.

3. Operational Framework

Regulatory	Investment	Institutional
1. Forest Act 2. Environmental Management Act 3. Wildlife Policy	1. The government should invest through education and training at all level; 2. Department of tourism should invest in service provision, eg. guest-homes and other facilities; and 3. Government to provide infrastructure to attract tourists.	Department of Parks and Wildlife Department of Forestry Communities Private investors

6.3 Private Common Assets

The private common assets identified under this work fall into three subsectors of enterprise development namely agro-processing, poultry production and small-scale mining. Since most of the technologies are generic, the policy, strategy and investment framework below addresses the three sectors rather than the individual technologies.

6.3.1 Agro-processing, Poultry Production and Small Scale Mining

Agro-processing is still in its infancy in Malawi. This subsector, therefore, has a lot of potential for new entrants including micro and small entrepreneurs.

Poultry industries have been established in Malawi for a number of years, with names like Mikolongwe becoming synonymous to improve breeds of chickens. The recent picture of the poultry industry has been rather gloomy, with a number of local poultry industries down sizing or completely closing down. This has been worsened by the influx of poultry products from Republic of South Africa and Zimbabwe which are being offered at more competitive prices. This state of affairs calls all Malawians to re-look at the enterprise with the aim of reversing the current trend.

Small-scale mining offers potential non-agriculture employment growth area. However, the sector has lacked support from relevant institutions and investors. Despite the abundance of some mineral products like lime and coal, Malawi has remained a net exporter of these products.

Entry into and/or growth of the above enterprises has been restricted in the past due to a number of constraints, including the following:-

1) Limited Access to Credit

The financial institution have negatively contributed to the Development of the sector due to their restrictive policies and practices which tend to disfavour MMSE sector.

1.1) Collateral

Most lending institutions demand collateral from borrowers as the minimum entry qualification. This tends to disqualify the majority of start-up enterprises.

1.2) Lack of Equity Funds

Most of the lending institutions would demand from the borrower between 10% and 25% as the equity share capital. This amount is often well beyond the capacity of the MMSE sector.

1.3) Limited Lending by Commercial Banks

Commercial banks consider the MMSE sector to be risky, and expensive to administer small loans.

1.4) *Monetary Policy*

Lending rates have been escalating in the recent years to percentages well beyond the rate of return of most businesses within the MMSE sector. This makes borrowing from lending institutions uncompetitive.

1.5) *Discrimination Against Women Borrowers*

Most lending institutions used to demand spouse approval to give loan to a female borrower. Women are in the majority within the micro-enterprise.

2) Lack of Clear Policies for Development of MMSE Sector

While it is noticeable that some effort is being undertaken by the Government and multilateral institutions, lack of coordinated approach amongst MMSE support institutions and lack of MMSE sector specific conducive policies remain the greatest inhibitors for the growth of the sector.

3) Limited Access to Raw Materials and Inputs

Cost and inavailability of raw materials have been singled out as major constraints. This is aggravated by the fact that MMSE cannot singularly benefit from economies of scale that larger enterprises enjoy.

Interventions by programmes like BUPAD should be enhanced to serve more enterprises. Currently, the programme is restricted to LIAs.

4) Limited Access to Markets (including Export Market)

The majority of products offered by the sector tend to be more expensive due to high production cost. Thus markets tend to favour larger enterprises. The government, which is the largest buyer of most of the products, should make deliberate efforts to buy from the sector. GPPP programme which is run by DEMAT, needs to be strengthened and scope expanded.

On export market, institutions like MEPC should develop specific programmes to market the sector's products abroad.

5) Lack of Business, Entrepreneurship, Technical and Management Skills

Various studies indicate high demand for training in various skills within the sector.⁴⁰

6) Lack of Access to Technology

Accessibility to technologies is constrained by unwillingness of financiers to finance the acquisition of appropriate technologies.

7) Lack of Information on Available Technologies

Although information is available, it has not been effectively disseminated to the potential users, thereby limiting their choice of technologies available.

6.3.1.1 Policy Objectives

- 1.1 To promote and support the agro-based industries as a means of economic empowerment of Malawian Communities through value-adding of their primary agricultural produce.
- 1.2 To revamp the poultry industry in order to ensure self-sufficient in poultry products as well as meeting nutritional needs of all Malawians.
- 1.3 To develop and utilise the mineral resources to full capacity and reverse the trends of overdependency on imported mineral products like lime and cement.

6.3.1.2 Strategies

- 2.1 Support the formation of clubs cooperatives and associations to establish enterprises in the above areas.
- 2.2 Provide technical and financial support to MMSE support institutions;
- 2.3 Provide effective and efficient advisory and extension services for the sector;
- 2.4 Review regulations and policies that tend to favour imports at the detriment of local industries;
- 2.5 Provide human resource capacity to support various technical needs of the selected enterprises;

⁴⁰ Davils and Ngoma, 1992

- 2.6 Finance lending institutions should be supported and encouraged to extend their services to the MMSE Sector;
- 2.7 The government should provide incentives to encourage new investment in non-traditional areas such as mining and agro-processing; and
- 2.8 The government should invest in R&D activities to develop new technologies and products.

6.3.1.3. Operational Framework

Regulatory	Investment	Institutional
Cooperative Development Policy	- Micro finances programme of UNDP to be extend to beyond LIAs;	MCI
Quality & Standardisation		NASME
Market liberalisation	- Commercial banks to be encouraged to invest in MMSE sector;	NABW
Registration of Business		MIRTDC
Forest Act	- Continued government support for the institutions offering services to the sector;	MEPC
Environmental		DEMAT
	- Government should identify and support priority research project periodically.	MEDI
		MBS
		NGOs
		Geological Survey
		Veterinary Dept
		Department of Mines
		Associations

7. INSTITUTIONAL CAPACITY ASSESSMENT⁴¹

⁴¹ This section has been heavily adapted from the following books:

1. Getrud Faltermeier. Micro and small-scale Enterprises Promotion in the Northern Region - Description and Analysis of Support Institutions and Promotion Strategies. Malawi German Borderzone Development Project, March 1997.
2. Ministry of Commerce and Industry. Capacity Assessment for Implementation of Small and Medium Enterprise Programmes. Project No. 97P13, April 1997.

7.1 INTRODUCTION

Information contained in this section was sourced from literature study and was mainly focussed on identifying the strengths of an institution to implement one or more strategies for sustainable livelihood. Their weaknesses, however, revealed the need for strengthening their capacities in the areas of human resource development, infrastructural and capital assets, financial resources, monitoring and evaluation systems, financial accounting and management systems, management information systems (MIS), technology transfer and extension services.

It was observed in the literature search that most of public institutions suffered from limited financial base due to their over reliance on government and donor funding. In addition, it was noted that such institutions lack capacity to generate revenue from commercialization of their products and services. This is an area that requires intervention to sustain their operations. Inadequate and inappropriate office facilities and equipment, the case of MIRTDC and a few NGOs, for instance, hampered the implementation of core strategies. Location of office premises also was seen to concentrate in industrial and commercial activity towns thus geographically discriminating rural masses that could best benefit from the sustainable livelihood system programmes. The following sections give an institution by institution account of the literature review on capacity assessment.

7.2 Public Sector Institutions

7.2.1 MIRTDC

The Centre was established to become the national focal point for conducting industrial research and technology development work in Malawi. The Centre has been established capacity for improving engineering services in the field of mechanical. engineering, food technology, electrical engineering, chemical engineering, manufacturing technology, technology assessment and transfer, feasibility studies for investment projects, market research, and assistance in sourcing technology for enterprise development. Engineering workshops (with basic machinery) have been established in Blantyre and Lilongwe which provide technology support to manufacturing enterprises.

The Centre has also developed capacity for industrial linkage. Exchange programmes of the Centre include the development and dissemination of the technologies listed on Table 7 above. The Centre also has a few vehicles that are used in programme operations most of which need repairs and replacement.

The Centre has strong linkages with other support institutions such as DEMAT, SEDOM, MEPC, etc and internationally the Centre is linked to WIPO, WAITRO. The Centre has a staff level of about 10 professionals in different fields of expertise.

The Centre is participating in the technology development and transfer components of the EDEC and has, therefore, a very important role to play in the implementation of sustainable livelihood systems. The major constraints of the Centre include the lack of appropriate office premises and workshop facilities, inadequate incentives to staff and limited financial base due to its overdependence on government and donor funding and a weak revenue generation capacity.

7.2.2 DEMAT

DEMAT has been involved in a number of initiatives including the Small and Medium Enterprise Fund (SMEF), a credit scheme initiated by the government. DEMAT was also involved as the implementing institution of the Training and Marketing Component of the UNDP 5th Country Programme, and in the implementation and supervision of the Credit Component. Currently, DEMAT is participating in the EDEC Programme, providing business skills training to entrepreneurs.

The major core programmes of DEMAT are Business Advisory Services, Technical Advisory Services, Business Advisory Services for Women and New Business Development Programme for potential entrepreneurs. In addition, DEMAT runs special programmes which are executed on a cost recovery basis. These include the Government Preferential Purchase Programme (GPPP), and the Bulk Purchase and Delivery Programme (BUPAD). DEMAT has offices in most of the districts of the country signifying a country-wide operation, which are manned by Business Promotion Officers.

Employment level is about 147 personnel 84 of whom have expertise in MSME promotion. Currently, funding is sourced from government and donors and income generation constitute minor contribution to its budget. The institution cooperates with a number of players locally such as the GTZ supported projects, NABW, NASME,WVI, MoWCACDSW, and MIRTDC.

The constraints of DEMAT include the need to strengthen their revenue generation capacity, the need to replace the old fleet of vehicles, motor cycles and computers, lack of adequate incentives for staff, and the need to construct own office blocks in districts in order to reduce rental costs. In the Sustainable Livelihood Programme DEMAT can play a major role in the implementation of marketing, business and technical advisory services, co-operative development, the GPPP and BUPAD programmes.

7.2.3 Ministry of Women Youth, Community Development and Social Welfare

7.2.3.1 Appropriate Technology Training for Income Generating Activities

ATTIGA, since inception in 1991, has been run as a project of the Ministry. The overall purpose of ATTIGA has been to develop and disseminate Appropriate Technologies Training

for Income Generating Activities for micro-enterprises and the informal sector. ATTIGA was until 1997, financially and technically supported by the German Agency for Technical Cooperation (GTZ). The main programmes included the following:

1. conduct research and development work on appropriate technologies;
2. training of trainers in appropriate technologies;
3. training of rural artisans in tools and equipment fabrication; and
4. fabrication and sale of specific tools and equipment.

ATTIGA has already provided training in the following technologies: oil extraction, soap making, production of sisal mats and sisal bags, blacksmithing, roofing tiles production and roofing skills, fruit juice pressing, tanning and manufacturing leather bakery fabrication, fish smoking with portable smoking kilns, beekeeping, weaving and tile machine fabrication, and others. ATTIGA workshops and technology development centre are located in Lilongwe run by the Program Manager, Workshop Manager and training officers. Most of training is conducted at a fee. ATTIGA collaborates with its mother Ministry and its Community Development Assistants, and has links with World Vision International, Caritas Malawi, Save the Children Federation.

The major constraints of ATTIGA is the withdrawal of funding from GTZ as a result activities have scaled down and staff morale has declined, while others are leaving the institution for better jobs. In addition, bureaucratic tendencies have hampered the implementation of its programmes. Since 1994, ATTIGA has trained more than 880 extension workers thus reaching out to over 8000 beneficiaries. The long serving experiences of ATTIGA for the micro and informal sector of rural areas makes it suitable for participation in the sustainable livelihood programme and therefore needs support.

7.2.3.2 Magomero Appropriate Technology Centre

The Magomero Centre is run by the Ministry and offers appropriate technology training in the following areas to SMEs:

1. handloom technology(weaving);
2. homecraft training;
3. food nutrition;
4. biogas technology;
5. handcraft(cane furniture).

Its major constraints is the overdependence on government funding for operations and for running its programmes.

7.2.4 SEDOM

SEDOM founded in 1982 by government, was established to provide credit to SMEs in modernizing, improving, expanding and diversifying their enterprises. SEDOM was created as a kind of development bank which offers credit at a subsidized interest rate to local entrepreneurs. The main function of SEDOM are thus provision of credit loans, business and technical advisory services and provision of industrial estates to SMEs.

The core programmes of SEDOM include the following

1. Crop Marketing Scheme aimed at stimulating agricultural trading activities, funded by World Bank since 1992. To secure the loan financial collateral is required. Since 1996 about over 1070 individuals have benefited from this scheme totalling K105 million of disbursements of up to K400,000 per beneficiary. Interest rates are at commercial market rates and repayable within one year.
2. Main funding scheme started in 1983 and aimed at assisting SMEs with short and long term loans to finance fixed and working capital. Financial support has been made available from the European Union, KfW and UNCDF. The number of beneficiaries includes 4,400 from K25.5 million disbursements of up to K250,000 each. The interest rate is charged at a subsidized rate over a range of a repayment period of up to 10 years. Statistics indicate that 30% of beneficiaries are women and 40% are rural people.

Other programmes offered by SEDOM include export finance, leasing schemes, renting out industrial estates and handcrafts production facilities to entrepreneurs and provision of export marketing services to small scale handcraft producers, and getting Letters of Credit on their behalf. SEDOM is headquartered in Blantyre, operates national wide with three regional offices and four sub-regional offices located in Mulanje, Karonga, Kasungu and Mangochi. Employment level is about 162 personnel of varying expertise.

The major constraints of SEDOM include the lack of funding for the main funding scheme since the withdrawal of UNCTAD in 1992/93, the need to increase client accessibility by opening more offices in rural areas, the need for improved staff incentive packages to recruit and retain able staff, the need for the government to support its development functions. The issue of collateral is an impediment to MSMEs and the informal sector to access SEDOM loans, the government should seriously look into this scenario to make available a credit guarantee scheme. SEDOM is, however, commendable for its 16 years of experience in providing group and individual loans to participate in credit provision in the Sustainable

Livelihood Programme.

7.2.5 MEDI

MEDI was established in 1985 to train artisans for self employment in rural and peri-urban areas and provide extension services.

Core programmes include:

1. Start a business
2. Build a business
3. Improve your business
4. Training of trainers
5. Improve your construction business
6. Women entrepreneurship development

MEDI is well equipped with facilities at their campus to support their programmes, in addition, they are flexible to deliver their services at premises of client's choice. Language of instruction is both English and vernacular.

MEDI as a government parastatal depends on government funding mainly to support their capital expenditure. MEDI is able to generate a sizeable income from fees to support operations and compliment government subvention.

The major constraint of MEDI include the need for short term training assistance for its personnel for capacity building and strengthening, the need to automate their operation system and increased support to strengthen its financial base.

MEDI has long experience and expertise in training entrepreneurship with special focus on the micro and small scale sector. MEDI is therefore being recommended to support sustainable livelihood systems in provision of entrepreneurship skills training.

7.2.6 MINISTRY OF FORESTRY, FISHERIES AND ENVIRONMENTAL AFFAIRS

7.2.6.1 Fishery Research Department⁴²

⁴² Adapted from the Malawi Agricultural and Natural Resources Research Master Plan Draft Report. Prepared by the Agricultural Sciences Committee, National Research Council of Malawi, 1999.

This is mostly undertaken by the Ministry of Forestry, Fisheries and Environmental Affairs whose main objective is to promote increased fish production through the sustainable use and management of fish resources. Research work which is mostly funded by donors and cooperating partners on specific programmes is undertaken in the areas of aquaculture and capture fisheries. Government funding is mostly in support of administrative costs. Technology transfer is facilitated by fisheries assistants located in strategic areas.

The aquaculture Project is mainly conducted by the International Centre for Living Aquatic Resources Management (ICLARM/GTZ), a regional centre located at Domasi in Zomba. The main focus of the research centre is on the development of low input aquaculture technologies for smallholder fish farming. Fish species being used include *Tilapia rendalli*, *Oreochromis shiranus* and *Claris gariepinus* with financial support from FAO, ICLARM and JICA.

Research on capture fisheries is conducted by the Monkey Bay Fisheries Unit in Mangochi. The unit has two main research centres in Nkhata Bay and Senga Bay and substations in Zomba and in the Shire Valley. Research focus is on *Bathyclarias* and *Bagrus species*, demersal fisheries of Lake Malawi and limnological studies on the fisheries of Lake Malombe. The unit also investigates the relationship among limnological, ecological and fishing gears on fish catches from the major water bodies, including investigating socio-economic factors especially involving children, women and men in the management of fisheries and environmental effects on fish catches and spawning habits. Research work is conducted in collaboration with the SADC/GEF Lake Malawi/Nyasa Biodiversity/Conservation Project, Bunda College of Agriculture and Chancellor College at local level and the University of Zimbabwe, University of Bangor in UK and British Museum on the international level.

The major constraints of fisheries research include:-

- (i) overdependence on donor funding for research projects and staff training;
- (ii) low levels of uptake of technologies by farmers requiring increased extension services;
- (iii) inadequate incentives for staff since the scientists are most civil servants.

7.2.6.2 Forestry Research Institute of Malawi (FRIM)

Forestry research in Malawi this is conducted by the Forest Research Institute of Malawi (FRIM) established within the Forestry Department. Its work include development of appropriate technologies for silviculture management and multiple land use systems, sustained wood production, reduced risk in losses from timber, tree pests and disease and advising on the optimum use of forest products. Substations are established at Chikangawa and Viphya Plateau in the North and Dedza in the Centre and satellite research sites are

located in Kasungu, Karonga, Rumphi, Mangochi and Nsanje. The institutes collaborates locally with DARTS, University of Malawi, SADC/ICRAF Agroforestry Project etc. International collaborative links are established with Oxford University in the UK, the Centre for International Forestry Research (CIFOR) etc. FRIM also undertakes technical and information services that covers management of the National Tree Seed Centre, dissemination of research findings and managing forest research information.

Outputs from the Frim Programme⁴³

Technologies have been developed for plantation forestry, nursery, establishment, tending and harvesting of trees for several species of pines, Eucalyptus and Gmelina. Pest and disease control technologies have been developed, especially for the control of Phoracantha beetle, termites, aphids, lead defoliators, leaf blight, powdery mildews and Blue Stain on wood. Some technologies which utilize various wood products have been established, including wood slabs and joineries. Standards for some wood products have been developed by the Malawi Bureau of Standards.

Recommendations have been made for the use of trees in different farming systems, including management strategies for *Sesbania sesban*, *Gliricidia sepium*, *Moringa oleifera*, and *Faidherbia albida*. In collaboration with DARTS and the SADC/ICRAF project, two technologies have been released; namely mixed cropping of maize with *F. albida* and relay cropping maize with *Sebania* to improve soil fertility and crop yields. Useful products, such as Karaya gum for the confectionery industry, wild mushrooms and fruits, and Masuku for wine making from the Miombo woodlands, have been characterized and recommendations on seedling establishment and ecology of these has been developed for different silvicultural zones. FRIM established an apiculture programme with the Department of Parks and Wildlife for bee keeping and processing of honey. Research on seeds has succeeded in storing some difficult succulent species, including Masuku and neem, which can now be stored and retain their viability for over a year. Seeds of species that are in high demand, such as those of *Gliricidia* and *Sesbania*, have been multiplied and standards developed by the Department of Land Resources Conservation through the Promotion of Soil Conservation and Rural Production Project. Farmers have been trained in tree selection and community seed collection of *Sambamfumu*, *Mlombwa* and *Acacia*.

Technologies on propagation, species and provenances screening, plantation establishment, stand management, wood processing and utilisation have been recommended by Forestry Department. These have been adopted by various end-users, notably the Wood Industries

⁴³

Adapted from the Malawi Agricultural and Natural Resources Research Master Plan Draft Report. Prepared by the Agricultural Sciences Committee, National Research Council of Malawi, 1999 page 75-76.

Corporation and Viphya Pulpwood. Similarly, tree seed technologies have been adopted by the National Tree Seed Centre which is able to produce and distribute well over 15 metric tones of seed/year. The Department of Forestry has successfully established 111,650 hectares of plantations of which 53,000 hectares are on the Viphya Plateau providing employment to over 2,000 employees. A similar number of people is employed in the wood processing industry.

Legume tree species are contributing to soil fertility improvement and agricultural productivity where trees and planted for wood are not a common feature in most parts of Malawi. These trees are contributing to household cash economy, particularly when meeting local demand for demand house and granary construction. Trees also provide shade, windbreak and are a habitat for bees that produce honey. Owing to an ever growing tree planting initiative, particularly on farmland, demand for seed is over 100 metric tones, for multipurpose and indigenous tree.

7.2.6.3 The University of Malawi

The University of Malawi is mainly an academic institution of higher learning offering diploma, degree, and post graduate courses. However, considerable research in agriculture and renewable natural resources is conducted by most of the constituent colleges of the University while the Polytechnic offers engineering services to industry.

The constituent colleges of the University and their programmes that can support sustainable livelihood systems are as follows:-

7.2.6.3.1 Bunda College of Agriculture

The college has capacity to undertake the following work:-

- 1) research in farm structures, post harvest storage and processing, soil and water conservation, and farm machinery;
- 2) research in animal nutrition, production, breeding, dairy management, livestock feed and fish production;
- 3) diseases and management of field crops;
- 4) food processing/utilisation, nutritional status and vitamin content of local foods;
- 5) rural development marketing, extension, agribusiness, and poverty indicators.

7.2.6.3.2 Chancellor College

The college has capacity to conduct research in various fields and has several facilities and

departments that can support sustainable livelihood projects. For instance, the biology department collaborates with ICRAF at Makoka on research on indigenous fruits and on aquaculture, soil pests, plant ecology and fish biology at Lake Chilwa. The chemistry department conducts research on cyanide levels in cassava and nutrient content of indigenous fruits, vegetables and spices.

7.2.6.3.2 The Polytechnic

The Applied Sciences and Environmental Health departments conduct agricultural and natural resources research including monitoring of surface water resources using Geographical Information Systems and investigation of the chemical and protozoan pollution in the Shire river.

The Engineering department has engineering workshop facilities and expertise that assist industries in technology development.

The major constraints of the University are:-

- 1) the lack of appropriate incentives to retain its professional staff;
- 2) most of the projects conducted are supported by donors or private funding and government support is considered inadequate;
- 3) the University staff are allowed 25% of their time for external research and projects; and
- 4) low revenue generation capacity to support its activities.

The University can, however, play a big role to sustain sustainable livelihood system activities using its expertise to conduct research in the various areas of need.

7.2.6.4 NGO Capacity in Sustainable Livelihood Systems Support

Various initiatives and interventions have been undertaken by non-governmental organizations for the sustenance of people's livelihood in Malawi. In the area of technology assessment and transfer institutional capacity has been built along the following key areas:

- Identification of livelihood technology needs;
- Sourcing and/or development of the required technologies;
- Dissemination of livelihood technologies including providing technical support services, providing training in utilization and maintenance, field testing of technologies and creating public awareness of the technologies;

- Implementation, evaluation and monitoring of livelihood programmes and projects.

However, the various institutional effort to support sustainable livelihood have been fragmented due to a number of constraints including the following:

- The need to build capacity in terms of human expertise and technology in the institutions to effectively participate in the initiatives or execute planned projects;
- The need for greater collaboration between institutions, promoting joint efforts, sharing of resources such as skills and information in the implementation of livelihood support activities;
- The need to increase and strengthen financing of sustainable livelihood activities through collective, contributory or participatory financing of the activities.

The various programmes and projects that NGO institutions have been involved in include the following:

- Modern farming (horticulture and agronomy);
- Poultry farming;
- Animal production;
- Adult literacy;
- Dissemination of agricultural technologies such as egg incubators, ploughs, oil presses, provide extension services to farmers, treadle pumps, water drilling equipment, beehive technology;
- Provision of safe water facilities through installation of Afridev pumps and other types;
- Provision of sanitation facilities;
- Provision of health services;
- Entrepreneurship development and skills training;
- Provision of credit to business start-ups.

Sustainable livelihood support initiatives in rural areas of Malawi have mostly been undertaken by NGOs. The major constraint in NGOs, however, has been overdependency on

donor funding and lack of capacity to generate own income to support their operations and livelihood support activities, and the lack of appropriate equipment and workshop facilities to support technology transfer on livelihood systems.

Location of support institutions with respect to the communities of need is another aspect posing problems in programme implementation. Most institutions are not centrally located or lack national presence. As a result only areas within the reach of the support institutions benefit from the various initiatives while others are geographically discriminated and denied access to the services.

The Sustainable Livelihood Programme is therefore expected to address these problems. While in the public sector, Government supported institutions, currently, have been affected in their operations by the Public Sector Reform Programme which has embarked on abolishing institutions which largely supported sustainable livelihood systems at the expense of government funding. Those that continue have had their budgetary allocation reduced mainly to cover administrative costs.

Table 10 below shows a number of NGOs that have been active in supporting Sustainable Livelihood Systems in rural areas

Table 10: NGOs Supporting Sustainable Livelihood Systems

Name of NGO	Type of Support
Beekeepers Association of Malawi	Promotion of beekeeping
Christian Hospitals Association of Malawi	Income generating activities (IGA)
Disables Persons Association of Malawi	IGAs and promotion of wood carving, doll making, tailoring, handloom
Leather Association of Malawi	All aspects of the leather sector including training
Lime Makers Association of Malawi	Promotion of small scale lime making, promotion of lime production and marketing of lime, advisory services
National Association of Business Women (NABW)	IGAs promotion to business women and provision of credit
National Association of Small and Medium Scale Enterprises	Assistance to SMEs in business formulation and promotion, linking up with credit facilities
MUSCCO	Private institution set up to promote savings and credit cooperatives (SACCOs). SACCOs provide short and long term productive loans while MUSCCO provides business loans
Malawi Mudzi Fund	Savings and credit programme for the lowest income segment of the rural population not reached by existing credit institutions.
AFRICARE	Community development, savings and credit schemes
Anglican Diocese of Southern Malawi (Malindi Engineering Workshop)	Appropriate technology workshop and training centre
CARITAS Malawi	IGAs, skill development
CCAP Blantyre Synod	IGAs
CCAP Livingstonia Synod	IGAs
Christian Council of Malawi	Skills training, homecraft
Christian Services Committee	Self-help, development projects to improve living standards, credit and savings, agricultural projects and services
Concern Universal	Fund raising, technology dissemination
EVARD	IGAs
Evangelical Lutheran Church of Malawi	IGAs incl oven making, tailoring
Habitat for Humanity	Construction of low cost houses

Kaporo Foundation for Rural Development	construction of roads, bridges and provision of maize mills
Mission for Evangelical Training and Development	Business and technical skills training
Nazarene Vocational School	Vocational training, carpentry, tailoring, tinsmithing, leather goods
Nkhomano Institute for Development	IGAs
OXFAM	IGA, credit
PAMET	Provision of paper making skills from used paper
Muslim Association of Malawi	Modern farming, animal production, adult literacy
Save the Children Federation (UK)	IGAs, appropriate technology, safe water, sanitation, health
Save the Children Fund of Malawi	Vegetable growing and fruit production
Sue Ryder Foundation of Malawi	IGAs, home industries, marketing of products, skills training
Women's World Banking /Malawi Affiliate	Financing women's businesses
World Vision International	Soap making, micro-enterprise revolving loans

8. CASE STUDIES

8.1 Salt Production in Chikwawa

8.1.1 Background

Chikwawa district in Southern Malawi is one of the less developed areas in the country. In and around the village of Chigweshe about 1,000 to 1,500 families are engaged in the production of common edible salt. This is a traditional occupation which has been in existence for many years and is closely interwoven with the social structure and beliefs within the community. The salt extraction and production method used an indigenously devised process which is rather primitive. It however provides a means of livelihood to a very large number of families.

8.1.2 The importance of the project

Most of the salt consumed in Malawi is imported. The foreign exchange outlays are, therefore, considerable. Looked at from a more micro-perspective, the people in this particular area in Malawi have few other methods of survival except the manufacturing of salt. The soil is salinated which prevents the growing of agricultural crops. The only alternative income generating activities are small vegetable gardens at the river side and the keeping of livestock. However, both these activities are only providing income for a very small portion of the population.

8.1.3 Production process

Salt deposits have occurred naturally in this area for several decades. The salt rises to the surface of the soil through capillary action and forms a thin layer on the ground. The top-soil is scraped off by the villagers and the salt is then extracted by a locally derived but somewhat primitive process. The soil is placed in a crude filter consisting of hessian cloth or poly-woven sack cloth hung between wooden silts. Water is poured from the top which slowly percolates through the salt bearing earth and emerges below in a thin trickle. During the process the water extracts salt and the brine solution is collected beneath the filter in buckets or pans. The salt content in the brine is tested by Organoleptically. If the content is found lacking, the brine is poured back onto the filter bed until it has an adequate salt residue. This process takes about a day. The brine is then boiled in a large pot over wood fire till the water evaporates and the salt is left as a deposit. This process takes about six hours and is completed through the burning of fuelwood inside especially built sheds which serve as a shield from the wind and also as a store for the salt, implements, firewood, etc.

8.1.4 Origin of the project

In 1991 a mission from UNIDO visited the village. In its report it stated that there was a potential to develop the salt manufacturing in this village both quantitatively and qualitatively. Another recommendation stated that further study was required to come up with the best approach. However, no donor was willing to fund the costs of the study. Therefore, it was necessary to use a different approach.

8.1.5 An Overview of the project

In the initial stages of the project the villagers were skeptical of the initiatives of the officer from Malawi Industrial Research and Technology Development Centre. The villagers remembered quite well previous visits from various officials who had told them that their institution or department would assist them in improving their means of livelihood. However, nothing ever came from these visits. Officials from Malawi Industrial Research and Technology Development Centre had to make several visits to the project site and had a lot of discussions with traditional authorities and the villagers themselves before the people gained confidence in them to start the work.

Still more visits were needed because the actual work needed to be done by the villagers themselves under the guidance from Malawi Industrial Research and Technology Development Centre. After taking these first hurdles, it was decided to organise the villagers into a functional group.

In most cases the entire family is engaged in the production with a heavy representation of rural women. The soil is scraped in a thin layer, collected in baskets or similar containers and carried in head-loads to the filter. After a few weeks a fresh layer of salt rises to the surface and is ready again for collection. After extraction of the salt the soil is dumped in heaps nearby.

The firewood is collected from the surrounding area. Because of depleting resources, wood is collected from as far as 20 kilometers away, that too on head-loads. Wood is also needed for construction of the filters and sheds. Some transporters entered into the business of collecting firewood by trucks and selling it to the villagers. Needless to say, this process led to the destruction of the forests in the neighbourhood.

The pots, stirring spoons, and vessels for storing the salt are purchased by the villagers from the nearby Nchalo Trading Centre.

The salt is sold by the individual villagers at Nchalo Trading Centre. It is purchased either directly by consumers or, increasingly, by traders or transporters for resale. This salt finds its way even to such distant places as the far North of the country. The villagers have complained that they get a very low price from the traders, who pocket the bulk of the profits. Each family produces 80 - 90 kilogram of salt per week for which it gets about MK30⁴⁴, i.e about K120 per month per family. There is no production during the rainy season, when the area gets flooded or water logged, thus there is no income during 4 to 5 months of the year.

After initial successes, more and more people wanted to join the functional group. However, through traditional authorities it was explained that more functional groups would be formed once the R&D work had been completed successfully. Acceptance in the village of the experimental phase was facilitated because the project developed one aspect at a time. Through this process the villagers

⁴⁴ The price of K30 was applicable in 1995 when this case study was undertaken.

were not only explained what needed to be done but were also involved in all aspects of the work.

The group members, under guidance from the of Malawi Industrial Research and Technology Development Centre, have made several improvements as follows:-

- i) The filtration process was improved through the design of a new filter assembly which introduced a second filter. This also has reduced the impurities in the salt.
- ii) Formation of a functional group which now keeps record of individual group members who bring in soil and how much salt they are left with.
- iii) Proper measurements were being undertaken and, consequently, a relationship between the amount of water and the amount of solid was established for optimal results. Therefore, villagers do not need to taste the brine anymore.
- iv) Installation of a rope and washer pump; this has eliminated the need for a twenty minute walk (up and down) to the river carrying one bucket of water only.
- v) The salt was quality tested by the Malawi Bureau of Standards and, one of the main findings was that the chemical content of the salt was acceptable, but the moisture content was too high.
- vi) Solar stills were installed to evaporate water to crystallise the salt. This had the potential to reduce the moisture content of the salt (in relation with a little boiling). An additional advantage was that villagers obtain pure drinking water (evaporated water is obtained from the side drains).
- vii) Agreement on the installation of a demonstration biogas plant was reached. Building was to start in the month of May or June, 1995.

The beauty of the project was that it was fully accepted by the villagers. In fact, the villagers became so enthusiastic that they started experimenting themselves with different boiling techniques.

These are considerable achievements if one takes into account that the villagers are dependent on the proceeds of the sale of the salt for their livelihood.

Furthermore, the project has increased local awareness of environmental issues, such as deforestation and more importantly, villagers are now aware of alternative energy-producing technologies, such as biogas and solar power, and have the organizational skills to further protect, whilst utilising, their environment.

8.1.6 Expansion of the project

Similar deposits are known to occur in different districts in Malawi. Once the technology has been

suitably developed to produce high quality salt it is expected that similar assistance will be given to other districts such as Kasungu, Nsanje, Mangochi and Mzimba.

The expansion of the project will encourage local salt production, increase rural incomes and reduce poverty. With the environmentally sound production methods being explored, the project demonstrates a strong integration of economic and environmental decision making.

8.1.7 Salt Production and Sustainable Livelihoods

The Salt Production Project in Chikwawa has integrated some of the elements of the Sustainable Livelihood Programming Approach.

The following is an analysis of this case study in relation to the Sustainable Livelihoods Approach.

1. *Identification of Common Assets*

The community is endowed with the following common assets.

1.1 Land

The land and its capability to produce salt through efflorescence is the most important "public" common asset to this community. The productivity of this asset is diminished greatly because of flooding that takes place during the rainy season and, hitherto, no effort has been made to mitigate this problem..

1.2 Forestry Resources

The salt production process requires the use of fuelwood as an energy source for heating. Wood as a public common asset is not currently available in the vicinity of the production site as most of it has been depleted. Other common assets for energy are solar and animal wastes (cow dung) which are generally classified as renewable energy sources. However, the access to these sources require technological interventions.

1.3 Water Resources

The community has access to water from Shire River but this requires a 20 minute journey to collect. Other operations requiring water could use groundwater resources and the area has a high water table.

1.4 Knowledge Base

The community has been producing salt for a long time and the knowledge of doing this constitutes an important common asset for the community.

1.5 Production Equipment and Accessories

Each salt production micro enterprise has its own set of salt production equipment. The main technology in use is the salt filtration assembly.

2. *Policy Impact on Salt Production*

This salt production case study was documented in 1995 and since then a number of policy changes have taken place which have impacted on this livelihood system. The key changes are as follows:-

1. Land

The Government established a Land Reform Commission whose results, although not yet in the form of legislation, will impact on land tenure.

2. Macro-economic Policies

The liberalization policy currently in force is a macro-micro-economic policy that has impacted on enterprises as livelihood systems in Malawi. The markets for local products have been reduced due to unrestricted imports of the same products and salt has not been an exception.

3. The Forestry Act

The Forestry Act, 1997 has imposed restrictions on access to woodfuel by the salt producing community in this case study.

3. *Key technologies: Productivity Improvement*

The Centre, as an S&T institution has made a number of interventions to improve the productivity of the key technologies and assets of the salt producing community. The following are the key interventions.

1. Salt Extraction

The Centre made improvements to the salt extraction assembly the community had been using. the new salt extraction assembly more than doubled the salt concentration in the brine from 10% m/v to an average of 26% m/v . The community has since copied the technological changes.

2. Renewable Energy Technologies

The Centre has introduced the use of solar still evaporators and biogas as renewable energy technologies. Initially a 6 cubic meter biogas digester was installed but was inadequate. A 50 cubic meter digester is currently under construction.

3. Salt Crystallization

The use of solar evaporators has improved the crystallization of salt from the brine solution. This has also resulted in salt of better quality in terms of sodium chloride and moisture content to the extent that the salt now meets the national standard requirement for common salt as prescribed by the Malawi Bureau of Standards.

The interventions of the Centre have also led to a clear understanding of the potential of the enterprise. It is now known that saline soils from 1400 square meters of land is required to produce one tonne of salt. This is a small fraction of the total land area available for this enterprise. The one tonne of salt may be produced from 5,000 litres of brine which, using the improved extraction assembly is obtainable from 15 filtration batches. In relation to solar crystallization, it has been established that 22 kg of salt may be produced from a 4.6 square meter solar still in 14 days. The result of a direct extrapolation of this observation is that 585 square meters of solar still is required to crystallise one tonne of salt per week.

8.2 Ndawambi Village Revisited

8.2.1 Village Profile

Ndawambi Village is twenty five kilometres north west of Mchinji Boma. The Village is accessed through a secondary gravel road that branches off the M12 road at Kholeni, going North. The road proceeds to Magwero Zambian border post that is five kilometres from the village. The Village lies in a valley almost surrounded by hills, the main ones being the Mchinji Hills that are to the east of the Village. Within the valley, Bua River has its source. The Bua Valley forms the Village's economic lifeline as most vegetables that are a major source of income for the village are grown here.

8.2.2 Economic Activities

Ndawambi Village is an essentially agricultural village; growing onions, irish potatoes, cabbages, soya beans, groundnuts, beans, maize and cassava. The main livestock kept are chickens, cattle, goats and pigs. Other businesses include beer brewing, baking and trading, ox-cart carpentry, bricklaying, tinsmiths, lumberjack, tailoring, hire operation, repair works (radio, shoes and bicycle). Despite this long list, the major sources of income in Ndawambi are the selling of dimba and farm products, namely: onions, tomatoes, vegetables, irish potatoes, maize and beans. The average land holding capacity per household is 0.5 a hectare for dimbas and 2 hectares for farmland.

8.2.3 Technological Characteristics of Economic Activities

As stated earlier, the major economic activity of the village is agricultural production of food crops mainly. The crops are preserved in times of plenty and later sold during the times of scarcity with solar drying as the main method for preservation.

8.2.3.1 *Crop Production*

1. *Onions*

Ndawambi can be said to be a major onion growing area in the country. The 195 households present in Ndawambi, each household produces between 40 to 50 bags of onions per year. Each bag sales at about K1,800.00. Onions from the village sold as far markets as Mchinji Boma and Lilongwe in Malawi and Lusaka in Zambia. Customers meet their own costs to travel and buy onions from the village. Onions are grown in dimbas within the Bua Valley in the dry season. The dimbas are

irrigated mainly through gully irrigation and the use of a watering can. The village benefitted from a water pump through the Department of Irrigation. The pump, however, has not been used because the villagers feel the pump was undersized.

After harvesting, onions are air dried in well ventilated sheds and, when dried in this manner, the onions can last for six months.

2. *Irish Potatoes*

Irish Potatoes are grown in both rain fed upland gardens and the irrigated Bua Valley. The method of irrigation is the same as the one mentioned for onions. The Villagers could not give an average output per household, however, a bag the size of a 50 kg maize sells at an average price of K250.00.

Potatoes are stored in pits (*nkhuti*) for long term storage. Just like onions, customers travel to the village to buy the product. At one time the villagers used to have seed problems; they used to bring in the seeds from Dedza, another potato growing area in Malawi. The problem was overcome by planting potatoes in the rain fed gardens and then using part of the crop as seed for the dimba crop and vice versa.

3. *Cabbages and Tomatoes*

Cabbages and tomatoes are also grown in Ndawambi. Both the crops are grown in dimbas within the valley. The two crops are sold as fresh produce. In the event that customers are not forthcoming or when the crop is plentiful, the farmers take the crop on bicycles, ox-carts or pick-ups to markets at the Boma or Chipata in Zambia.

The vegetables are not processed currently except for pumpkin and bean leaves which are solar dried as *mfutso*. The dried vegetables are however not for sale but domestic consumption.

4. *Maize*

Maize is grown in rain fed gardens in the arable land up of the valley. The maize is left to dry on its stalks. During times of persistent rains, the crop is harvested before it is fully dry. It is then further dried on reed and palm mats during sunny days. When dry, it is stored in granaries or hessian/woven sacks for sale during times of scarcity.

Maize, that is to be used for food, is pounded in a mortar and pestle then soaked for three to four days. On the fourth day, the maize is dried in the sun and later taken to maize mills. Currently, there is one diesel powered maize mill in Ndawambi. The

mill, however, breaks down frequently and when this happens the villagers get their maize milled at Kachebere which is situated more than 15 kilometres away.

5. *Livestock*

The Ngoni's of Ndawambi, like Ngoni's elsewhere, are reknown for their love of keeping especially cattle. Livestock was kept as a sign of wealth. Ndawambi has the following recorded livestock population; cattle 219, pigs 395 and goats 255. There are two poultry farmers that are keeping three hundred layers between them. Besides the layers, local breed poultry and ducks are also kept.

8.2.3.2 *Non Agricultural Economic Activities*

1. *Building and Construction*

Up to the PAPSL study period, December 1997, people of Ndawambi were unaware of the family planning methods resulting in high population growth: the growth figure for the village was not recorded. The high population growth opened opportunities for home construction and brick moulding become significant non-agricultural economic activities in the village. The houses being built are generally traditional; and due made from sun dried bricks and are grass thatched. There were, however, a few houses with burnt bricks, cement floor and covered with iron sheets or cement tiles.

2. *Trading*

Another off-farm activity popular in the village is trading. Being near the, a significant amount of cross border trading takes in the village. Products like sugar, soap, beverages, are bought at wholesalers in Mchinji and Lilongwe and find their way to the Zambian markets of Chipata and Lusaka while Zambian textiles, chickens, chicken feed are imported and sold locally. The goods are mostly transported on bicycles to their foreign markets. Some of the villagers are either employed in Malawi or Zambia.

3. *Bakery*

There are two traditional bakery ovens in the village. One oven is used on commercial basis for baking buns for sale in the village. The other oven is hired out to families wishing to bake on festive occassions. During such times, both ovens are busy as demand for baked products shoots up.

4. *Beer Brewing and Kachasu Distillation*

People of Ndawambi, being ngoni, are reknown for their love of beer. After hard work in the mornings, the villagers relax in the afternoon by drinking locally opaque brewed beer and *kachasu*. The beer is brewed in used drums while *kachasu* is distilled using sealed earthen ware.

8.2.4 Limiting Factors to Technology Acquisition

Life in Ndawambi, in general, relies on traditional technologies. Much of the technologies in the village have been learned either through experience and practice, handed over from parents: like the bakery ovens which were other skills have been elsewhere copied from Mchinji Boma; or bought in by folks that had travelled to other places and countries and have brought the technology on return, like television sets and solar panels. On very few occasions have the people of Ndawambi been accorded institutionalized technology training. It was learnt that some residents of the village have had access to training in bee-keeping, ox-cart manufacturing, poultry keeping, feed mixing and forestry management.

8.2.4.1 *Location*

The location of Ndawambi may be considered to be economically fairly well off; an average of 40 bags of onions per household per year and bag selling at K1,800.00 brings a family an annual income of K72,000.00 per year as turnover. Even though this figure includes money spent on farm inputs, the villagers could be considered to be better off than most rural Malawians. This implies that though finance might limit access to technology, the major factor could on the contrary considered to be lack of information. As an example, it was learnt that after a beekeeping training, a group in the village was provided with one bee hive. Upon observing the benefits of the technology, the group wanted to acquire ten more hives but did not know where to go to for assistance. At the time this was happening, an MIRTDC Office that could have supplied the required hives was at Mchinji Boma, a distance of 25 kilometers away from the village.

8.2.4.2 *Coordination*

The above example amplifies lack of coordination among support institutions as a constraint to the development and transfer of technologies. The Beekeepers Association of Malawi together with the Department of Forestry, who initiated the beekeeping training, could not alert MIRTDC Officers at the Boma of the training so as to provide back up service to the trainees. Thus capacity to intervene was wasted

due to lack of coordination.

8.2.4.3 Access to Training

Limited access to training also limits utilisation of various assets in Ndawambi that would otherwise improve the livelihood of the community. Ndawambi has adequate river sand that can be utilized for house construction through the making of cement tiles and cement blocks. This opportunity is lost due to lack of training. The people that have roofed their houses using cement tiles have had to purchase the tiles from Zambia. Also with sawyers present in the village and others doing carpentry, the problem of bee hives would not have lasted very long if the carpenters were trained in the production of the Malawi Standard Hive.

8.2.5 Existing Technological Intervention Opportunities for Enterprise Development

8.2.5.1 Forestry

The productivity of the forestry assets could increase with appropriate technological interventions. Ndawambi borders Mchinji Forest Reserve and has an own customary forest. From the two forests, beekeeping could, be practiced intensively. This would require intervention in the construction of bee hives and tailoring of beekeepers suits. From the same forests, aromatic and medicinal plants could be harvested. Interventions would include documenting the aromatic and medicinal plants existing in the forests and accessing the community to technology for the extraction of essential oils.

8.2.5.2 Water

Another common asset in Ndawambi is water with the main sources being groundwater, Bua River, Kachimwa Stream, and rain water. Groundwater is currently used for drinking water and five boreholes have been sunk in the village. In addition to being source of drinking water, the groundwater could also be used for irrigation if appropriate irrigation equipment was installed. This intervention would increase the productivity of farm land that is otherwise only productive during the rainy season. The Bua river could be used for capture and culture fisheries. The Kachimwa stream which is currently not being utilized has a natural fall to gardens of the Villagers. Thus if the river coarse was deviated to the gardens, it would offer a reliable source of water for irrigation as well as domestic water. Kachimwa stream has a steady flow throughout the year, unlike the Bua river which runs very low during the dries months.

8.2.5.3 Solar Energy

As is the case in Malawi where solar energy averages 21MJ/m², Ndawambi also receives adequate solar energy. Currently, solar energy is used mainly for the drying of crops but one household is using a solar photo-voltaic cell to power a radio. The use of PV systems could be enhanced to include lighting, cooling and pumping. Lighting can help extend business hours; cooling could facilitate crop preservation while pumping could support irrigation and supply of potable water.

8.2.5.4 Land

With average land holding on 0.5 hectare of dimba land and 2 hectares of arable land per household and a population growing, it is necessary that the land available in Ndawambi village be utilized efficiently and effectively. The current cropping system utilizing open land may be enhanced if agroforestry, techniques were introduced. Intercropping of maize and groundnuts needs to be encouraged as it helps rejuvenate the soil. Irrigation utilizing the Kachimwa stream, either by daming or river deviation, would enable the all-year-round utilisation of the farmland.

8.2.5.5 Human Resources

The people of Ndawambi are the ultimate asset of the community. Of the 537 people that are over sixteen years old, 230 can read and write. The people of Ndawambi could be trained in various enterprise development skills. Technology skills training would start by strengthening existing knowledge base such as carpentry skills, food processing skills, construction skills, transport skills, farming skills and repair service skills.

8.2.6 Conclusion

The people of Ndawambi are a hard working people who have used indigenous technologies to enhance their livelihood. They have also copied technologies outside their village such as the bakery oven and replicated it in their village. The population has shown willingness to eradicate illiteracy. Of the 40 boys and girls aged between six and twenty four, 317 are school going. These factors indicate that with a little bit more effort and focus, the people of Ndawambi can take up technology for their sustainable livelihood.

9.0 Proposed key Technologies proposed for Ndawambi Village

9.1 Intensive Agriculture

The summarised baseline information for Ndawambi that has been presented earlier indicates that agricultural productivity is the major issue as far as the sustainance of the village is concerned. The high population growth rate coupled with limited land calls for the given piece of land to be more productive. The development of irrigation farming utilising Kachimwa stream offers the greatest potential.

9.2 Oil Processing Enterprise

Value adding of primary products such as groundnuts offer an alternative business enterprise. It is proposed that oil processing enterprise be introduced in the village so that people could have the option of producing and selling value added products from groundnuts.

9.3. Policy and Regulatory Framework that may affect the Enterprise

At the community level, it is expected that an edible oil association/cooperative will be formed to manage the enterprise. Thus effective cooperative formation will be key to the success. MIRTDC, DEMAT and MEDI will be expected to offer technical and business management support.

9.3.1 Competition Policy

Currently, the decanted oil being sold at Mchinji major market and other markets within the district is brought from Lilongwe in 20 litre tins and there is potential for group to supply the oil at the boma in addition to serving the surrounding communities.

9.3.2 Market liberalisation

Market liberalisation does not directly affect the enterprise as it aims at serving a specific niche, the consumers with low disposable income.

9.3.3 Standards

Quality and hygiene are key to any food business. The enterprise will be expected to adhere to the relevant codes of standards as pacified by Malawi Bureau of Standards.

Table 10: Selected Technologies for the Enterprises for Ndawambi Village

Ser No.	Enterprise	Potential Products	Key Technologies	Development and Training Needs	Support Institutions
1	Irrigation Farming	Potatoes Onions Cabbages	-Water channels -Water pumping Treadle pump - Solar pump -Land Management -Environmental Management	Technical Assessment Training in use of technologies and management technologies	- MoAI -Bunda College -Chitedze -MIRTDC -Other private suppliers
2	Oil processing	Edible oil Groundnut flour (nsinjiro) Feedmix	-Oil press -Oil filter -Processing equipment -Packaging -Feed mixer	Technology refinement Training in use of technology and quality control	-MIRTDC -MBS -Chitedze

9.4 Proposed Project Financing

The people of Ndawambi Village have the necessary financial resource and motivation to undertake business activities. What is required is to mobilise and train the key persons the necessary skills to form and manage a cooperative and run an enterprise. However, like any worthwhile enterprise, the initial cash outlay is normally high. This calls for a financing arrangement that would provide the initial capital equipment and working capital. For a business enterprise like oil processing, the group could be linked to the micro-finance programme which DEMAT is running. Some flexibility may have to be exercised in terms of cash allocation per individual if a sizeable enterprise was to be set up.

For the irrigation scheme, the cost diverting the river could be provided to the community as a grant. However, the cost of technologies for water pumping and distribution could be borne by individuals and associations while the cost of training programme could be provided as a grant.

undp.7