Oilseed Processing Technologies Adoption Survey

Case of Yenga Oil Press Technology in Southern Province

Farming Systems Association of Zambia

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Table Of Contents

Table Of Contents .............................................................................................................................i
List of Tables ....................................................................................................................................v
List of Figures ...................................................................................................................................v
Acronyms .........................................................................................................................................vi
Acknowledgements ........................................................................................................................ vii
Executive Summary....................................................................................................................... viii
1.0 Introduction ............................................................................................................................1
1.1 Contextual Analysis....................................................................................................................1
1.2 Background and Rationale .........................................................................................................3
1.3 Objectives............................................................................................................................4
  1.3.1 Overall Study Objective ...........................................................................................................4
  1.3.2 Specific objectives ............................................................................................................4
  1.3.3 Methodological Design and Analysis ...............................................................................4
    1.3.3.1 Methodology Used .....................................................................................................4
      1.3.3.1.1 Desktop Study .....................................................................................................4
      1.3.3.1.2 Stakeholder Appraisal .........................................................................................4
      1.3.3.1.3 Participatory Rural Appraisal (PRA) ...................................................................5
      1.3.3.1.4 Individual Interactive Discussions .......................................................................5
      1.3.3.1.5 Data Analysis ......................................................................................................5
  1.3.4 Study Coverage................................................................................................................5
  1.3.5 Team Composition ...........................................................................................................5
2. Key Concepts ...............................................................................................................................5
3. Overview of the Oil Processing Project ........................................................................................6
  3.1 Historical Evolution of the Project ...........................................................................................6
  3.2 Project Goal(s) .......................................................................................................................6
  3.3 Project Objectives ...................................................................................................................6
    3.3.1 General objectives............................................................................................................6
    3.3.2 Specific objectifies ............................................................................................................6
    3.3.3 Expected Outputs .............................................................................................................7
      3.3.3.1 Promotion and Distribution ........................................................................................7
      3.3.3.2 Manufacturing ............................................................................................................7
      3.3.3.3 Training ......................................................................................................................7
      3.3.3.4 Seed ..........................................................................................................................7
      3.3.3.5 Monitoring and Evaluation .........................................................................................7
4. Study Findings and Discussions ..................................................................................................8
  4.1 Description of the Study Area .................................................................................................8
  4.2 Study Area Geographical information .....................................................................................8
  4.3 Demographic Information .......................................................................................................8
  4.4. Economic Activities .............................................................................................................8
4.5 Agricultural Production trends

4.6 District Profiles of the Study Area

4.6.1 Kalomo District

4.6.1.1 Geographical Information

4.6.1.2 Drainage System

4.6.1.3 Agro-climatic Information

4.6.1.4 Demographic Information

4.6.1.5 Agricultural Activities

4.6.1.6 Cropping and Livestock Systems

4.6.1.7 Agricultural Extension services

4.6.2 Monze District

4.6.2.1 Geographical Information

4.6.2.2 Physical Characteristics

4.6.2.3 Agro-climatic Information

4.6.2.4 Demographic Information

4.6.3 Mazabuka

4.6.3.1 Geographical Information

4.6.3.2 Physical Characteristics

4.6.3.3 Agro-climatic Information

4.6.3.4 Demographic Information

4.6.3.5 Agricultural Activities

4.6.3.6 Cropping and Livestock Systems

5. Stakeholder Inventory and Analysis

5.1 Oilseed Processing Coverage Areas

5.2 Target Areas

5.3 Project Stakeholders

5.3.1 Target Beneficiaries

5.2.2 Stakeholder Categories in Oilseeds Processing

5.4 Extent of technology promotion

5.4.1 Technology Transfer and Promotion Strategies

5.5 Technology Adoption

5.5.1 Mode of Yenga Oil press Acquisition

5.5.2 Yenga Oil Press Sales Agent

5.5.3 Reasons for Owning Yenga

5.5.4 Reasons for not Using Yenga Oil Press Currently

5.6 Oilseed crop production

5.6.1 Major Oilseeds

5.6.2 Oilseeds Area and Production Trends

5.6.3 Sunflower Variety Preferences

5.6.4 Seed Acquisition and Constraints Faced
5.6.5 Use of Sunflower

Sold as grain

5.6.6 Use of other Oilseeds for Oil Extraction

5.6.7 Oil seed Crushing Capacity

5.6.8 Oil and Seed Cake Utilization

5.6.8.1 Edible Oil Utilization

5.6.8.2 Oil Marketing

5.6.8.3 Oil Price Determination

5.6.8.4 Uses of Sunflower Cake

5.6.8.5 Sunflower Cake Storage

6. Efficiency of the Yenga press oil processing technology

6.1 Costs and benefits of the technology dissemination programme

6.1.2 Dissemination Costs

6.1.2.1 Technology Promotion Costs

6.1.2.2 Entrepreneurship training costs

6.1.2.3 Yenga Press and Seed Distribution

6.1.2.3.1 Salaries, wages and administrative costs

6.1.2.3.2 Adoption costs

6.1.3 Benefits of Technology Dissemination Programme

6.1.4 Cost Benefit Relationships for the Yenga Oil Processing Business

6.1.4.1 Cost Benefit Aspects (of the Overall Dissemination Programme) At Micro-Level

6.1.4.2 Cost Benefit Analysis at Micro Level

6.1.4.3 Testing the Yenga press efficiency at (household level) Micro-level

7. Technology Impact

7.1 Intermediate Impact

7.1.1 Institutional Factors Influencing Technology Adoption and Impact

7.1.2 Institutional Contributions

7.1.2.1 Oilseeds Research

7.1.2.2 Extension Services

7.1.2.3 Manufacturers

7.1.2.4 Non Governmental Organizations

7.1.3 Institutional Capacity to Handle Technology Transfer

7.1.4 Policy Factors which influenced Technology Uptake

7.1.4.1 National Policy

7.1.4.2 Collaborating Stakeholders’ Policy

7.1.4.3 Political Environment

7.2 People Level Impact

7.2.1 Socio Cultural Factors

7.2.2 Gender Participation

7.2.3 Perception and Preferences
7.2.3.1 Individual Benefits ...................................................................................................23
Case study 1: Mr. T.B. Maulu .....................................................................................................23
7.2.3.2 Community Benefits ................................................................................................23
7.3 Environmental Impact ........................................................................................................24
  7.3.1 Deforestation ..................................................................................................................24
  7.3.2 Soil Degradation ..........................................................................................................24
8. Problems faced During Promotion of Yenga Oilseed Processing Technology ..................25
  8.1 Oilseed Production Among Smallholder Farmers .................................................................25
  8.2 Yenga Press Acquisition and Utilization ...........................................................................25
  8.3 Institutional Capacity for Technology Promotion ...............................................................25
  8.4 Other Factors Which Affected Sustainability ......................................................................25
9. Conclusions ..........................................................................................................................26
10. Recommendations ..............................................................................................................27
  10.1 Seed Supply .....................................................................................................................27
  10.2 Yenga Oil Press Acquisition and Accessories Back-up Services ......................................27
  10.3 Oil and Seed Cake Marketing .........................................................................................27
  10.4 National and Regional Oilseed Processing Technology Replication ...............................27
Overall Group Summary ........................................................................................................29
Appendix II: Workshop presentations question and answer session .......................................37
Appendix III: Yenga Oilpress technology adoption study ............................................................39
Appendix IV Yenga oilpress stakeholders workshop - List Of Participants ...............................46
List of Tables

Table 1: Small-scale Oilseed Processing Target Areas Visited During the Survey ........................................ 11
Table 4: Stakeholders roles in Yenga oil press promotion ........................................................................ 1
Table 5: Yenga oil press acquisition by farmers, 1993 - 2001 across the study districts ............................. 1
Table 6: Mode of Yenga oil press acquisition ......................................................................................... 2
Table 7: Yenga Oil Press Sales by Agent .................................................................................................. 3
Table 8: Benefits experienced by respondents for affiliating to clubs ...................................................... 3
Table 9: Reasons for not Owning Yenga Presses ..................................................................................... 3
Table 10: Average sunflower yield (kg) per household ............................................................................ 5
Table 11: Farmer variety selection criteria for oil extraction ................................................................. 6
Table 12: Use of sunflower produced by Yenga oil press owners ........................................................... 7
Table 13: Other crop seeds used for oil extraction at village level .............................................................. 7
Table 14: Comparison of benefits realized through oil extraction option compared to sunflower sold as grain ............................................................................................................................................. 8
Table 15: Demonstrations attendance by District ..................................................................................... 10
Table 16: Entrepreneurship training by District ......................................................................................... 11
Table 17: Summary & Breakdown of the total dissemination costs (1993 - 1998) ..................................... 12
Table 18: Assets bought by District ........................................................................................................ 13
Table 19: Cost benefit analysis at (micro) household level ........................................................................... 16
Table 20: Internal Rate of Return assuming (a five year period) the economic life span of a Yenga press .................................................................................................................................................. 17
Table 21: Summarized Institutional Stakeholder Roles .......................................................................... 20

List of Figures

Figure 1: Yenga oil press acquisition trend, 1993-2001 .......................................................................... 2
Figure 2: Reason for not using Yenga oil press currently, 2001 ............................................................... 4
Figure 3: Oilseed PHS Production Trends in Southern Province .............................................................. 5
Figure 4: Sunflower Variety Preferences by District ................................................................................ 6
Figure 5: Uses of Cake ............................................................................................................................ 9
Figure 6: Sources of Information About Yenga Oil Press among Farmers ............................................ 11
Acronyms

ASIP   Agricultural Sector Investment Programme
GDP    Gross Domestic Product
FTA    Free Trade Area
COMESA Common Market for East and Southern Africa
AOPP   Africare Oilseed Processing Project
MAFF   Ministry of Agriculture Food and Fisheries
NGO    Non-Governmental Organizations
UNIDO United Nations Industrial Development Organization
GTZ    German Technical Aid to Zambia
CBO    Community Based Organizations
PAM    Programme Against Malnutrition
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The team would like to recognize the indispensable contributions that Africare made to the success of the whole Adoption survey exercise. Other stakeholder (ZNFU, Monze Dioceses, Kalulu Development Foundation, CLUSA, SAMs, WVI, MAFF,) contributions during the fieldwork and appraisal workshop is greatly appreciated because it added more meaning to our findings and made our work manageable.

The unequalled hospitality and the valuable time farmers and development agents willingly spent with the study team inspired each one of us and will remain a true eye opener to realities of field experiences and challenges surrounding on-farm processing and smallholder agricultural development. We also sincerely thank all those people and institutions that contributed in one way or another towards the successful completion of the Adoption survey exercise.

It is the team’s sincere hope that the existing stakeholder collaboration and networking will continue and even be strengthened for smallholder agricultural development and enhanced food and nutritional security.
Executive Summary

Table 1

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<thead>
<tr>
<th>Study Title</th>
<th>Oilseed Processing Technologies Adoption Survey</th>
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<td>Client</td>
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<td>Survey Objectives</td>
<td>The survey objectives included among other things the following,</td>
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<td>• Carrying out of a comprehensive collaborating stakeholders appraisal in order to assess the effectiveness and efficiency of the Yenga oilpress technology transfer linkages.</td>
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<td>• Assessing the appropriateness of the Yenga oilseed processing technology in meeting the needs of the resource poor women, men and youth farmers.</td>
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<td>• Developing appropriate extension strategies for collaborating stakeholders on the Yenga oilpress technology transfer based on the constraints and impacts identified during the survey and;</td>
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<td>• Assist develop recommendations on conditions necessary for possible Yenga oilpress technology replication at both national and regional level.</td>
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Factors Considered | The Oilseed Processing Technology Survey assessed the effectiveness and efficiency of the Yenga Oilpress technology transfer linkages, technology appropriateness for smallholder farmer income generation and nutrition security, and sustainability of the promotion of engendered oilseed processing technologies among the resource poor farmers in Zambia.

Study Design | Adoption study involved the desktop study for review of project secondary data, structured field study among smallholder farmers and selected personal interviews with key personnel who were involved in the implementation of the project that included Government (MAFF), NGO (Africare) and private sector involved in the manufacturing of the Yenga Oilpress and marketing of oil seeds. Data collected was analyzed using SPSS and MS Excel and provided basis for statistical justification of field survey findings and recommendations.

Study Findings | Africare Oilseed Processing Project (AOPP) aimed at improving the nutrition and income levels for the ever-increasing numbers of rural Zambians, especially women through the establishment of a market driven rural on-farm oilseed processing industry stressing rural entrepreneurship.

| Study Findings | Despite tremendous promotion and dissemination efforts of the technology, current status show withering adoption of what was initially a very popular enterprise. Stakeholders concerned have accrued suspicions on effectiveness of the existing technology transfer linkages. |
|                | It is this that the Adoption Survey of the Oilseed Processing Technology on Household Food and Nutrition Security was conducted to assist stakeholders in coming up with technology dissemination strategies necessary for sustainable Yenga oil press adoption and utilization at national and regional levels. |
|                | The Project concentrated on the development and dissemination of village level oil processing technologies to improve nutrition security and economic well being of mostly women headed households most vulnerable to food and nutrition security problems. |
|                | Sunflower growing belts and areas with critical potential in oilseed village processing were selected as project areas. Selection was done with the guidance of the Crop Diversification Project and the Red Cross. |
|                | Promotion and distribution of Yenga oil presses was done through on-farm... |
demonstrations, farmer groups training and organized field days, focusing on technical aspects of press maintenance, seed processing and appropriateness of seed varieties, and an agronomic package for sunflower and other oilseeds production.

Collaborative promotions with other NGOs with established development structures were initiated. Private manufacturing companies were contracted to meet certain Yenga oil press and spare part needs based on field performance tests and farmer preferences. The project also promoted a seed multiplication programme for improved farmer access to composite seeds.

There has been a general decline in the number of farmers acquiring the Yenga oil press in Southern province following the phasing out of the Africare Oilseed Processing Project. About 70% of the farmers who do not own Yenga oil presses cited high Yenga purchasing prices while 29.8% cited lack of dealers in their respective areas where they can purchase Yenga presses as the limiting factors to owning Yenga presses.

Most Yenga oil press sales to smallholder farmers in the province were done through Africare Oilseed Processing Project. Of the total number (424) of Yenga oil presses sold in Southern province between 1992 – 1998 period, 56.4% were sold by the project office while 43.6% were sold through various marketing agents in the districts.

Marketing agents in the districts included; (1) Mazabuka Marketing Company in Mazabuka district; (2) ZATCO and Star Services in Monze; (3) ZATCO in Choma; (4) D.C.L and Elvina Enterprise in Kalomo and; (5) G.A.S in Livingstone.

About 55% of stopped using the oil presses due to low sunflower yields resulting into non-availability of sunflower seed for oil extraction while 36.4% indicated that their presses had broken down and lacked spare parts to repair them whereas. About 9% of the farmers sold off their Yenga oil presses after failing to make money out of the oilseed processing business.

The two major oilseed crops grown in Southern province include sunflower and groundnuts. Groundnuts are only used to a lesser extent for oil extraction. Farmers are financially better off selling groundnuts as seed grains as opposed to processing and marketing by-products.

Production estimates indicate a marginal downward trend in area and production of Sunflower in Southern province over the six-year period from 1992 to 1998 while the area and production of Groundnut have gone up by 120% (to 215,528 ha) and 60% (to 625 mt) respectively during the same period.

Sources of sunflower seed in the study area include commercial seed marketing companies outlets and agents found in major towns, and non-governmental organizations like PAM (SHAPES), Africare, and Care International, WVI and many other.

Most farmers opted for open pollinated sunflower varieties whose seed could easily be recycled by small-scale farmers without losing significantly in both grain and oil yields for some time. Record seed variety was preferred by most farmers because of its high oil yield (an average of 15 bottles x 750ml for a 50kg bag) and softness of the seed when crushing. Non-availability of sunflower seed locally (49.2%) and high prices of sunflower seed (8.5%) are the major problems farmers are facing when acquiring seed.

Farmers have diversified target oilseeds covering, new crops like sesame and pumpkin/squash seeds. Farmers however, face problem when extracting the new oilseeds due to poor adaptability of the present model of Yenga oil press to these...
crop seeds newly included on the crushing list

Majority of the Yenga press owners (38.9%) crush on average one bag of sunflower per day. About 15% of the farmers crush at least two bags of sunflower daily while 5.5% and 1.5% of the farmers crush three and four bags of sunflower per day respectively. The average yield of cake per bag was estimated at 37 kilograms. Average production period is 6 months.

Most of the oil extracted (87.0%) is sold on both local markets and in nearest towns. About 9% of the oil extracted is retained for home consumption. Despite the high market potential for other extracted oil products like home made soap and jelly, farmers expressed ignorance on how to make such products.

Price determination is based on prevailing market price (30.0%), production costs (4.6%). Average price of a 750ml bottle of Yenga extracted cooking oil is ZMK2, 958 on average translating into ZMK44, 370 per 50kg bag of sunflower. Most of the sunflower cake realized is used for livestock feeding. However, only 21.5% of the farmers in oil extraction business were trained on livestock feed formulation by the Small-scale Oilseed Processing Project.

Major costs attributable to the Yenga oil press processing technology are classified as Technology Promotion costs, Entrepreneurship training costs, Yenga Press and Seed Distribution and Adoption costs.

The promotion of the Yenga oil press has contributed to enhanced demand for improved cultivars of sunflower seed, effective demand for Yenga presses and enhanced national and regional stakeholder collaboration. The technology has also assisted in narrowing the cooking oil deficit gap in the country.

At household (micro) level the technology has impacted positively on the lives of the beneficiaries at two levels; (1) the Yenga press owners through income and improved nutrition and; (2) the consumers through improvement in nutritional status and affordable sources of cooking oil.

Cost benefit analysis reveals that the Yenga press business is still a profitable undertaking. At the current level of operation it is possible for an entrepreneur to net K1, 314 400 (US$355) in 6 months.

A cost benefit ratio of 0.5 is thus possible given the current level of output and the prevailing prices. For every Kwacha invested in the business there is a corresponding return of half a Kwacha. The ratio can be much more if the entrepreneurs increase their level of output. The assumption in the analysis is that the majority are operating for only 20 days.

The return to labor is 0.64 indicating that for every Kwacha invested in the business there is a corresponding return of a K0.64. This is still attractive considering the fact that the opportunity cost of labour at the time when the Yenga press is fully utilized is off-season and that no competing enterprises were identified at the time of this study.

Efficiency could be attained to the fullest if farmers and Yenga press owners can increase their production of sunflower and by increasing the economies of scale and a vigorous search of an outside market away from the local areas.

Despite efforts made by the project in establishing institutional linkages for an enhanced Yenga oil press technology promotion and transfer, the existing linkages between the technology generation and transfer are not sufficient and effective enough to sustainably promote and transfer the oilseed processing technology among smallholder farmers.
The project placed special emphasis on encouraging women farmers and women clubs participation, as most vulnerable households to food and nutrition security problems in rural areas.

No serious cultural beliefs affected the promotion of the technology apart from isolated incidences of poor quality oil produced by some of the farmers (black, with a bad odor), which partially affected customer confidence and preferences.

Yenga Oil Press Technology has minimal negative effect/impacts on the environment with respect to deforestation and soil degradation.

The major problems threatening sustainability of the Oilseed Processing Technology include; (1) lack of human and institutional capacity by collaborating stakeholders to continue the technology promotion beyond project period; (2) lack of adequate sunflower seed for crushing due to poor yields; (3) poor Yenga spare parts back up; (4) lack of start up capital requirements for establishing oilseed processing enterprise and; (5) lack of leadership qualities and poor accountability among farmer clubs.

### Conclusions

- Promotion of the Yenga oil press has contributed to enhanced income and improved nutrition to the Yenga press owners and affordable sources of cooking oil for the local consumers at household level. There was also increased demand for improved cultivars of sunflower seed, Yenga presses and enhanced national and regional stakeholder collaboration. The technology assisted in narrowing the cooking oil deficit gap in the country.

- Cost benefit analysis reveals that the Yenga press business is still a profitable undertaking with a possibility of an entrepreneur netting K1, 314 400 (US$355) in 6 months. A cost benefit ratio of 0.5 is achievable at the current level of output and the prevailing prices. For every Kwacha invested in the business there is a corresponding return of half a Kwacha. The return to labor (0.64) indicates that for every Kwacha invested in the business there is a corresponding return of a K0.64.

- Efficiency could be attained to the fullest if farmers and Yenga press owners increased sunflower production and sunflower the economies of scale and a vigorous search of an outside market away from the local areas.

- Despite efforts made by the project in establishing institutional linkages for an enhanced Yenga oil press technology promotion and transfer, the existing linkages between the technology generation and transfer are not sufficient and effective enough to sustainably promote and transfer the oilseed processing technology among smallholder farmers.

- The project operation placed special emphasis on encouraging women participation and had no serious cultural beliefs, which affected the promotion of the technology. There was minimal if all any significant negative impacts on the environment with respect to deforestation and soil degradation.

- Sustainability of the project is threatened by lack of human and institutional capacity for technology development, lack of adequate sunflower seed for crushing, poor spare parts back up, lack of start up capital required Yenga Oilseed Processing, lack leadership skills and poor accountability among farmer clubs members.

- There is need to come up with technology dissemination strategies necessary for sustainable Yenga oilpress replication at both national and regional level for enhanced economic well-being and nutrition security of resource poor smallholder farmers. There is need to strengthen human and institutional
capacity in promoting technologies like Yenga Oilpress processing if Zambian small-scale agriculture is to rise above subsistence levels and assume a business orientation.

**Recommendations**

For enhanced/sustainable up take and utilization of Yenga oil processing technology among smallholder farmers in peri-urban and rural areas at both national and regional levels, there is need to create conducive conditions for establishing the Oilseed Processing Business. Based on the adoption survey results and the stakeholder consultative/feedback workshop the following are the recommendations made for improved and sustainable Oilseed Processing Technologies in Zambia and to some extent the sub-Saharan region.

- **Seed Supply**

In order to minimize the problems of non availability of sunflower and other oil crop seeds among smallholder farmers, there is need to; (1) establish seed banks in rural areas among smallholder farmers through on-farm oilseed multiplication and farmer training in oilseed production; (2) promotion of open pollinated oilseed varieties among smallholder farmers and; (3) strong collaboration and operationalization of links between the oilseed processing promoters and the Oilseed Research Team of the Soils and Crops Research Branch of MAFF for the development of improved/high yielding, diseases and pests resistant varieties. There should also be deliberate efforts to encourage local oilseed dealership among smallholder farmers. A lot can be learnt from the Oilseed on-farm multiplication scheme in Siavonga where oilseed multiplication is currently doing fine. A comprehensive Seed Needs Assessment for oilseeds in all target areas should be conducted.

- **Yenga Oil Press Acquisition and Accessories Back-up Services**

For easy and affordable Yenga press acquisition and smooth accessory back-up services, manufacturers and promoters must establish local outlets (through sales agents) in high potential areas at district levels. Farmers can easily purchase their Yenga presses and accessories in nearest towns.

Standardization of Yenga presses and accessories and promotion of local artisans for service back-ups will assist easy the problems on unaffordable and non-available spare parts for Yenga press owners. Acquisition of Yenga presses could be made more affordable to farmers through establishment of Hire purchase schemes for able eligible smallholder farmers. Manufactures and promoters must also encourage production of training manuals on maintenance and repairs for each and every oil press model. Feedback mechanisms on oil press performance between manufacturers and users should be maintained to assist in fine-tuning the oil press efficiency.

- **Oil and Seed Cake Marketing**

In view of the dwindling cooking oil market prices as a result of cheaper cooking oil from other countries, there is need Yenga press owner and promoters to embark on Yenga extracted oil /product development and promotion among local consumers. There is immediate need to train farmer in the oilseed processing business, improved aspects of labeling, packaging and product storage. This should be supplemented by education/information tips on nutritional factors of Yenga pressed cooking oil comparatively to industrial produced cooking oils. There is need for improved processing for improved oil quality. The Integrated Support to Sustainable Development Programme and Food Security Programme (IP) could assist on these aspects.

Knowledge of market and consumer trends is very vital for the oil producers if they are to keep themselves in business. As such there is need for national and regional edible oil market surveys. This will assist in knowing the area specific consumer
demands and preferences. Market research must be a pre-requisite for establishing oilseed-processing business at both the farmer level and promoter level. There is also need to diversify in the oilseed product range to include; (1) essential oil extraction and; (2) peanut butter production. Rural farmers must consider exploring and exploiting outside markets for their Yenga pressed oil.

• National and Regional Oilseed Processing Technology Replication

For sustainable national and regional replication of the oilseed processing technology, there is need to document and disseminate the field survey findings highlighting the lessons learnt. This will assist in fine-tuning the technology promotion and application strategies and make them more adaptive among the manufacturers, promoters and end users.

There is need to conduct regular market surveys for oilseed products and seed needs assessments to help determine the economical oilseed production and expected processing levels.

There is still need for capacity building through training on promising technologies and extension methodologies for grass root and broad based institutions involved in promotion of on-farm processing technologies as a way of adding value to smallholder farmers produce.

Following the Oilseed Processing Technologies Adoption survey, there is need to disseminate the survey results and publish conditions and recommendations necessary for establishing Oilseed Processing Business among Rural and Peri-urban Entrepreneurs.
1.0 Introduction

Zambia like many other developing countries in the region is faced with agricultural development challenges, which influence strategies to sustainable technology development. One such challenge of paramount importance is the development of technologies, which could assist, alleviate poverty for the majority rural poor households. These technologies should not only be economically viable but also socially acceptable and sustainable enough to improve the livelihoods of the rural populace through increased agricultural production and incomes.

Agro-processing offers an option but just one among several other strategies spelt out in the national agricultural policy through which employment and income could be increased to assist uplift the living standards of the rural poor. It is this that agri-business activities are currently pursued and exploited to help add value to agricultural produce. Over the years however, the agribusiness sub sector has not probably performed much to the expectations of the users and other stakeholders partially because the approaches and strategies used to design and support agribusiness activities have not addressed key issues of sustainability.

In Zambia, quite a good number of agro-processing technologies in the country have been identified and tested but have not stood the test of time because they lack basis for sustainability. The oilseed processing technology is a good reference case study from which lessons could be drawn to guide future implementation of similar technologies.

Consistent with the development objective of Integrated Support to Sustainable Development and Food Security Programme of the Food and Agriculture Organisation (IP-FAO), which seeks to develop and implement an integrated strategy for support to sustainable development and food security that takes into account the main social, economic, environmental and technical aspects of sustainable development, the study worked to highlight reasons why a given promising technology could sometimes fail.

In Zambia, the Oilseed agro-processing technology that initially showed great promise and potential in the recent past was slowly withering away. This study reiterates the fact that short lived oilseed processing technology is highly attributable to the fact that it was not adequately designed to integrate some key social, economic, environmental and technical aspects as was the case in the findings documented in this report.

It is also important to note that research into technology development; assessment and transfer as has been the case for this study could undoubtedly help influence the use and allocation of resources much to the advantage of the country. A lot of investments have in many instances translated to a waste of resources because no guidance and evaluation to support continued investments have been carried out. This study has fully explored and assessed the issues pertaining to the use and allocation of resources in the oilseed processing technology and in a way offers a common ground from which the technology users and other stakeholders can make informed decisions.

Through a representative forum comprising both users and stakeholders, this study has fully tackled many issues of acceptance on the way forward and has therefore provided ground that would help chart a course of action for future investments into the oilseed processing technology both at national and regional level.

Key issues pertaining to the management of resources at both household and farm level were among the issues which attracted interest and participation of the smallholder farmers and technology users through a stakeholders workshop prior to the recommendations documented in this report.

1.1 Contextual Analysis

In the recent past Zambian people have suffered a drastic decline in their living standards. Over 70% of the rural population are living below the poverty line with 68% classified as core poor. The comprehensive program of economic reforms pursued since 1991 has virtually eliminated price and
market controls and transformed Zambia into one of the most urbanized and liberalized economy in Africa. But this has not been without cost, with deterioration in nearly every social indicator. The impacts on the ground of such structural adjustment measures/policies are visually manifested into the current poverty levels among Zambia’s peoples.

It is interesting to note that Zambia now appears to be emerging from the most difficult stages of its economic transformation and is projected to achieve annual GDP growth of 4-5% over the coming ten (10) year period with agriculture as the engine of the future growth. The national accounts data on the other hand indicates a mildly favorable economic activity in the year 2000 as the real GDP increased by 3.4% as compared to 2% recorded in 1999 and the agricultural sector contribution to national GDP rose by 1.8% in the year 2000.

Currently the agricultural sector accounts for approximately 23.8% of GDP with about 50% of the population depending directly on agriculture for its livelihood. Agriculture absorbs most of the labour force and remains the main source of income and employment for rural women who constitute 65% of the total rural population. Production is dominated by smallholder farmers who constitute 75% of slightly over 600,000 farming households.

Significant increase in the productivity and sustainability of the smallholder farming systems in Zambia and opportunities for a better nutrition is still being perceived as the central strategy to achieve the overall goals of agricultural development and to ensure that its benefits are spread as widely as possible. One of such strategy was the introduction of the Agricultural Sector Investment Program (ASIP) in 1996, which provided the general framework for on going IFAD-support projects and had intended to create a stable and effective system for agricultural services for food crop and subsistence production.

However, policy changes in the sector in the 1990s, which saw Government withdraw from input supply, subsidized credit and crop marketing provoked a crisis for Small scale farmers, which today stands in contrast to Zambia’s higher potential for expanding and diversifying her agricultural production.

Market liberalization and opening up of market opportunities and more recently the introduction of Free Trade Area (FTA) through the policies of regional integration under the Common Market for Eastern and Southern Africa (COMESA), has led to the growth of agribusiness out grower schemes, which represent a functioning mechanism for linking smallholder into commercial agriculture, though introducing a risk of exploitation through disadvantaged terms.

By and large, it could be summarized that the performance of the agricultural sector is still below the country’s potential. This is due to the fact that the majority of the smallholder farmers are still suffering from amplified effects of high costs of production and/or lack of appropriate market arrangements. This is true because marketing of produce still remains a problem. Currently there have been no large and reliable traders that have emerged, thus giving little choice to the farmers and therefore not allowing much competition among the traders.

As a result the farmers have suffered under the dictates of the few traders who venture into the agro-marketing sector and more often these merchants have continued offering exploitatively low prices. Lack of proper infrastructure as it pertains to on-farm and off-farm infrastructure and inappropriate development policies continues undermining the profitability of small-scale agriculture.

Poor institutional support (creating a supportive environment for farming activities and rural life by promotion of and provision of access to finance services, farmer organizations, markets, research and extension), low farm productivity and production which is a result of low labour productivity, lack of appropriate farm management, low levels of agricultural inputs and investment and soil fertility problems are other constraint affecting smallholder intensification and diversification.

In addition to low value added, there is an almost complete lack of technology application in the form of processing of crop products (vegetables in particular), meat and dairy products, which would increase the farm income as the products could be sold at comparatively higher prices during peak market periods other than at harvest.
On-Farm processing such as the use of the Yenga Oil Pressing Machine in the extraction of cooking oil and cake from sunflower is one form of adding value to raw produce, which subsequently increases household income levels and alleviates food and nutrition insecurity. However, intensification and diversification by optimizing crop yields and adding value by way of on-farm processing means little to smallholder farmers if their produce can not be marketed and converted into cash.

It is therefore important for rural development agents trying to foster intensification and diversification, and on-farm processing to integrate into their promotion programmes, entities to regulate the markets and fight for market prices, which can create incentives that will encourage local farmers to increase production.

For the Village level Oilseed Processing, the biggest challenge in view of the regional integration and free trade protocols to smallholder farmers in this business, is the flooding of heavily subsidized edible oil product imports from neighboring countries on the local market to an extent that local production is choked.

1.2 Background and Rationale

The introduction of new and inexpensive Yenga Press by the Africare Oilseed Processing Project (AOPP) in the early 1990s had shown high initial promise in field trials for both productivity and endurance. The technology aimed at improving the nutrition and income levels for the ever-increasing numbers of rural Zambians, especially women through the establishment of a market driven rural on-farm oilseed processing industry stressing value adding to agricultural produce among rural entrepreneurs.

The Yenga oil press has been developed and further re-modified by local companies for the last eleven years and has been promoted in Mazabuka, Kalomo, Choma, and Monze districts of Southern Province. This technology has also been promoted in the Central, Eastern and Lusaka provinces of Zambia. The promotion has been done through strategic alliances between the Ministry of Agriculture Food and Fisheries (Research and Extension), Africare, TDAU (University of Zambia) and other well-placed stakeholders.

Considering the overwhelming role of women in farm and household tasks, gender considerations were given to the development and promotion of these oilseed-processing technologies. This approach is in line with the current policy of the Ministry of Agriculture, Food and Fisheries of mainstreaming gender in all activities. The Yenga press technology’s likelihood to impact directly in the areas of women concerns was expected to be very high.

Despite tremendous efforts made to popularize and disseminate the Yenga oil press technology, the current status show some withering adoption of what was an initially very popular technology. As a result the stakeholders concerned have accrued suspicions on the effectiveness of the technology transfer linkages in promoting the Yenga oil press technology among smallholder farmers.

Farmers still find it difficult to exploit fully benefits of technologies like Yenga oilseed processing as a way of boosting their production value and adapting their farming systems to changing social needs of local and external markets. The challenge for Researchers and Development Agents remain that of making smallholder and resource poor farmers to match their farming systems and production with market demands at a sustainable rate. This will make smallholder farmers have better income opportunities and, thus, a higher social status in rural communities.

It is this that stakeholders in Oilseed processing development and promotion need to assess the appropriateness and impact of the technology and its transfer strategies among smallholder- farmers to enhance technology adoption and its sustainability.

Based on this premise, the Adoption Survey of the Oilseed Processing Technology on Household Food and Nutrition Security was conducted in the Southern Province of Zambia. This was meant to assist all stakeholders come up with recommendations and technology dissemination strategies necessary for possible Yenga oil press adoption and utilization at both national and regional levels.
It is now clear that reforming agricultural extension systems in support of technologies like the Yenga Oil Press which boosts crop yields, and enables farmers add value to their crops like sunflower, is the only way to make Zambian and regional agriculture rise above subsistence to an economically viable and socially acceptable smallholder enterprise.

1.3 Objectives

1.3.1 Overall Study Objective

The main objective of the proposed activity is to; (1) assess the effectiveness and efficiency of the existing technology transfer linkages/extension systems; (2) technology appropriateness and; (3) sustainability of engendered oilseed processing technologies among the resource poor farmers in Zambia.

1.3.2 Specific objectives

The specific objectives of the proposed activity are:

- To carry out a comprehensive stakeholders appraisal in order to assess the effectiveness and efficiency of the Yenga oil press technology transfer linkages;
- To assess the appropriateness of the Yenga oilseed processing technology on the needs of the resource poor women, men and youth farmers;
- To develop appropriate extension strategies for all the stakeholders on the Yenga oil press technology transfer based on the constraints and impacts identified and;
- To assist develop recommendations on conditions necessary for possible Yenga oil press technology replication at both national and regional level.

1.3.3 Methodological Design and Analysis

1.3.3.1 Methodology Used

The Adoption Survey Team conducted the following during fieldwork; (1) desktop study to review available and accessible project documents and evaluation reports; (2) structured study among smallholder farmers in the project areas and; (3) stakeholder appraisal though group discussions with personnel involved in oilseed processing project in Government (MAFF), NGOs and private sector in the manufacturing of the Yenga Oil Press and spares, and marketing of oil seeds.

1.3.3.1.1 Desktop Study

Documentation materials, which were reviewed for the purposes of the study included, Government Policy documents, oilseed project documents and progress and evaluation reports, COMESA quarterly export bulletins and the statistical data sets in the CSO Census of housing and population preliminary report.

1.3.3.1.2 Stakeholder Appraisal

The stakeholders’ appraisal exercise involved inventory of different stakeholder categories in the oilseed processing technology. The exercise assessed the type and extent of Africare’s collaborating stakeholders’ contribution during the Oilseed Processing project. Collaborating stakeholders’ expected roles and anticipated constraints in sustained technology promotion and transfer among smallholder farmers beyond the Oilseed Processing Project period were evaluated.

A stakeholder synthesis/feed back meeting on key factors critical for sustainability and possible Yenga Oil Press technology national and/or regional replication/scaling up was also conducted where recommendations and dissemination strategies conducive for sustained and scaled up Oilseed Processing technologies among smallholder farmers were developed.
1.3.3.1.3 Participatory Rural Appraisal (PRA)

Participatory Rural Appraisal methodologies were used in obtaining various beneficiary views and feelings on the Yenga Oil Press technology business appropriateness and sustainability. This was done largely through focus group discussions and also using the semi-structured questionnaire so as to provide qualitative and quantitative data respectively.

1.3.3.1.4 Individual Interactive Discussions

Individuals interviewed during the study included key informants; staff from Africare, MAFF and traditional leaders. Discussions with the private sector, in particular the Seed companies and Yenga Oil press manufacturing companies, focused on their perceived role in addressing the needs of the small-scale farmers in the sustained oilseed processing technology promotion, transfer and dissemination and subsequent adoption.

1.3.3.1.5 Data Analysis

Data collected through the structured study was subjected to computer analysis using a Statistical Package for Social Sciences (SPSS 10.1) and Micro Soft Excel for the quantitative data sets. Qualitatively analysis was also done on other data sets collected through PRAs (focus group discussions and key informant interviews).

1.3.4 Study Coverage

The study was carried out in the three districts of the Southern Province of Zambia over a period of ten working days. The districts covered included; Mazabuka, Kalomo and Monze districts.

1.3.5 Team Composition

The Impact study Team was comprised of five consultants; (1) a Team leader with vast experience in Project Impact Assessment and planning including Stakeholder Appraisal methods supported by; (2) four national consultants. Six field staff assisted the team during the administration of semi-structured questionnaires among smallholder farmers in the four districts of Southern Province and the stakeholders synthesis meeting.

2. Key Concepts

Effectiveness Analysis: This compares the actual achievements with the original targets of the project/program

Efficiency Analysis: This assesses the people level impact by comparing the benefits that society gets from the technology and the cost incurred in conducting the technology transfer program. The benefits are collapsed into rate of return

Adoption: Adoption can be defined in several ways. It can be the proportion of farmers using the technology (at some defined level). In other cases it can be the actual proportion of the field or crop area under the new technology e.g. variety

Impact: This is an evaluation of the extent to which the program or particular intervention causes changes in the desired direction. To have an impact, a program must have some movements towards the desired objectives.

Technology: Any policy or behavioral change (interaction) that increases the efficiency (reduce cost) in any activity of the system through which commodities are produced and flow to final consumers.

Institutional Impact: Effect of the technology on the capacity of research, extension and other complimentary programs to generate and disseminate the new technology
Facilitation: Process by which the development worker or change agent turns felt but unarticulated needs within the community into an identifiable topic for shared investigation and discussion.

Community: Specific system of action, which arises when a human population, settled in a given territory, establishes structural arrangements for adaptive-ness to it in order to live and survive as a group.

3. Overview of the Oil Processing Project

3.1 Historical Evolution of the Project

Studies conducted by Zambia Agribusiness Management Support Project (ZAMS), a USAID funded project, Deloitte & Touche and the United Nations Industrial Development Organization (UNIDO) in the late 1980’s noted that Zambia’s annual production of edible oil consistently fell far short of meeting the domestic demand. This was partly due to the suspension of crude oil vegetable imports from the United States under the PL 480 program. It was therefore thought that the shortfall might grow even larger unless Zambian oil seed production and processing was dramatically improved.

With the continued increase in prices of imported edible oil which was beyond the reach of most rural households, there was need to support the Zambian oilseed production and processing industry at village level. The large-scale commercial producers, such as Premium Oils (the former Refined Oil Products (ROP)) faced many impediments in their response to market demands. This included frequent changes in the management, insufficient oilseed for processing, poor back-up services for provision of spare parts, poor distribution networks and later on, the government’s move to privatize the parastatal companies pursuant to the Structural Adjustment Policies (SAP) since 1991.

In view of this the Ministry of Agriculture, Food and Fisheries (MAFF) in collaboration Africare and TDAU, promoted the locally made Oil Pressers aimed at promoting village level oil processing through the Oil Processing Project largely spearheaded by Africare, thereby creating an alternative for farmers to selling unprocessed oil seed (e.g. sunflower) to companies at lower prices.

Further more the study indicated that there was potential for more earning power if farmers processed their oilseed themselves to add value to the produce in form of cooking oil and it was strongly felt that this could alleviate the plight of poor rural farmers and also contributes to their enhanced basic needs through increased incomes.

With the availability of high oil content oilseed crop varieties such as Record and Milika sunflower varieties, whose oil yield averages about 15litres/50kg bag of sunflower, it was estimated that a farmer would net approximately ZMK60, 000 per 50kg bag at the current market price of K3, 000/liter of cooking oil and about 38kg of sunflower cake at K365/kg from the same 50kg bag.

3.2 Project Goal(s)

The overall goal of the project was to meet the edible oil and sunflower cake shortfall and also promote on-farm rural entrepreneurship in oil processing among smallholder farmers of Zambia.

3.3 Project Objectives

3.3.1 General objectives

To carry out training in oilseed processing and technology dissemination among smallholder client entrepreneurs, and promote on-farm seed multiplication and other programs on all aspects of edible oil processing and management.

3.3.2 Specific objectifies
• To train client smallholder farmers on how to use oil pressing equipment safely, efficiently and productively
• To provide sufficient training for NGOs, churches and other promoter partners to enable them coordinate and participate in demonstrations, organization and monitoring
• To undertake seed dissemination, multiplication and promotion through information packages
• To manufacture, repair and provide spare parts for the Yenga oil press
• To carry out monitoring and evaluation exercises on the activities of the project.

3.3.3 Project Funding

3.3.3 Expected Outputs

3.3.3.1 Promotion and Distribution

This meant; (1) broad awareness of the Oil processing technology created among smallholder farmers, NGOs, church groups, MAFF personnel and individuals who already; (2) putting up investment in specific areas and; (3) private distributors recruited and distribution channels established with manufacturers.

3.3.3.2 Manufacturing

Different manufacturers recruited with capacity to make Yenga Oil press to acceptable standards and competition and innovation encouraged and stimulated

3.3.3.3 Training

Client entrepreneurs trained in the following aspects; (1) agronomic information relating to raising oil seeds; (2) processing of seed; (3) pre-treating of the seed; (4) efficient and productive use of the oil pressing machines; (5) handling and processing the oil and cake; (6) appropriate use of the cake; (7) Yenga oilpress maintenance; (8) Yenga oilpress dis-assembly and assembly; (9) basic oil ram press repair and problem diagnosis and; (10) elements of good press design and manufacturing.

In addition, clients would have been trained in; (11) record keeping, the pros and cons of financial structure for service and commercial pressing; (12) pricing of oil and cake and marketing, including; (13) the development of simple handbooks and other written materials to support the training efforts.

3.3.3.4 Seed

Oil seeds such as Records and Milika supplied and seed multiplication methods put in place among smallholder farmers.

3.3.3.5 Monitoring and Evaluation

A monitoring system developed with assistance from ZAMS and being coordinated in the field by Field Managers and partners able to collect significant raw data and available market information.
4. Study Findings and Discussions

4.1 Description of the Study Area

The study was carried out in the three districts of the Southern Province of Zambia over a period of ten working days. The districts covered during the study include; Mazabuka, Kalomo and Monze districts with a sample size of 131 farm households.

4.2 Study Area Geographical information

The Southern Province covers an area of 85, 283 sq. km representing about 11.8% of the country’s total land. The province has eleven administrative districts namely Choma, Gwembe, Kalomo, Livingtsone, Mazabuka, Monze, Namwala, Itezhi-tezhi, Kazungula, Siavonga and Sinazongwe. The province lies in the low rainfall zone of Zambia with a rain season which ranges from about November to March. The province has mean maximum temperatures of about 35°C.

The soils found in most parts of the province are plateau soils (sandy loam). The province has four main types of topography, which are, valley, plateau escarpment and the Kafue flats. The Kalahari sands are found in the western part of the province.

4.3 Demographic Information

The population of Southern Province has a total population of 1 302 660 of which 639 356 (49.1%) and 663 304 (50.9%) are males and females respectively (CSO 2000). The population has increased from 907 150 in 1990 representing a 3.0% growth rate. However, there has been a reduction of 18.9 % in average annual intercensal population growth rate between 1980 and 1990 (3.7% growth rate) and 1990 and 2000 (3.0 % growth rate).

Among the districts of the province, Livingstone has the highest population growth rate of 6.6 percent, followed by Siavonga with 4.6 %, Mazabuka and Itezhi-tezhi with 4.0% and Kazungula with 3.9% while that of Gwembe has had a negative growth rate of 1.7% representing the lowest growth rate in the province.

4.4. Economic Activities

The main economic activity in the province is agriculture. Until recently, the province has been the main producer of Zambia’s staple food (maize). The agricultural industry in the province has been supported by the early development of a transport network (railway, highway and a web of feeder roads) and emergence of a strong albeit small commercial farming community.

The province hosts the tourist capital of Zambia, with Africa’s greatest single attraction, the Victoria Falls, locally called Mosi-ao-Tunya in Livingstone. There are few developments that have been extended the appeal of the falls and these are the introduction of the wild water rafting along the gorges just below the falls up to the man made lake Kariba and the building of the new multimillion dollar luxurious hotel. The province has a coalmine, which is Zambia’s only producer of coal, at Maamba Coal mine in Gwembe and a sugarcane factory and sugar estate at Nakambala in Mazabuka district.

4.5 Agricultural Production trends

The Post Harvest data indicates that there has been a general upward trend in the value of production in the province and this is largely attributed to increase in maize and cotton production (FSRP 2000).

Maize production has been on the increase apart from the last two years. Between 1993 and 1996 maize area and production went up by 35% and 14% (almost 3, 000 MT) respectively (amidst variations). Maize production has been declining slightly in 1997 and 1998.

Cotton area and production has increased by 180% (11 515 ha) and 400% (to 9,319 MT) respectively. Groundnut area and production has gone up by 120% (to 215 528 ha) and 60% (to 625 MT)
respectively. There is no discernible trend in sweet potato production, which has been fluctuating from year to year. Area and production of millet and sorghum have been on the decline.

4.6 District Profiles of the Study Area

4.6.1 Kalomo District

4.6.1.1 Geographical Information

Kalomo district was the first capital of by then Northern Rhodesia and has one sub district known as Zimba. The district has physical coverage of 9292Km² with an altitude of 900 –1200 m.a.s.l. The main physical features of the district are the plateau, Zambezi valley and the sand plains.

4.6.1.2 Drainage System

The Zambezi river basin is the only drainage system of the district and only one major river. The slope is generally flat to undulating with deforestation being medium but the district experiences a high soil erosion rate.

The major soil groups of the district are Acrisols, Greysols, Arenosols and Vertisols characterized by low water holding capacity, shallow rooting depth and erosion hazards being the major soil physical limitations. Furthermore the soil chemical limitations in the districts are (1) low nutrient reserve; (2) low nutrient retention capacity; (3) low calcium and magnesium and; (4) Micro-nutrient deficiencies.

4.6.1.3 Agro-climatic Information

The district lies in region IIa with an average annual rainfall of 600-900 mm. The district has a growing season of ninety-five (95) days with drought frequency and frost occurrence rated as 9 high and 4 high respectively. The relative humidity is at 55 percent with mean minimum and maximum temperatures being 14°C and 29°C respectively and the sunshine hours estimated at 8.4 per day.

4.6.1.4 Demographic Information

Kalomo district has a total population of 167 446 (CSO, 2000) made up of 37 368 households out of which 48.15% and 51.85% are males and females respectively. The major ethic groupings in the district are the Toka, Subiya and Leya and the most common language is Toka-leya and the overall population growth rate is estimated at 2.7% while that of men and women is 2.6% and 2.8% respectively.

4.6.1.5 Agricultural Activities

In 1990, the number of farm holders was estimated at 3754 (CSO1990) out which 77% and 22% representing small scale and medium farm holders respectively while only 1% of farm holders was for large scale.

4.6.1.6 Cropping and Livestock Systems

The major farming systems under cropping in the district are semi-commercial maize, sunflower, groundnuts, cotton, traditional maize, sorghum, pearl millet, cassava and cowpeas. In addition the level of commercialization under the cropping system is very high.

It is estimated that up to 70% of the farm household keep cattle. The 1990 CSO data, estimated the cattle population to be over 300 000 and 36 690 for sheep while that of pigs was 14 700. The common disease of cattle in the district is Foot and Mouth and Corridor diseases.

4.6.1.7 Agricultural Extension services

The district is endowed with a wide network of agricultural extension service providers, which is largely dominated by MAFF extension staff and a number of NGOs.
4.6.2 Monze District

4.6.2.1 Geographical Information

Monze district has a physical coverage of 4 860 km² with Chisekesi and Chivuna as its sub-districts.

4.6.2.2 Physical Characteristics

The district has altitude of 900 –1200 m.a.s.l and the plateau and Kafue flats are the major physical features. The main drainage system for the district is the Kafue river basin and is endowed with two rivers namely Kafue in the southwest and Magoye in the northeast.

Deforestation and soil erosion in the district are rated as high and the main soil groups are Luvisols, Vertisols and Acrisols. The soil physical limitations are (1) low water holding capacity; (2) shallow rooting depth; (3) rapid physical deterioration; (4) Erosion hazards and; (5) poor workability where as the soil chemical limitations include low nutrient reserve, low nutrient retention capacity, high acidity in some pockets, low calcium and magnesium, micro-nutrients deficiencies, low organic matter and low phosphorus.

4.6.2.3 Agro-climatic Information

The district lies in region IIa with an average annual rainfall of 800 mm. The district has a growing season of 90 days, with drought frequency and frost occurrence rated as 9 high and 2 high respectively. The relative humidity is at 63 percent with mean minimum and maximum temperatures being 12°C and 25°C respectively and the sunshine hours estimated at 8 per day.

4.6.2.4 Demographic Information

Monze district has a total population of 165 741 (CSO, 2000) made up of 26 194 households out of which 49.14% and 50.86% are males and females respectively. The major ethic grouping in the district are the Tonga, and the most common language is Tonga and the overall population growth rate is estimated at 2.2% while that of men and women is 2.3% and 2.1% respectively.

4.6.3 Mazabuka

4.6.3.1 Geographical Information

Mazabuka district has a physical coverage of 6,822 sq. km with Magoye, Chikankata and Nega- nega as its sub-districts.

4.6.3.2 Physical Characteristics

The district has altitude of 900 –1200 m.a.s.l with a plateau and Kafue polder as its major physical features and a general slope ranging from generally flat to undulating landscape. The main drainage system for the district is the Kafue river basin and is endowed with two rivers namely Kafue and Magoye.

The main soil groups in the district include, Acrisols, Luvisols and Vertisols. The soil physical limitations are (1) low water holding capacity; (2) shallow rooting depth; (3) rapid physical deterioration; (4) Erosion hazards and; (5) poor workability where as the soil chemical limitations include low nutrient reserve, low nutrient retention capacity, high acidity in some pockets, low calcium and magnesium, micro-nutrients deficiencies, low organic matter and low phosphorus. Currently, deforestation and soil erosion in the district are rated comparatively and major causes include agricultural activities and fire wood collection,charcoal burning.

4.6.3.3 Agro-climatic Information

The district lies in region IIa with an average annual rainfall of 800 mm. The district has a growing season of 90 days, with drought frequency and frost occurrence rating 9 high and 2 high respectively.
The relative humidity is at 63 percent with mean minimum and maximum temperatures being 12°C and 27°C respectively and the sunshine hours estimated at 8 per day.

4.6.3.4 Demographic Information

Mazabuka district has a total population of 240,116 (CSO, 2000) made up of 44,033 households out of which 49.73% and 50.27% are males and females respectively. The major ethnic grouping in the district are the Tonga people, and the most common language is Tonga and the overall population growth rate is estimated at 4.0% while that of men and women is 3.9% and 4.1% respectively.

4.6.3.5 Agricultural Activities

The number of farm holders was estimated at 7,120 (Food Security Project, 1998) out of which 80% and 19% representing small scale and medium farm holders respectively while only 1% of farm holders was for large scale. Male farmers head 89% of farm holdings and female farmers head a 19% of farm holdings with a mean small-scale farm holding of 2.2 hectares.

4.6.1.6 Cropping and Livestock Systems

The major farming systems under cropping in the district are commercial maize and wheat, semi-commercial maize, groundnuts, sunflower and cotton, traditional maize, and sorghum. Level of commercialization under the cropping system is very high with a mean area cultivated for major crops of 48,000 ha. Commercial crops whose area continues increasing include sugar cane and coffee among the commercial farmers and sunflower and cotton among smallholder farmers.

Table 2

<table>
<thead>
<tr>
<th>Major Crop</th>
<th>Area under Cultivation as at 1998</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>30,144 hectares</td>
</tr>
<tr>
<td>Sugar cane</td>
<td>6,000 hectares</td>
</tr>
<tr>
<td>Wheat</td>
<td>5,399 hectares</td>
</tr>
<tr>
<td>Soya bean</td>
<td>3,697 hectares</td>
</tr>
<tr>
<td>Cotton</td>
<td>2,902 hectares</td>
</tr>
<tr>
<td>Groundnuts</td>
<td>2134 hectares</td>
</tr>
<tr>
<td>Sunflower</td>
<td>1966 hectares</td>
</tr>
</tbody>
</table>

Source: Integrated Crop Management/Food-Legume Project ZAM/92/003, 1998

It is estimated that up to 69% of the farm household keep cattle with an approximate total herd 398,519. The common diseases of cattle in the district are Foot and Mouth and Corridor diseases.
5. Stakeholder Inventory and Analysis

5.1 Oilseed Processing Coverage Areas

During the first year of operation, the Oilseed Processing Project was established in Southern, Eastern, Central and Lusaka provinces of Zambia. The provincial project coverage expanded during the second year to include Northern and Northwestern provinces.

Due to the rural areas’ lack of cost-effective marketing and transport systems, which make provision of services in rural areas not readily available, the Oilseed Processing Project’s efforts were concentrated on the development and dissemination of village level oil processing technologies to improve nutrition security and economic well-being of smallholder farming households in rural areas. The Small-scale village edible oil extraction in Zambia utilized modified ram presses herein referred to as Yenga oil press.

5.2 Target Areas

Sunflower growing belts and other areas with critical potential in oilseed village processing were selected as project areas in the project districts. Target area selection was done with the guidance of the Crop Diversification Project and the Red Cross and with close collaboration with Ministry of Agriculture Food and Fisheries.

Table 3: Small-scale Oilseed Processing Target Areas Visited During the Survey

<table>
<thead>
<tr>
<th>Name of agricultural camp</th>
<th>District name</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of agricultural camp</td>
<td>kalomo</td>
<td>monze</td>
</tr>
<tr>
<td>Chisuwo</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Chikuni</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Chicheleko</td>
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<td></td>
</tr>
<tr>
<td>Fufwa</td>
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<tr>
<td>Kayuni</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Mulando</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Nadezwe</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Simutwe</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Manungu</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Nteme</td>
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</tr>
<tr>
<td>Munjile</td>
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<td></td>
</tr>
<tr>
<td>Dumba</td>
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<td></td>
</tr>
<tr>
<td>Mulando</td>
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<tr>
<td>Kabobola</td>
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<tr>
<td>Chiyobola</td>
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<tr>
<td>Chilala</td>
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<tr>
<td>Choonga</td>
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<tr>
<td>Siambankuli</td>
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</tr>
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<td>Miyoba</td>
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<td>Chifusa</td>
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</tr>
<tr>
<td>Silwili</td>
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<td></td>
</tr>
<tr>
<td>Katete</td>
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<td></td>
</tr>
<tr>
<td>Total</td>
<td>48</td>
<td>40</td>
</tr>
</tbody>
</table>
5.3 Project Stakeholders

5.3.1 Target Beneficiaries

Small-scale farmers in rural areas formed the core of the Small-scale Oilseed Processing project target group. Special emphasis was placed in encouraging women farmers and women clubs as it was felt that women headed households were the most vulnerable to food and nutrition security problems.

5.2.2 Stakeholder Categories in Oilseeds Processing

Three stakeholder categories (Primary, Secondary and Tertiary) were considered under the Oilseed and their specific roles in Oilseed Processing project assessed. The primary and secondary stakeholders participated during the stakeholders appraisal exercise.

Primary stakeholders in the Oilseed Processing project included male and women small-scale farmers in rural areas. The project encouraged active women participation and this resulted into a good number of women clubs running Yenga Oil Press business.

Secondary stakeholders included Africare as the lead promoting organization and other grass root NGOs as collaborating partners. Among the active collaborating partners during the project period were MS-Zambia, Gossiner Mission, Macha Mission, Monze Dioceses, World Vision Stakeholder participation through out the stages of technology testing and dissemination was critical in assessing technology appropriateness, acceptability and sustainability beyond the project period.

The project promotion strategy targeted entrepreneurs through the development of close partnership with Yenga oil press manufacturers, agro-inputs and marketing institutions, Ministry of Agriculture food and Fisheries research and extension staff, and other like-minded organizations in smallholder agricultural development as secondary stakeholders.

The programme identified and utilized strong organizational linkages, which played a key role in the success of the programme. Institutional collaborative linkages were mainstreamed at all stages of oil processing cycle starting from the oil crops breeding aspects, Yenga oil press manufacturing, technology promotion and dissemination, and marketing.

Tertiary stakeholders included USAID and other collaborating donor agencies in the province. Below is a table showing the stakeholder categories and their respective mandates.

### Table 4: Stakeholders roles in Yenga oil press promotion

<table>
<thead>
<tr>
<th>Organization name and Stakeholder category</th>
<th>Organization objectives</th>
<th>Role in Yenga oil press promotion</th>
<th>Constraints faced in Yenga oil press promotion</th>
<th>Comments on way forward</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAFF-Extension (District) – Secondary stakeholder</td>
<td>Increased agricultural production, Coordinating agricultural activities at district level.</td>
<td>Delivering extension messages on sunflower production, Training of farmers in Yenga oil press operation and maintenance, Worked as a link between Africare the lead promoting NGO and farmers through farmer mobilization, field days and demonstrations.</td>
<td>Poor access to appropriate oilseeds for farmers in terms of oil content, disease resistance and yield has affected technology dissemination, - Non-availability of spare parts locally, -Low funding levels affected effective delivery of extension messages to distant places as well as farmer training, - Weak linkage between the lead NGO Africare and extension has affected continuity of the technology promotion after the oilseeds project phased out.</td>
<td>- Promote local artisans - All Yenga oilpress owners should be trained if the life span has to be longer - Encourage close collaboration among stakeholders - Promote oilseed production - Cost-sharing measures should be promoted among stakeholders</td>
</tr>
<tr>
<td>Programme Against Malnutrition - Food Security Pack project</td>
<td>Empower vulnerable resource-poor farmers by providing seed to improve food production and reduce hunger.</td>
<td>-Make available oilseeds for production. -Support farmers in seed production.</td>
<td>-Lack of seed to process. -Purification of the oil. -Lack of marketing skills by the farmers. -Cost of purchase of the machine is too high for the target group.</td>
<td>-Institution should look into how the farmers could access seed. (Distribution centres.) -Capacities for farmers should be enhanced to understand marketing and nutrition issues related to oil processing.</td>
</tr>
<tr>
<td>SASWAZ-VEFLO Enterprises.</td>
<td>- Build capacity of small workshop owners to manufacture, repair and supply Yenga oil presses to farmers, - Provide service backup support to small-scale farmers in form of spare</td>
<td>-Manufacturing of Yenga oil presses and repairs - Seed sales</td>
<td>- Most small-scale farmers lack capacity to purchase Yenga oil presses and spare parts directly from the manufacturers.</td>
<td>-Need to empower and build capacity of retailers. -Improve linkages between retailers, farmers and manufacturers.</td>
</tr>
<tr>
<td>Organization</td>
<td>Strategy</td>
<td>Constraints</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------</td>
<td>---------------------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIOCESES OF MONZE</td>
<td>Promotion of sustainable development through the following:</td>
<td>- Lack of spare parts&lt;br&gt; - Finances to purchase sunflower in bulk&lt;br&gt; - Market not readily available, selling on credit&lt;br&gt; - Lack of packaging materials&lt;br&gt; - Need for farmer training in packaging and quality production&lt;br&gt; - Encourage yenga oilpress owners to grow their own seeds.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kaluli Development Foundation</td>
<td>Promoting socio-economical development of the inhabitants of the Gwembe valley through community based developments projects</td>
<td>Oil processing fits within KDF sustainable agriculture project frame work and could easily be undertaken as part of project activities.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>World Vision Siachitema/Twachiyanda-ADP</td>
<td>Promote economical status of Siachitema/Twachiyanda ADP through the use of improved oil ram press</td>
<td>Need for sales promotion.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smallholder Agricultural Mechanisation Services (SAMS)</td>
<td>To manufacture low-cost manual operated Yenga oil presses for small scale farmers</td>
<td>SAMS’s ultimate goal is to build farmer capacity to ensure continuity of the technology. After having satisfied the small scale farmer, we fill to move forward, probably to meet the medium and large farmers according to demand.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Africare SAMeP</td>
<td>Promoting conservation tillage, Promoting post-harvest</td>
<td>Increased sensitisation on the benefits of yenga oilpresses and expansion of SASWAZ activities in.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology Adoption and Challenges</td>
<td>CLUSA</td>
<td>Zambia National Farmers Union</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-------</td>
<td>-----------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technologies such as shellers, Yenga oil presses</td>
<td>- Improvement of household food security among farmers and the nation, - Raising rural incomes through group formation which should be self-managed, financially viable, transparent and sustainable</td>
<td>Facilitate capacity building amongst small scale farmers through; - Leadership skills training - Business skills training - Conservation farming - and crop diversification to enhance income and nutrition security</td>
<td></td>
<td></td>
</tr>
<tr>
<td>such as leaflets</td>
<td>- Business skills training, depot and financial management, farmer sensitization on Yenga oilpress technology, - Training in sunflower production.</td>
<td>Support smallholder farmers in Yenga oilpress ownership</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural areas.</td>
<td>Inadequate technical information on Yenga oilpress management</td>
<td>The quality of Yenga oil presses has gone down affecting the marketing of genuine presses, Low sunflower production, Sunflower growers lack incentives and prices are too low</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Involvement of all stakeholders in technology promotion right from the beginning, - Collaboration among participating stakeholders in the promotion of yenga oilpresses</td>
<td>- Need for quality control in yenga oilpress business, - Need for close collaboration between the lead organisation and other stakeholders in technology promotion to ensure continuity of the technology after the lead promoting project has wound up, - Need for incentives such as economic prices to encourage sunflower production.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5.4 Extent of technology promotion

5.4.1 Technology Transfer and Promotion Strategies

To achieve a viable and sustainable Yenga oil press promotion programme, the Oilseeds Processing Project under Africare addressed the following key factors,

1. Promotion and distribution of the Yenga oil press through on-farm demonstrations and training to farmer groups, clubs and organized field days in villages. The demonstrations focused on the oil processing system particularly the technical aspects of the press, maintenance, elements of good design and manufacturing, seed processing and appropriateness of seed varieties, and an agronomic package for sunflower and other oilseeds production. The programme also looked at basic business aspects such as record keeping, pricing of oil and cake and marketing.

2. The programme also initiated collaborative promotions with other NGOs in the province, especially German Technical Aid to Zambia (GTZ), World Vision International, Monze Diocese, District Women’s Associations, church groups, business entrepreneurs, the Ministry of Agriculture Food and Fisheries and other Community Based Organizations (CBO). The promotion programme involved these organizations in areas were they already have established development structures on the ground.

3. The oilseed programme contracted private companies to manufacture Yenga oil presses and spare parts to meet certain needs based on field performance tests and farmer preferences. Among the contracted companies were; TAZARA Engineering, SARO Agri-equipment, CLW Engineering, Kudu Engineering and Kaleya Engineering. Other companies are also involved in manufacturing of the presses such as ZAMS and Jung and company.

4. The programme also promoted a seed multiplication programme of sunflower to facilitate farmer access to composite seed, especially record variety.

5.5 Technology Adoption

Promotion of village-level oilseed processing technologies plays a key role in the rural setting. It addresses among other key household nutritional factors, which; (1) increased diversification of relishes; (2) increased household incomes through oil sells and; (3) seed cake, as well as supplementing livestock feed.

The Yenga oil press promotion in Southern Province started in 1993 with Africare as the lead NGO. The table below shows a trend in terms of farmers who acquired the Yenga oil press in the period 1993 to 2001.

Table 5: Yenga oil press acquisition by farmers, 1993 - 2001 across the study districts

<table>
<thead>
<tr>
<th>District</th>
<th>Yenga oil press acquisition/year response (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kalomo</td>
<td>29.6</td>
</tr>
<tr>
<td>Monze</td>
<td>40.7</td>
</tr>
<tr>
<td>Mazabuka</td>
<td>29.6</td>
</tr>
</tbody>
</table>

There has been an increase in the number of farmers who have acquired the Yenga oil press between 1996 and 2001 in Mazabuka and Monze districts. This has been mainly due to intensive promotions by NGOs after the Africare oilseed processing project phased out in 1998. Among the major NGOs are the German Technical aid to Zambia and the SHAPES project under the Programme Against Malnutrition (PAM).
On the contrary, there has been a decline in the number of farmers acquiring the Yenga oil press in Kalomo district mainly due to lack of promoting agents in rural areas as the only Africare oilseed processing project that used to promote the Yenga oil press phased out in 1998.

This scenario signifies weak linkage between promoting agents, especially the permanent MAFF extension structure whose network is well established and must have continued promoting and complementing NGOs efforts even after the projects have phased out.

5.5.1 Mode of Yenga Oil press Acquisition

Most of the Yenga oil press owners bought them cash, while 14.5% bought on credit from the promoting agents. There is strong group cohesion especially for the women clubs, and this is portrayed in 23% of the respondents who acknowledged that the Yenga oil presses they are using belonged to women clubs.

Table 6: Mode of Yenga oil press acquisition

<table>
<thead>
<tr>
<th>Mode of acquisition</th>
<th>% Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bought (Cash)</td>
<td>38.9</td>
</tr>
<tr>
<td>Credit</td>
<td>14.5</td>
</tr>
<tr>
<td>Inherited</td>
<td>0.8</td>
</tr>
<tr>
<td>Club ownership</td>
<td>23</td>
</tr>
<tr>
<td>Borrows on Service charge</td>
<td>3.1</td>
</tr>
</tbody>
</table>

5.5.2 Yenga Oil Press Sales Agent

Most of the Yenga oil press sales to smallholder farmers in the province were done through the Small-scale Oilseed Processing Project under Africare. Of the total number (424) of Yenga oil presses sold in Southern province between 1992 – 1998 period, 56.4% were sold by the project office while 43.6% were sold through various marketing agents in the districts.
Major marketing agents in the districts include; (1) Mazabuka Marketing Company in Mazabuka district; (2) ZATCO and Star Services in Monze; (3) ZATCO in Choma; (4) D.C.L and Elvina Enterprise in Kalomo and; (5) G.A.S in Livingstone.

Table 7: Yenga Oil Press Sales by Agent

<table>
<thead>
<tr>
<th>Year</th>
<th>Sales through the project Office</th>
<th>Sales through other agents</th>
<th>Total Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992</td>
<td>-</td>
<td>-</td>
<td>30</td>
</tr>
<tr>
<td>1993</td>
<td>21</td>
<td>-</td>
<td>21</td>
</tr>
<tr>
<td>1994</td>
<td>53</td>
<td>29</td>
<td>82</td>
</tr>
<tr>
<td>1995</td>
<td>57</td>
<td>8</td>
<td>65</td>
</tr>
<tr>
<td>1996</td>
<td>166</td>
<td>30</td>
<td>196</td>
</tr>
<tr>
<td>1997</td>
<td>82</td>
<td>18</td>
<td>10</td>
</tr>
<tr>
<td>1998</td>
<td>20</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>239</td>
<td>185</td>
<td>444</td>
</tr>
</tbody>
</table>

Source: Africare, Choma Field Office

Table 8: Benefits experienced by respondents for affiliating to clubs

<table>
<thead>
<tr>
<th>Benefits</th>
<th>% Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Able to access group credit/loan</td>
<td>25.8</td>
</tr>
<tr>
<td>Facilitate knowledge sharing</td>
<td>35.5</td>
</tr>
<tr>
<td>Able to pool resources with other farmers</td>
<td>25.8</td>
</tr>
<tr>
<td>Improved income</td>
<td>6.5</td>
</tr>
<tr>
<td>No benefits</td>
<td>6.5</td>
</tr>
</tbody>
</table>

Among the individual benefits for affiliating to clubs stipulated by the respondents are as follows; (1) 25.8% of respondents affiliated to community clubs indicated in a club, farmers are able to access group loans; (2) 35.5% of respondents have experienced that by affiliating to a club, a farmer has an opportunity for knowledge sharing in terms of development of ideas and is not seen as a passive recipient; (3) and individual farmers are able to pool resources (25.8%) together to purchase services which they cannot afford as by themselves.

The group/club approach to information and rural development has been adopted among the women clubs. About 12.2% of the respondents belong to women clubs, 3.1% youth clubs and 6.2% general community clubs whose club activities include selling Yenga extracted cooking oil and sunflower cake.

5.5.3 Reasons for Owning Yenga

Table 9: Reasons for not Owning Yenga Presses

<table>
<thead>
<tr>
<th>reason for not owning a yenga oilpress</th>
<th>Percent</th>
<th>Valid Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>too expensive</td>
<td>25.2</td>
<td>25.8</td>
</tr>
<tr>
<td>yenga oilpress outlet/dealer not locally available</td>
<td>10.7</td>
<td>10.9</td>
</tr>
</tbody>
</table>

The two major reasons why farmers did not own Yenga Presses were; (1) Prices of Yenga oil presses beyond the farmers reach and; (2) Lack of locally availability of Yenga Press and accessory/spare parts dealers. Table 9 above shows percentage representation of the responses from the field surveys.
5.5.4 Reasons for not Using Yenga Oil Press Currently

Out of the total number of farmers in the study districts who had acquired Yenga presses between 1993-2001, 19.8% were not utilizing them by the time of the study. The respondents who were not using the oil presses gave three major reasons; (1) 54.5% of had stopped using the oil presses due to low sunflower yields resulting into non availability of sunflower seed for oil extraction; (2) 36.4% indicated that their presses had broken down and lacked spare parts to repair them whereas; (3) 9.1% had sold off their Yenga oil presses because they failed to make money out of the business. Below figure 2 shows explicitly the reasons farmers are no longer utilizing their Yenga oil press.

**Figure 2: Reason for not using Yenga oil press currently, 2001**

<table>
<thead>
<tr>
<th>Reason</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No sunflower</td>
<td>54.5%</td>
</tr>
<tr>
<td>Yenga brokedown</td>
<td>36.4%</td>
</tr>
<tr>
<td>Yenga sold</td>
<td>9.1%</td>
</tr>
</tbody>
</table>

On the other hand, farmers who do not own Yenga oil presses cited the following factors as the major limitation/hindrance in owning an oil press; (1) 70.2% of the farmers interviewed stated that the Yenga oil presses are beyond their reach/too expensive; (2) 29.8% cited lack of dealers in their respective areas where they can purchase one without incurring serious transportation costs and also facilitate ease contacts/information flow.

The reasons cited above by farmers for not using their Yenga oil presses need special attention for any future plans of promoting village level oilseed processing in the country and the region as a whole. Sustainability of the Small-scale Oilseed Processing programme/project has been greatly affected by these factors.

5.6 Oilseed crop production

5.6.1 Major Oilseeds

The major oilseed crops grown in the study areas and in Southern province as a whole are sunflower and groundnuts. However groundnuts are only used to a lesser extent for oil extraction. Farmers are financially better off selling groundnuts as seed grains as opposed to processing and marketing by-products. Generally the available oil presses are not adapted to processing groundnuts and the groundnut oil yields are uneconomically low. Other minor oilseed crops utilized to extract oil include sesame and pumpkin/squash seeds.

5.6.2 Oilseeds Area and Production Trends

Post-Harvest Surveys Production estimates indicate a marginal downward trend in area and production of Sunflower in Southern province over the six-year period from 1992 to 1998 (FSRP, PHS production trends, 2000). During the same period, Groundnut area and production have gone up by
120% (to 215,528 ha) and 60% (to 625 mt) respectively. Figure 3 below shows the Post-Harvest Surveys production trends for Sunflower and Groundnuts over a six-year period in Southern province.

**Figure 3: Oilseed PHS Production Trends in Southern Province**

The marginal increase in sunflower production between 1993/94 and 1996/97 seasons could be attributed to among other things the promotion efforts by the Small-scale Oilseed Processing Project. The phasing out of the project on the other hand marked the beginning point for the current down ward trend in both areas under cultivation and crop yields production of sunflower in all the districts of Southern Province.

The general downward trend in both hectarage and production of sunflower among smallholder farmers in Southern province possess a threat to the sustainability of Small-scale Oilseed Processing projects.

District sunflower production trends show a steady decline in sunflower production per household between 1999 and 2001 from an average of 970kg/household to 694kg/household in 2001 in Kalomo. On the contrary, Monze district despite low production figures per household, showed an increase in sunflower production from an average of 178kg/household in 1999 to 269kg/household in 2001. This could be due to the presence of organizations still promoting sunflower production like the soil fertility programmes under DAPP and CLUSA.

**Table 10: Average sunflower yield (kg) per household**

<table>
<thead>
<tr>
<th>District</th>
<th>Average sunflower yield (kg) per household per cropping season</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1999</td>
</tr>
<tr>
<td>Kalomo</td>
<td>970</td>
</tr>
<tr>
<td>Monze</td>
<td>178</td>
</tr>
<tr>
<td>Mazabuka</td>
<td>400</td>
</tr>
<tr>
<td>Seasonal Mean</td>
<td>541</td>
</tr>
</tbody>
</table>

*Source: Field Survey, 2001*

Fluctuations in seasonal sunflower production could also be attributed to variations in seasonal rainfall intensity and distribution and availability of market for the crop. Last season’s floods negatively affected sunflower yields in the study districts.
5.6.3 Sunflower Variety Preferences

Out of the available sunflower varieties (Record, Saona, G101, G100, Milika and Mutinta), farmers used various criteria in selecting the sunflower variety to grow. Two important factors which dominated variety selection included; (1) softness of the seed to crush for oil extraction and; (2) the oil content of any given varieties. Majority of the farmers (27.7%) considered both softness of the seed to crush and oil content. High oil content attribute was highly ranked among the sunflower growers (25.4%) whose main reason for sunflower production was oil extraction.

Table 11: Farmer variety selection criteria for oil extraction

<table>
<thead>
<tr>
<th>Criteria for Variety selection</th>
<th>Response score (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soft to crush</td>
<td>6.9</td>
</tr>
<tr>
<td>High oil content</td>
<td>25.4</td>
</tr>
<tr>
<td>Soft and high oil content</td>
<td>27.7</td>
</tr>
<tr>
<td>None</td>
<td>2.3</td>
</tr>
</tbody>
</table>

Source: Yenga Adoption Field Survey, 2001

Most farmers opted for open pollinated sunflower varieties whose seed could easily be recycled on-farm by small-scale farmers without losing significant quantities in terms of grain yield. Among the open pollinated varieties, Record was the most adopted due to farmer appreciation of its high oil content. The variety gives the highest yield in terms of oil at an average of 15 bottles x 750ml for a 50kg bag.

Majority of the farmers (37.7%) grew Record sunflower variety in the study areas. This was because the demonstration package under the Africare oilseed-processing project promoted Record as the most suitable variety for the earlier oil presses which the project promoted. However, new varieties are being promoted though at a slow pace.

Other varieties adopted included, (1) a combination of Record and Saona (8.5%); (2) Saona (8.0%); (3) G100 (4.6%); (4) Milika (3.8%) and; (5) Mutinta (1.5%). 5.4 % of the respondents did not planted any variety available.

Figure 4: Sunflower Variety Preferences by District

Record variety was highly adopted in Kalomo district while a combination of Record and Saona was highest in Monze. Mutinta and G101 varieties were most popular in Monze and Mazabuka respectively. A high number of farmers in Kalomo did not mind the type sunflower varieties they planted regardless of the intended use of the crop. This might point out to low numbers of Yenga presses owned by farmers in the district. There was also comparatively high preference for G100 in Kalomo and Mazabuka.
5.6.4 Seed Acquisition and Constraints Faced

The major sources of sunflower seed in the study area include agents for the commercial seed marketing companies found in major towns and rural development non-governmental organizations like PAM (SHAPES), Africare, and CARE International, WVI etc.

Over 56% of the farmer interviewed during the survey indicated that they face problems in acquiring the sunflower right seed quality and quantity at the right time. The major problems farmers face in sunflower seed acquisition are mostly non availability of sunflower seed locally (49.2%) and 8.5% of the farmer also complained that sunflower seed was too expensive.

5.6.5 Use of Sunflower

Table 12: Use of sunflower produced by Yenga oil press owners

<table>
<thead>
<tr>
<th>Use</th>
<th>% Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sold as grain</td>
<td>1.3</td>
</tr>
<tr>
<td>Retained for oil extraction</td>
<td>80.5</td>
</tr>
<tr>
<td>Either sold as grain or retained for oil extraction</td>
<td>13.0</td>
</tr>
</tbody>
</table>

Most of the sunflower produced by the Yenga oil press owners is retained for oil extraction (80.5%), whereas a small percentage of press owners (1.3%) sell it as grain and 5.2% sell it as grain or retain it for oil extraction. Oil extraction is at its peak during the dry season (June to September) after harvesting sunflower.

5.6.6 Use of other Oilseeds for Oil Extraction

Despite the initial targeting and emphasis on sunflower as the main crop meant for oil extraction using the Yenga oil press, farmers have diversified and broadened their target oilseeds covering some traditional crops which they use as ingredients (in form of flour or as grain) for their relishes to extract oil.

Among these crops were sesame, pumpkin seeds, groundnuts (particularly MGV-4) and squash seeds. Most important among these was sesame seed (12.3%), pumpkin/squash seeds (10.8%). Groundnut especially MGV-4, which has high oil content, is also being used in oil extraction in addition to sunflower.

The problem however is the poor adaptability of the present Yenga oil press to these crop seeds newly included on the crushing list. Amounts available of these crops among farmers are also very minimal for any economical oil extraction.

Table 13: Other crop seeds used for oil extraction at village level

<table>
<thead>
<tr>
<th>Other oilseeds used in oil extraction</th>
<th>% Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sesame</td>
<td>12.3</td>
</tr>
<tr>
<td>Pumpkin/squash</td>
<td>10.8</td>
</tr>
<tr>
<td>Groundnuts</td>
<td>0.8</td>
</tr>
<tr>
<td>Sesame &amp; groundnuts</td>
<td>2.3</td>
</tr>
<tr>
<td>Pumpkin &amp; groundnuts</td>
<td>3.1</td>
</tr>
</tbody>
</table>

Source: Field Survey, 2001
5.6.7 Oil seed Crushing Capacity

Majority (38.9%) of the Yenga press owners crush on average one bag of sunflower per day. About 15% of the farmers interviewed crush at least two bags of sunflower daily while 5.5% and 1.5% of the farmers crush three and four bags of sunflower per day respectively. The average yield of cake per bag was estimated at 37 kilograms.

5.6.8 Oil and Seed Cake Utilization

5.6.8.1 Edible Oil Utilization

The Yenga extracted oil is used for frying food. The survey results indicate high acceptability of locally produced oil for its colour and appearance. Farmer interviewed indicated that Yenga pressed sunflower oil lasted longer and tested better than industrial cooking oils.

Most of the oil extracted 87.0% is sold on both local markets and in nearest towns. About 9% of the oil extracted is retained for home consumption and mainly not recorded as sold. Some farmers also indicated that they exchanged extracted oil with other goods in form of barter exchange. Farmers however could not account for oil losses during extraction, processing and packaging.

Despite the high market potential for other extracted oil products like home made soap and jelly, farmers in the study area expressed ignorance on how to make such products. This limited the utilization of extracted oil for vegetable oil consumption only.

5.6.8.2 Oil Marketing

Field survey in the 5 districts of the Southern province of Zambia indicates high acceptability of the extracted sunflower oil locally. This is shown in the number of farmers who market their cooking oil locally (92.2%), 2.6% sell their oil in the nearest town and 2.6% sold their oil locally and in town.

5.6.8.3 Oil Price Determination

Farmers in sunflower oil extraction business gave the following criteria as basis for oil price determination; (1) price based on prevailing market price (30.0%); (2) price determined on the basis of production cost (4.6%) and; (3) 0.8% of the respondents indicated that they determined oil price on the basis of market demand for edible oil.

The price of a 750ml bottle of oil costs about ZMK2,958 on average. This price translates to about ZMK44,370 per 50kg bag of sunflower.

Table 14: Comparison of benefits realized through oil extraction option compared to sunflower sold as grain.

<table>
<thead>
<tr>
<th>District</th>
<th>Price (ZMK) of a 750ml bottle of cooking oil</th>
<th>Price (ZMK) of a 50kg bag of sunflower</th>
<th>Price (ZMK) of sunflower cake/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kalomo</td>
<td>2,872</td>
<td>21,676</td>
<td>335</td>
</tr>
<tr>
<td>Monze</td>
<td>2,968</td>
<td>23,883</td>
<td>416</td>
</tr>
<tr>
<td>Mazabuka</td>
<td>3,047</td>
<td>18,704</td>
<td>321</td>
</tr>
<tr>
<td>Overall average price in the study districts</td>
<td>2,958</td>
<td>21,686</td>
<td>365</td>
</tr>
<tr>
<td>Total gross benefits based on a 50kg bag</td>
<td>44,370  (a)</td>
<td>21,686  (b)</td>
<td>13,505 (c)</td>
</tr>
<tr>
<td>** Benefits for oil extraction option/50kg</td>
<td>36,189</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NB. A 50kg bag yields about 15 bottles x 750ml and 37kg of seed cake

\[** = (a) + (c) - (b), \text{i.e.} (44,370 + 13,505) - (21,686)\]
5.6.8.4 Uses of Sunflower Cake

Over 44% of the farmers interviewed utilize the sunflower cake collected from the Yenga press for both their own livestock feeding and as a source of income. Approximately 36% of the farmers use the cake accumulated for livestock feed purposes mostly for their poultry without selling to other buyers. Of all the farmers utilizing the cake for livestock feed, 50.8% use it for supplementary feeding while 6.9% use it as a substitute for expensive and rarely available feedstock. However, only 21.5% of the farmers in oil extraction business were trained on livestock feed formulation by the Small-scale Oilseed Processing Project.

Other farmers (19.8%) sell all the cake they produce mainly on the local markets. The rest of the cake is either sold to some agents (6.2%) or to the nearest town markets (1.5%). The average sunflower cake price is currently estimated at ZMK 365.00 per kilogram.

Figure 5: Uses of Cake

5.6.8.5 Sunflower Cake Storage

Farmers interviewed during the survey indicated that they faced no storage problems for their sunflower cake because of the weather conditions at the time of the year (dry season) when farmers have the cake in abundance. Amounts of cake accumulated in most cases do not reach the rainy season.

The sunflower cake is stored in bags under cool and dry conditions to avoid rotting or over heating.
6. Efficiency of the Yenga press oil processing technology

6.1 Costs and benefits of the technology dissemination programme

6.1.2 Dissemination Costs

The major costs attributable to the Yenga oil press processing technology can be classified under 4 main categories as follows,

6.1.2.1 Technology Promotion Costs

The promotion aspect of the technology was designed to create awareness among rural households about the potential of the Yenga press oil business in terms of income and sustainability. The main strategy was to conduct demonstrations in the primary oilseed growing areas of rural Zambia in order to show how the Yenga press operates as well as to sensitise the would be entrepreneurs about the advantages of owning a Yenga press.

Supportive to the demonstrations were pamphlets in both English and Zambian languages (Tonga for Southern Province), which were mainly used to strengthen the awareness campaigns. By the end of 1998, well over 170 demonstrations capturing close to 7,877 attendants had been conducted by Africare in Southern province at an approximate monetary value of K51, 000 (US$ 110 equivalent in 1993) per demonstration and K1, 700 000 (US$ 1,884.) per demonstration in 1995. The table below shows the number of demonstrations conducted by District and the attendance levels.

Table 15: Demonstrations attendance by District

<table>
<thead>
<tr>
<th>District</th>
<th>Total number of Demonstrations conducted</th>
<th>Attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kalomo</td>
<td>35</td>
<td>1312</td>
</tr>
<tr>
<td>Monze</td>
<td>45</td>
<td>1400</td>
</tr>
<tr>
<td>Mazabuka</td>
<td>37</td>
<td>2015</td>
</tr>
<tr>
<td>Other districts</td>
<td>53</td>
<td>3150</td>
</tr>
<tr>
<td>Totals</td>
<td>170</td>
<td>7,877</td>
</tr>
</tbody>
</table>

Source: Africare Records

The expenditure items were mainly over fuel, allowances for the demonstrators and the cost of publishing pamphlets. This was a big achievement considering the fact that over 534 entrepreneurs by 1998 had acquired Yenga presses in the province. There is reason however to believe that the awareness campaigns were cost effective following the findings of the field survey conducted that clearly showed that 47% of the total number interviewed acknowledged having heard about the Yenga press through Africare at some demonstration scene compared with 33.3% and 15.5% from fellow farmers and MAFF respectively. The figure below gives an overview about the sources of information among the respondents interviewed during the field survey by district.
6.1.2.2 Entrepreneurship training costs

The entrepreneurship training costs are an integral part of the technology dissemination costs because the training courses were designed and focussed to provide adequate artisan and business management skills to the would be entrepreneurs to enable them operate and run the oilseed processing business in rural areas. In addition to the clientele entrepreneurship courses, Africare also organised and conducted 3 special training courses for its promoting partners to ensure that the dissemination programme of the oilseed processing business would remain sustainable after the project period.

For the entrepreneurship training, the notable items of expenditure were lodging fees for the entrepreneurs, fuels and lubricants, allowances for the resource persons and the cost of stationery.

By the end of 1998, 18 entrepreneurship training courses out of the possible 25 had been conducted by Africare and some cooperating partners benefiting 534 entrepreneurs at a cost of K500,000 per course i.e. K936 or US$ 3 per course participant in 1993/1994. Data analysis undoubtedly indicates that all the entrepreneurs who acquired their Yenga presses through the project had at least received some backup training on oilseed processing business, running and maintaining oil press. Results of the field survey confirm that there are some significant differences in the performance of those who did not receive some backup training and those who did.

For instance the average output of cooking oil from a 50kg bag of sunflower was observed to be slightly higher from those who were trained than those who did not receive any training. The table below shows the responses obtained from the field regarding training.

Table 16: Entrepreneurship training by District

<table>
<thead>
<tr>
<th>District</th>
<th>Yenga press owners interviewed</th>
<th>Trained</th>
<th>Un trained</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kalomo</td>
<td>32</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td>Monze</td>
<td>31</td>
<td>19</td>
<td>12</td>
</tr>
<tr>
<td>Mazabuka</td>
<td>34</td>
<td>15</td>
<td>19</td>
</tr>
</tbody>
</table>

Source: Field Survey, 2001

(Note: the Club and NGO sources of information refer to Africare Project)
It is important to note that those who did not receive any form of training acquired their Yenga presses in the recent years after close of the second phase of the project in 1997.

6.1.2.3 Yenga Press and Seed Distribution

Another cost category that was part of the promotion exercise and falls under the technology dissemination costs was that of promoting improved varieties of seed among small holder farmers with a view to boost the availability of enough quality oilseed for pressing.

Over the years, Africare has been promoting composite sunflower cultivars known as ‘Record’ that understandably meets the required attributes for a good oil seed. During the life span of the project, the overall response to growing (Record) the quality sunflower seed was good but declined after the project wound up in 1998. The Government extension system does not seem to have provided continuity soon after the project wound up.

The total seed distributed by Africare from the time the project started to date in the province is estimated to be 22.27 metric tonnes. The exact contribution of this category to the total dissemination costs is not clear, given an understanding that the seed was for sale. What is obvious according to the field survey however is that there is a decline in sunflower production, an aspect that was acknowledged by nearly 95% of the total respondents interviewed. This was heavily attributed to non-availability of improved sunflower seed. Other farmers complained of the high cost of improved sunflower varieties.

6.1.2.3.1 Salaries, wages and administrative costs

The costs counted as part of the dissemination costs are those incurred by the project through salaries wages and administrative costs. The salaries and wages were for the project staff whose composition was 1 Project manager, 1 Accountant, 1 Project coordinator and 1 Receptionist at national level including 1 Field manager, 1 Support secretary and 1 Driver at provincial level.

6.1.2.3.2 Adoption costs

The adoption costs are not directly related to the dissemination costs but it is important however to mention that they play a significant role in the technology adoption process and that they are directly incurred by entrepreneurs as a result of the dissemination programme. In the Yenga press oil processing business, the adoption costs are those related to the acquisition and purchase of the Yenga press oil processor and the constituent accessories. The cost for start up oilseed and the required labour are also counted as part of the adoption costs.

At the time of this study the average price for a Yenga press from a manufacturer was in the range of K580, 000 to K600, 000 (US$ 156 -163) while that of a 50 Kg bag of sunflower was at an average field price of K 24, 000 (US$6.50). The cost of acquisition and purchase of a Yenga press was however estimated at K734, 000 (US$ 199) to cover acquisition costs, accessories and the training component. This is the cost that was used in the economic analysis of the Yenga press business at household level.

The table below gives an estimate of the total dissemination costs as extracted from some Africare project documents. The values may not be very exact considering the fact that some figures were just taken as estimates after some intensive search and enquiries from staffs that were involved in running the Africare project.

Table 17: Summary & Breakdown of the total dissemination costs (1993 - 1998)

<table>
<thead>
<tr>
<th>Dissemination cost category</th>
<th>Estimated present value in ZMK</th>
<th>US $ Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Technology awareness &amp; promotion</td>
<td>69,190,000</td>
<td>18,700</td>
</tr>
<tr>
<td>2. Entrepreneurship training</td>
<td>99,900,000</td>
<td>27,000</td>
</tr>
<tr>
<td>3. Salaries &amp; wages</td>
<td>76,945,200</td>
<td>20,796</td>
</tr>
<tr>
<td>4. Administrative costs</td>
<td>68,450,000</td>
<td>18,500</td>
</tr>
<tr>
<td>Total</td>
<td>314,485,200</td>
<td>84,996</td>
</tr>
</tbody>
</table>

Source: Africare project records
6.1.3 Benefits of Technology Dissemination Programme

The benefits of the oilseed processing technology can be looked at in a broader perspective by valuing its contributions to society as Macro level and to household as micro level.

At macro level, the major contribution of this technology to society is supposed to be employment creation. No information however was collected to assess the contribution of the industry to employment but some evaluation study conducted by KPMG in 1999 revealed that employment creation was very negligible. Understandably, the Yenga press oil processing business has the potential to provide employment opportunities in the rural areas through Yenga press owners, sunflower seed dealers and in urban areas through Yenga press manufacturers.

The promotion of the Yenga oil press has however contributed to enhanced demand for improved cultivars of sunflower seed as well as an effective demand for Yenga presses. At the time of this study it was apparent that most entrepreneurs and sunflower producers were aware of the quality seed that is suitable for oil extraction. Among the varieties mentioned as suitable for oil extraction were Record and Saona.

There are only 4 Yenga press manufacturers in the country and at least one sunflower seed dealer in each of the districts where the Yenga press was promoted in Southern province. Although the average cost to manufacture a Yenga press was not assessed at the time of this study, there is indication that it is attractive for manufacturers to keep on investing their resources into the production of Yenga presses. SAMS Company is a good example of a manufacturer that is making an edge in this industry. The company started manufacturing Yenga presses in 1998 and by 2001 the company had sold out over 800 presses.

The other type of benefit at macro level is the enhanced national and regional stakeholder participation and collaboration. Over the years there has been some networking efforts in the region by way of information exchange based on experiences in the oil processing business with a view to improve the lives of the majority poverty stricken rural dwellers. This is a positive attribute that could be applied to several developmental programmes within the country and region.

The oil processing business has also assisted to narrow the deficit gap for cooking oil and in some way the consumers have benefited from affordable cooking oil. One needs to look at the convenience and accessibility aspects in favour of the consumer in order to appreciate the contribution that this technology has made to society.

At (Household level) micro level the technology has impacted positively on the lives of the beneficiaries at two levels; (1) the Yenga press owners through income and improved nutrition and; (2) the consumers through improvement in nutritional status and affordable sources of cooking oil. One parameter that was indirectly used to assess the impact of the business on the income of the adopters was the nature of assets acquired through the accumulated profits. Among the assets frequently mentioned were Work oxen, Ox-drawn ploughs, bicycles and household goods. The table below shows an approximate sample distribution of those who bought assets from the profits realized in the Yenga press business by district.

Table 18: Assets bought by District

<table>
<thead>
<tr>
<th>District</th>
<th>No. of Respondents interviewed</th>
<th>Assets bought</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Kalomo</td>
<td>30</td>
<td>24</td>
</tr>
<tr>
<td>Monze</td>
<td>27</td>
<td>14</td>
</tr>
<tr>
<td>Mazabuka</td>
<td>26</td>
<td>20</td>
</tr>
</tbody>
</table>

Source: Field survey, 2001

It was not possible to quantify the extent to which the oil press business had contributed to their healthy in terms of nutrition but nonetheless most respondents indicated as a proxy that their body weights had somehow increased and that there was a corresponding increase on the reproduction of livestock especially chickens as a result of supplementing them with sunflower cake.
6.1.4 Cost Benefit Relationships for the Yenga Oil Processing Business

6.1.4.1 Cost Benefit Aspects (of the Overall Dissemination Programme) At Micro-Level

This adoption study quotes and comments on the results of the study conducted by KPGM in 1999 whose major objective was to evaluate the overall performance of the oil press processing technology with regard to achievements and impact on rural household income. A total of US$ 2,318,544 was invested in the oil press technology from 1989 to 1996 covering four provinces, broken down into phases as shown in the table below.

<table>
<thead>
<tr>
<th>Phase</th>
<th>Phase description</th>
<th>Period</th>
<th>Investment in US$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pilot</td>
<td>1989-1992</td>
<td>100,000</td>
</tr>
<tr>
<td>3</td>
<td>Expansion</td>
<td>1993-1995</td>
<td>1,569,766</td>
</tr>
<tr>
<td>4</td>
<td>Extension</td>
<td>1995-1996</td>
<td>500,000</td>
</tr>
<tr>
<td>5</td>
<td>Commercialization</td>
<td>1996-1997</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>2,318,544</td>
</tr>
</tbody>
</table>

Source: OPP evaluation study

According to the findings, the cost benefit ratio was 0.68 for investments from 1989 to 1997 and 0.70 for investments from 1993 to 1997 indicating that it was worthwhile to have invested into the rural oil processing technology. The projection was that the cost benefit ratio would be 1.32 by 2002. This however is doubtful, going by the findings of the survey explained at household level in the text below.

6.1.4.2 Cost Benefit Analysis at Micro Level

At household level the current scenario is that income to entrepreneurs has declined especially from 1998 to date. The reasons for this decline could partly be explained following the findings of the field survey.

(1) Sunflower production has gone down making it difficult for entrepreneurs to operate at higher economies of scale. The sunflower production records can confirm this over the years from 1992 to 1997 as shown in the table below.
It is clear from the table that sunflower production decreased sharply from 1997 some notable phenomena that was acknowledged by almost 95% of the total respondents interviewed.

Most entrepreneurs still operate inefficiently citing oilseed unavailability as the major drawback. From a farmer's point of view, seed availability and late delivery have undermined their willingness to grow sunflower. According to the findings of the field survey, farmers feel that yields are too low when they plant sunflower late because of the blight disease.

In addition farmers complained and indicated that it is difficult to get oilseed even when one had the money to purchase because the producers were not only scattered but also produced very little. Apparently, the acquisition costs are too high so that the profit from a 50kg bag of sunflower would be too little. As a matter of fact only 47% of the total Yenga press owners were found operational at the time of this study most of which hardly crush a 50 Kg bag of sunflower a day. The average output of cooking oil from a 50kg bag (12 liters) was found to be okay but it was the quantities of sunflower crushed in a year that indicated that entrepreneurs were not making much out of the business.

(2) Even if there is free entry into the business, credit facilities to boost sunflower production and to purchase Yenga presses are not available. Most respondents who do not own Yenga presses showed willingness to enter into the business if only credit facilities for the Yenga press and oil seed could be made available.

(3) The dissemination programme was not picked up by the Ministry of Agriculture soon after the project run by Africare ended. High staff turn over in MAFF has affected the oil press business. At the time of this study only one staff trained as a Trainer under MAFF could be accessed to articulate Yenga press skills. The technology is however being cherished by NGOs who still relies on technical expertise from former technology promoters.

What was also found worrying was that the Yenga presses had changed hands over the years as such that the new owners were not that efficient in the use of their Yenga presses. It is clear however that the effective demand for cooking oil has gone down as a result of liberalization that has seen dumping of large quantities of cooking oil at lower prices. This to some extent has discouraged entrepreneurs from increasing their economies of scale especially starting from 1998.
The field price for a 750mls bottle of cooking oil was found to be K2, 900 (US$ 0.78) compared to a retail price of K3, 500 (US$ 0.95) from a shop while that of a 50Kg sunflower bag averaged US$ 6.50. The inefficiency that is currently inherent among Yenga press owners has nothing to do with the current profit margins as most entrepreneurs can still operate at an edge. The value added to a 50Kg sunflower bag was computed to be in the range of K25, 000 to 33,370 (US$ 6.76 to US$ 9)

6.1.4.3 Testing the Yenga press efficiency at (household level) Micro-level

The Yenga press business viability was tested at household level using the current levels of production and the prevailing market prices as shown in the cash flow statement in the table below.

**Table 19: Cost benefit analysis at (micro) household level**

| Cash Flow Statement for an average Entrepreneur based on the current field situation |
|-----------------------------------|---------------------------------|---------------------------------|
| Initial costs (Fixed costs)       | Cost in ZMK                     | Remarks                         |
| Retail price of a Yenga press     | 630,000                         | The cost includes the training component and cost of acquisition |
| Plank & other accessories         | 80,000                          |                                 |
| Daily operating costs (Variable costs) |                                  |                                 |
| Sunflower seed (50Kg bag)         | 24,000                          |                                 |
| Labor for 2 operators             | 7,000                           | The opportunity cost of labor at the time of the year is lower than the wage rate |
| Bottles                           | 5,000                           |                                 |
| Charcoal                          | 2,000                           |                                 |
| Repairs                           | 2,500                           |                                 |
| Daily production                  |                                 |                                 |
| Liters of purified cooking oil    | 12 Liters                       |                                 |
| Quantity of sunflower cake        | 38 Kg                           |                                 |
| Work days per month               | 20 days                         |                                 |
| Sales                             |                                 |                                 |
| Price for 750 ml cooking oil      | 2,900                           |                                 |
Price per Kg sunflower cake | 365
---|---

### Cash into business

<table>
<thead>
<tr>
<th>Month 1</th>
<th>Month 2</th>
<th>Month 3</th>
<th>Month 4</th>
<th>Month 5</th>
<th>Month 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales of oil</td>
<td>870,000</td>
<td>870,000</td>
<td>870,000</td>
<td>870,000</td>
<td>870,000</td>
</tr>
<tr>
<td>Sales of cake</td>
<td>277,400</td>
<td>277,400</td>
<td>277,400</td>
<td>277,400</td>
<td>277,400</td>
</tr>
<tr>
<td>Total</td>
<td>1,147,400</td>
<td>1,147,400</td>
<td>1,147,400</td>
<td>1,147,400</td>
<td>1,147,400</td>
</tr>
</tbody>
</table>

### Cash out of business

<table>
<thead>
<tr>
<th></th>
<th>Month 1</th>
<th>Month 2</th>
<th>Month 3</th>
<th>Month 4</th>
<th>Month 5</th>
<th>Month 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial costs</td>
<td>710,000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Operating costs</td>
<td>810,000</td>
<td>810,000</td>
<td>810,000</td>
<td>810,000</td>
<td>810,000</td>
<td>810,000</td>
</tr>
<tr>
<td>Total</td>
<td>1,520,000</td>
<td>810,000</td>
<td>810,000</td>
<td>810,000</td>
<td>810,000</td>
<td>810,000</td>
</tr>
</tbody>
</table>

### Turnover

<table>
<thead>
<tr>
<th></th>
<th>Month 1</th>
<th>Month 2</th>
<th>Month 3</th>
<th>Month 4</th>
<th>Month 5</th>
<th>Month 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly profit</td>
<td>-372,600</td>
<td>337,400</td>
<td>337,400</td>
<td>337,400</td>
<td>337,400</td>
<td>337,400</td>
</tr>
<tr>
<td>Cumulative profit</td>
<td>-372,600</td>
<td>-35,200</td>
<td>302,200</td>
<td>639,600</td>
<td>977,000</td>
<td>1,314,400</td>
</tr>
</tbody>
</table>

### Cost Benefit analysis

<table>
<thead>
<tr>
<th>Cost Benefit Ratio</th>
<th>Total investment in 6 months</th>
<th>=</th>
<th>710,000</th>
<th>=</th>
<th>0.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Net Benefit in 6 months</td>
<td>1,314,400</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Returns to labor</th>
<th>Total Investment in labor for 6 months</th>
<th>=</th>
<th>840,000</th>
<th>=</th>
<th>0.64</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Net Benefits in 6 months</td>
<td>1,314,400</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The cost benefit analysis reveals that the Yenga press business is still a profitable undertaking. At the current level of operation it is possible for an entrepreneur to net K1, 314 400 (US$355) in 6 months. A cost benefit ratio of 0.5 is thus possible given the current level of output and the prevailing prices. The implication is that for every Kwacha invested in the business there is a corresponding return of half a Kwacha. The ratio can be much more if the entrepreneurs increase their level of output. The assumption in the analysis is that the majority is operating for only 20 days in a month when more days are possible.

The return to labor is 0.64 indicating that for every Kwacha invested in the business there is a corresponding return of a K0.64. This is still attractive considering the fact that the opportunity cost of labour at the time when the Yenga press is fully utilized is off-season and that no competing enterprises were identified at the time of this study.

The internal rate of return was computed after discounting the costs and benefits at a discount rate of 10% for a period of 5 years taken as the maximum economic life span of a Yenga press as shown in the table below.

### Table 20: Internal Rate of Return assuming (a five year period) the economic life span of a Yenga press

<table>
<thead>
<tr>
<th>Year</th>
<th>Discount factor at 10%</th>
<th>Net cash flow</th>
<th>Npv</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>1,314,000</td>
<td>1,314,000</td>
</tr>
<tr>
<td>1</td>
<td>0.7463</td>
<td>2,024,400</td>
<td>1,510,810</td>
</tr>
<tr>
<td>2</td>
<td>0.5569</td>
<td>2,024,400</td>
<td>1,127,388</td>
</tr>
<tr>
<td>3</td>
<td>0.4156</td>
<td>2,024,400</td>
<td>841,341</td>
</tr>
<tr>
<td>4</td>
<td>0.3102</td>
<td>2,024,400</td>
<td>627,969</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>5,421,508</td>
<td></td>
</tr>
</tbody>
</table>

**NB: The discount rate at which the Net present value is equal to 0 is (200%) the internal rate of return**
The business yields an internal rate of return of up to 200% indicating that this is the maximum
economic rate of return at which it would be possible to borrow to finance the project if the loan were
to be repaid with interest out of the receipts from the business.

The overall conclusion is that the Yenga press business is a profitable undertaking and that it is
worthwhile to invest into this business. Efficiency could be attained to the fullest if farmers and Yenga
press owners can increase their production of sunflower compared to the current level of production.
Efficiency could also be improved by increasing the economies of scale and a vigorous search of an
outside market away from the local areas. The farmers who were found to be operational with high
output of cooking were those who were relying on the outside market.

7. Technology Impact

7.1 Intermediate Impact

7.1.1 Institutional Factors Influencing Technology Adoption and Impact

In order to achieve the Small-scale Oilseed Processing Project objectives, Africare worked closely
with several like-minded public and private sector institutions and stakeholders in entire project areas.
Institutional arrangements were put in place to facilitate quick Yenga Oil press technology promotion
and transfer among smallholder farmers.

Institutional arrangements were made with organizations already involved in specific community and
developmental programs in respective project areas. The collaborating institutions and stakeholders
included; (1) line Government Ministries like MAFF, Community Development; (2) NGO s and; (3)
other interest groups.

The main purpose of working with these institutions was to assist the project identifying potential
areas, clients, arranging for demonstrations, training, and monitoring and oilseed sales.

The advantage of using these institutions was that they were well established in the province and
knew the areas very well and had a good network as such they guided the project staff to identify
areas of operation without wasting much time. It was also assumed that these institutions would be
well vested in the project operations and continues with the promotion of the technology after project
closed up. Initially the collaborative efforts worked well as the institutional arrangements were both at
national and field level.

Promotional linkages were established through meetings, field days and networking. Table 22
summarizes the roles played by different institutional stakeholders in technology transfer and
promotion during the project period.

7.1.2 Institutional Contributions

Institutional stakeholders’ contribution to Yenga press technology transfer and promotion among
smallholder farmers in Southern province mainly involved networking through collaborative
arrangements and cost sharing in extension services delivery. Other key institutional contributions to
technology transfer and promotion are itemized below.

7.1.2.1 Oilseeds Research

The Oilseeds Research is a division of the Soils and Crops Research Branch in the Ministry of
Agriculture Food and Fisheries responsible for conducting national research in oil seeds crop breeding
and variety development, pest and disease management and promotion of new crops for industrial,
edible and essential oils.

During the project the division contributed in monitoring the performance of Open Pollinated Sunflower
varieties like Record in the project areas, seed crop inspections, crop development and research of
new cultivars, short maturing varieties, disease resistant and Breeders seed maintenance.
7.1.2.2 Extension Services

The Extension Branch of the Department of Field Services falls under MAFF is charged with the responsibilities of establishing and maintaining a national network of extension officers in the field whose main role is to give Agricultural Extension Advisory Services to the farmers and to work closely with developmental organizations.

During the project and to a lesser extent, the Extension Branch provided free extension advisory service to farmers, assisted in farmer mobilization and setting up demonstration plots and monitoring, involved in on-farm seed multiplication and crop monitoring and also involved in technology promotion through information dissemination.

7.1.2.3 Manufacturers

These were responsible for manufacturing Yenga oil presses and provision of spare parts. The two major manufacturers during the project period were Jung and Company of Kitwe and SAMs in Lusaka. Other Yenga manufacturing and suppliers in the country include, SARO Agricultural Equipment, Kudu, TAZARA, Kaleya and CLW Engineering Companies.

The key manufacturing companies’ contributions involved promotion of the Yenga oil presses through information dissemination, research and development of more suitable oil presses upon receiving feedback from the field on the performance of the oil presses in the field and delivery of Yenga oil presses to marketing agents.

7.1.2.4 Non Governmental Organizations

The non-governmental organizations provided an entry point for the Small-scale Oilseed Processing Project in the province. The NGOs were actively involved in target group and project area identification. The same organization assisted greatly in farmer mobilization and management of on-farm demonstrations.

The farmer training on small-scale oilseed processing and supply and promotion of improved sunflower seeds was also done by the NGOs at the grass roots. Of all the collaborating institutional stakeholders, NGOs were the most involved because it was believed that these institutions had better networks in the project areas and were sought to be the best to carry on the project activities beyond the project period.

Some of the programmes which existed and were in line with oilseed processing before the commencement of the project were; (1) Crop diversification and Household Food Security joint venture programme between MAFF /SPHHFSP; (2) Promotion of small scale Businesses under CARE; (3) Nutrition Promotion Program under WVI; (4) Support to women groups through income generating activities under GTZ and the Gossiner mission.
7.1.3 Institutional Capacity to Handle Technology Transfer

Despite efforts made by the Project in establishing institutional linkages for an enhanced Yenga Oil Press technology promotion and transfer, the present existing linkages between the technology generation and transfer are not sufficient and effective enough to sustainably promote and transfer the oilseed processing technology among smallholder farmers. The current situation has been attributed to the following reasons,

The Extension network of the Field Services Branch of MAFF has failed to promote and transfer the technology to the farmers due to funding constraints and lack of trained staff on the operations of the oilseed processing technology.

The Oilseeds Research and Promotion under the Soils and Crops Research Branch lack capacity to carry out client oriented research among smallholder farmers and rural development organizations due to limited funding and staffing. This has led to Researchers not releasing new cultivars, developing alternative seeds or maintaining breeders seed of sunflower hence shortage of basic seeds.

The private sector organizations in the oilseed processing (mostly manufacturers and sales agents) have been reluctant to invest in the rural areas due to disaggregated demand making expensive for inputs and services provision. The seed companies have failed to deliver affordable OPV of sunflower seeds in particular Record to its agents in the province leading to non-availability of improved varieties of sunflower seed. This has resulted in farmers planting recycled seed leading to a drop in crop hacterage and production, and failure to utilize the Yenga Presses to the maximum.

On the other hand, there has been non-availability of Yenga presses and spare parts in the province making it difficult for the farmers to continue servicing their oil presses. Apart from DCL Hardware, which orders the Yenga presses from SAMS, there is no other shop in the province, which is stocking these items.

Reasons cited as reasons by the private sector institutions’ reluctance in investing into small-scale oilseed processing include the following; (1) Poor rural roads, communication, and energy limiting easy access to markets and resulting in high production costs; (2) lack of sustainable smallholder farmer groups making it uneconomical/expensive for the private sector to doing business or providing services to smallholder farmers and; (3) the general poor oilseed yields among smallholder farmers fall

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Table 21: Summarized Institutional Stakeholder Roles

<table>
<thead>
<tr>
<th>Institution/stakeholder</th>
<th>Roles Played during Technology Transfer and Promotion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ministry of Agriculture Food and Fisheries, Ministry of Community Development and Social Welfare</td>
<td>Farmer mobilization for village demonstrations, information dissemination on agricultural policy, extension advisory services and identification of target areas.</td>
</tr>
<tr>
<td>2. NGOs and churches (World Vision/Zambia, Monze Diocese, Salvation Army, Macha Mission (BIC), MS/Zambia, Gossner Mission, CARE, Red cross)</td>
<td>Seed sales and farmer training, information dissemination, identification of target areas, technology transfer and promotions</td>
</tr>
<tr>
<td>3. Manufacturers (Jung and company, SAMS)</td>
<td>Manufacturing presses and spare parts, research and development</td>
</tr>
<tr>
<td>4. Retailers (ZATCO, DCL Hardware, Mazabuka marketing, Elvina Trading, Small sales agents)</td>
<td>Sales of sunflower seed, spare parts and Yenga presses</td>
</tr>
<tr>
<td>5. Soils and Crops Research Branch SCRB/Oilseeds</td>
<td>Development of new sunflower varieties and promotion of other oilseed crops for both edible and essential oils</td>
</tr>
<tr>
<td>6. International Organizations (Donors)</td>
<td>Technical back stopping and project funding</td>
</tr>
</tbody>
</table>

Source: Field Survey, 2001
short of the critical required amounts to attract any meaningful investment in on-farm oilseed processing ventures.

There is also need to harmonize the operations of the Yenga press manufacturers in regards of standardizing the spare part models. At the moment most of these parts are not easily compatible to the older oil press models owned by most farmers. This complicates further the availability spares to allow farmers continue servicing their machines. Similarly the local Artisans don’t have the capacity to produce high quality spare parts for the Yenga presses due to lack of proper tools, equipment and metals.

All in all, the present linkages among the stakeholders are very weak to effectively promote and transfer the small-scale oilseed processing technology among farmers. The institutions in the province lack trained personnel who have the experience to effectively promote and transfer the technology. There is need therefore, to strengthening both human and institutional capacities through training of the stakeholders on tenets of technology promotion and transfer so as to achieve sustainability of the program and any other similar programme to come.

7.1.4 Policy Factors which influenced Technology Uptake

7.1.4.1 National Policy

In the early 90s Zambia failed to meet its edible oil requirement as such it relied on imports. The two oil mills ROP and Premium oils could not meet the demand due to constant breakdowns and lack of seed to satisfy these two mills resulting in shortages of cooking oil.

In reaction to the above situation and in line with the Market liberalization and opening up of market opportunities and more recently the introduction of Free Trade Area (FTA) under regional integration policies of the Common Market for Eastern and Southern Africa (COMESA), the Government of the Republic of Zambia came up with a central strategy of agricultural intensification and diversification by optimizing oilseed crop yields and adding value by way of on-farm processing in order to increase in the productivity and sustainability of the smallholder farming systems in the country.

It is against this background that the Government of the Republic of Zambia made a deliberate policy to promote oilseeds through the Crop Diversification Programs and the usage of small motorized and manual presses in rural areas of Zambia so to assist improve on-farm oilseed processing for edible and essential oils, and oilseed cake as one way of adding value to smallholder farmers’ raw produce and subsequently increase household income levels and help alleviate problems of food and nutrition security.

It was also on this premise that the Small-scale Oilseed Processing Project was envisaged so as to assist in meeting the national edible oil and oilseed cake shortfall (more pronounced in rural areas) and also in promoting on-farm rural entrepreneurship in oilseed processing among smallholder farmers of Zambia.

The field survey results reviewed that the project operated within the National Policy Framework and was wholly accepted by all the line Ministries of the Government of the Republic of Zambia. From the government point of view, the project was a welcome and relevant innovation brought about as a result of enabling environment created as a result of Liberalized Market Economy obtaining in the country.

7.1.4.2 Collaborating Stakeholders’ Policy

In any rural development programme/project, it is important to understand the objectives of the would-be collaborating partners so as to avoid conflicts of interest and to know specific roles each stakeholder would play for successful outcome the case project. Collaborating stakeholders seldom cooperate in development programmes/projects if their objectives are not compatible with that of the intended project.

In case of the Oilseed Processing Project, collaboration with other grass-root institutions was not a problem because the project was demand driven and its activities integrated well with the collaborating...
institutions’ on-going development activities. Stakeholders were convinced that the project was a viable program, which could benefit their target groups.

7.1.4.3 Political Environment

The political environment played a very important role in the adoption of the technology as several Members of Parliament used the Constituency Development Fund in their respective areas to assist women and youth clubs purchase Yenga presses. This in a way empowered female farmers and youths economically through income generation from oil and cake sales. In Southern Province over 50 presses were distributed to 15 women clubs through this program.

Unfortunately, almost all of these clubs are no longer running economically due to poor accountability among club members. It appears formation of the majority of the clubs under the Constituency Development Fund were rushed and forced on people and somewhat not demand driven. This at the end affected the sustainability of such business ventures.

7.2 People Level Impact

7.2.1 Socio Cultural Factors

The Yenga oil press technology proved very popular among the women and men folk. Owning an oil press was regarded as a vital asset for income generation, source of affordable cooking oil and seed cake. Most farmers who purchased Yenga presses acknowledged an increase in their households’ income, improvement in life styles and were able to meet most of their daily basic needs in their homes. This resulted in improved social status in their communities.

The clubs, which procured these machines, recorded an increase in membership, as the members were able to benefit from the clubs through the provision of cooking oil and income.

7.2.2 Gender Participation

The project placed special emphasis on encouraging women farmers and women clubs participation in the oilseed processing project because it was felt that women headed households were the most vulnerable to food and nutrition security problems in the rural areas. A credit programme was established by the project to assist women farmers invest in oilseed processing as clubs. This was in line with other collaborating institutional stance on target group beneficiaries.

Despite men dominating individual oil press ownership and control of resources from oil and cake sales, the women did the processing of the cooking oil and marketing as it was regarded as a woman’s job.

7.2.3 Perception and Preferences

No serious cultural beliefs affected the promotion of the technology apart from isolated incidences of poor quality oil produced by some of the farmers (black, with a bad odor), which partially affected customer confidence and preference. However this problem was taken care after the producers underwent a skills training.

The cooking oil from the Yenga press proved popular among the local community and the people in towns due to its natural properties and high viscosity. Bakeries and house wives making fritters preferred using this type of cooking oil, as it proved more economical because it lasted longer when frying.

The Yenga oil press is regarded as a very important asset at village level and is rated number two to the hammer mill. Farmer noted that apart from the non-availability of spare parts, it is comparatively cheaper to run an Oil Press since it does not require fuel to operate. Manual labour is still relatively cheap and available in rural areas. The initial ownership costs are also lower than those for motorized Hammer mills.
7.2.3.1 Individual Benefits

The obvious individual benefits of Yenga Press owners are; (1) improved income through oil and cake sales and; (2) enhanced household food and nutrition security. The consumers also have individually benefited through improvement in nutrition status and affordable sources of cooking oil and cake for livestock feed.

Yenga Press owners revealed during the field survey that their income status has significantly increased as a result of operating the Yenga presses and they are now able to buy most of the agricultural inputs from the monies raised from their oilseed processing businesses. Another benefit for individual/club ownership of the Yenga Press is the availability of an oil press service charge for other farmers who may have sunflower seed to crush at a cost.

Case study 1: Mr. T.B. Maulu

Mr. Maulu is 41 years old and a small-scale farmer in Chikankata area in Mazabuka district. He is an ambitious farmer who always stands ready to adopt any new technology meant to improve his agricultural productivity and profitability.

He acquired his Yenga oil press on hire purchase soon after attending demonstrations organized by the Africare Oilseed Processing Project in 1993. He made maximum use of the Yenga oil press by employing 2 operators. He operated for 5 months (June to October) and could crush a 50kg sunflower bag with an average oil yield of 11 liters. His payment for labour was a 750ml bottle of cooking oil per operator per day.

Not until 1998, all was well for the farmer in terms of profits and effective demand for cooking oil. He could at sell an average of 18 liters of Yenga pressed cooking oil per day through the local market during the peak periods. Farmer using prevailing retail prices as basis so that the farmer could sell lower than the retail price determined the price for cooking oil.

The profits then were as high as 100%. The farmer used this opportunity to make substantial income for himself out of which he bought 2 second hand motor bikes and 2 donkeys.

Five years later, the Yenga press started giving him problems. The maintenance costs became too high while profits well dwindling. The price for cooking oil had dropped due to low demand for Yenga pressed cooking oil because of too much cheaper cooking oil from other countries on the local market. He finally sold off his Yenga Press in 1998.

He however regrets having sold his Yenga oil press because he no longer have a steady flow of income. He acknowledges the current low household nutritional status and the decline in the number of chickens as a result of not having a Yenga press.

The farmer is currently making a Yenga press of his own after having seen a fellow farmer in the vicinity who successfully assembled one Yenga press from some scrap metal that is operational. The farmer feels that there is need to boost sunflower production in the area if the Yenga oil pressing business is to flourish.

7.2.3.2 Community Benefits

The major community benefits as a result of smallholder Yenga Press ownership and utilization include; (1) locally availability of affordable cooking oil (37.7%); (2) local availability of oil and cake (13.1%) and; (3) farmers owning Yenga Presses able to process own cooking oil at a very low cost (11.5%). This has assisted narrow the cooking oil deficit gap in rural communities. Rural people are now able to buy cooking even in smaller quantities based on the money available.

<table>
<thead>
<tr>
<th>Community Benefits</th>
<th>Percent</th>
<th>Valid Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>oil locally available</td>
<td>37.4</td>
<td>37.7</td>
</tr>
<tr>
<td>other farmers able to process own oil at a cost</td>
<td>11.5</td>
<td>11.5</td>
</tr>
<tr>
<td>oil &amp; cake locally available</td>
<td>13.0</td>
<td>13.1</td>
</tr>
</tbody>
</table>

Source: Field Survey, 2001
The oilseed processing technology has empowered communities with an ability to add value on their oilseed crops thereby increasing the communities’ income status. As stated earlier, the promotion of Yenga has also contributed to enhanced demand for improved cultivars of sunflower and inclusion of other oilseed crops into smallholder farming systems and, thus, resulting into crop diversification and intensification. Some retail shops and press owners who were engaged in the sale of record sunflower seed experienced an increased volume in business especially during the planting season. There is also increased demand for Yenga Press among Smallholder farmers.

Another positive effect of the technology was that of the village and town based artisans conducting business with press owners by repairing the Yenga oil presses, fabricating of metals to make Yenga oil presses and spare parts. This was observed in Chikankata, Kalomo and Batoka. In chikankata some local artisan is making roaring business through manufacturing of presses and spare parts.

Case Study 2: Lumama Women Farmers Cooperative

Lumama Women Farmers Cooperative is located in Mazabuka town and was formed in the year 2000. They heard about GTZ promoting the Yenga oil press as a potential income generating business through the district agricultural office and decided to request for a grant to purchase one club Yenga oil press.

The Yenga oil press was acquired in 2000, four years after the Africare Oilseed Project wound up. The cooperative members however feel that they don’t have adequate knowledge about the Yenga press due to lack of training.

Contrary to the expectation of many, the cooperative has just managed to crush only one and half (50kg) bags with an output of 7.5 liters of cooking oil since they acquired the Yenga oil press. The members are not aware of rightful seed for crushing and as a result they bought their oilseed for crushing unknowingly.

The cooperative is facing problems in finding oilseed for crushing and the market price for the produced oil is not very attractive for the local market. It is only now that the cooperative intends to grow its own sunflower in the coming season. There is also a strong feeling among cooperative members that the Yenga press is very tedious to operate.

7.3 Environmental Impact
As a manually operated technology, the Yenga Oil Press Technology has minimal negative effect/impacts on the environment with respect to deforestation and soil degradation. The technology does not depend on fuel; as such it is environmental friendly. It is however, important to take not of the indirect pollution on the environment during the processing of cooking oil.

7.3.1 Deforestation
The field survey results indicated that the oilseed processing technology required the usage of charcoal or firewood during the processing of the crude oil to cooking oil. Despite other several methods of processing the crude oil into edible oil, farmer interviewed heavily utilized the Boiling and Filtering method because it was faster.

Although there is no evidence of deforestation as result of oil processing there is need to sensitize the likely negative environmental impacts such a processing method could bring if done excessively. Frequent change of Yenga Press slippers could also exert some pressure on tree trunks in areas susceptible to deforestation.

7.3.2 Soil Degradation
The study did not find any negative impact of the Yenga Press oil extraction technology on the soil. In presses where there is no much livestock, sunflower cake was used in the vegetable gardens as manure, which improved the soil structure leading to good crop stand and a cost saving measure on chemical fertilizer.

As regards crop production, there is minimal utilization of chemical fertilizers in sunflower fields. Mostly farmers practice crop rotation so as to utilize the residual fertilizers in the maize fields. As such the impact on soil degradation is minimal it at all existent.
8. Problems faced During Promotion of Yenga Oilseed Processing Technology

The promotion of Yenga Oilseed Processing Technology among smallholder farmers was not without constraints. Constraints, which affected the adoption and full potential operation of Yenga presses, were attributed to poor sunflower yields, expensive Yenga presses and non-availability of spare parts and to some extent effects of dumping of cheap oil from neighboring countries. Below are summaries of the major constraints, which affected promotion, and sustainability of the Yenga oilseed processing technology.

8.1 Oilseed Production Among Smallholder Farmers

The poor sunflower crop yields, which led to farmers’ failure to utilize, fully (through out the year) their Yenga Presses are as a result of the following,

- Non-availability of improved (preferably OP) sunflower seed locally at the time of planting leading to most farmers depending on recycled seeds as highlighted by about 49% of the farmers interviewed during the field survey.
- Non-affordability of improved sunflower seed by the farmers (8.5%). Farmers complained that the seed is beyond their reach and, thus, resulting into reduced area under cultivation and production.

8.2 Yenga Press Acquisition and Utilization

The following are some constraints revealed by correspondents as to having affected Yenga Press acquisition,

- Prices of Yenga Presses beyond the farmers reach and,
- Lack of locally availability of Yenga Press and accessory/spare parts dealers.

On the other hand utilization of the Yenga Presses by the owner was affected by,

- Non-availability of sunflower for crushing, majority of the Yenga Press owners (54%) had sunflower only during the periods of June to September.
- About 36% of the farmers had their Yenga Press broken down and not repaired. Farmers find it difficult to maintain Yenga Presses in serviceable conditions due to scarcity of spare parts.

8.3 Institutional Capacity for Technology Promotion

Sustainability of the Yenga Oilseed Processing technology was affected by lack of capacity by collaborating institution to carry on with technology promotion and transfer. There was no budgetary allocation for human and institutional capacity building among collaborating institutions to enable them carry on the promotion activities beyond the life span of the Small-scale Oilseed Processing Project.

Due to lack of funds and skilled manpower, collaborating institutions are unable to,

- Carry out effective monitoring of the performance of Open Pollinated Sunflower varieties like Record in the project areas, seed crop inspections, crop development and research of new cultivars, short maturing varieties, disease resistant and Breeders seed maintenance.
- Assist in farmer mobilization and setting up demonstration plots and monitoring, on-farm seed multiplication and crop monitoring and technology promotion through information dissemination.
- Harmonize and/or standardize Oil Press models to minimize problems of spare part’s compatibility across different Yenga Press models. Of the Yenga Press broken down and not repaired, most of them are of the older version, which are no longer being manufactured.

8.4 Other Factors Which Affected Sustainability

Other factors likely to have affected the adoption and sustainability of Yenga Oilseed Processing Technology include; (1) lack of capacity by farmers to store sunflower for some time so as to take
advantage of peak market periods like the rain season; (2) the dumping of cheap imported cooking oil from other countries and, thus, affecting the profitability of small-scale oil processing; (3) poor storage facilities for the processed oil and cake; (4) heavy dependency on local markets by Yenga oil producers when external markets (nearest towns) could offer higher better prices and; (5) disaggregated demand for both improved seeds and Yenga presses and spare parts making it uneconomic for services providers to invest in the sector.

9. Conclusions

• Promotion of the Yenga oil press has contributed to enhanced income and improved nutrition to the Yenga press owners and affordable sources of cooking oil for the local consumers at household level. There was also increased demand for improved cultivars of sunflower seed, Yenga presses and enhanced national and regional stakeholder collaboration. The technology assisted in narrowing the cooking oil deficit gap in the country.

• Cost benefit analysis reveals that the Yenga press business is still a profitable undertaking with a possibility of an entrepreneur netting K1, 314 400 (US$355) in 6 months. A cost benefit ratio of 0.5 is achievable at the current level of output and the prevailing prices. For every Kwacha invested in the business there is a corresponding return of half a Kwacha. The return to labor (0.64) indicates that for every Kwacha invested in the business there is a corresponding return of a K0.64.

• Efficiency could be attained to the fullest if farmers and Yenga press owners increased sunflower production and economies of scale in oil extraction and a vigorous search for an outside market away from the local areas.

• Despite efforts made by the project in establishing institutional linkages for an enhanced Yenga oil press technology promotion and transfer, the existing linkages between the technology generation and transfer are not sufficient and effective enough to sustainably promote and transfer the oilseed processing technology among smallholder farmers.

• The project operation placed special emphasis on encouraging women participation and had no serious cultural beliefs, which affected the promotion of the technology. There was minimal if all any significant negative impacts on the environment with respect to deforestation and soil degradation.

• Sustainability of the project is threatened by lack of human and institutional capacity for technology development, lack of adequate sunflower seed for crushing, poor spare parts back up, lack of start up capital required Yenga Oilseed Processing, lack leadership skills and poor accountability among farmer clubs members.

• There is need to come up with technology dissemination strategies necessary for sustainable Yenga oil press replication at both national and regional level for enhanced economic well-being and nutrition security of resource poor smallholder farmers. There is need to strengthen human and institutional capacity in promoting technologies like Yenga Oil press processing if Zambian small-scale agriculture is to rise above subsistence levels and assume a business orientation.
10. Recommendations

For enhanced/sustainable uptake and utilization of Yenga oil processing technology among smallholder farmers in peri-urban and rural areas at both national and regional levels, there is need to create conducive conditions for establishing the Oilseed Processing Business. Based on the adoption survey results and the stakeholder consultative/feedback workshop the following are the recommendations made for improved and sustainable Oilseed Processing Technologies in Zambia and to some extent the sub-Saharan region.

10.1 Seed Supply

In order to minimize the problems of non-availability of sunflower and other oil crop seeds among smallholder farmers, there is need to; (1) establish seed banks in rural areas among smallholder farmers through on-farm oilseed multiplication and farmer training in oilseed production; (2) promotion of open pollinated oilseed varieties among smallholder farmers and; (3) strong collaboration and operationalization of links between the oilseed processing promoters and the Oilseed Research Team of the Soils and Crops Research Branch of MAFF for the development of improved/high yielding, diseases and pests resistant varieties. There should also be deliberate efforts to encourage local oilseed dealership among smallholder farmers. A lot can be learnt from the Oilseed on-farm multiplication scheme in Siavonga where oilseed multiplication is currently doing fine. A comprehensive Seed Needs Assessment for oilseeds in all target areas should be conducted.

10.2 Yenga Oil Press Acquisition and Accessories Back-up Services

For easy and affordable Yenga press acquisition and smooth accessory back-up services, manufacturers and promoters must establish local outlets (through sales agents) in high potential areas at district levels. Farmers can easily purchase their Yenga presses and accessories in nearest towns.

Standardization of Yenga presses and accessories and promotion of local artisans for service back-ups will assist easy the problems on unaffordable and non-available spare parts for Yenga press owners. Acquisition of Yenga presses could be made more affordable to farmers through establishment of Hire purchase schemes for able eligible smallholder farmers. Manufactures and promoters must also encourage production of training manuals on maintenance and repairs for each and every oil press model. Feedback mechanisms on oil press performance between manufacturers and users should be maintained to assist in fine-tuning the oil press efficiency.

10.3 Oil and Seed Cake Marketing

In view of the dwindling cooking oil market prices as a result of cheaper cooking oil from other countries, there is need Yenga press owner and promoters to embark on Yenga extracted oil /product development and promotion among local consumers. There is immediate need to train farmer in the oilseed processing business, improved aspects of labeling, packaging and product storage. This should be supplemented by education/information tips on nutritional factors of Yenga pressed cooking oil comparatively to industrial produced cooking oils. There is need for improved processing for improved oil quality. The Integrated Support to Sustainable Development Programme and Food Security Programme (IP) could assist on these aspects.

Knowledge of market and consumer trends is very vital for the oil producers if they are to keep themselves in business. As such there is need for national and regional edible oil market surveys. This will assist in knowing the area specific consumer demands and preferences. Market research must be a pre-requisite for establishing oilseed-processing business at both the farmer level and promoter level. There is also need to diversify in the oilseed product range to include; (1) essential oil extraction and; (2) peanut butter production. Rural farmers must consider exploring and exploiting outside markets for their Yenga pressed oil.

10.4 National and Regional Oilseed Processing Technology Replication
For sustainable national and regional replication of the oilseed processing technology, there is need to document and disseminate the field survey findings highlighting the lessons learnt. This will assist in fine-tuning the technology promotion and application strategies and make them more adaptive among the manufacturers, promoters and end users.

There is need to conduct regular market surveys for oilseed products and seed needs assessments to help determine the economical oilseed production and expected processing levels.

There is still need for capacity building through training on promising technologies and extension methodologies for grass root and broad based institutions involved in promotion of on-farm processing technologies as a way of adding value to smallholder farmers produce.

Following the Oilseed Processing Technologies Adoption survey, there is need to disseminate the survey results and publish conditions and recommendations necessary for establishing Oilseed Processing Business among Rural and Peri-urban Entrepreneurs.
10.4 Appendix I: Stakeholders group discussions on technology adoption, sustainability and replication factors

**Overall Group Summary**

1. **What key elements would you consider if you were to replicate the Yenga oil press technology in the nation or region?**
   - There would be need to emphasize the need for spare parts standardization among the manufacturers to ensure compatibility of spare parts
   - Training and involvement of local artisans in manufacturing of spare parts
   - Ensure availability of adequate seed sources for economical operation of the Yenga oil press through out the year
   - Need to promote on-farm seed multiplication and community seed banks
   - Need to conduct an awareness campaign and market survey and establish needs for oilseeds/crops, edible oil, and seed cake so as to assure a viable oil extraction business
   - Consider seriously business skills, machine maintenance, oil processing and oilseed crop production training
   - Need to consider a credit facility either on hire purchase or through farmer associations

2. **What key elements would you consider to enhance Yenga oil press technology diffusion among the poor women and youth farmers?**
   - Promote field days.
   - Conduct on-farm demonstrations.
   - Support market information dissemination, processing and packaging
   - Encourage regular stakeholders meetings
   - Support local seed multiplication and community seed banks to ensure readily availability of oil seeds for seed and oil extraction
   - Manufacturers to closely interact with end users.

3. **What strategies should promoting institutions put in place to address farmer inability to access adequate sunflower seed through out the year for oil extraction? (List and propose mode of operation).**
   - Establish community seed banks for open pollinated oilseed varieties
   - Formation of Yenga oilpress associations to handle marketing issues such as bulk buying, selling and community linkage to outside supporting agents such as research, extension, and NGOs.
   - Sensitizations on variety characteristics especially yield potential.
   - Facilitate farmer access to credit schemes.

4. **What measures should be put in place to ensure availability of standardized spare parts for smooth operation of Yenga oil presses in rural areas? (Elaborate on measures suggested).**
   - Manufacturers should be encouraged to work closely with local artisans and use of jigs templates
   - Enforcement of jigs patents to ensure production of genuine spare parts and quality control
   - Training of local artisans

5. **What key sustainability factors should stakeholders consider if this technology is to be sustained beyond the Africare project period?**
   - Capacity building for farmer associations who should take a leading role in technology promotion
   - Promotion of oilseed out-grower schemes
• Strengthen linkages between manufacturers, retailers, extension agents, farmers, and researchers through regular stakeholder meetings

6. What policy elements and production measures should be put in place to make the Yenga oil press business more competitive and sustainable?

• Established agricultural institutions such as national and district farmer associations, Ministry of Agriculture, Ministry of Commerce and Industry to build capacity of local farmer associations in processing, packaging and other marketing aspects
• Farmer associations to institute measures for effective monitoring of standards for imported edible oils
• Deliberate measures should be effected to protect local Yenga oil press extraction businesses, manufacturers and local artisans through import quotas for edible oils
• Disseminate health aspects and advantages of sunflower oil which has been proven scientifically that it reduces levels of cholesterol
• Farmer associations to link small scale oil processors to established companies

7. Suggestions to ensure increased farmer access to the Yenga oil press technology? (Acquisition and mode of operation)

➢ Individual Versus Farmer Club/Association Yenga oil press access and ownership. Which is a better approach (As a promotion method)? Give reasons.

• Manufacturers to accommodate the sale of Yenga oil presses on hire purchase or down payment
• Conduct an awareness campaign and market survey

8. List and suggest conditions necessary for;

(a) Technology introduction and set up,
   • Accessibility of the area where the technology is to be introduced
   • Existence of extension agents with a well established grass root network

(b) Technology promotion activities
   • Availability of adequate resources, i.e. funds, labour, transport
   • Availability of back up services (e.g. availability of replaceable components and technical know-how)
   • Existence of an institution that will take a leading role in technology promotion

© Technology adoption
   • Viability and availability of market for the technology products to ensure efficient running of the technology
   • Availability of necessary backup services (especially spare parts, technical know-how locally)
   • Effective linkages between stakeholders
   • Technology should be simple and appropriate for the target group
   • The technology should be profitable venture for the adopters

Group I

9. What key elements would you consider if you were to replicate the Yenga oil press technology in the nation or region?

• There would be need to emphasise the need for spare parts standardisation among the manufacturers to ensure compatibility of spare parts
• Training and involvement of local artisans in manufacturing of spare parts
• Ensure availability of adequate seed sources for high quality seeds
• Need to promote on-farm seed multiplication and community seed banks
• Need to conduct an awareness campaign and market survey and establish needs for oilseeds/crops, edible oil, and seed cake so as to assure a viable oil extraction business
• Consider seriously business skills, machine maintenance, oil processing and oilseed crop production training
• Need to consider a credit facility either on hire purchase or through farmer associations

10. What key elements would you consider to enhance yenga oil press technology diffusion among the poor women and youth farmers?
• Promote field days
• Conduct on-farm demonstrations
• Support market information dissemination, processing and packaging

11. What strategies should promoting institutions put in place to address farmer inability to access adequate sunflower seed through out the year for oil extraction? (List and propose mode of operation).
• Establish community seed banks for open pollinated oilseed varieties
• Formation of yenga oilpress associations

12. What measures should be put in place to ensure availability of standardised spare parts for smooth operation of yenga oil presses in rural areas? (Elaborate on measures suggested).
• Manufacturers should be encouraged to use jigs templates
• Enforcement of jigs patents to ensure production of genuine spare parts
• Training of local artisans

13. What key sustainability factors should stakeholders consider if this technology is to be sustained beyond the Africare project period?
• Promotion of oilseed out-grower schemes
• Strengthen linkages between manufacturers, retailers, extension agents, farmers, and researchers through regular meetings

14. What policy elements and production measures should be put in place to make the yenga oil press business more competitive and sustainable?
• Need for established agricultural institutions such as farmer associations, Ministry of Agriculture, ministry of Commerce and Industry to train local farmer associations on processing, packaging and other marketing aspects
• Promote a deliberate policy on sunflower production

15. Suggestions to ensure increased farmer access to the yenga oil press technology? (Acquisition and mode of operation)
- Individual Versus Farmer Club/Association yenga oil press access and ownership. Which is a better approach (As a promotion method)? Give reasons.
- Targeting of individual farmers through associations

16. List and suggest conditions necessary for;
(a) Technology introduction and set up,
  o Accessibility of these areas
o Establish the community needs

(b) Technology promotion activities
- Availability of adequate resources, i.e., funds, labour, transport

© Technology adoption
- Viability and availability of market
- Availability of necessary inputs locally
- Effective linkages between stakeholders
- Farmer accessibility to initial capital needs
Group II

Questions For Group Discussion

1. What key elements would you consider if you were to replicate the yenga oil press technology in the nation or region?
   - There would be need to emphasise the need for spare parts standardisation among the manufacturers to ensure compatibility of spare parts
   - Training and involvement of local artisans in manufacturing of spare parts
   - Ensure availability of adequate seed sources for high quality seeds
   - Need to promote on-farm seed multiplication and community seed banks
   - Need to conduct an awareness campaign and market survey and establish needs for oilseeds/crops, edible oil, and seed cake so as to assure a viable oil extraction business
   - Consider seriously business skills, machine maintenance, oil processing and oilseed crop production training
   - Need to consider a credit facility either on hire purchase or through farmer associations

2. What key elements would you consider to enhance yenga oil press technology diffusion among the poor women and youth farmers?
   - Promote awareness campaigns through drama, demonstrations, meetings

3. What strategies should promoting institutions put in place to address farmer inability to access adequate sunflower seed throughout the year for oil extraction? (List and propose mode of operation).
   - Promote community seed banks
   - Establishment of storage facilities
   - Farmer sensitisation on variety characteristics especially oil content
   - Facilitate farmer access to credit schemes
   - Formation of farmer associations to handle marketing issues such as bulk buying and selling

4. What measures should be put in place to ensure availability of standardised spare parts for smooth operation of yenga oil presses in rural areas? (Elaborate on measures suggested).
   - Train local artisans and support them with a credit facility to purchase jigs
   - Manufacturers to work closely with local artisans in spare parts manufacturing
   - Need to enforce quality control measures

5. What key sustainability factors should stakeholders consider if this technology is to be sustained beyond the Africare project period?
   - Strengthen farmer associations
   - Encourage community seed multiplication and seed banks
   - Capacity building within associations

6. What policy elements and production measures should be put in place to make the yenga oil press business more competitive and sustainable?
   - Need to encourage linkage of small scale oil processors to big companies through associations
• Disseminate health advantages of sunflower oil (proven scientifically that sunflower oil is the best in reducing levels of cholesterol)
• Deliberate policy be effected to protect local yenga oilpress businesses, manufacturers and local artisans through import quotas
• Promote out-grower schemes for quality and adequate seeds locally
• Encourage contract farming through farmer groups

7. Suggestions to ensure increased farmer access to the yenga oil press technology? (Acquisition and mode of operation)

   a. Individual Versus Farmer Club/Association yenga oil press access and ownership. Which is a better approach (As a promotion method)? Give reasons.
      • Individual yenga oilpress promotion is better at production level due to reduced bureaucracy
      • Association approach however is more effective to obtain credit, in marketing, ability to operate year round

8. List and suggest conditions necessary for;

   ➢ Technology introduction and set up,
      • Encourage crop diversification and other farm enterprises
      • Add value to sunflower
      • Existence of a willing extension service

   ➢ Technology promotion activities
      • Awareness campaigns through demonstrations, field days, drama
      • Extension services

   ➢ Technology adoption
      • Acceptability by farmers
      • Profitability of the enterprise
      • Improved nutrition at household level
Group III

Questions For Group Discussion

1. What key elements would you consider if you were to replicate the yenga oil press technology in the nation or region?
   - There would be need to emphasise the need for spare parts standardisation among the manufacturers to ensure compatibility of spare parts
   - Training and involvement of local artisans in manufacturing of spare parts
   - Ensure availability of adequate seed sources for high quality seeds
   - Need to promote on-farm seed multiplication and community seed banks
   - Need to conduct an awareness campaign and market survey and establish needs for oilseeds/crops, edible oil, and seed cake so as to assure a viable oil extraction business
   - Consider seriously business skills, machine maintenance, oil processing and oilseed crop production training
   - Need to consider a credit facility either on hire purchase or through farmer associations

2. What key elements would you consider to enhance yenga oil press technology diffusion among the poor women and youth farmers?
   - Manufacturers closely interaction with farmers need promotion
   - Facilitate farmer access to sunflower seed
   - Support local seed multiplication

3. What strategies should promoting institutions put in place to address farmer inability to access adequate sunflower seed through out the year for oil extraction? (List and propose mode of operation).
   - Formation of committees to access funds for storage sheds
   - Storage of seed in bulk and locally for crushing
   - Have own seed source
   - Formation of district yenga oilpress associations
   - To promote agencies to technology storage of sunflower

4. What measures should be put in place to ensure availability of standardised spare parts for smooth operation of yenga oil presses in rural areas? (Elaborate on measures suggested).
   - Farmers should know serial numbers and manufacturer of the spare part in need.
   - Training of rural artisans should be conducted.
   - Rural artisans should be trained in making small components

5. What key sustainability factors should stakeholders consider if this technology is to be sustained beyond the Africare project period?
   - Training of trainers from MAFF and other stakeholders should be carried out. Where possible, SAMs used as resource persons.
   - Identify a local to play a leading role in Yenga press promotion.

6. What policy elements and production measures should be put in place to make the yenga oil press business more competitive and sustainable?
   - Farmer associations which will buy Sunflower in bulk and store it.
   - Ensure that the ram press users also grow Sunflower.
   - Encourage Sunflower seed multiplication.
   - Ensure that effective monitoring standards are put in place to check imported oils.
   - Ensure that local oil is improved upon.
7. Suggestions to ensure increased farmer access to the yenga oil press technology? (Acquisition and mode of operation)

a. Individual Versus Farmer Club/Association yenga oil press access and ownership. Which is a better approach (As a promotion method)? Give reasons.
   - There would be need to emphasise the need for spare parts standardisation among the manufacturers to ensure compatibility of spare parts
   - Training and involvement of local artisans in manufacturing of spare parts
   - Ensure availability of adequate seed sources for high quality seeds
   - Need to promote on-farm seed multiplication and community seed banks
   - Need to conduct an awareness campaign and market survey and establish needs for oilseeds/crops, edible oil, and seed cake so as to assure a viable oil extraction business
   - Consider seriously business skills, machine maintenance, oil processing and oilseed crop production training
   - Need to consider a credit facility either on hire purchase or through farmer associations
   - Encourage community owned ram press

8. List and suggest conditions necessary for:

a. Technology introduction and set up;
   - Awareness campaigns.
   - Surveys
   - Market research

b. Technology promotion activities;
   - Exchange visits
   - Backup services (sales and suppliers)
   - Monitoring and evaluation
   - An institution to play a leading role.

c. Technology adoption;
   - Technology should be simple and appropriate.
   - Monitoring and evaluation.
   - Have an institution play a leading role.
Appendix II: Workshop presentations question and answer session

Comment: Wrong manufacturers and wrong material as they enter into the manufacturing venture. The researchers and promoters may not have done enough to train the end users and not been informed about the genuine manufacturers.

Comment: Most farmers who bought presses are from around Monze town due to easy accessibility and NGOs (GTZ) giving loans to farmers leading to increased participation. CLUSA, ZNFU and Dunavant also made sunflower seed available to farmers. The problem of flooding has affected sunflower production especially during 2000/2001.

Comment: The breaking down of the presses has led to the decline in adoption and use of the machines.

Comment: Farmers lack training on the use of Yenga presses. Before they start using it, a press owner needs to be trained.

Comment: Is there a possibility that we can divert from the use of Sunflower to other crops like groundnuts.

Answer: There are other crops such as Sesame, Groundnuts, Pumpkinseeds, which can be used, but when the Economics of crushing these seeds (groundnuts) was conducted it was found not to be economical.

Question: How attractive is the oil from the oil press?  

Comment: There is need to make the cooking oil very attractive to customers in order to compete favorably with the imported one.

Comment: Yenga presses should go side by side with Sunflower production and with marketing of oil.

Question: Since quality of cooking oil is an issue, were Food Technologists involved from the inception in the improving of the quality of oil?  

Answer: The training aspect covered the processing of good quality oil.

Question: Is there any way that the efficiency of the machine can be improved to also cater for women?  

Answer: The Yenga press is friendly with women. The only problem is that they have a lot of roles to play hence they employ men to it.

Comment: The quality of the yenga presses should be improved to lessen constant breakdowns also taking into account gender sensitivity.

Comment: Health aspect is very critical especially from the blended vegetable oils which are associated with cholesterol levels in the human body. Looking at the negative effects of the damped poor quality oil, there is need to produce good quality oils.

Question: In view of the problems of sustainability coming up, how can the issue of a technology that is profitable and yet adoption is declining in most areas be tackled.  

Comment: Were the presses given at a subsidized price or actual price? Otherwise if it’s a grant then its not a sustainable development effort in the region.

Answer: The presses were a grant to the farmers in Monze area.

Comment: The programme lacked clear vision or had no deliberate move to create markets beyond the farmer capability.

Comment: The aim of the workshop is for stakeholders to come up with the way forward.

Comment: Purchased a press during the 1992/93 season, grew more sunflower, produced more oil and high profits realized. But in 1996, there was flooding of the local market by imported cooking oil, seed was also in short supply and also delivered late. Corridor disease also wiped off a good number of work oxen hence there was no source of drought power during the same year.
Comment: Commercial farmers purchase most of the sunflower crop from the farmers depriving the local press owners of the commodity. The price of the presses is very high and the spare parts are not available locally.

Comment: Commercial farmers able to buy in bulk wiping out all available stocks, spares problem hence start welding and reduce efficiency of the machine, yenga press very expensive therefore need to provide support in terms of hire purchase.

Comment: Farmers have been encouraged to form Associations to enable them purchase sunflower in bulk and assist each other in other related issues.

Comment: The promotion agents did not adequately inform the manufacturers when the project was winding up/phasing out hence the lack of information on the availability of spare parts.

Comment: Those who are complaining about spare parts should use good quality seed because from experience, the wear and tear is reduced.

Comment: Some presses are not well-designed thereby affecting efficiency.

Comment: Some farmers have gone to the extent of making their own yenga presses because of spare parts problems.

Comment: Availability of seed locally is a problem especially in the far flung rural areas. This poses a problem to the farmer who has to spend a lot of money on transport to travel to and from town where the seed is. This also applies to the Yenga press machines. The quality of Yenga presses manufactured in the recent years have been of poor quality.

Question: When it comes to training Blacksmiths in manufacturing spare parts, do they have the equipment to manufacture spare parts or does the training offer a package in terms of supply of equipment?

Answer: Africare basically identifies Blacksmiths that already have an idea on blacksmithing and improve on their knowledge. These are then supposed to be linked to a credit organization for possible acquisition of tools and machinery.

Comment: To ensure that there are proper linkages and sustainable, this can be done through the Network of Sustainable Agriculture Network to which some organisations in the province are members.

Comment: The current yenga press is all right only that the oil content in the cake is a little too high for livestock especially cattle. Motorised oil expellers can be targeted towards groups otherwise it’s too expensive for individual small-scale farmers.

Question: Are there activities running currently in each of the sub components under the FAO-IP Programme?

Answer: They are there e.g. the Local Foods programme, which has even been on radio.

Question: Are there enough pamphlets on the IP programme to go round the participants?

Answer: There is only 1 available, which will be photocopied.
Appendix III: Yenga Oilpress technology adoption study

Field Study Questionnaire

September 01

Section A: Identification Details

Questionnaire Serial Number [ ]

1. District ........................................
2. Block ...........................................
3. Camp ...........................................
4. Village: ...........................................
5. Distance to nearest town (KM) .................

Demographic Characteristics

6. Name of Household Head: ..............................................................

7. Age of Farmer: [ ]

8. Sex of farmer: 1. Male [ ] 2. Female [ ]


10. Name of the respondent (if different from the household head)

11. Date of interview: ..............................................................

Official Use only

Name of interviewer: ........................................
Interview checked by: ........................................
Language used by the respondent: ......................
Coded by: ...........................................................
Date coded: ...........................................................
Section B: Household Bio-Data

1. Size of the household

<table>
<thead>
<tr>
<th>Sex</th>
<th>Age group (Years)</th>
<th>0 - 5</th>
<th>6 - 16</th>
<th>&gt; 16</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Household member’s main contributions

- Adult males [ ]
- Adult females [ ]
- Children under 16 [ ]

1 = income  2 = labour  3 = labour & income  4 = In kind  5 = Nothing

3. Education level of the farmer [ ]

1 = Illiterate  2 = Primary  3 = Secondary  4 = Tertiary  5 = Adult literacy

4. Farming experience in years [ ]

5. What is the farmer’s most important source of income?

- Agriculture [ ]
- None agriculture [ ]

6. List your most important agriculture source of income [ ]

1 = sales of crop produce  2 = sales of livestock  3 = Aquaculture
4 = horticultural produce  5 = others (specify) ...........................................

7. List your most important non-agriculture source of income [ ]

1 = wage labour  2 = trading  3 = tailoring  4 = carpentry
5 = remittances from relatives  6 = donations/gifts  7 = slash fund
8 = others (specify) ..............................................
**Section C: Farmer resource ownership**

<table>
<thead>
<tr>
<th>Livestock</th>
<th>Number</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Food</td>
</tr>
<tr>
<td>Goats</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poultry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pigs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sheep</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cattle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Donkeys</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other assets</th>
<th>Yes</th>
<th>No</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bicycle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radio</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil expeller</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ox-Plough</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ox-cart</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ridger</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harrow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tractor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Section D: Farm resources**

1. Farm size ............ ha
2. Land under cultivation ..........ha
3. Type of land tenure .................
4. Main source of labour
   1. Family 2. Labour exchange for other goods 3. Hiring
5. When are the peak labour periods during the year (State period in months)
6. Do some household members work off-farm?
   1. Yes 2. No
7. If so, during what period? .................................................................
8. What was your production in the last four years?

<table>
<thead>
<tr>
<th>Crop</th>
<th>Production Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1998</td>
</tr>
<tr>
<td>Maize</td>
<td>Area (ha)</td>
</tr>
<tr>
<td></td>
<td>Yield (kg)</td>
</tr>
<tr>
<td>Groundnut</td>
<td>Area (ha)</td>
</tr>
<tr>
<td></td>
<td>Yield (kg)</td>
</tr>
<tr>
<td>Cotton</td>
<td>Area (ha)</td>
</tr>
<tr>
<td></td>
<td>Yield (kg)</td>
</tr>
<tr>
<td>Crop</td>
<td>Area (ha)</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td>Sunflower</td>
<td></td>
</tr>
</tbody>
</table>

NB. Note the change in sunflower production from the year the farmer acquired the yenga oilpress.

Section E: Crop utilization

1. List your most important staple food crops (at least 5) in order of importance? 

2. List your most important relishes (at least 5) in order of importance?

3. List your most important cash crops (at least 5) in order of importance?

4. In what form are the crops consumed?

<table>
<thead>
<tr>
<th>Crop</th>
<th>Use</th>
<th>Sold as grain</th>
<th>Processed</th>
<th>Barter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunflower</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. Have you ever heard of an oilpress called Yenga press?

1. Yes
2. No

6. If yes, where did you first learn about it?

1. Fellow farmer
2. NGO (specify)
3. MAFF
4. Other (specify)

7. Do you own one?

1. Yes
2. No

8. If no why?

9. If yes, how did you acquire it?

1. Bought
2. Purchased on credit
3. Inherited
4. Other

10. If you bought it on credit, which institution assisted you with the financial resources/credit?

11. What was the source of the yenga oilpress?

12. When did you acquire it?

13. If yes, are you currently using it?

1. Yes
2. No

14. If no, why have you stopped using it?

15. Did/do you attend any training courses on the Yenga oilpress and the use of its products?

1. Yes
2. No
16. If Yes, who organizations these trainings? ……………………………

17. If No, why didn’t you attend the training courses? ………………………

18. Source of labour to operate the yenga oilpress?
   1. Family  2. Hired

19. If hired labour what is the mode of payment?
   1. Cash  2. Oil  3. Other (specify) ……………………………

20. How has the local community benefited from the yenga oilpress?

21. Which time (Months) of the year is the yenga oilpress most busy? ……………………………

22. What was the purpose of buying the Yenga oilpress?
   1. Income  2. Seed cake for livestock  3. Cooking oil

23. What do you use the oil extracted for?

24. What do you use the sunflower cake for?
   1. livestock feed  2. income  3. nothing  4. Other (specify) ……………………………

25. Which sunflower variety are you using for oil extraction and why?

26. Why this variety and not any other? …………………………………………

27. Do you experience problems in securing sunflower seed?
   1. Yes  2. No

28. If yes, what kind of problems? …………………………………………………

29. Has sunflower production among yenga oilpress owners increased or reduced of late? 
   (explain) …………………………………

30. Which other oil seeds do you crush using the yenga oilpress?

31. What key constraints/problems did/do you face with the use of the yenga oilpress?

32. What should be done to overcome these problems? ………………………………

Section F: Income generation

1. How do you compare the profitability of other income sources with the yenga oilpress? 
   (explain) ………………………………………………………………

2. What assets have you bought from the yenga oilpress business?

3. Who controls the resources realized from the sales of oil and cake?
   1. husband  2. Wife  3. club  4. Family  5. Other (specify)
4. How do you value sunflower against its products in monetary terms (ZK)

<table>
<thead>
<tr>
<th>Per 50kg bag:</th>
<th>Monetary value (ZK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunflower (grain)/50kg</td>
<td></td>
</tr>
</tbody>
</table>

**Sunflower products:**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil/50kg bag</td>
<td></td>
</tr>
<tr>
<td>Cake/50kg bag</td>
<td></td>
</tr>
</tbody>
</table>

5. How many 50kg bags of sunflower are you able to crush per day during the busy months?

6. Where do you buy the spare parts for your yenga oilpress?

7. Who repairs/maintains the yenga oilpress for you? ..........................................

8. Which parts require frequent replacement? .........................................................

9. How often do you replace the parts? .................................................................

10. What is the usual mode of payment for repairing? ..........................................

11. Have you been trained on simple maintenance of the yenga oilpress?
    1. yes  2. no

12. If yes, who trained you? ....................................................................................

   13. If no, why were you not trained ........................................................................

**Section G: Nutrition**

1. Were you consuming cooking oil in your home before purchasing the yenga oilpress?  1. yes  2. No

2. If yes, how many bottles were you consuming on average per months? ............... 

3. How often do you use cooking oil now after acquiring the yenga oilpress? (in terms of number of bottles/month).
   1. Very often (so long sunflower is available) 2. rarely (because oil is meant for sell)

4. Do you think the nutritional status has improved since you acquired the yenga oilpress? (explain). .................................................................

5. Do you buy sunflower from other farmers for oil extraction? 1. Yes 2. No

**Section H: Utilisation of sunflower cake**

1. Where do you sell the cake?

2. Is it on high demand? (explain) ..............................................................

3. Do you feed your livestock with sunflower cake? 1. Yes 2. No
4. If yes, what benefits do you get? 1. Supplements other feed sources 2. It serves on expenditure 3. Other (specify)

5. If no, explain why?

6. Have you been trained on how to formulate livestock feed using sunflower cake as one of the ingredients? 1. yes 2. no

7. If yes, who trained you?

Section I: Marketing

1. Where do you sell your cooking oil?

2. At what price/750ml bottle?

3. How do you determine the price for your cooking oil and sunflower cake?

4. How many bottles of cooking oil are you able to sell in a week on average?

5. What do you suggest should be done to improve the adoption of the yenga oil press/continued use of the oil press?

6. Are you affiliated to any organization/association which is promoting the use of the yenga oil press? 1. yes 2. no

7. If yes, what is the name of the association/club/organization?

8. Membership (i.e. number of members in the club)


7. What benefits are you getting by being affiliated to this club?

8. Are there any problems with affiliating to this club?
### Appendix IV Yenga oilpress stakeholders workshop - List Of Participants

<table>
<thead>
<tr>
<th>Name</th>
<th>Designation</th>
<th>Organisation</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Edward Hantuba</td>
<td>Asst. Photographer</td>
<td>MAFF</td>
<td>Box 42, Choma</td>
</tr>
<tr>
<td>2. Masauso Lungu</td>
<td>Program Producer/TV</td>
<td>MAFF/NAIS</td>
<td>Box 42, Choma</td>
</tr>
<tr>
<td>3. M. M. Malambo</td>
<td>DACO</td>
<td>MAFF</td>
<td>Box 30, Kalomo</td>
</tr>
<tr>
<td>4. M. Mwiinga</td>
<td>SAIO</td>
<td>NAIS-MAFF</td>
<td>Box 42, Choma</td>
</tr>
<tr>
<td>5. Samson Muyembe</td>
<td>District Coordinator</td>
<td>ZNFU</td>
<td>Box 03, Choma</td>
</tr>
<tr>
<td>6. Stanley Kaunzwe</td>
<td>Devt. Facilitator</td>
<td>WVI- Siachitema</td>
<td>Box 784, Choma</td>
</tr>
<tr>
<td>7. Margaret Mwenya</td>
<td>Prov. Coord. FSP</td>
<td>PAM</td>
<td>Box 418, Choma</td>
</tr>
<tr>
<td>8. Aggie Z. Munsaka</td>
<td>Admin Assistant</td>
<td>WVI Twachiyanda</td>
<td>Box 68, Choma</td>
</tr>
<tr>
<td>9. Dominic Hamuwele</td>
<td>Teacher/Farmer</td>
<td>Batoka Co-operative</td>
<td>Box 401, Choma</td>
</tr>
<tr>
<td>10. Highland Hamududu</td>
<td>Seed Coordinator</td>
<td>CONASA Project</td>
<td>Box 292, Kalomo</td>
</tr>
<tr>
<td>11. Mbangu Ndumba</td>
<td>S.A.S</td>
<td>MAFF/RESEARCH</td>
<td>Box 90, Choma</td>
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<tr>
<td>12. Dr. L. Munsimbwe</td>
<td>A/PACO</td>
<td>MAFF</td>
<td>Box 42, Choma</td>
</tr>
<tr>
<td>13. A. Mwalusaka</td>
<td>PM-SPHFSP</td>
<td>MAFF</td>
<td>Box 42, Choma</td>
</tr>
<tr>
<td>14. G. Chooye</td>
<td>P.A.S</td>
<td>MAFF</td>
<td>Box 30, Kalomo</td>
</tr>
<tr>
<td>15. A. Songiso</td>
<td>Agricultural Specialist</td>
<td>MAFF</td>
<td>Box 06, Monze</td>
</tr>
<tr>
<td>16. M. Mapepula</td>
<td>SARO/CDF-DO</td>
<td>MAFF</td>
<td>Box 42, Choma</td>
</tr>
<tr>
<td>17. Nawale E. M.</td>
<td>Agronomist</td>
<td>MAFF/RESEARCH</td>
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</tr>
<tr>
<td>18. Hamusimbi C.</td>
<td>Agricultural Researcher</td>
<td>FASAZ</td>
<td>P/Bag 7, Chilanga</td>
</tr>
<tr>
<td>19. Hamazakaza P.</td>
<td>Agronomist</td>
<td>FSRT</td>
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<tr>
<td>20. P. H. Sohati</td>
<td>SARO-Food Legumes</td>
<td>MAFF/RESEARCH</td>
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<tr>
<td>21. Chilimboyi K.</td>
<td>S.A.S</td>
<td>FSRT</td>
<td>Box 90, Choma</td>
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<tr>
<td>22. S. Siajunza</td>
<td>Field Coordinator</td>
<td>Africare- Samep</td>
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<tr>
<td>23. C. P. Kapunda</td>
<td>FSRT Economist</td>
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<tr>
<td>24. O. Hangandu</td>
<td>Farmer</td>
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<tr>
<td>25. T. B. Malik</td>
<td>Farmer</td>
<td>Box 539, Mazbuka</td>
<td>Box 207, Choma</td>
</tr>
<tr>
<td>26. Noah Kadimba</td>
<td>Field Manager</td>
<td>Africare</td>
<td>Box 207, Choma</td>
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<tr>
<td>27. Isaac Sakala</td>
<td>Project Coordinator</td>
<td>Africare</td>
<td>Box 921, Lusaka</td>
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<tr>
<td>28. Nyambe Luhila</td>
<td>Project Officer</td>
<td>Kaluli Devt. Foundation</td>
<td>Box 4 Sinazongwe</td>
</tr>
<tr>
<td>29. Emmanuel Kasekwa</td>
<td>Technical Officer</td>
<td>MAFF-TSB</td>
<td>Box 118, Mazabuka</td>
</tr>
<tr>
<td>30. Jonathan Mwewa</td>
<td>Asst. D/Coordinator</td>
<td>CLUSA</td>
<td>Box 276, Monze</td>
</tr>
<tr>
<td>31. M. C. Sikanyenyene</td>
<td>Farmer</td>
<td>Zibotakwabana Co-op</td>
<td>Box 79, Kalomo</td>
</tr>
<tr>
<td>32. N. Mukanda</td>
<td>CARO</td>
<td>SCRB/Mt. Makulu</td>
<td>P/Bag 7, Chilanga</td>
</tr>
<tr>
<td>33. B. Mweete</td>
<td>Farmer</td>
<td>SAMS</td>
<td>Lusaka</td>
</tr>
<tr>
<td>34. Willard Mutinta</td>
<td>Manufacturer</td>
<td>SAMS</td>
<td>Box 220, Monze</td>
</tr>
<tr>
<td>35. Stanley Milimo</td>
<td>Farmer</td>
<td>Box 220, Monze</td>
<td>Box 220, Monze</td>
</tr>
<tr>
<td>36. V. Phiri</td>
<td>Businessman</td>
<td>VEFLO Ent/SASWAZ</td>
<td>Box 34, Kalomo</td>
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<tr>
<td>37. Steve Harris</td>
<td>Technoserve</td>
<td>CONASA</td>
<td>Box 292, Kalomo</td>
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</tbody>
</table>