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MALAWI AGROFORESTRY

WASHINGTON STATE UNIVERSITY

Proceedings
Wrap-Up Workshop/Seminar

MALAWI AGROFORESTRY EXTENSION PROJECT 1992-2002

Achievements, Lessons Learned and Recommendations

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Thanks very much from all "the MAFE Team".

LIST OF MAFE ACRONYMS AND ABBREVIATIONS

ADD	Agricultural Development Division
AF	Agroforestry
ASAP	Agricultural Sector Assistance Program (USAID)
ASNAPP	Agribusiness in Sustainable Natural African Plant Products
ARET	Agricultural Research & Extension Trust (parastatal)
BERDO	Bwanje Environmental Rural Development Organization
BCA	Bunda College of Agriculture
CBM&E	Community-Based Monitoring & Evaluation
CBO	Community-Based Organization
CCCD	Chancellor College Chemistry Department
COMPASS	Community Partnerships for Sustainable Resource Management in Malawi
CPAR	Canadian Physicians for Aid & Relief
CSIR	Center for Scientific & Industrial Research
CSC	Christian Services Committee
CU	Concern Universal
CURE	Coordinating Unit for the Rehabilitation of the Environment
DARTS	Department of Agriculture Research & Technical Services (MAI)
DAET	Department of Agricultural Extension & Training (MAI)
DOI	Department of Irrigation
DPO	District Planning Officer
DSI	Dispersed Systematic Interplanting
EDO	Environmental District Officer
EDETA	Enterprise Development & Training Agency
EU	European Union
FD	Forestry Department (MFF&EA)
FRIM	Forestry Research Institute of Malawi (MFF&EA)
GIS	Geographic Information Systems
GOM	Government of Malawi
GPS	Global Positioning System
ICRAF	International Center for Research in Agroforestry
IEF	International Eye Foundation
IFR	Institute for Food Research
LFRA	Leatherhead Food Research Association
LMC	Lutheran Mobile Clinics
LRCD	Land Resources and Conservation Department (MAI)
MAI	Ministry of Agriculture & Irrigation
MBS	Malawi Bureau of Standards
MCCG	Mvera Catholic Church Group
M&E	Monitoring and Evaluation
MAFEP	Malawi Agroforestry Extension Project
MFF&EA	Ministry of Forestry, Fisheries & Environmental Affairs
MIRTDC	Malawi Industrial Research & Technology Development Center
MPT	Multi-purpose Trees
NASC	National Agroforestry Steering Committee (MFF&EA/MAI)
NASFAM	National Smallholder Farmers Association of Malawi
NATURE	Natural Resource Management and Environmental Support Program (USAID)
NGO	Non-Governmental Organization
NTSC	National Tree Seed Center (FRIM)
PA	Project Assistance
PROSCARP	Promotion of Soil Conservation & Rural Production (formerly PAPPPA)
PVO	Private Voluntary Organization
RC	Resource Center
RT	Reduced Tillage
SC	Soil Conservation
SCRI	Scottish Crops Research Institute
SHDI	Self Help Development International
SO	Strategic Objective

SSI	Small-Sale Irrigation
TEAM	Tobacco Exporters Association of Malawi
UNIMA	University of Malawi
USAID	United States Agency for International Development
WSM	Wildlife Society of Malawi
WSU	Washington State University

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MALAWI AGROFORESTRY EXTENSION PROJECT (MAFE)
Achievements, Lessons Learned, Recommendations
Wrap-up Workshop/Seminar
June 17-19 and 27, 2002

INTRODUCTION AND EXECUTIVE SUMMARY

The Malawi Agroforestry Extension Project (MAFE) has been successfully implemented by a ten (10) year collaborative effort to increase adoption of agroforestry, soil conservation and small-scale irrigation practices by smallholder farmers that support and sustain agricultural productivity. Results and indicators of success are given in these Proceedings and include the identification, testing, and extension of "best-bet" technologies and practices. This has resulted in extensive adoption and use of these technologies and practices by a large and ever-increasing number of smallholders and communities covering thousands of hectares. Participating farm families and rural communities have significantly improved their incomes and food security. Benefit-cost analysis has shown significant current and potential future economic returns to investment. The enthusiastic adoption and use of the technologies by thousands of small holders and communities are further indications of the relevance and utility of the approach and technologies. The successes, described in more detail below, are the results of individual and collaborative efforts of many individuals and organizations that have worked in partnership to assist Malawi's smallholders. The development, testing and validation of this partnership approach (the Results-Based Partnership Model) are also important outcomes of the MAFE that are a further indicator of success with broader potential application in Malawi beyond MAFE and in other countries.

All 77 of the partners as well as the multiple donors have contributed in positive ways to the successes that have been collectively achieved in Malawi. These partners' many and varied experiences have provided lessons learned given in the following that can be applied to future efforts to enhance smallholder agricultural development and sustainability in Malawi. MAFE has demonstrated a viable, cost-effective approach to increase food security, generate income, and improve the quality of life of farm families and communities, while maintaining and improving the natural resource base.

Based upon 10 years of implementation, MAFE planned and carried out a Final Partner Meeting and a Wrap-up Workshop/Seminar as opportunities for the partners to identify achievements, share lessons learned, and develop recommendations for the future. Additional details about the workshop/seminar activities, lessons learned and recommendations for the future are summarized in the following Proceedings.

MAFE PURPOSE AND OBJECTIVES

The MAFE is a Cooperative Grant Agreement between the Unites States Agency for International Development (USAID) and Washington State University (WSU) under the Land Resources Conservation Department (LRCD) in the Ministry of Agriculture and Irrigation (MAI), Government of Malawi. The purpose of MAFE was to improve the management and conservation of natural resources with sustainable increases in smallholder production. To

achieve this purpose, MAFE focused on the following specific objectives in order to increase the adoption of agroforestry, soil conservation, and small-scale irrigation practices:

- Decrease soil erosion and runoff;
- Improve soil fertility and crop yields;
- Increase wood supplies for basic energy and building needs; and
- Increase farm incomes and food security.

In order to achieve the purpose and objectives, MAFE targeted the expansion, strengthening, and demand-driven delivery of agroforestry (AF), soil conservation (SC) and small-scale irrigation (SSI) extension services to farmers and farm communities through collaborative partnerships with government-affiliated agencies, non-governmental organizations (NGOs), and the private sector. The approach utilized a results-based partnership model depicted in *Figure 1*. (Note that all figures are included in a separate section that directly follows the text of these Proceedings).

ORGANIZATION AND CONDUCT OF THE FINAL PARTNER MEETING AND THE WRAP-UP WORKSHOP/SEMINAR

The Final Partner Meeting and the MAFE Wrap-up Workshop/Seminar were planned and carried out as two (2) separate, but highly integrated activities. These are summarized as follows.

Final Partner Meeting: Assessment of Partnerships and Their Past and Future Role (June 17-19, 2002)

This Final Partner Meeting, held on June17-19, 2002, was attended by thirty-two (32) of the MAFE partners. The objectives of the meeting were to document the last season's results and experiences and to assess and make recommendations on the MAFE partnership model. Outcomes of the workshop were incorporated into the final MAFE results and the powerpoint presentation in the Wrap-Up session.

For the partnership assessment, each partner representative was asked to complete a questionnaire indicating the organization's activities and their location and duration; an assessment of the utility of services provided by MAFE; and future needs for services. The results of the questionnaire are summarized in a later section of these Proceedings.

The partner representatives were then divided into small groups and were asked to prioritize MAFE partnership activities that had been most important for Malawi smallholders and to identify potential partners services/activities that will likely be most important in the future (*Attachment I*). They were also asked to identify and prioritize factors or characteristics of the partnerships that had influenced MAFE successes and impacts, including factors that contributed in a positive way to partnership successes and factors that constrained or detracted from them. The participants were also asked to make recommendations for needed support services and technical assistance in the future.

The completed questionnaires were examined and the results analyzed. In addition, the discussions and points identified by the partner representatives were recorded on flip charts and presented to the plenary group and further examined and discussed. The results were summarized for presentation in the Wrap-up Workshop/Seminar and are included in the following sections.

MAFE Wrap-up Workshop/Seminar (June 27, 2002)

The MAFE Project Wrap-up Workshop/Seminar, held on June 27, 2002 at the Malawi Institute of Management, was a day-long series of presentations and discussions of MAFE's results and successes, examination of the needs for support services beyond MAFE, key lessons learned, and recommendations for the future. *Attachment I I* outlines the agenda and schedule of topics addressed. Discussion, questions and responses followed each of the topics in the program.

The workshop/seminar was attended by 44 representatives from 29 partner institutions, NGOs, government, universities, and the press (see *Attachment III*). Following each of the presentations, there were questions, discussions and exchanges of ideas and information. The enthusiastic participation by those in attendance indicated the great depth of interest and need and the validity of the MAFE approach and results. The morning sessions (*Attachment II*) were chaired by Mr. N. J. Mulenga, Director of the Land Resources Conservation Department, Ministry of Agriculture and Irrigation. The afternoon session was chaired by Dr. James B. Henson, International Programs, Washington State University.

Introductions and Official Opening

Dr. W. Trent Bunderson, who provided leadership from WSU for the MAFE project throughout its 10-year lifespan, welcomed the participants on behalf of the MAFE project. He provided a brief overview of the Workshop agenda and its participatory format. Dr. Bunderson and Mr. Zwide Jere, MAFE Project Manager, then presided over the introduction of the MAFE team, the participants representing MAFE partners and the officials representing MAFE's major supporters.

The workshop was officially opened by representatives of the Land Resources Conservation Department (Ministry of Agriculture and Irrigation), US Agency for International Development, and Washington State University. The keynote address for the official opening was delivered by Dr. Ellard Malindi, Principal Secretary and Chief Technical Advisor to the Minister of Agriculture and Irrigation.

Mr. N. J. Mulenga, Director of the LRCD, MAI, welcomed the group on behalf of his department and the MAI. He indicated he had been involved in MAFE and had seen it progress from an idea based upon a previous six year project (the Malawi Agroforestry Research and Extension Project [MARE]), also funded by USAID to its current successes and impacts. Mr. Mulenga indicated a large number of people in his department and the Ministry had contributed much to MAFE's success. In addition, a number of the partners were units within LRCD and MAI. He thanked all for their many contributions.

Dr. Jan Noel, Director of Development Cooperation, International Programs at Washington State University, welcomed the attendees on behalf of Washington State University. She read a letter addressed to the Principal Secretary, Ministry of Agriculture and Irrigation from Vice Provost Douglas Baker of Washington State University. Dr. Baker congratulated the Principal Secretary on the successful conclusion of the project and on the approach. He further indicated WSU's commitment to continuing working with partners and government in Malawi building upon the 16 years of working together. The development, extension, and adoption of technologies and the

strengthened human and institutional capacities were emphasized by Dr. Baker (see *Attachment IV*).

Dr. Lawrence Rubey, Chief, Agriculture and Natural Resources, USAID/Malawi, welcomed the group on behalf of USAID. Dr. Rubey indicated MAFE had been quite successful and reflected a long-term commitment to Malawi by USAID and the US government. Dr. Rubey further indicated the foundation had been established upon which further successes could be built. He again indicated USAID Malawi's commitment to assist the Government of Malawi and its citizens to achieve greater economic growth, food security, and conservation of natural resources. Dr. Rubey thanked all those that have made the MAFE project a success, including the GOM, the LRCD, WSU, and the many partners.

Mr. Mulenga then introduced the keynote speaker, Dr. Ellard Malindi, Principal Secretary and Chief Technical Advisor, Ministry of Agriculture and Irrigation. Dr. Malindi welcomed the attendees and extended thanks to all those that had made the project possible. He indicated he, his wife and children had been to WSU arriving in a cold winter in clothes suited to Malawi. He further indicated he and his family had a good experience at WSU and elsewhere they studied in the US.

Dr. Malindi indicated that MAFE had contributed significantly to Malawi. He emphasized that Malawi's economy depends upon agriculture and the country has experienced a ten-fold increase in population from 1911 to today for a total of 11 million. About 65% of the households are classified as resource poor with holdings of less than 1.0 hectare and, of these, 40% are farming less than 0.5 hectare. The aim of MAFE to improve natural resource management with sustained improvement in smallholder productivity has been successful. Dr. Malindi indicated the project's first phase from 1992-96 focused on evaluating and adapting prototype agroforestry and soil conservation practices with farmers under different ecological conditions. The second phase, from 1997-2002, switched the emphasis to a partnership paradigm with government, NGOs, donors, and the private sector to aggressively expand outreach efforts for fast track results. He further indicated the Department of Land Resources Conservation has had far-reaching impacts because of the MAFE project's broad-based partnerships in addressing problems in soil and water degradation and soil fertility.

Dr. Malindi finalized his presentation indicating the MAFE project with funding from USAID has assisted the Ministry of Agriculture and Irrigation in providing leadership in agroforestry and soil conservation nationwide. It has contributed significantly to improving the natural resource base and increasing food security and rural incomes. This is greatly appreciated by Government, he said. Soil fertility and agroforestry have always been identified as Government priorities. At present, a national strategy for sustaining soil fertility and management and improving food security is being formulated. Issues of soil conservation and agroforestry will be emphasized in this draft document. Government is now in the process of developing a proposal for scaling up agroforestry in the country.

Dr. Malindi thanked the MAFE staff for the cordial working relationship that has been evident. He thanked WSU, Trent Bunderson, Jan Noel, and others as well as USAID for having funded the MAFE project.

TECHNICAL PROGRAM

The MAFE team presented a summary of the project's technical programs, results, associated lesson learned and recommendations as outlined in *Attachment II.* Active discussion and question/response sessions followed each presentation topic, with MAFE staff and partners serving as respondents and as resource persons.

On-farm Technology Development and Testing

Dr. Bunderson prefaced the technical presentations with a review of MAFE's goal, objectives and partnership approach, as previously indicated in *Figure 1.*

The specific objectives for MAFE's on-farm technology development and testing program were to test and adapt prototype practices with farmers to produce recommendations for best-bet practices that meet farmers' needs, and to develop strategies for broad-based adoption and impact of the technologies. Dr. Trent Bunderson summarized a number of technologies that were screened and tested for adoption. The common factors evaluated included, among others, propagation by species, species performance in different agro-ecologies, farmer preferences, and others given in *Figure 2.* Technologies evaluated for soil and water conservation are given in *Figure 3.* Agroforestry technologies evaluated for soil fertility improvement are given in *Figure 4* and for wood, fiber and other uses are given in *Figure 5.*

A small-scale irrigation (SSI) initiative was recently begun by MAFE to expand the technology portfolio into treadle pump irrigation. This was a consumer-driven initiative to meet extension needs in the face of high farmer demand, the absence of extension and training materials, the need to reduce degradation in high risk dimba areas, and complementarity between improved food security, increased income and conservation (*Figure 6*). Various technologies and methodologies were examined for the use and impact of treadle pump, small-scale irrigation as given in *Figure 7.*

Some of the MAFE technologies evaluated, even though they were technically sound, had limited adoption potential for a variety of reasons. This emphasized the need to involve farmers in technology testing for potential adoption and use. Some of these technologies with low adoption potentials are given in *Figure 8* and include contour hedges with napier grass, green manure banks, and alley cropping/hedgerow intercropping, among others. All of the technologies tested were technically sound, but farmer adoption was low for a variety of reasons including labor requirements, the narrow window for management operations, decreased holding and land availability, and others (*Figure 9*). Dr. Bunderson presented illustrations in Malawi of technologies that had proven to have low adoption and identified the associated reasons. Examples included tephrosia alley cropping, gliricida fodder/green manure banks, crotalaria undersowing, and crotalaria improved fallow.

Results on Propagation and Nursery Management

Mr. Zwide Jere, MAFE Project Manager, presented this portion of the program with illustrations of village tree nursery establishment and operation. Mr. Jere presented a number of issues and problems that have been identified for the establishment and successful operation of village tree nurseries and vetiver nurseries. Recommendations for overcoming these problems to assist in

successful establishment and operation of tree nurseries were presented (*Figure 10*). One example of successful technology is air pruning of msangu (*Faidherbia albida*), which greatly increases seedling viability. Issues/problems and key recommendations for overcoming them for the establishment of successful vetiver nurseries are given in *Figure 11*.

Technologies with High Adoption Potential: Best-Bet Practices

Dr. Ian Hayes, MAFE Agricultural Economist, presented "best-bet" practices for soil and water conservation, agroforestry and small-scale irrigation (*Figure 12*). He also provided information about best-bet contour vetiver hedge conservation (*Figure 13*), dispersed systematic interplanting (DSI) (*Figure 14*), undersowing (*Figure 15*), and homestead/woodlot/boundary planting (*Figure 16*). In addition, he also had illustrations of these practices on farmers' fields that demonstrated domestic improvement in maize yields with dispersed systematic interplanting of *F. albida*, undersowing with *T. vogelli* and homestead and boundary planting with various species.

Dr. Hayes also presented data comparing the various technologies for best-bet agroforestry maize yields and showing the gross margins from best-bet agroforestry technologies. In terms of the maize yields, hybrid maize with the currently recommended level of chemical fertilizers yielded approximately 3,450 kilos/ha of maize. Hybrid maize with dispersed systematic interplanting of *F. albida* and no chemical fertilizer produced 4,200 kilos per hectare when the trees were fully established (year 20). These can be compared to hybrid maize with an annual undersowing of *T. vogelii* plus a small amount of fertilizer yielding approximately 4,500 kilos/ha from year 2 on. (The recommended fertilizer rate without undersowing is 380 kg/ha, which yields about 3,500 kg of maize). Hybrid maize with annual undersowing of *T. vogelii* and no fertilizer (year 2) yielded 1,720 kilos/ha, while hybrid maize with no fertilizer or undersowing yielded 1,400 kilos/ha. Local maize with DSI *F. albidi* yielded approximately 2,100 kilos/ha. Thus, the use of best-bet agroforestry technologies for hybrid maize production can result in greater yields than with normally recommended levels of chemical fertilizer alone. Also, yields of local maize with DSI in year 20 considerably exceeded yields of hybrid maize without fertilizer or AF technologies. Additional details are given in *Figure 17*.

Additional studies and results have demonstrated the impact of best-bet agroforestry technologies on gross margins (*Figure 18*). Hybrid maize with DSI *F. albidi* when the trees were well established (year 20) had a gross margin of over 37,000 MK/ha. This can be compared to hybrid maize undersown with *T. vogelii* plus 130 kg of fertilizer in year 2 had a gross margin of over 33,000 MK/ha. Hybrid maize with the recommended level of chemical fertilizer had a gross margin of 18,000 MK/ha. Local maize with DSI *F. albidi* (year 20) had a gross margin of 14,000 MK/ha.

Thus, the best-bet agroforestry technologies and practices have been shown to significantly enhance both yields and incomes (gross margins) for farmers. This demonstrates the primary reasons for the enthusiastic adoption of agroforestry technologies by smallholders.

The introduction of treadle pump irrigation has also been enthusiastically embraced by smallholders and communities. The treadle pump developed in India, had been available for a number of years in Malawi, with limited utilization by farmers. The primary constraints were the cost of the pump and lack of extension information and training in the use of the pumps and application of water to maximize production. In order to overcome the cost, a credit-based

extension approach was developed and utilized, providing loans to farmers or groups of farmers to enable them to buy and use treadle pump irrigation utilizing several financing schemes indicated in *Figure 19*. This indicates that the pumps with spare parts and other requirements can be purchased at a one-time cash price, a six-month credit price or a 12-month credit price. When loans to individuals or groups of farmers have been repaid, the funds are loaned to other individual farmers or groups, thereby recycling the available funds.

In addition to loans for the purchase of pumps, MAFE and its partners developed extension materials, provided training, and transferred information to farmers, extension agents and partner staffs. The training/extension materials demonstrate the development of water sources, the methods for basin-plot layout for gravity fed irrigation utilizing the pumps to raise the water to the basins, improved nursery techniques to start high value crops such as lettuce and green maize, and improved composting methods using the Chinese approach. Dr. Hayes demonstrated the use of the treadle pump and the methodologies provided in the extension materials for irrigating drum-head cabbage, green maize, and Chinese lettuce. All of these crops as well as others have performed extremely well for smallholder farmers, utilizing the methodologies and technologies tested and extended with MAFE assistance. Dr. Hayes indicated the average return for smallholders for irrigated cabbage was 52,000 MK/ha, and for irrigated green maize the return was extremely high at 140,000 MK/ha (*Figure 20*). It was pointed out that these are specialty, high value crops that all smallholders would not be able to produce. However, the treadle pump irrigation technologies have been shown by MAFE to be extremely successful in Malawi with a high return on investment. Typically farmers or groups of farmers purchasing the treadle pumps have been able to pay for the pumps during or after the first year of utilization.

In summary, best bet agroforestry, soil conservation and small scale irrigation practices have been identified, transferred and adopted with enhanced financial return and food security, as well as improved conservation of soil and water. Farmer incomes and food security have been improved.

Partner Support Services

MAFE through its partnership arrangements provided a number of services for partners. MAFE Resource Center Coordinator Dr. Henry S.K. Phombeya described these demand-driven services (*Figure 21*) that included training, production of extension materials, development and adaptation of suitable technologies, access to key inputs (e.g. germplasm, polytubes, line-levels) and others. A total of 77 partnerships were established and utilized during the life of the project. The total numbers are given by year from 1997-2002 in *Figure 22*. The type of partners including government (agencies and institutions such as public universities); other projects funded from a variety of sources; NGOs; Community-based Organizations (CBOs); and private sector (*Figure 22*). MAFE produced and provided a variety of training and extension materials of different types and in different languages for trainers and extension agents and for farmers and communities. These are summarized in *Figure 23*. *Figure 24* indicates the distribution to date of these materials to governmental institutions and projects and those to NGOs/CBOs/private sector. Training conducted since 1997 indicates that 1,018 trainers and 919 field staff and 885 farmers were trained (*Figure 25*).

In addition, MAFE developed a Community-Based Monitoring and Evaluation (CBM&E) system that the project successfully adapted and utilized in the field under a variety of partner

and farmer conditions. The types of M&E systems, results and future needs for M&E are summarized given in *Figure 26*. Large amounts of tree seed of various species, *Faidherbia albida* (msangu) seed, tephrosia seed, polytubes, and line levels were provided to government institutions/projects and to NGOs/CBOs/private sector (*Figure 27*).

Farmer Adoption: Partner Field Results to Date

Based on information developed by MAFE and results reported by partners, Mr. Zwide Jere reported on the adoption of technologies by smallholders. These included the establishment of vetiver nurseries that showed a significant increase from 1996 to 1999 at which time there were approximately 265 vetiver nurseries established. The number decreased slightly due to lack of polytubes and other materials, but again increased so there are approximately 270 vetiver nurseries in 2002 (*Figure 28*). The adoption of contour vetiver hedges, undersowing with tephrosia, the planting of soil improving trees, and the planting of trees for wood/fuel has shown dramatic increases from 1996 to present. In 1996 there was practically no use of these species and technologies, while in 2002 there are 80,000 farm families utilizing vetiver hedges on 21,000 hectares (*Figure 29*). For the undersowing of tephrosia, 28,000 farm families utilize these technologies on approximately 7,000 hectares (*Figure 30*). Soil improving trees were planted by 123,000 farm families involving 36,000 hectares while trees for fuelwood were planted by 390,000 farm families on 20,000 hectares, with adoption trends illustrated in *Figures 31* and *32*.

The ultimate test of MAFE and partner success is the adoption of the technologies by smallholders. Most development efforts focus on developing and testing improved technologies and practices and/or on extension delivery systems, without accepting the responsibility to monitor their final adoption and use. The above information given in *Figures 28-32* clearly indicates significant farmer adoption of various technologies and demonstrates the success of the partnership paradigm utilized by MAFE.

Production and Marketing of Natural Plant Products

MAFE activities for the production and marketing of natural plant products was presented by Mr. John Pratt, MAFE Natural Plant Products Marketing Specialist. MAFE began these activities in late 2000 as a set of pilot activities to identify potential production and marketing opportunities for existing and new natural resource-based plant products to generate income and to enhance adoption of natural resource management practices. Criteria were developed for screening potential candidate products (*Figure 33*) with the primary species identified with high potential being: Marula (*Sclerocarya birrea*); Moringa (*Moringa oleifera*); Natal Mahogany (*Trichilia emetica*); Neem (*Azadirachta indica*); Tephrosia (*Tephrosia vogelii*); African Star-Chestnut (*Sterculia africana*); Jatropha (*Jatropha curcas*); and Manketti (*Schinziophyton rautanenii*) (*Figure 34*). Over 170 subsistence, commercial and natural resource uses were identified from these species,

A number of research and development partnerships have contributed to the natural products activities. In Malawi, these include the Enterprise Development and Training Agency (EDETA), Khumbo Oil Refinery, Chancellor College Chemistry Department, and Bunda College Engineering Department of the University of Malawi, among others. Their roles are illustrated in *Figure 35*. MAFE has also collaborated with partners in the Southern Africa region, U.S., and Europe engaged in natural products research and development.

Investigations on potential markets, determinations of the physical and chemical characteristics of the potential products and opportunities to replace and/or compete with other products in commercial use were carried out. Research activities were also conducted to develop or improve efficiencies for mechanical extraction systems for various oils. The results of these preliminary investigations are summarized in *Figures 36 –37.* Examples of potential product uses were oils for skin care, polishes, lubricants, edible oils, pesticides, medical uses, and subsistence food products. Under current conditions in Malawi, the most promising appear to be marula and moringa oil for export and moringa oil for use in the cosmetic trade. Moringa also has vegetable and food, medicinal, and potential water treatment uses. Other oils have demonstrated some commercial potential as well.

The investigations are at an early stage and should be continued. Recommendations for follow-up have been developed, based on the results of these preliminary investigations. These are summarized in *Figures 38* and *39*. Partners with potential interest and capabilities in participating in future activities are illustrated in *Figure 40.*

In summary, the MAFE activities have demonstrated potential for the production, marketing and use of natural plant products as a component of development strategies for economic growth, food security and improved natural resource management in Malawi. Coupled with other ongoing natural products activities in the Southern Africa region, further investment in natural products research and development can expand the economic and nutritional potentials of tree and natural plant products and promote adoption of improved natural resource management practices.

MAFE Partnership Paradigm: How Successful?

In order to assess the success of the MAFE paradigm and the partnerships as well as develop recommendations for the future, a Final Partner Meeting was held on June 17-19, 2002 with attendance by 32 partners. Included in the day-long activities was the completion of a questionnaire that addressed the MAFE services provided, utility of the technologies and services, and their impacts. In addition, the participants were asked to identify factors that influenced partnership successes and failures and to make recommendations for the future.

The MAFE partnership paradigm is illustrated in *Figure 1.* It is results-based, demand-driven and end-user oriented, supported by sound research and technical support, and involves a diverse and flexible set of partners. Dr. Jan Noel presented the information and defined partners and partnerships in the MAFE context as sharing a common goal and sharing benefits and risks in working toward its achievement. The diversity of MAFE partners is illustrated in *Figure 41.* The partner relationships were dynamic with 77 partners involved during the MAFE project lifetime. Different partners provided different services, with partners entering and exiting partnerships with MAFE based upon their own needs and circumstances. MAFE services utilized and available evolved based upon partner demand. Changes in personnel, strategy, and internal and external circumstances changed the relationships over time.

Results of the partner assessment questionnaire were summarized. The 32 partner respondents indicated that all of them (100%) have ongoing partner activities with MAFE; 91% indicated their partnership activities with MAFE were moderately or highly successful; 100% said MAFE

adapted its services to their needs to a moderate or high degree; and 100% indicated that MAFE services were highly or moderately beneficial (greater than 75% stated highly beneficial).

The services provided by MAFE that were rated highly to moderately useful by the partner respondents included: plant materials (94%); teaching materials (69%); staff training (69%); farmer training (56%); M&E (53%); and funding (35%). When asked about the benefit of various technologies and activities to farmers themselves, 96% of the respondents indicated the control of soil erosion was moderately or highly beneficial; 83% indicated increased soil fertility; and 81% indicated increased crop yields. Other benefits identified but not quantified, included fuelwood production, stream bank and gully control, fruit and food products, and non-food value added products (extracted oils). In addition, the respondents indicated the partnerships had assisted them in developing their capacity to meet the needs of smallholder farmers. 44% indicated they as partners lack the resources to buy needed services (see Resource Center in following section). The respondents indicated services that would be most useful to them in the future included staff training (93%); provision of seed and other plant materials (87%); provision of technical materials (84%); farmer training (83%); and M&E support (80%).

The working group and plenary discussions by the participants in the Final Partner Meeting identified a number of factors influencing partnership successes. These included, among others, committed and qualified MAFE personnel with leaders and champions, high quality technical and research support, effective M&E and accountability, and others given in *Figures 42* and *43*. They also strongly recommended continuation of support for the services developed and provided through MAFE. Specific partner recommendations for the future are summarized in (*Figures 44* and *45)* and include continued provision of demand-driven and results-based services, with a single independent entity to coordinate inputs and services on a sustainable basis. Transition (bridging) between MAFE and the provision of future services and technologies should be provided to allow development of a sustainable funding base. The participants indicated the need to continue to adapt programs and services to serve local farmers and community needs including conduct of research. The participants also indicated the need to solicit long-term investment in the provision of services and technologies by donors, private industry sources, partners and clients for the payment for services. The core partners should include government and non-government representatives as well as beneficiaries, partners and clients.

In summary, partners' input based upon the questionnaire and discussions indicate the partnership relationships, activities and services have been extensively utilized, have been quite useful, and have demonstrated the value of the paradigm. There is a continued need for the provision of the technologies, inputs and services. Smallholder farmers, their families and communities have significantly benefited in the short-term (food and income), and they also value stabilizing and restoring the natural resource base for the future. The results further indicate the validity and foresight of the Government of Malawi in establishing agroforestry as a priority and facilitating the partnership approach. The group emphasized a variety of needs for the future and also stressed the necessity of flexibility and innovation to be able to respond to farmers' evolving needs and circumstances and to build on successes to date. An outstanding question is how continued support technologies and services will be provided in the future since 44% of the partners (primarily government) did not have the funds to buy services.

Based upon partner input and other information provided here in, the MAFE partnership paradigm is highly successful and provides information about how to establish and utilize successful future partnerships. The MAFE experiences can serve as a paradigm for others attempting to enhance sustainable productivity, income and food security by low resource farmers and communities.

Resource Center – Sustaining Support Services Beyond MAFE

Dr. Ian Hayes presented information about plans for sustaining the services and activities beyond the MAFE project. The need for such services have been clearly demonstrated in the above with 44% of the 32 participants in the Final Partner Meeting indicating they would have inadequate resources to purchase the inputs/services (if they were available on the free market, which for most of them is not the case at present). This has been taken into account in the development of the key recommendations in the following section.

Dr. Hayes indicated a Resource Center (RC) has been established on the ground floor of the LRCD building with a training classroom and audiovisual equipment, seed cold stores, warehouse, and library for extension materials and inputs established. The RC is currently staffed, with Dr. H.S.K. Phombeya having overall administrative responsibilities as the Resource Center Coordinator. The services provided by the Resource Center including provision of germplasm and other inputs, information and technical services, training of trainers, and the provision of training and extension materials. In order to sustain the activities, transfer of facilities, vehicles, and equipment are underway from MAFE to the Resource Center, and key RC personnel are prepared to continue. Seeds, extension materials and other stocks for the 2002/03 season are being consolidated and will be left in place.

MAFE has proposed that the RC be operated as a semi-commercial operation with partial donor support for two years, in association with income generated by charging partners subsidized prices for services. The potential financial self-sufficiency of the RC to operate on a full cost-recovery basis needs to be further evaluated. Dr. Hayes provided an indication of the current Resource Center price list (*Figure 46*). It was repeatedly indicated by Dr. Hayes and the participants in the workshop that it is essential the services, technologies, and other inputs continue to be provided to build upon an established foundation of successes and positive impacts on smallholders and communities. The role of agroforestry as demonstrated in MAFE is being recognized as a priority by government (see Keynote Address by Dr. Malindi above).

Benefit-Cost Analysis

In order to determine the benefit-cost from investment in MAFE and its various activities, a benefit-cost analysis was conducted by Dr. Hayes and Dr. P. Wyeth of WSU. Dr. Hayes showed that the MAFE budget began in 1992 with approximately $75,000 and expanded in 2002 to approximately $1,250,000. In the benefit-cost analysis, an internal rate of return over the period of 1992-2001, with zero agroforestry and soil conservation expansion after 2002, indicated a significant internal rate of return (IRR) of 17% (*Figure 47*). Although no expansion is assumed, the current trends and adoption indicated there will be continued expansion of agroforestry and soil conservation beyond 2002. Thus, the IRR will be even higher than that given in *Figure 47*.

Analysis of the current and potential number of hectares under extended improved natural resource technologies indicate significant hectares utilizing trees for wood (18,212 ha), DSI with *F. albida* (35,739 ha), undersowing with *T. vogelii* (18,131 ha), vetiver hedge conservation (21,043 ha), and irrigation (1,215 ha) in year 2002 (*Figure 48*). If one assumes a 10% increase per year (which is smaller than the experience to date), for five years, the number of hectares under extended technologies would significantly increase as given in *Figure 48*. Looking to the future, with no expansion in land under AF practices (though some expansion of irrigation), the total net farmer benefits for the years 2002-2022 amounted to $51,743,074 (*Figure 49*). If there were 10% adoption expansion as given above and in *Figure 42*, the net farmer benefit over the same years would be $87,222,930. Thus, a 10% expansion rate of AF technology adoption for the next five years, a valid assumption given current experience, could result in an enhanced net farmer benefit of $35,479,856 (*Figure 49*).

These data indicate a significant return to investment and benefit-cost from the current level of adoption and an even greater potential return in the future. These analyses as well as the other information provided herein further emphasize the need and benefits from continuation of services provided by MAFE.

Summary of Key Recommendations

Based upon the experiences and successes and input by the partners, four key recommendations were presented by Dr. Bunderson. This is based upon a clear need, demand, and benefit for sustaining and expanding the farmer adoption of agroforestry, soil conservation, and small scale irrigation practices. Recommendations are:

1. Continue provision of farmer support services through the Resource Center:
   Continue to provide germplasm, extension training materials, trainers of trainers, monitoring and evaluation; and technology and research liaison including the development of new technologies and their adoption and continued research on value-added products. The Resource Center should be an independent entity with control of its own resources. It is recommended a two-year semi-commercial operation be undertaken with donor support subsidizing partner services leading to financial self-sufficiency by charging full cost for continued donor/GOM support and/or other investments (*Figure 50*).

2. Address policy needs:
   Raise the national profile of agroforestry, soil conservation, and small-scale irrigation to enhance and sustain rural incomes. Improve coordination of extension approaches, the promotion of best bet technologies with high adoption potential and economic return and utilize appropriate incentives for all implementers. It was further indicated Land Resources Conservation Department (LRDC) should be responsible for government oversight of AF/SC and Department of Irrigation (DOI) for small-scale irrigation (*Figure 51*).

3. Improve field implementation:
   Improve field implementation by the coordination of activities at the district level through the Environmental District Officer (EDO) and District Planning Officer (DPO), emphasize capacity building, target resources and training more effectively, ensure

community ownership through participation at all stages from problem identification to implementation and evaluation and increase community self sufficiency in germplasm (*Figure 52*).

4. Sustain and increase funding by donors, private sector, and others:
Provide investments with long-term perspectives to ensure continuity and to capitalize on momentum and interrelationships already established. Improve donor coordination to avoid program overlap and conflict (*Figure 53*).

CONCLUDING REMARKS

Dr. James Henson, Professor of Development Cooperation at Washington State University, provided concluding remarks. He began by thanking all presenters and participants in the workshop for their presentations, provision of useful information and relevant questions. These tended to support the information provided in the program and the great success of MAFE. Dr. Henson indicated that MAFE is the most successful development project he has observed during 28 years of experience in development in Africa. The paradigm established utilizing the partnership model linking research and extension with farmer and community participation and input, and with stakeholders internal and external to Malawi, has been extremely successful. The significant adoption of technologies by increasing numbers of farm families, and increased hectarage under these technologies are indicators of success.

The current successes and potential for future benefits and impacts are further emphasized by the best-bet agroforestry technologies in maize yields and gross margins and rate of return and economic benefits. As indicated previously, farmers, households and communities as well as partners have found the technologies extremely beneficial as indicated in the information provided herein. This unique approach of integrating research and extension utilizing a partnership mode (the Results-Based Partnership Model – Figure 1) has been shown to be extremely effective. Continued progress will require commitment and support by a variety of players that have made MAFE successful. It appears the Government of Malawi has recognized this and is continuing to establish agroforestry as a priority for government as indicated by Dr. Malindi in the keynote address. Thus, the MAFE project, paradigm and experiences have shown great success and impacts.

Dr. Henson concluded by indicating Mr. Andrew Natsios, Administrator responsible for US Agency for International Development, recently indicated four factors that are required for success poverty alleviation in the developing countries. All of these have been met by MAFE and are the basis for its success. These factors indicated by Mr. Natsios include:

- Leadership – MAFE has had great leadership at all levels including Mr. Mulenga in LRCD and others in the Malawi government, USAID personnel over the last 10 years, Drs. Trent Bunderson, Jan Noel, and Ian Hayes of WSU, Mr. Zwide Jere, Dr. Henry S.K. Phombeya, and many partner leaders.

- Policies – Government of Malawi policies have stressed agriculture with agroforestry being an important component. Mr. Malindi indicated new policies are being formulated that will continue to emphasize agroforestry, soil fertility, and other considerations. A supportive policy has been important for MAFE's success.

- People – Enhancing the capabilities and information provided to people has been a central focus of MAFE. These include the training of trainers, partner staff, extension agents, farmers and communities. Enhancing people capabilities has been one of the prime functions of MAFE that has contributed significantly to success.
- Partnerships – Administrator Natsios emphasized partnerships can contribute greatly to poverty alleviation. The MAFE paradigm (Results Based Partnership Model) emphasizing the role of partnerships and team work has been extremely important and has great potential in Malawi and elsewhere.

Examination of these four factors indicate they have played an important role in MAFE's success and impacts. Dr. Henson added two others that cross-cut and impact all four of the above, which are knowledge and its centrality in development and innovation to meet evolving circumstances, opportunity and needs. These are also dimensions that have been important for MAFE.

Based on the above, there is need to build on the accomplishments to date for a brighter future. It is necessary to seize this opportunity to benefit Malawi, its farmers and communities, and other citizens. Continued success will depend upon the whole "MAFE Team". He asked the group to join him in expressing appreciation to all the past, present and future MAFE team members.

Dr. Henson finished by again thanking the organizations that have made MAFE a success, including the Government of Malawi and its Ministry of Agriculture and Irrigation and Land Resources Conservation Department; the US Agency for International Development, its staff in the Malawi Mission; European Union and other donors; Washington State University faculty and administration; the numerous partners that have and continue to participate; and the Malawi farmers and communities.

Dr. Henson declared the Wrap-up Workshop/Seminar in recess until the evening reception at the Lilongwe Hotel. The latter provided a final opportunity for productive discussions among the partners, expressions of gratitude for the many contributions, congratulations for what has been achieved to date and exchange of ideas for the future.

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FIGURES

MAFE Partnership Model

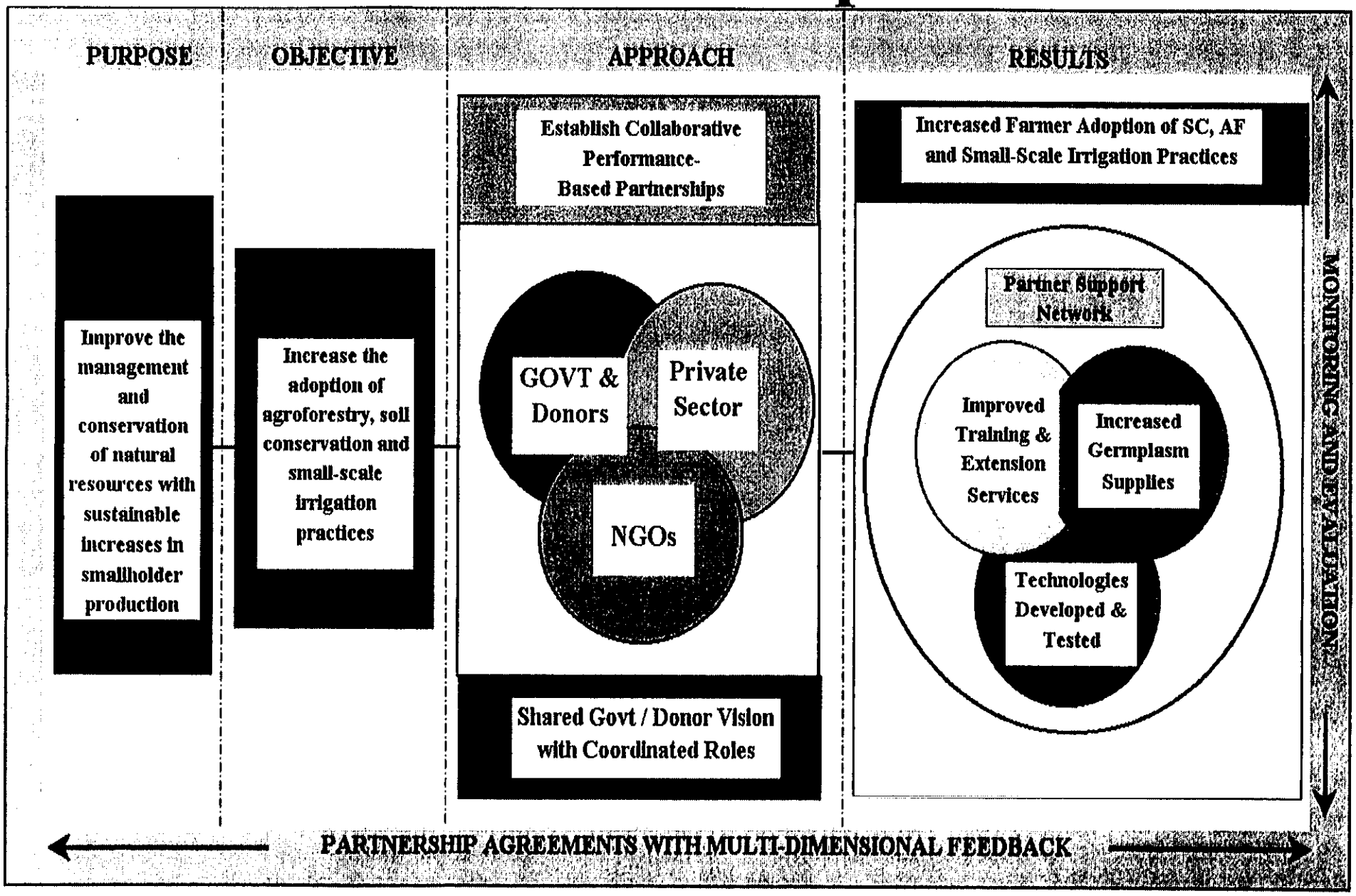

Figure 1

22

Technology Adaptation/Screening

Common factors evaluated:

- Methods to improve propagation by species
- Species performance in different agro-ecologies & farmer preferences
- Method & time of planting, spacing & maintenance
- Time & method of pruning/harvest/biomass application
- Labor & management costs relative to farmer situations
- Farmer interests & adoption rates
- Economic benefits observed & timeframe

Figure 2

Technologies Evaluated

Soil & Water Conservation:

- Contour ridging with A-frame & line level
- Contour vetiver & napier hedges
- Contour strips of leguminous shrubs
- Gully control with stone & brushwood checkdams, & vetiver grass
- Tied ridging, especially on field boundaries/paths
- Raised field boundaries/footpaths
- Streambank protection with planted or nat. vegetation

Figure 3

Technologies Evaluated cont.

Agroforestry for Soil Fertility Improvement

- Dispersed systematic tree interplanting
- Green manure banks
- Undersowing leguminous shrubs
- Improved fallows
- Alley cropping/hedgerow intercropping

Figure 4

Technologies Evaluated cont.

Agroforestry for Wood, Fodder & Other Uses

- Homestead & boundary planting
- Woodlots
- Reforestation on communal lands & bare hillsides
- Fodder banks & use of tree pods
- Live fences for farm demarcation, protecting crops or enclosing livestock
- Live barns for drying harvested crops

Figure 5

New Irrigation Initiative

MAFE has expanded its technology portfolio into treadle-pump irrigation for the following reasons:

- lack of a coordinated extension approach in the face of high farmer demands
- absence of extension & training materials
- need to reduce degradation in high risk dimba areas
- complementarity between improved food security, increased incomes & conservation

Figure 6

Small Scale Irrigation with the Treadle Pump

- Different types of pumps, their use & maintenance
- Plot layout for gravity-fed irrigation on different slopes - ridges & basins
- Nursery propagation of vegetable crops
- Management of different crops: spacing, water regimes, fertilizer, manure, weeding, harvesting
- Soil & water conservation with vetiver grass
- Development of credit schemes with village-based revolving funds for expansion/sustainability

Figure 7

Technologies with Low Adoption Potential

Soil & Water Conservation

- Contour hedges with napier grass
- Contour strips of leguminous shrubs

Agroforestry

- Green manure banks
- Undersowing with *Sesbania & Crotalaria spp.*
- Improved fallows
- Alley cropping/hedgerow intercropping
- Fodder banks & use of tree pods
- Live fences for farm demarcation, protecting crops or enclosing livestock
- Live barns for drying harvested crops

Figure 8

Key Reasons for Low Adoption

Despite technical soundness, farmer adoption was low for the following reasons:

- Labour intensive for establishment & management, e.g., live fences require 250 seedlings for 100 meters
- Narrow window for key management operations, e.g. late hedge pruning depresses crop yields
- Lack of farm land & for non-food crops, e.g., improved fallows & green manure banks
- Low farmer interest, e.g., live barns, fodder banks
- Problems of pests & diseases, e.g., *Leucaena, Sesbania*

Figure 9

Tree Nurseries

Issues/Problems	Key Recommendations
Poor seed supply & germination	• Community seed collection • Pre-treat seeds, e.g., nicking • Correct time & depth of sowing • Timely & adequate watering
Low seedling survival & growth	• Increase tube size • Use open-ended tubes • Air pruning e.g., msangu • Early outplanting
Poor nursery set-up & organization	• Village/group ownership & responsibility • Better training & supervision • Ensure access to reliable water

Figure 10

Vetiver Nurseries

Issues/Problems	Key Recommendations
Planting & management	• Distribute material timely • Plant in dambos • Space plants 45 X 45 cm • Plant & weed early • Protect from animals
Inadequate planting material	• Need organized supply network for material • Use open-ended tubes • Provide start-up material; there-after community responsibility

Figure 11

Best-Bet Practices

Soil & Water Conservation

- Contour ridging using line level/A-frame with vetiver hedges
- Gully control with tied ridging, checkdams, raised field boundaries/paths & vetiver grass
- Streambank protection

Agroforestry

- Dispersed systematic interplanting (DSI)
- Annual undersowing with *Tephrosia vogelii*
- Homestead, boundary & woodlot planting
- Reforestation on communal lands & bare hillsides

Small Scale Irrigation

- Basin-irrigation with treadle pump

Figure 12

Contour Vetiver Hedge Conservation

- Recommended species: e.g. *Vetiver zizanioides*
- Propagation: slips from dambo nurseries
- Spacing: slips 10 cm apart; contour hedgerows 5-15 m apart depending on slope
- Time of planting: Start of rains
- Benefit timeframe: Control of runoff & loss of topsoil from year 2

Figure 13

Dispersed Systematic Interplanting (DSI)

- Recommended species: e.g. *Faidherbia albida*
- Propagation: air-pruned seedlings in large tubes
- Spacing: 5 m x 10 m, 200 trees/ha
- Time of Outplanting: Start of the rains
- Benefit timeframe: Incremental maize yield increases starting at year 5 & 3-4 fold increase by year 20

Figure 14

Undersowing

- Recommended species: e.g. *Tephrosia vogelii*
- Propagation: direct sowing
- Spacing: double maize population density
- Time of planting: Same day as maize
- Benefit timeframe: Incremental maize yield increases starting at year 2 with 2-fold increase by year 3

Figure 15

Homestead/Woodlot/Boundary Planting

- Recommended species: e.g. *Acacia polyacantha; Senna siamea; Afzelia quanzensis; Khaya nyasica*
- Propagation: seedlings in large tubes
- Spacing: 2 x 1 m woodlots; 2 m apart boundaries
- Time of planting: Start of rains
- Benefit timeframe: Wood yields from year 4 with fast-growing species

Figure 16

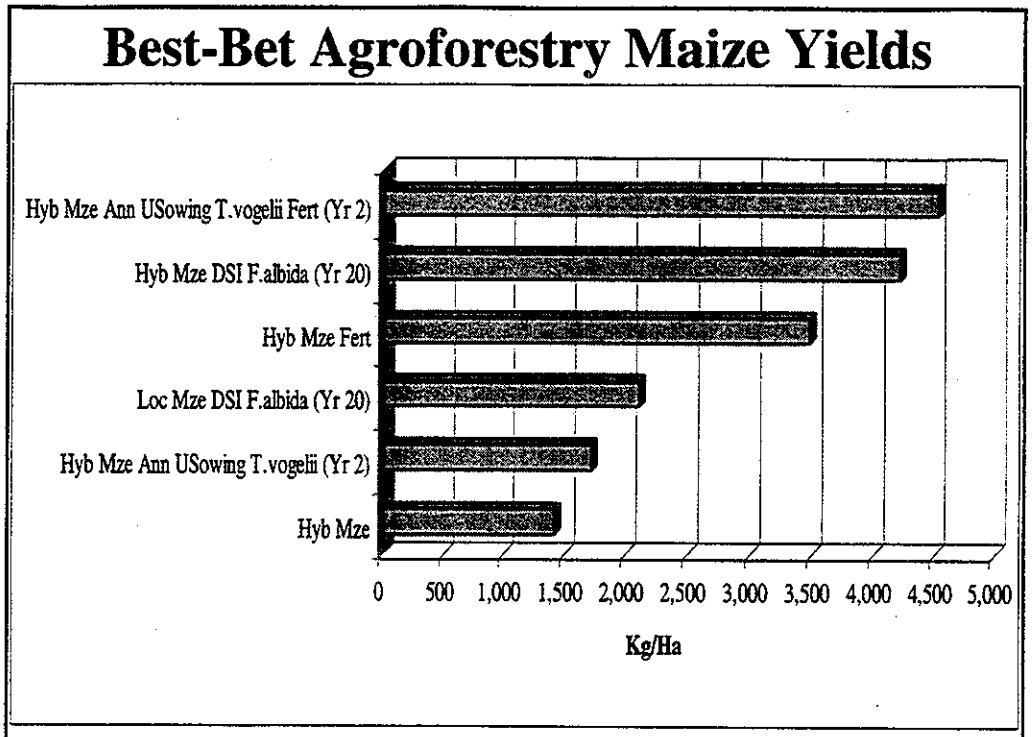

Figure 17

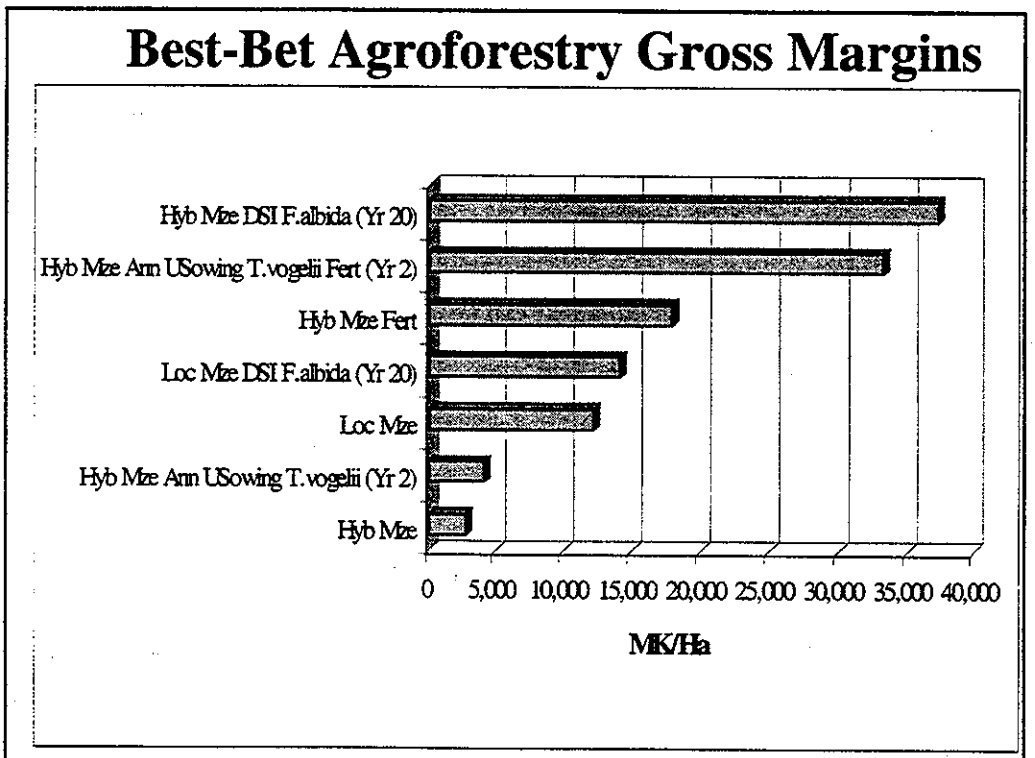

Figure 18

Sample Credit Repayment Schedule

		Cash price	6 months credit price	12 months credit price
TPump, spare parts pack, 5m suction, 25m delivery pipe, inputs pack	Initial deposit	-	MK 800	MK 800
	Remaining Balance	-	MK 2,000	MK 2,600
	Total Price	MK 2,500	MK 2,800	MK 3,400

Figure 19

Small Scale Irrigation Gross Margins (Yr 2)

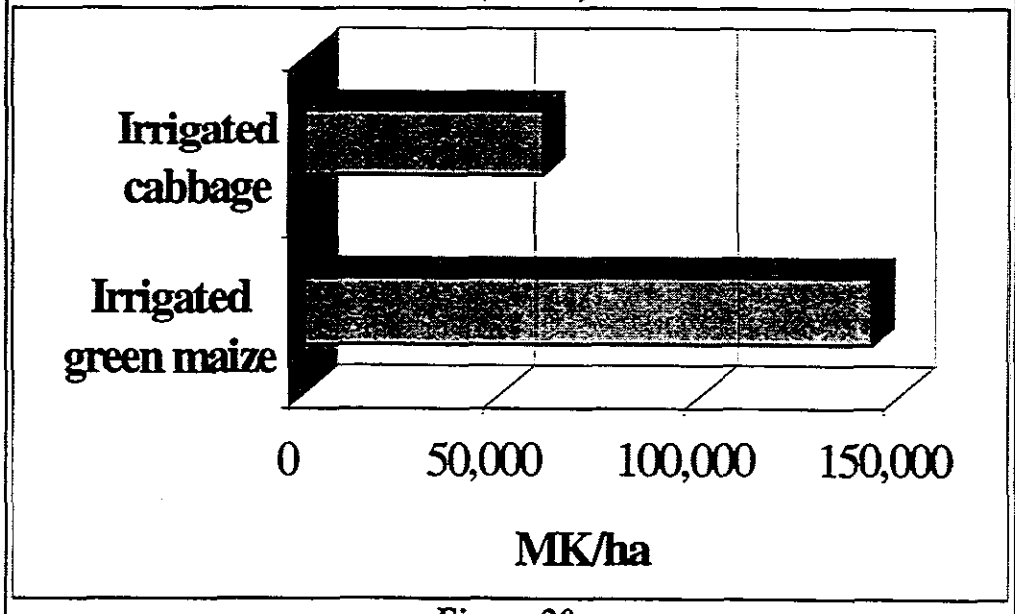

Figure 20

Demand-Driven Support Services to Partners

- Identify suitable technologies to address location-specific farmer problems
- Produce/distribute extension/training materials
- Build partner capacity through training
- Develop simple & reliable M&E systems
- Supply quality germplasm / polytubes / line levels

Figure 21

Number & Type of MAFE Partnerships 1997-2002

Year	Govern-ment	Projects	NGOs	CBOs	Private Sector	Total
1997/98	11	4	10	0	4	**29**
1998/99	11	5	12	1	2	**31**
1999/00	11	5	18	1	3	**38**
2000/01	12	6	18	2	4	**42**
2001/02	12	6	18	2	4	**42**

Total number of partners over life of project was 77

CBOs = community-based organizations; NGOs = Non-governmental organizations

Figure 22

Production of Materials

Trainers & Extension Agents	Numbers	Language
Field Manuals on Agroforestry, Soil Conservation & Irrigation	18,000	English
AF/SC Booklets	15,000	English & Chichewa
AF/SC & SSI Training Kits	400	English
Video on L & -use Problems & Practices	100 each	English & Chichewa
Farmers & Communities		
AF/SC Posters	130,000	Chichewa
AF/SC & SSI Leaflets	150,000	Chichewa

Figure 23

Distribution of Materials

Government Institutions / Projects	Manuals	Booklets	Posters	Leaflets	Training Kits
1997/98	4,653			3,500	
1998/99	100				12
1999/00		2,773	17,911		
2000/01		352	2,556		
2001/02		789	4,337		21
Sub-Totals	4,753	3,914	24,804	3,500	33
NGOs / CBOs / Private Sector					
1997/98	337			500	
1998/99					3
1999/00		97	3,318		
2000/01	4	345	3,528		
2001/02		240	320		3
Sub-Totals	341	682	7,166	500	6
Grand Totals	5,094	4,596	31,970	4,000	39

Figure 24

Training Conducted Since 1997/98

	No. of Participants Trained		
Govt. Institutions/ Projects	Trainers	Field Staff	Farmers
1997/98	72	316	15
1998/99	114	96	-
1999/00	287	140	30
2000/01	105	66	48
2001/02			
Totals	**578**	**618**	**93**
NGOs / CBOs / Private Sector			
1997/98	1	66	-
1998/99	139	33	709
1999/00	158	167	75
2000/01	142	35	8
2001/02			
Totals	**440**	**301**	**792**
Grand Total	**1,018**	**919**	**885**

Figure 25

Development of CBM&E Systems

In response to partner demand, MAFE developed 3 simple, low cost M&E systems to monitor AF/SC programs

Types of Community-based Monitoring/Evaluation Systems

Village-based; Catchment; Association

Results to Date

- **Accurate, reliable & cost-efficient data collection**
- **Consistency for aggregation across sites**
- **Computerization for easy analysis**

Future Needs

- **More M&E training & technical back-stopping**
- **Institutionalization among partner organizations**

Figure 26

Supply of Seed & Other Inputs

Government Institutions / Projects	General Tree Seed kg	*Faidherbia* Seed kg	*Tephrosia* Seed kg	Polytubes No.	Lime Levels No.
1997/98	3,024	463	2,119		200
1998/99	1,896	1,210	2,086		
1999/00	1,584	526	6,982	7,236,786	2,352
2000/01	5,085	1,049	7,844	9,284,780	259
2001/02	5,807	1,137	3,332	10,940,770	210
Sub-Totals	17,396	4,385	22,363	27,462,336	3.021
NGOs / CBOs / Private Sector					
1997/98	576	181	81		
1998/99	668	128	638		
1999/00	930	217	533	698,600	196
2000/01	2,429	373	1,653	3,654,900	1,396
2001/02	3,211	539	4,705	4,988,898	120
Sub-Totals	7,814	1,438	7,610	9,342,398	1,712
Grand Totals	25,210	5,823	29,973	36,804,734	4,733

Figure 27

Vetiver Nurseries

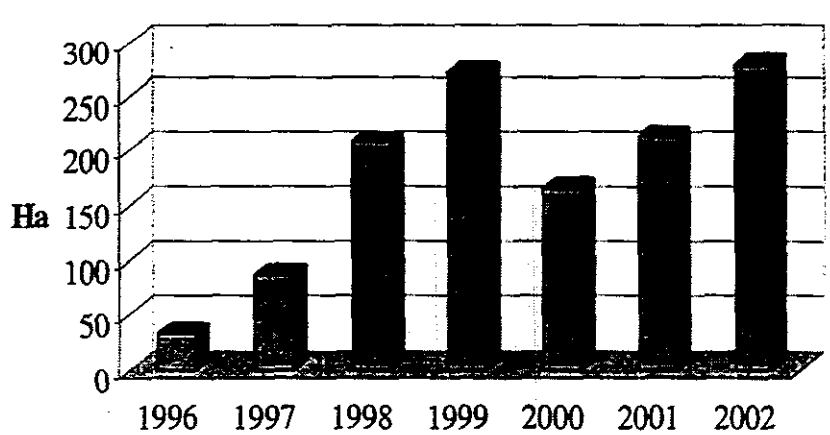

Figure 28

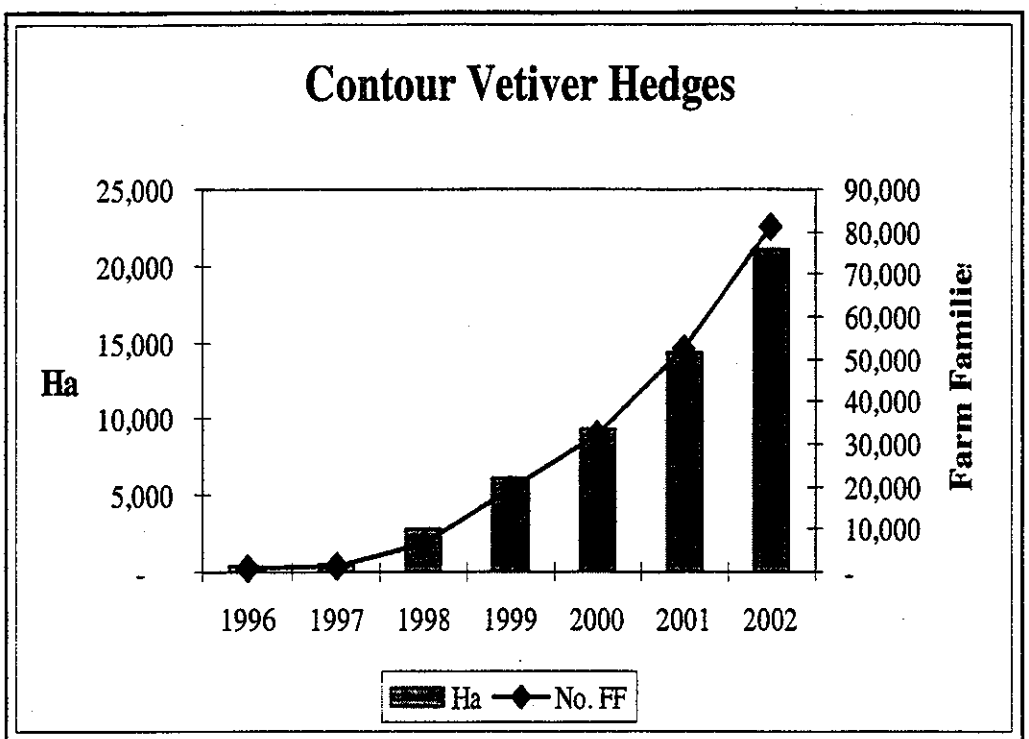

Figure 29

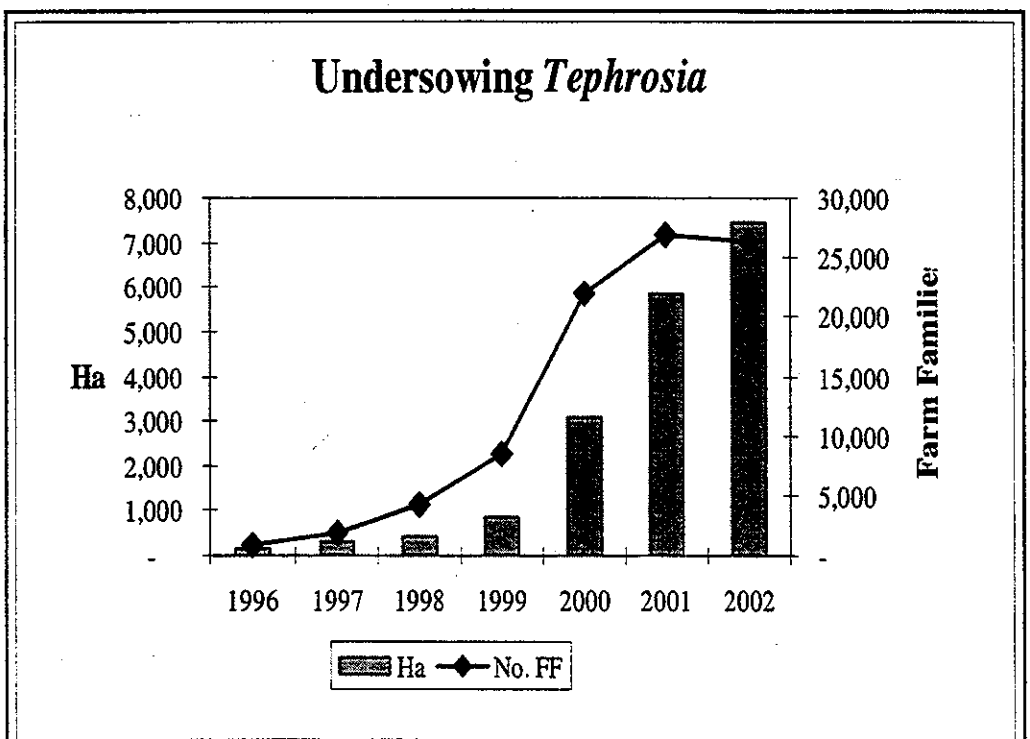

Figure 30

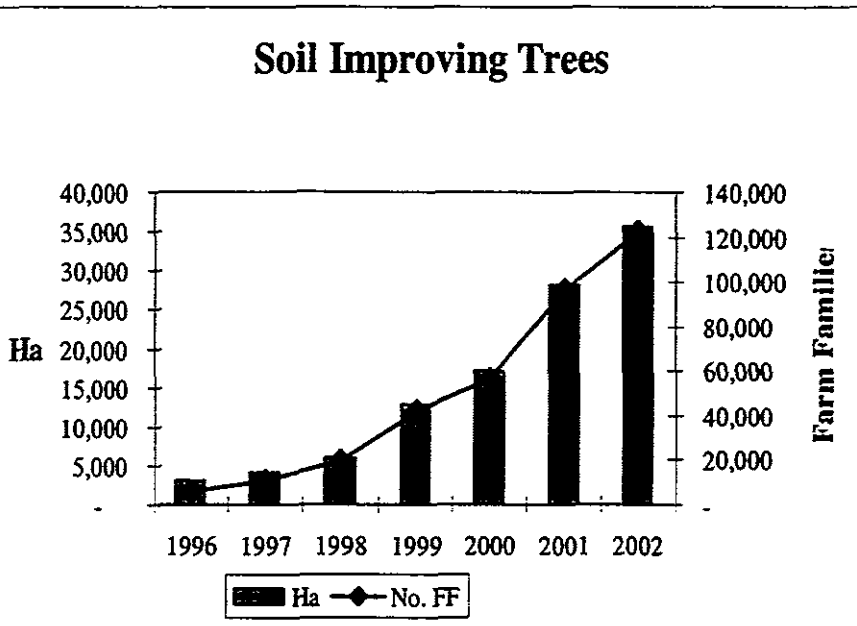

Figure 31

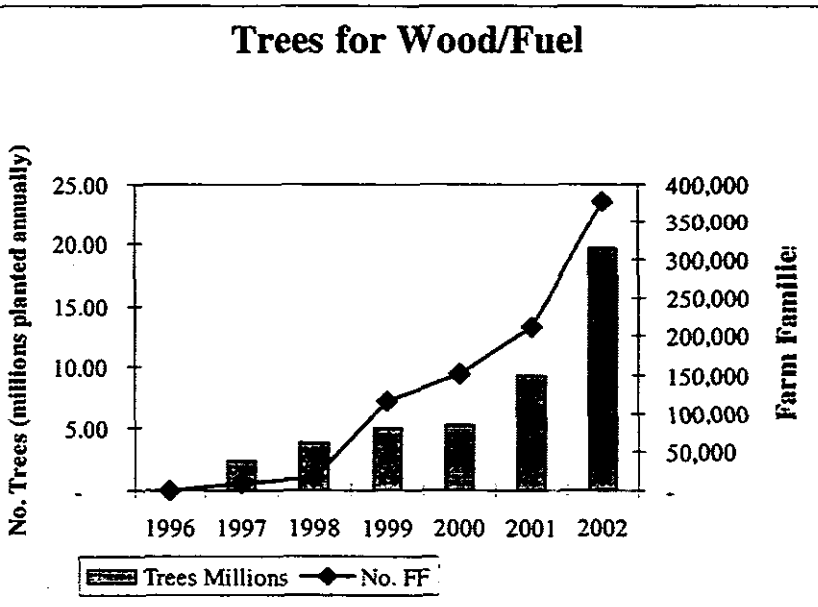

Figure 32

Natural Products/ Species Selection Criteria

- National & regional market potential
- Significant local subsistence or commercial use
- Feasible & economic production & processing operations
- Widely grown or locally abundant to allow for sustainable rapid production response
- Benefits in addition to commercial development (e.g. soil fertility)
- Production & processing opportunities/synergies that have the potential to increase value added within existing farming systems
- Early maturity, & are already promoted by MAFE for NRM purposes

Figure 33

Natural Products Production/Marketing

Initial Species Selected

- Marula *(Sclerocarya birrea)*
- Moringa *(Moringa oleifera)*
- Natal Mahogany *(Trichilia emetica)*
- Neem *(Azadirachta indica)*
- Tephrosia *(Tephrosia vogelii)*

Other Agroforestry Species Added to Target List

- African Star-Chestnut *(Sterculia africana)*
- Jatropha *(Jatropha curcas)*
- Manketti *(Schinziophyton rautanenii)*

Over 170 subsistence, commercial & NRM uses identified

Figure 34

Natural Products Collaborators

- EDETA: Monitoring production trials; economic analysis, market research, social organization & capacity building
- Khumbo Oil Refinery: Small scale groundnut oil producers; innovators in tree seed oil production/ commercialization
- Chancellor College Chemistry Dept:Assay of samples; suitability determination (with Malawi Bureau of Standards MBS); oversight of overseas testing; research
- Bunda College (University of Malawi) Engineering Dept:Manual and motorised press tests and reconfiguration; invention of new press cylinder for Moringa

Figure 35

Products/Uses

- Oils for skin care: Natural anti-oxidants/Vitamin E; linoleic acid
- Polishes, lubricants, leather-making
- Edible oils
- Pesticide and medicinal uses and potential of plant parts but beyond the scope of MAFE: Chancellor College; WSU; IFR
- Subsistence food uses: e.g., Moringa, etc.
- Other subsistence uses: e.g., Tephrosia and Neem for crop storage, pesticides and medicine

Figure 36

Promising Market Opportunities

- Marula oil already exported from Southern Africa >$10/liter; Moringa oil from Tanzania at $9/liter
- 3 international buyers in the cosmetic trade want to test Malawi Moringa oil
- Moringa also important as vegetable in food security (& medicine); potential in water treatment
- Other oils of interest under investigation: *Sterculia africana* and *Schinziophyton rautanenii*

Figure 37

Natural Products Recommendations (Next Steps)

- Holistic approach: *subsistence* uses and *commercial/* commodity development with Moringa as the model
- Opportunities: Moringa (fence, vegetable/relish, oil, animal feed), Sterculia (kernel relish, oil), Neem (medicine & pesticide), Baobab and Marula (fruit & oil)
- Target sites:
  - →Southern Lakeshore and Shire Valley for Moringa, Sterculia, Neem, Marula and Baobab
  - →Mzimba North for *Schinziophyton*

Figure 38

Natural Products Recommendations (Next Steps) cont.

- Issues to be addressed: organization of producers; quality control of production/processing; markets; business and marketing management
- Capacity development and training: for business, marketing and technical needs (production, processing)
- Diversify as opportunities arise (including wild and farmed trees; traditional oilseeds)
- Continue to identify & fill key information gaps (research); e.g. match chemistry of Malawi products to market needs

Figure 39

Potential Future Natural Products Partners

Core Local Partners:

EDETA; Chancellor College; Bunda; Resource Center

Support Partners:

Forestry Res. Institute of Malawi (FRIM)/Nat. Herbarium; Internat'l Eye Foundation; Malawi Bureau of Standards; Shire Highlands Organic Growers Association; Business Consult Africa; Scottish Crop Research Institute

International Market Intelligence:

Moringa Network, France; SANProTA - Southern Africa Natural Products Trade Assoc.; ASNAPP - Agribusiness in Sustainable Natural African Plant Products; OPPAZ - Organic Producers and Processors Assoc. of Zambia

Figure 40

MAFE Partners

Diverse Partners:

- Government: GOM, bilateral & multilateral donors
- International Private Voluntary (PVO) & foundations
- Local NGOS & community-based organization - CBOs
- Private Sector: Commercial firms, associations & entrepreneurs
- Colleges, universities, research organizations
- Parastatal organizations
- Projects

Figure 41

Final Partner Meeting

Factors influencing partnership success

- Effective communication & information exchange (IT)
- Effective monitoring & evaluation, including incentives or sanctions
- Adaptation to changing needs, flexibility
- Specialized capacities of partners, exploiting comparative advantages
- Resources: human, equipment, technical inputs, funds
- Collaborative planning & review

Figure 42

Final Partner Meeting cont.

Factors Influencing Partnership Success cont.

- Committed, qualified personnel
- High quality of technical & research support
- Timely delivery of appropriate inputs & services
- Shared understanding & agreement of partnership goals objectives, & operations
- Equitable treatment of partners
- Complementary strengths & synergy
- Effective "champions" or advocates as leaders & implementers

Figure 43

Partner Meeting Recommendations

- Continue provision of services based on demand and demonstrated results
- Single entity needed to coordinate inputs & services on sustainable basis
- Coordinating entity should be independent
- Transition period is required to develop sustainable funding base
- Continue to adapt programs to serve local farmer & community needs (research)

Figure 44

Partner Recommendations for Future

"There is a clear need and demand to sustain and expand farmer adoption of AF/SC/SSI practices"

1. Continue Provision of Partner Support Services through the Resource Center
   - Germplasm; Training & Extension Materials; Training of Trainers; M&E; Research liaison function - new techs, adaptation, value-added products
   - Coordinating entity should be independent with control of its own resources
   - Interim 2 yr semi-commercial operation with donor support with subsidized prices for partner services leading to: a) continued donor/GOM support &/or other investment OR b) financial self-sufficiency by charging full-cost prices

Figure 50

Partner Recommendations for Future-Cont.

2. Address Policy Needs
   - Raise national profile of agroforestry, soil conservation & small scale irrigation to enhance & sustain rural incomers
   - Improve coordination of:
     - Extension approaches consistent in content & delivery
     - Promotion of best-bet technologies: high adoption potential & economic returns attractive to farmer
     - Use of *appropriate incentives* by all implementers
     - Oversight: LRCD (AF/SC) & DOI (irrigation)

Figure 51

Partner Recommendations for Future-Cont.

3. Improve Field Implementation by all Players
   - Coordinate activities at District level through Environ. District Officer (EDO) & District Planning Officer (DPO)
     - Identify Resource Center services required
     - Target areas to avoid duplication/conflict
     - M&E data collection, aggregation & analysis
   - Emphasize capacity building; Ensure community ownership through local participation at all stages:
     - Problem identification
     - Solution design & implementation
     - Monitoring & Evaluation
   - Increase community self-sufficiency in germplasm
   - Target resources & training more effectively

Figure 52

Partner Recommendations for Future cont.

4. Sustain Core Funding & Increase to Expand Impact (donor, private sector, government, others)
   - Promote & provide investment with a long-term perspective
   - Ensure continuity to capitalize on momentum & partner relationships
   - Improve donor coordination to avoid overlap, conflict & gaps

Figure 53

ATTACHMENTS

Attachment I
Partnership Discussions & Lessons Learned for the Future
Malawi Agroforestry Extension Project
June 19, 2002

We have reached the successful conclusion of the MAFE project. MAFE itself has been a 10 year effort focusing on increasing adoption by smallholder farmers of agroforestry and soil conservation practices that benefit their lives now and into the future. Its success is a reflection of the individual and collaborative efforts of the many individuals and organizations that have worked in partnership to assist Malawi's smallholders. This partnership approach was almost unheard of 10 years ago, but has now been widely recognized as a preferred development approach.

All of the partners have contributed in very positive ways to the successes we have collectively achieved here in Malawi. We have had many experiences that have directly affected our success. At this time it is worthwhile to capture lessons we have learned that can provide useful information as we look to the future. The result can be enhanced capabilities for sustainable smallholder agricultural development -- increasing food security, generating income and improving quality of life of farm families, while maintaining and improving the natural resource base in Malawi.

Your ideas are important not only to Malawi but to the development community worldwide. Together we have been developing and testing a partnership model for a decade, while others merely talked about them.

The Wrap-up Workshop/Seminar is composed of two sessions, with this being the first one. This session will focus on past and potential future agroforestry, soil conservation and smallscale irrigation technologies that have been most useful; the characteristics of partnerships that have made them successful. Finally, the group will be asked to recommend how useful support services can be provided in the future.

Agenda

1. Introduction to the session - including purpose & methods to be utilized
2. Fill out survey questionnaire
3. ***Discussion/working group topics: These topics to be covered in small working groups and reported back & discussed in plenary sessions.***

A. TECHNICAL CONTENT OF PAST AND FUTURE PARTNERSHIPS:
   a. **Prioritize the MAFE partnership activities (services) that have been most important for Malawi smallholders for successful agroforestry/soil conservation (AF/SC) activities in the past;**
   b. **Identify partner services/activities and that will likely be most important in the future for Malawi's smallholder farmers to increase their productivity and income.**

B. PROCESS OF PARTNERSHIPS:
   Identify [list] and prioritize factors or characteristics of the partnerships that have influenced MAFE's success and impact. Consider factors internal to the

partners themselves [over which partners exert some control – such as management systems, quality of personnel, etc)] and external factors (largely outside the control of the partners themselves [such as drought, government budget cuts, changes in donor strategies, etc. so example factors might be "flexibility" "diversified funding". etc.)

a. **Identity and prioritize factors that contributed in a positive way to partnership successes;**
b. **Identify the factors that constrained or detracted from partnership successes;**

C. **Based on your experiences in our partnership and the information from topics A and B. above, how do you recommend that these development support services be provided in future? Consider:**
   - **Who will provide services;**
   - **How provision of the services can best be organized;**
   - **Who will pay for services;**
   - **Other important considerations (please identify)**

Discuss the results from the small group sessions at plenary sessions with opportunities for questions and answers and discussion. Provide summaries of small group discussions on flip charts for presentation at plenary sessions.

The results and discussions by the group will be presented at the second session on June 27 at the Malawi Institute of Management.

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Partner Meeting Recommendations cont.

- Solicit long-term investment by donors, private sources, partners & clients (payment for services)
- Core partners should include government & non-government representation including beneficiaries
- Partners & clients should be responsible for local delivery – decentralized approach needed

Figure 45

Resource Center Price List 2002/03

Products/Services	Partner Prices MK
Tree seed average (kg)	250
Tephrosia seed	50
Polytubes ('000):	
15 x 10 cm	160
20 x 10 cm	610
Line levels (#)	250
Training fees/participant/day	500
Training Kits (#)	7,500
Posters (#)	40
AF/SC Leaflets (#)	25
Irrigation Leaflets (#)	25
Booklets (#)	600
Manuals (#)	1,500

Figure 46

MAFE Project Benefit-Cost Analysis

Internal Rate of Return over the period 1992-2011 with zero AF/SC expansion after 2002

All technologies, all costs	17.0%
Agroforestry, all costs	11.5%
Farmers, AF only	39.3%
Farmers, all tech	68.0%
Farmers, irrigation only	profitable every year

Figure 47

Adoption Expansion - Field Results

Hectares under extended techniques

	0% Expansion	10% (5 yrs)
Trees for Wood	18,212	71,077
DSI with *F.albida*	35,739	114,527
Undersowing with *T.vogelii*	18,131	68,303
Vetiver Hedge Conservation	21,043	59,215
Irrigation (Year 2021)	1,215	5,365

Figure 48

Adoption Expansion - Economic Benefits

Monetary Costs and Benefits 2003-2022 US$ at a 15% discount rate

	Net Farmer benefits	Total Net Benefits
0% Expansion after 2002 (except irrigation)		
Farmer AF	36,453,525	
Farmer irrigation	15,289,549	
Total	51,743,074	50,829,208
10% Expansion in new hectarage every year for 5 years (20 years for irrigation)		
Farmer AF	62,995,228	
Farmer irrigation	24,227,702	
Total	87,222,930	82,563,416
Difference between expansion and no expansion		
Farmer AF	26,541,702	
Farmer irrigation	8,938,154	
Total	35,479,856	31,734,208

Figure 49

Attachment II

Agenda: MAFE Project Wrap-up Workshop/Seminar
Malawi Agroforestry Extension Project
June 27, 2002

Date	Time	Activity	Presenter/Facilitator
Wednes., June 26	16:00	Participants arrive in Lilongwe	LRCD/MAFE
Thursday, June 27	08:00-10:00	Registration and Introductions: Official Opening Keynote Address	MAFE/WSU (various) Mr. N.J. Mulenga - LRCD Dr. Ellard Malindi - MAI
	10:00-12:00	Morning Session Chairman	Mr. N.J. Mulenga
	10:15-12:00	Project Purpose and Objective On-farm Technology Development and Testing: Results on Propagation and Nursery Management Results on Best-Bet Practices	Dr. W. Bunderson Mr. Z. Jere Dr. I. Hayes
	12:00-13:00	Lunch Break	
	13:00-17:00	Afternoon Session Chairman	Dr. J. Henson
	13:00-15:00	Partner Support Services Farmer Adoption: Partner Field Results to Date Production and Marketing of Natural Plant Products	Dr. H. Phombeya Mr. Z. Jere Mr. J. Pratt
	15:00-15:15	Tea Break	
	15:15-17:00	Partnership Paradigm: How Successful? Res. Center–Sustaining Support Services Beyond MAFE Benefit-Cost Analysis Summary of Key Recommendations Concluding Remarks	Dr. J. Noel Dr. I. Hayes Drs. Hayes/P. Wyeth Dr. T. Bunderson Dr. J. Henson
	18:30-20:00	Official Partnership/Stakeholder Function – Lilongwe Hotel	MAFE
Friday, June 28		Participants depart	

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ATTACHMENT III. PARTICIPANTS TO MAFE CLOSING WORKSHOP HELD AT MALAWI INSTITUE OF MANAGEMENT- JUNE 27, 2002

NAME	ORGANIZATION	ADDRESS	TEL/E-MAIL
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wrap-up workshop participants.xls

WASHINGTON STATE UNIVERSITY

Office of the Provost

June 18, 2002 Attachment IV

Principal Secretary
Ministry of Agriculture and Irrigation
Government of the Republic of Malawi
Lilongwe, MALAWI

Dear Principal Secretary:

On the occasion of the Malawi Agroforestry Extension (MAFE) project wrap-up workshop, on behalf of Washington State University I want to extend to you, the Land Resources Conservation Department, and the Ministry of Agriculture and Irrigation our congratulations and appreciation for a job well done.

I have been informed by my colleagues here at Washington State University (WSU) that the project has been highly successful. In this regard, we appreciate the opportunity of working since 1986 with you, your colleagues in the Ministry, MAFE's many excellent partners, and the citizens of Malawi. It is quite unique for a development relationship to span 16 years, especially during the past decade of such rapid transition and change. I believe this reflects the shared commitment and collaboration of our many partners in the Malawian government, private, NGO and donor communities, and other sectors. Such a relationship is congruent with WSU's strategy of establishing mutually beneficial, sustainable partnerships and relationships with selected institutions, organizations, and countries. We, too, have benefited in many ways from our 16 year association.

Our collaborative activities have covered a spectrum of inter-related programs and activities. Together we have developed agroforestry and soil conservation technologies, tested them on the research station and in farmers' fields and extended them for their adoption and use by agriculturalists, communities, and governmental and non-governmental agencies. We have also strengthened our human and institutional capacities through degree and non-degree training, research collaborations and professional consultations. All of these have established a foundation which will allow us to continue beyond our past 16 year association to assist in building a Malawi for the 21st century. In the process, WSU will be a better university.

We also wish to acknowledge the human and financial support of the US Agency for International Development (USAID). Without their support MAFE would not have been possible. The Government of Malawi, the Rockefeller Foundation, the European Union and many others have also provided significant support.

PO Box 641046, Pullman, WA 99164-1046 • 509-335-5581
Fax: 509-335-0103 • www.wsu.edu/provost/provost.html

Again, thank you very much for the opportunity of working in your country. We look forward to a bright future with you.

Sincerely yours,

Douglas D. Baker
Vice Provost for Academic Affairs

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