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**MALAWI AGROFORESTRY
EXTENSION PROJECT:**

**CONSULTANCY REPORT:
ECONOMIC ANALYSIS**

APRIL 2-18, 2002

**Prepared By
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CONSULTANCY REPORT
MALAWI AGROFORESTRY EXTENSION PROJECT
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WASHINGTON STATE UNIVERSITY
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CONSULTANCY REPORT – MAFE PROJECT

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April 2 -18, 2002

This report is based on an April 2002 consultancy with the MAFE staff in Lilongwe. Trent Bunderson, Project Coordinator, and his staff were most cordial and helpful in making arrangements for my work. It has been several years since my initial consultancy with the MAFE project. The project itself may be drawing to a close in the near future, but there is ample evidence that its work will have a long term impact on the rural resource base of Malawi and the income of farmers using recommended practices.

MAFE has been a true cooperative effort of multiple units, both public and non-government. One of the key elements in its success has been a mechanism for getting needed inputs into the hands of cooperating farmers. Continued functioning of the current Resource Center, or something akin to it, will be critical to future expansion of land area under practices currently recommended by MAFE.

The Internal Rate of Return study provides ample evidence that MAFE activities contribute substantially to farm earnings of participating farmers. Additionally, there are substantial natural resource conserving benefits that will accrue to the nation as a whole.

The following report is divided into three sections corresponding to the portion of MAFE under consideration.

I. Overall MAFE Economic Analysis – IRR and related issues

The Internal Rate of Return (IRR) economic analysis was based on data compiled by the MAFE project and entered into a linked spreadsheet developed by Ian Hayes. The computational components of the spreadsheet program itself were not examined. This would have been impractical given the time available. Responses provided by the model were directionally consistent with expectations. The model was based on project results during the 1996 to 2001 period. It essentially reproduced these experiences during that period of the project. Given this demonstrated capacity to incorporate the observed years performance and its development of projected scenarios revealing economic phenomena consistent with logic, the computational correctness of the linked spreadsheet model was accepted. Although the computational components were accepted, several structural modifications, largely focused on partner costs and selected elements of gross margins, were discussed with Ian and led to substantive revision of the model structure.

The developer of this somewhat elegant model, Ian Hayes, was quite candid in expressing his concerns about the precision of some technical coefficients and prices embedded in the model. The sources of technical production relationships and prices used are provided in footnotes to

the annex tables of this report. Data on activity levels from 1992 to 2002 are from published information. The estimated aggregate production response to these activity levels was based on either MAFE research or responses from cooperating farmers.

Projections of future levels of farmer participation in each activity reflect the considered judgement of MAFE personnel. A scenario of zero expansion of area covered by activities after year 2002, except for Treadle Pump (TP) irrigation, is provided as a conservative baseline. The alternative scenario reported reflects a 10% per year expansion in all activities except for a more rapid expansion of the recently available TP irrigation activity.

These two scenarios are included in this report to illustrate the major findings, as well as strengths and weaknesses of this approach as perceived by this reviewer. The MAFE project may well elect to provide other scenarios in future reports in order to illustrate other issues or dimensions of the project. If future MAFE work were envisaged, it would be useful to enhance the linked spreadsheet model to facilitate the easy varying of commodity prices, non constant rates of response, etc.

IRR Model Results

The internal rate of return (IRR) was selected as a method that provides a single comprehensive measure of the economic merit of the overall MAFE project. From an aggregate economic standpoint, a calculated IRR that well exceeds representative national lending rates generally would be viewed as favorable to MAFE like activities. There is no single acceptable IRR for all conditions. As stated by Gittinger (1982) in his classic textbook, Economic Analysis of Agricultural Projects, the IRR is, "the discount rate that makes the net present worth of the net benefit stream ... equal to zero." Perhaps a more understandable statement would be that the IRR is the rate of return on funds invested in an activity over the lifetime of that activity.

Projects similar to MAFE are often evaluated on the basis of several criteria. The MAFE project may wish to use additional criteria, but for this farmer centered project, a key basis for an economic evaluation should be whether farmer returns are sufficient to offset MAFE project and both farmer and partner costs of MAFE related activities. The model developed and used by the MAFE project meets this standard.

The internal rate of return for the base scenario, no project area expansion except for TP irrigation for the period 1992 through 2011 was 23.5%. When all activities were projected to increase at a rate of 10% from the base area the IRR increased to 26.0%. These IRR results are quite impressive, particularly in light of the fact that the benefit stream had to offset all farmer, partner, and MAFE costs. The initial four years of the project were solely project research costs involving no farmer participation. Thus, zero returns were shown for the years 1992 through 1995. These IRR figures are commonly related to the normal costs of capital for ordinary business ventures. The current economic scene in Malawi has resulted in exorbitantly high interest rates. The current (April 12, 2002) National Bank of Malawi commercial lending rate is 46% and its rate paid on savings is 24% (personal inquiry of National Bank of Malawi on April 12, 2002).

The heavy front-end loading of costs with the 1992-1995 MAFE research expenditures severely impacted the net benefit stream during the early years of the project. If one excludes the two years when crop legumes were actively considered, 1999 and 2000, the annual net benefit stream did not turn positive until 2004. Given this factor of disproportionate weighting of the early cost stream, makes the IRR figures that much more impressive. As can be seen, the IRR

was relatively insensitive to the 10% annual rate of area expansion, increasing only 2.5 percentage points to 26.0%. This results from the production processes assuming constant returns to scale for a farm sector in equilibrium. The only reason for the IRR to be higher with the 10% annual expansion of area is that TP irrigation was assumed to increase at a faster rate than the other practices. The TP irrigation practice is the only alternative providing sufficient first year earnings to permit immediate full cost recovery in Year 1 of the practice. In contrast, wood production does not have its initial earnings increase over that earned in the baseline production year until Year 4. The Dispersed Systematic Interplanting (DSI) practice produced no net benefits until Year 8. The last several years prior to 2011 of the land area that experienced establishment of new DSI activity therefore made negative contributions to the calculated net benefit stream of this model. Thus, as time progresses these time-deferred alternatives have a higher and higher percent of their area reaping a full benefit stream each year, particularly under the zero growth scenario. The fact that the TP irrigation was projected to increase at a faster rate biases the IRR upward because the ratio of the higher earning TP irrigation to total area under MAFE practices is increased. One might have expected the IRR to have risen at an even faster rate under the expansion scenario. This effect was moderated by the higher ratio of time-deferred benefit streams under the 10% expansion scenario. This effect would have been even more pronounced if the whole model were not heavily impacted by the early years, particularly the 1992 - 95 years when only costs existed. If the model were to reflect the post 2011 returns, attributable to costs borne pre 2012, but properly discounted to 2011 values, it would treat the alternatives more evenly, but would only very minimally impact the final calculated IRR.

A more adequate explanation of the IRR model is afforded by examining the results in more detail over the full 20 year period and discussing the assumptions involved in generating the cost and return streams for each enterprise on a year by year basis.

The cost and benefit stream for each enterprise is presented in **Table 1** for zero expansion subsequent to 2002, except for TP irrigation area. **Table 2** presents the same information for the scenario involving a 10% annual rate of area expansion of MAFE activities. It needs to be remembered that the TP irrigation area increase is based on the already expanded irrigation area assumed under the so-called zero expansion scenario. **Tables 3** and **4** present the number of hectares under each activity during the period 1996 to 2011 for the zero expansion and 10% rate of expansion to provide a better understanding of the physical volumes involved.

As one looks at the cost and benefit figures in tables 1 and 2 one might be inclined to make comparisons among the practices. Clearly, TP irrigation dominates the income stream and one might want to conclude that all efforts should go towards increasing this practice. However, caution is urged against direct comparisons between enterprises because of all the limitations of the relative allocation of partner and MAFE costs and the handling of long term production assets purchased during the first year of the activity. Cost of purchasing the treadle pumps, shown in the Partner cost column represent the cost of pumps for new treadle pump hectareage minus the cost of pumps for the new irrigation area during the previous year. This reflects the current practice of farmers essentially borrowing the money from the Partners at the beginning of Year 1 and repaying the entire amount at the end of that year. Thus, these repayments by farmers are available to the partners for purchase of additional pumps to support further expansion in the succeeding year.

A casual perusal of either of the above mentioned tables clearly shows the dominant income earning power of the TP irrigation alternative. Even in Year 2002, the initial year of treadle pump irrigation, 6% of the total benefit stream came from treadle pump irrigation. By the Year

0%

Table 1
MAFE Project: Summary Cost-Benefit Analysis

	Project Costs		COSTS (US\$)					Total Cost	
	MAFE Project/ RCenter	Partner	Wood	DSI	USowing	Crop Legumes	Vetiver		Irrigation
1992	96,851	0	0	0	0	0	0	0	96,851
1993	324,987	0	0	0	0	0	0	0	324,987
1994	250,118	0	0	0	0	0	0	0	250,118
1995	302,147	0	0	0	0	0	0	0	302,147
1996	412,157	71,319	1,504	32,545	6,733	0	6,569	0	530,827
1997	596,221	49,535	72,791	704	21,152	0	4,088	0	744,491
1998	724,603	165,550	144,079	8,867	24,939	0	43,045	0	1,111,084
1999	720,317	615,176	224,211	51,677	115,699	51,966	71,133	0	1,850,179
2000	766,933	393,552	281,611	7,475	236,642	65,382	87,477	8,202	1,847,273
2001	1,072,305	590,774	448,864	65,601	353,172	0	134,039	26,457	2,691,212
2002	1,286,374	716,533	562,355	39,045	536,017	0	173,121	153,510	3,466,954
2003	36,810	703,886	666,123	5,717	743,572	0	203,656	298,269	2,658,034
2004	265,696	748,150	756,011	-26,758	949,452	0	234,450	515,407	3,442,408
2005	0	751,312	849,171	-58,426	1,155,332	0	265,496	841,113	3,803,998
2006	0	819,290	948,253	-59,909	1,361,212	0	296,792	1,329,673	4,695,311
2007	0	858,021	1,051,984	-60,619	1,567,092	0	328,334	2,062,513	5,807,325
2008	0	979,353	1,161,028	-47,389	1,772,972	0	360,118	3,161,772	7,387,855
2009	0	1,038,092	1,270,891	17,654	1,978,852	0	392,141	4,616,024	9,313,655
2010	0	1,165,052	1,380,754	95,226	2,184,731	0	424,399	6,414,898	11,665,061
2011	0	1,216,537	1,490,617	232,590	2,390,611	0	456,888	8,526,826	14,314,070

	BENEFITS (US\$)						Total Benefit	Net Benefit	IRR
	Wood Sales	DSI	USowing	Crop Legumes	Vetiver	Irrigation			
1992	0	0	0	0	0	0	0	-96,851	23.5%
1993	0	0	0	0	0	0	0	-324,987	
1994	0	0	0	0	0	0	0	-250,118	
1995	0	0	0	0	0	0	0	-302,147	
1996	0	0	1,644	687,574	0	0	689,219	158,392	
1997	0	0	12,789	865,092	3,366	0	881,247	136,756	
1998	0	0	30,880	0	5,716	0	36,596	-1,074,488	
1999	672	0	59,440	0	28,079	0	88,191	-1,761,988	
2000	33,264	0	128,863	0	66,369	14,208	242,704	-1,604,569	
2001	101,069	0	331,251	0	115,001	52,096	599,417	-2,091,795	
2002	210,134	0	686,517	0	189,177	288,895	1,374,723	-2,092,231	
2003	357,062	71,265	1,145,313	0	285,973	644,094	2,503,707	-154,327	
2004	597,542	203,492	1,604,109	0	401,148	1,176,892	3,983,183	540,775	
2005	896,525	393,267	2,062,905	0	534,424	1,976,089	5,863,210	2,059,212	
2006	1,239,264	776,980	2,521,702	0	685,531	3,174,884	8,398,361	3,703,050	
2007	1,616,352	1,348,050	2,980,498	0	854,201	4,973,078	11,772,179	5,964,853	
2008	2,032,704	2,237,317	3,439,294	0	1,040,171	7,670,368	16,419,854	9,031,999	
2009	2,455,104	3,568,364	3,898,091	0	1,243,181	11,379,142	22,543,881	13,230,227	
2010	2,877,504	5,335,996	4,356,887	0	1,462,976	16,131,008	30,164,371	18,499,310	
2011	3,299,904	7,559,670	4,815,683	0	1,699,303	21,885,222	39,259,782	24,945,712	

Table 2
MAFE Project: Summary Cost-Benefit Analysis

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	COSTS (US\$)								Total Cost
	Project Costs		Farmer Costs					Irrigation	
	MAFE Project/ RCenter	Partner	Wood	DSI	USowing	Crop Legumes	Vetiver		
1992	96,851	0	0	0	0	0	0	0	96,851
1993	324,987	0	0	0	0	0	0	0	324,987
1994	250,118	0	0	0	0	0	0	0	250,118
1995	302,147	0	0	0	0	0	0	0	302,147
1996	412,157	71,319	1,504	32,545	6,733	0	6,569	0	530,827
1997	596,221	49,535	72,791	704	21,152	0	4,088	0	744,491
1998	724,603	165,550	144,079	8,867	24,939	0	43,045	0	1,111,084
1999	720,317	615,176	224,211	51,677	115,699	51,966	71,133	0	1,850,179
2000	766,933	393,552	281,611	7,475	236,642	65,382	87,477	8,202	1,847,273
2001	1,072,305	590,774	448,864	65,601	353,172	0	134,039	26,457	2,691,212
2002	1,286,374	716,533	562,355	39,045	536,017	0	173,121	153,510	3,466,954
2003	36,810	778,069	696,205	17,892	743,572	0	213,354	318,774	2,804,676
2004	265,696	904,250	831,088	-4,622	971,321	0	257,802	591,459	3,816,994
2005	0	1,009,425	985,647	-28,768	1,221,846	0	306,884	1,041,389	4,536,423
2006	0	1,199,773	1,159,358	-25,407	1,497,422	0	361,059	1,783,774	5,975,978
2007	0	1,402,200	1,353,178	-24,221	1,800,557	0	420,834	3,008,708	7,961,256
2008	0	1,743,532	1,570,228	-12,340	2,134,005	0	486,768	5,029,851	10,952,042
2009	0	2,067,682	1,808,714	47,789	2,500,797	0	559,472	7,985,440	14,969,893
2010	0	2,522,715	2,071,048	116,894	2,904,269	0	639,621	12,025,507	20,280,054
2011	0	2,947,485	2,359,617	242,466	3,348,088	0	727,957	17,264,674	26,890,286

	BENEFITS (US\$)						Total Benefit	Net Benefit	IRR
	Crop and Wood Sales					Irrigation			
	Wood Sales	DSI	USowing	Crop Legumes	Vetiver				
1992	0	0	0	0	0	0	0	-96,851	26.0%
1993	0	0	0	0	0	0	0	-324,987	
1994	0	0	0	0	0	0	0	-250,118	
1995	0	0	0	0	0	0	0	-302,147	
1996	0	0	1,644	687,574	0	0	689,219	158,392	
1997	0	0	12,789	865,092	3,366	0	881,247	136,756	
1998	0	0	30,880	0	5,716	0	36,596	-1,074,488	
1999	672	0	59,440	0	28,079	0	88,191	-1,761,988	
2000	33,264	0	128,863	0	66,369	14,208	242,704	-1,604,569	
2001	101,069	0	331,251	0	115,001	52,096	599,417	-2,091,795	
2002	210,134	0	686,517	0	189,177	288,895	1,374,723	-2,092,231	
2003	357,062	71,265	1,152,830	0	285,973	679,614	2,546,744	-257,932	
2004	597,542	203,492	1,665,775	0	406,116	1,324,299	4,197,225	380,231	
2005	896,525	393,267	2,230,014	0	551,736	2,388,030	6,459,572	1,923,149	
2006	1,252,704	776,980	2,850,677	0	725,178	4,143,187	9,748,726	3,772,748	
2007	1,664,736	1,348,050	3,533,406	0	929,025	7,039,196	14,514,413	6,553,157	
2008	2,146,406	2,237,317	4,284,409	0	1,166,123	11,817,610	21,651,864	10,699,822	
2009	2,674,257	3,568,364	5,110,511	0	1,439,602	19,044,961	31,837,695	16,867,802	
2010	3,254,892	5,362,656	6,019,224	0	1,752,912	29,231,009	45,620,693	25,340,639	
2011	3,893,591	7,683,691	7,018,808	0	2,109,848	42,799,143	63,505,081	36,614,795	

Table 3

Summary of MAFE Project Achievements (1996-2001) and Projected Targets (post 2001) *No expansion*

Hectares		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	
Trees planted for wood	Annual	20	960	1,528	1,992	2,120	3,720	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
	Cumulative		980	2,508	4,500	6,620	10,340	14,340	14,340	14,340	14,340	14,340	14,340	14,340	14,340	14,340	14,340	14,340
Trees planted for soil fertility	Annual	3,136	952	2,007	6,698	4,327	11,148	11,732	11,732	11,732	11,732	11,732	11,732	11,732	11,732	11,732	11,732	11,732
	Cumulative		4,088	6,095	12,793	17,120	28,268	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
Undersowing with <i>T.vogelii</i>	Annual	175	293	430	845	3,076	5,841	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000
	Cumulative		506	2,872	6,154	9,375	14,316	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Contour vetiver hedge conservation	Annual	385	121	2,366	3,282	3,221	4,941	5,684	5,684	5,684	5,684	5,684	5,684	5,684	5,684	5,684	5,684	5,684
	Cumulative		506	2,872	6,154	9,375	14,316	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Crop Legumes	Annual				2,506	647	0	0	0	0	0	0	0	0	0	0	0	0
Irrigated crops	Cumulative					3	8	50	75	113	169	253	380	570	783	1,003	1,215	

Notes and assumptions:-

1. Data from 1996-2001 are MAFE partner achievements
2. Data for 2002 are MAFE partner targets
3. Data from 2003-2011 are based on 2002 targets increasing by 0%, *excluding projected increases in irrigated crops*
4. Irrigation targets are expected to increase substantially from 2003 onwards due to high farmer demand

Table 4

Summary of MAFE Project Achievements (1996-2001) and Projected Targets (post 2001) *10% expansion*

Hectares		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Trees planted for wood	Annual	20	960	1,528	1,992	2,120	3,720	4,000	4,400	4,840	5,324	5,856	6,442	7,086	7,795	8,574	9,432
	Cumulative		980	2,508	4,500	6,620	10,340	14,340	15,774	17,351	19,087	20,995	23,095	25,404	27,945	30,739	33,813
Trees planted for soil fertility	Annual	3,136	952	2,007	6,698	4,327	11,148	11,732	12,905	14,196	15,615	17,177	18,895	20,784	22,862	25,149	27,663
	Cumulative		4,088	6,095	12,793	17,120	28,268	40,000	44,000	48,400	53,240	58,564	64,420	70,862	77,949	85,744	94,318
Undersowing with T.vogellii	Annual	175	293	430	845	3,076	5,841	8,000	8,800	9,680	10,648	11,713	12,884	14,172	15,590	17,149	18,864
Contour vetiver hedge conservation	Annual	385	121	2,366	3,282	3,221	4,941	5,684	6,252	6,878	7,565	8,322	9,154	10,070	11,077	12,184	13,403
	Cumulative		506	2,872	6,154	9,375	14,316	20,000	22,000	24,200	26,620	29,282	32,210	35,431	38,974	42,872	47,159
Crop Legumes	Annual			2,506	647	0	0	0	0	0	0	0	0	0	0	0	0
Irrigated crops	Cumulative				3	8	50	83	136	225	371	611	1,009	1,526	2,151	2,865	

Notes and assumptions:-

1. Data from 1996-2001 are MAFE partner achievements
2. Data for 2002 are MAFE partner targets
3. Data from 2003-2011 are based on 2002 targets increasing by 10%
4. Irrigation targets are expected to increase substantially from 2003 onwards due to high farmer demand

2011, under the zero expansion scenario 53% of the total benefit stream came from irrigation. When treadle pump irrigation was expanded at an even greater rate under the 10% expansion scenario, 67% of the total benefit stream came from irrigation.

This reviewer cannot help but note that the two activities most profitable in terms of total economic returns to farmers have no evident relationship to Agro-Forestry. Regardless of any data or conceptual limitations to the study, these results reveal that activities examined within MAFE that were truly Agro-Forestry had problems matching up to either an "improved seed" (crop legumes) or a "technology" alternative (treadle pump irrigation) in terms of overall income impact under the assumed levels of adoption through 2011. However, this does **not** necessarily imply that the Agro-Forestry practices were not profitable, only that the absolute scale of earnings were dominated by treadle pump irrigation. **Table 5** presents information on Year 2011 benefits and costs for each of the alternatives considered in 2011, under the zero rate of expansion scenario. The right hand column expresses these returns as a ratio of benefits to costs for the year 2011. These B:C ratios reveal that Dispersed Systematic Interplanting (DSI) has a remarkably high B:C ratio and that vetiver grass establishment has a modestly higher B:C ratio than TP irrigation.

Table 5. Projected Benefits and Costs in Year 2011, By Practice a/

Practice	Benefits K	Costs K	B:C Ratio
DSI	7,559,670	232,590	32.50
Vetiver grass	1,699,303	456,888	3.72
TP irrigation	21,885,222	8,526,826	2.57
Wood for fuel	3,299,904	1,490,617	2.21
Undersowing	4,815,683	2,390,611	2.01

A/ zero expansion scenario

Table 5 figures show that one should not dismiss Agro-Forestry as an approach to improving the income of Malawian farmers and improving the natural resource base of Malawi. Additionally, the IRR measure captures no explicit benefits for natural resource maintenance or soil conservation, except for the assumption of a 1.5% annual decline in maize yields that would have occurred in the area under vetiver if the vetiver had not been planted. Calculation of IRRs for Agro-Forestry investments commonly include estimates of "public", or non farmer, benefits accruing from these activities. In this IRR analysis, except for the vetiver grass alternative, the MAFE project chose not to make estimates of either the physical quantity or value of these public benefits, if any, from activities under MAFE.

As with TP irrigation, crop legumes were quite profitable for participating farmers. However, MAFE dropped crop legumes from consideration as a long term strategy to be pursued within the context of MAFE. The income improvement from the crop legume alternative was merely a function of planting an improved seed costing K1,440 more per hectare while producing a K20,578 increase in revenue per hectare. It is unclear to this reviewer why crop legumes were excluded from further consideration unless it was presumed that Partner and Resource Center support was not needed for the crop legume option. Unless this is the rationale and it is further assumed that TP irrigation cannot be adopted without support of Partners and the RC, it would seem that TP irrigation should have received similar consideration.

Although not central to interpretation of the IRR results, the reviewer has to note the absolute size of Partner costs in future years even under the assumption of no increase in prices over time. These costs are based on the Partners paying the RC full cost recovery prices for all physical items secured from the RC. Thus, absence of MAFE costs after the projected 2003 and 2004 bridging funds assumes the establishment of the RC as a self financing entity. The projected Partner costs become quite large, reaching over \$1.2 million in 2011, even under the zero expansion scenario.

This level of growth in Partner costs is based largely on one critical assumption. That assumption is that farmers will not follow production practices that will sustain these yields without continuing Partner support. Hopefully, that would not be the case. Partner costs post the Year 2002 in this model would be substantially reduced if one were to assume some rate of farmer disassociation from the Partner organizations after a given period of years. The increase in Partner costs after 2002 in the zero expansion scenario results from the dramatic costs of pumps imposed with net new acreage of irrigation. This reviewer believes that Partner participation requiring US\$ 1,216,537 for a year like 2011, even under the zero growth scenario, is most unlikely to be forthcoming.

Although not a direct part of the rationale for this particular IRR analysis, construction of a model with these general properties allows one to draw some interesting policy conclusions for the Government of Malawi and others potentially interested in advancing the incomes of Malawian farmers. This IRR model provides an IRR after all costs are included, even those borne by MAFE and Partners. The 23.5% IRR represents early years when large MAFE costs were incurred without any immediate farmer benefits. Thus, one can safely assume that considering only later years, post MAFE, would result in a higher IRR than 23.5%. During the post 2004 years, the only non farmer costs are those of the Partners. The Gross Margin budgets provided in the Annex require farmers to pay for all physical inputs secured, whether through a Partner/RC connection or purchased directly from the open market. The remaining Partner costs are for classical Extension type functions (education, monitoring, etc.). Thus, the model is saying that the only input needed that is not paid for directly by the farmer is an effective Extension type function. Additionally, it assumes that some entity (RC or another public or private entity) will collect and distribute tree seeds at the same cost now experienced by the RC.

Thus, if the income enhancing activities stemming from MAFE are to be adopted by additional Malawian farmers and the projected Partner costs are not likely to be forthcoming from Partners, the GOM must decide whether, given the projected IRR, it wishes to provide similarly effective Extension type functions as now provided by the Partners.

Another policy consideration relates for the "financial" or "cash flows" feasibility of these activities from a farmers standpoint. The model, as specified, says that farmers not only can, **but will** undertake these expenditures/investments from either household savings or from borrowings. The calculated IRR reveals that farm earnings would support the borrowing of funds if the interest rate were below 23.5%. Actually, the break off rate would be considerably higher for the farmer since the model is charging for non farm costs and is imposing a cost for farm labor that is largely unpaid operator and family labor. Regardless, from a financial management standpoint, there is clear evidence that the activities under MAFE will provide farmer returns sufficient to more than compensate for interest on borrowed funds.

Given this situation, policy issues regarding agricultural credit are clear. Because of the "common good" character of many Extension type activities they were treated separately in the above section. Physical inputs that become a part of the production process (seeds, fertilizer,

irrigation equipment, etc.) are the private property of the purchasing farmer and any benefits forthcoming from them accrue to the farmer. Thus, a farmer will gain if the rate of return on funds invested in these assets exceeds the cost of those funds.

If farmers do NOT invest funds, given these favorable expected rates of return, we are faced with one of two possible situations, either internal or external capital rationing.

INTERNAL CAPITAL RATIONING: Under this condition the farmer either has savings sufficient to meet these cash needs or can borrow the funds at interest rates favorable to the investment, but does not make the cash investments. If this type of situation should exist and, if the GOM or another entity wants to do something about this situation, they must seek a mechanism for reducing farmer internal capital rationing. This might take the form of things such as education to reduce the factors that give rise to internal capital rationing, development of crop insurance, etc.

EXTERNAL CAPITAL RATIONING: This is the condition wherein the farmer is willing to borrow and make the investments, but either there is no credit available to him or the interest rate exceeds the rate he expects to earn on such investments. The resulting policy questions revolve around the provision of credit to small farmers. There have been a multitude of programs advanced in this area, most of which have not been roaring successes. Nevertheless, this type of IRR analysis indicates the level of the bar that must be surpassed.

Details of the coefficients embedded in this linked spreadsheet model are provided in the price data and gross margins included as Annex 1 of this report. My comments relate largely to situations where I have some degree of reservation about a particular item or how it is treated in the model. These comments are not to imply that there is an error in how the model is specified, only that Ian and I either differ as to the appropriate approach or the changes in the model needed to examine a particular issue were considered beyond the scope of this inquiry.

The first page of the annex is entitled, GM Price list and is a simple listing of input and output prices used and the source of the reported prices. The second page, Gross Margins Details, provides miscellaneous data used in the gross margin budgets. I failed to inquire of Ian about the labor requirements for years 11 to 15 for the DSI enterprise. I could not generate these numbers from the available data, but was able to calculate the reported labor figures for the other years. Regardless, this small discrepancy, if an error, is so small that it would have no effect upon the IRR.

The remaining Annex tables are gross margin budgets for activities considered in the model. Most of them represent enterprise budgets for MAFE enterprises. The other reported gross margin budgets are for enterprises using the traditional methods that existed prior to the MAFE procedures. These non-MAFE gross margin budgets are presented because the IRR approach compares the situation conducted with a MAFE alternative versus without that particular MAFE alternative. The footnotes of these tables specify the "without" alternative used in generating the net benefits used in the model.

The first gross margin budget, local maize DSI with *F. albida*, contains an area of disagreement between Ian and myself. I believe that the non-hybrid (NH) maize seed price should be no less than the producer price. These farmers typically retain seed from their NH maize to use as seed the following year. Using even the same price for both implicitly assumes no opportunity cost for withholding consumption on funds for the period from harvest to planting and unless an adjustment is made, there is no accounting for storage loss. Ian's position was that 2002 data

was being used for the budgets and that the producer price for maize was K7/kg in 2001, the year in which the maize was not sold. This is true, but the farmers opportunity cost at planting time in 2002 was, in fact, K12/kg for he could have sold it rather than plant it. Gross margin budget #2, Non-hybrid maize, no fertilizer, provided the "without" base for the immediately preceding DSI with F. albida budget. The reader needs to note that the maize with F. albida budget is carried out for 20 successive years from the year in which the F. albida tree seedling was planted. Each of the initial five years are reported, but only years 10, 15, and 20 afterwards. The interlinked spreadsheet model contains budgets for each of the twenty years because annual wood yields commence in year 8 and increase each year through year 20. This multi-year budget is required to properly represent enterprises having increasing (or decreasing) annual yields as the crop yields and/or input requirements change with time. Note also that primary thinning labor initially appears in the table for Year 15.

Annex tables 7 and 8 relate to the vetiver alternative. It should be noted that the maize yields remain constant at 1,420 kg/ha for the "with vetiver" budget (table 8), but that yields go down 1.5% per year under the "without vetiver" budget (table 7). As noted earlier, this is the only explicit recognition of soil productivity loss under traditional production procedures.

Annex tables 9 and 10 are simply annual budgets for groundnuts. It is assumed that the change in yield results only from the use of improved seed costing K45/kg as opposed to K27/kg for retained seed. I raise the same issue of product price exceeding seed price, particularly with no interest or storage loss. Additionally, I question the same labor requirement per hectare when yields differ by almost a three fold measure. Similarly, "output transport" costs are the same when the quantity hauled is so markedly different.

Annex tables 12 and 13, irrigated green maize and irrigated drumhead cabbage, represent a different kind of gross margin budget than the preceding budgets. These irrigated crop budgets reflect the costs and benefits from producing two crops each year. However, the pump depreciation and maintenance costs are an annual fee that covers the two crops produced during the year. The budget operating within the interlinked spreadsheet represents 75% of the land area being devoted to irrigated green maize and 25% devoted to irrigated drumhead cabbage. The Treadle Pump irrigation activity is the only alternative with a major cash requirement in Year 1, largely for acquisition of the pump and associated irrigation equipment. Since farmers acquire these pump system assets from the RC on essentially an interest bearing loan, an interest charge is assessed in Year 1. Experience to date has shown that farmers retire these loans at the end of Year 1 in entirety. Therefore, there is no interest charge for Year 2. The imposition of an interest charge for seed and fertilizer purchases treats this irrigated option differently than the rainfed alternatives. The immense profitability of irrigation more than offsets this added cost. The depreciation charge simply averages the purchase price out over the expected 20 year life of the pump.

In summary, I support this application of IRR procedures in the analysis of the MAFE project. The differences between Ian and myself regarding the issues mentioned above would have only a very very small impact on the final IRR calculated. Determination of whether calculated IRRs represent success or failure depends largely upon two issues: (1) whether one considers full inclusion of all MAFE and Partner costs is appropriate and (2) what one considers to be the appropriate interest rate against which the calculated IRR should be compared.

Additionally, if IRR procedures are considered and if the project were to be continued or a new project initiated, it would be useful to consider development of a linked spreadsheet model that would facilitate easy manipulation of other variables. These might include such things as yearly

price changes that are not constant, differential rates of expansion over time and/or between enterprises, changes in levels of Partner support as farmers gain experience with practices, etc.

II. Resource Center Proposal

Unfortunately, I find that my comments on this bridging funding proposal are a bit late. Ian informed me that the proposal was going to USAID on Tuesday afternoon, April 9. I had some editorial comments the first week, but was waiting to get the backup information on costs of the RC before trying to do any analysis. Nevertheless, some of these comments may be useful if Trent has to do some negotiating with USAID. If funded, the timing of the mid course review and recommendations is likely to be important. My discussions with Ian and the Director of the RC gave me some ideas that you might wish to think over in any mid-course review of the operation of the RC.

A meaningful review of the proposal for two year bridging funding for the Resource Center is almost impossible without detailed budget information on how the "Sales Revenue Generated" by the Resource Center are calculated. However, it doesn't seem particularly important to speculate about pricing strategies now that the proposal has been submitted. Ian has provided the requested data and unless the RC has some more current and better information at the time of the initial mid-course review, this data will be useful to whomever does that review.

At the time of the initial mid-course review of Year 1 under Bridging funding, unit pricing information should be available in the RC accounts on revenues obtained from sales of each item. If the same price is not charged to all Partners, the RC needs to keep a record of the prices charged and quantities purchased by different Partners.

Perhaps the most critical aspect of the Year 1 review is its timing. It is my understanding from discussions with Ian and the Director of the RC, the majority of sales commence in June. Prices for the 2002/2003 year need to be **in place by June 1, 2002**. It is contended that the majority of sales are completed during August. Therefore, the initial review of RC operation for Year 1 should be as soon as data are available after **September 1, 2002**. If annual sales occur as speculated, the bulk of information will be available at this time. This will allow analysis and suggestion of prices for sales commencing June of 2003. Admittedly, the announcement of higher prices effective June 1, 2002 is likely to induce some early buying to avoid the price increases. This will need to be taken into account when the review is conducted. Similarly, the announced price increases for June 1, 2003 are likely to induce early buying for that year. I have no idea how and when the RC makes price information available to Partners, but this is not a minor detail.

Although not important to this proposal, if one tries to relate the RC proposal information to the IRR study, there is a critical assumption that is not explicit in the IRR study. That is, the RC operates on a constant returns to scale basis. The fact that there are no economies to scale associated with operation of the RC is unimportant for the bridging period. However, if the RC is maintained, the unit costs of products provided to Partners should decrease if there are economies of scale and the RC is operated on a non-profit basis. If such were true, the deficit of Year 2 would be reduced in relation to existing economies of scale in subsequent years. This might make USAID a bit less leery of funding the proposal. (Bitter cranks, like me, are likely to assume that any cost savings as a result of increased volume are likely to result in better vehicles, fancier desks, air conditioners, etc. for bureaucrats rather than reduced prices for Partners/farmers.)

Comments based on the draft proposal and no information regarding prices received by the RC for items sold other than whatever prices are currently embedded in Table 7 of the proposal.
The following comments were prepared prior to becoming aware that the proposal had already been submitted. A copy of the proposal as submitted to USAID is attached as Annex 2.

In general the proposal appears to be well drafted based on the assumption that the reader is familiar with the MAFE project and its relationship to both Partners and the RC. My comments below are keyed to sections of the draft proposal.

Pg 1, para 1

You use the term "great momentum". Without explicit data, this term has little meaning. As noted above, if the reader is closely familiar with MAFE, he will have some perception of "great momentum". It might be better to include some real numbers to assure the reader that you are not "puffing" the results. This would also support the "rapidly expanding adoption" phrase in para 2.

Pg 1, para 2, sent. 2

This may be a tough sentence to understand. Perhaps use of the word "exclude" gives me unwarranted confusion. How about something like, "Bridging funds requested from USAID represent expected budgetary needs of the RC less expected receipts from Partners for services rendered to these partners by the RC (Table 7)."

Pg 1, para 3, last sentence

My analysis of the RC budget implies that continuation of the RC after year 2 would entail a budget deficit unless prices (whatever they are in Table 7) charged to partners were increased. I deleted all the WSU expenses for Year 2 and the RC would still run a deficit. Without the above requested price information, one cannot get any idea how much RC prices would have to be increased in 2004 in order to break even. My discussion with the Director of the RC indicated that he thought prices would need to be further increased past Year 2 of this proposal. I don't believe that there is anything false in this paragraph, but a projected budget deficit of \$265,644 for Year 2 less the WSU portion of the year 2 budget still results in a projected shortfall for future years. (This assumes that the WSU contribution to the RC in year 2 has zero effect on its operation). Since the RC presumably will price items at the levels used in Table 7, the drafters of this proposal are assuming that the RC will not be self sufficient post year 2 without further price increases during or after year 2 and further assume that Partners will not reduce their purchases in response to the price increases.

Pg 1, Items under **DESCRIPTION OF THE RESOURCE CENTER**

The five items listed herein include only physical product oriented items other than offices for the RC Coordinator and Manager. Later on under the Partnership Model section you explicitly mention conducting or providing for the conducting of training courses and technical support for community based problem identification and resolution. It seems to me that the **DESCRIPTION** section should give explicit recognition to these later recognized products.

Pg 3, targeted item "Improved fallows of Tephrosia"

It may not be important in this proposal, but this alternative is not included in the IRR study unless it is somehow combined with the non-fallow undersowing with Tephrosia.

Pg 3, first two targeted items under Partnership Model

These are the two services mentioned earlier that probably merit inclusion under the DESCRIPTION OF THE RESOURCE CENTER section.

Pg 4, Table 1

Suggest first column heading be a bit more complete--"Organization Providing Training"

Pg 6, Tables 3 and 4

As above, the left hand column heading could use some added clarity, simply "receiving materials" or "receiving germplasm" to the existing heading would help.

Pg 7, first para, sent 1

This is a tough sentence for the uninitiated to understand. I would consider terminating the first sentence after Center on the second line. I would then add something like the following as a second sentence to replace the balance of existing sentence 1. An integral element of this proposal is continuous monitoring of the performance of partners in meeting projected costs of maintaining the RC. As appropriate, operating procedures of the RC will be revised to better achieve economic sustainability under real market conditions.

It might tip one's hand more than you desire, but if you have any real sense of how you expect to do this monitoring, review and development of alternate operating strategies for the RC it might be a good idea to include some idea of what is expected. Even if you do not want to include this dimension in your proposal, I suggest that some thinking go into what needs to be done and the appropriate timeframe for performing this exercise. I note that you call for one short term consultancy in year 1 and two in year 2. I believe that you might do well to get on top of this issue as soon as sufficient information is known about partner/farmer willingness to pick up more of the expenses. (Note the opening part of this section about when the initial review should take place.) The paragraph just below item 3 mentions the end of the first 12 month period. It depends upon when the year closes and when procurement for the following year takes place. But, if it takes 2 to 3 months for a decision to be made after commencement of the review, this may be too late.

Pg 8

first checked item

I have an aversion to the word "running" when used in this context. I would prefer managing or operating.

3rd checked item

You might add a sentence something like the following: This documentation will be done and reported at least quarterly in a manner to permit the earlier mentioned review and possible revision of operating procedures for the RC.

first item starred under "Staff Required in Malawi"

I would suggest that the RC Coordinator should report dually to the WSU Project Director and whomever is the appropriate administrator within LRCD. If long term sustainability for the RC within the LRCD is the goal, it seems to me that LRCD needs to be as up to speed as possible about the internal workings of the RC. (Subsequently Ian informed me that USAID has little regard for LRCD. Although this may be both true and justifiable, failure to bring LRCD along almost assures death of the RC after the bridging fund period.

Pg 9, numbers at bottom under "training"

What do these numbers represent, number of people to be trained or number of training sessions?

Pg 10, top line

Is it useful to be a bit tighter in this meaning by inserting after LRCD the phrase "to retain within the RC" and delete "of" and "RC"?

Pg 11, Table 6.

As I interpret this table, it is assumed that the same price will be charged in both year 1 & 2 for the items sold by the RC to partners. This will give you two points towards an estimation of the elasticity of demand for RC products, but no indication of how partners (or farmers, if the partners decide to pass along these price increases to farmers) would respond in terms of quantity purchased if the price had been increased a different amount. It seems to me that any suggested pricing strategies that you might make depend upon your guess at the shape of the demand function for these services. You can't get real world observations of these phenomena in this situation, but your initial consultancy might try to gain some idea of this function. Ultimately I suppose it should be farmer willingness to pay if you want to approximate a "market economy". I'm not a marketing economist, but presumably people developing new products must conger up some estimate of consumer response to various prices for a product.

last sentence in next to last para

the word should be "and" not "am"

Pg 12, Table 7

As noted earlier, the derivation of total project costs is documented in the annex table. Similar documentation for derivation of the line "Minus Sales Revenue Generated" is needed as an annex.

III. Natural Plant Products

Regional Survey

After my phone conversation with Peter on Thursday, April 11, it was decided that I not spend any further time on the regional survey since it may or may not be conducted. Instead, I am to

work with John to try and get a decision on what he plans to get finished during the balance of MAFE. Then to be of whatever help I can be to help him firm up a plan of attack. However, since I had spent some time on the regional survey forms and made some comments, I will include these comments. (my activities with John on his remaining activities are included at the end of my comments on the regional survey.)

It has never been clear to me what John/Peter/MAFE/ or whomever is involved want to know about markets/marketing of NPPs produced or potentially to be produced/gathered in any or all of these 5 SA countries? I presume one would like to know something about the markets as a means to ultimately increasing local incomes from the production/gathering, processing, and marketing of NPPs in these countries.

I have only limited marketing experience, but it seems to me that the existence of such an income enhancing opportunity is partially dependent upon the existence &/or relationship of the components of such a production/marketing system. I have tried to set this down to help me get a hold on what might be involved in such an inquiry. Grossly oversimplified, we might think of the system as something like the following, recognizing that many of these steps would be collapsed, depending upon the extent of vertical integration in the industry.

By individual NPP (Although I presume many actors perform these functions across not only these NPPs, but other products and functions).

Set of final consumers w/some interest in this NPP

^

^

^

Retailer - healer

^

^

^

Wholesaler/consolidator of final product

May be an exporter from producing nation or importer from consuming nation

^

^

Processor/packager

^

^

^

Intermediate consolidator/marketer

^

^

^

Primary raw product buyer/consolidator

^

^

^

Producer &/or Gatherer

There may well be an whole array of auxiliary service providers to support these market functionaries, including some of the following: transport, market information, standards, finance, and any other supplier of inputs, etc. Basically these are not of interest to this study other than whether some of those surveyed believe that one or more of these services currently or in the future will represent a problem.

I have tried to take each of these levels and relate it to the two categories of schedules that I have seen and to then speculate on the types of information one might want to gather from each group. This was done in a hurry and clearly omits numerous items. More importantly, since I don't know exactly what those directly involved in the study are trying to accomplish with these surveys, I may have completely missed the boat.

I am assuming that there are only the two schedule forms that I have seen: (1) Gatherer (which I presume would be used for producers should the trees be managed) and d(2) Stallholder/Trader/Processor schedule.

1. Final consumer

Certainly, for this study, one is not going to examine the issue of existence of a consumer market, except possibly to exam the consumption of NPPs by the gatherers and producers (self-subsistence). Although as time in Malawi progressed and I talked more with John, it appears that one may not safely assume the existence of a meaningful final consumer for some of these products. That is, some of them are simply not cost competitive. There is no effective demand at prices which cover costs of production.

1. Gatherer/Producer schedule

- quantity going to this final market
- opportunity cost of that used in home consumption
- relative importance of home consumption versus sales for the Gatherer/Producer

In some sense one might want to determine the opinion of respondents to the current and future scope and character of such final consumer markets. But one will need to separate:

- 1---their sales to final consumers
- 2---their sales to primary or first level marketers

2. Processor, wholesaler, exporter schedule (Assume these people make no sales to final consumers, at least not in their role as processor, wholesaler, exporter)

Secure information on physical location of the market to which they are selling, at least with respect to consumer.

- Non-African
- Other African countries
- National
- Regional/local

Secure information on what form the product takes, including certificates necessary for health, etc. in each market and cost to get it in that form and transport costs, duties, etc. needed to get product to the point where price used is appropriate.

Expectation with respect to future volume, prices, etc.

II. Retailer (I'd put "healer" here. They are last person before consumer, if they provide the product).

For medicinal products, one might want to consider them a completely separate marketer.

1. There is no interest in retailers external to the countries producing NPPs in SA. We assume that prices by and charged to these retailers reflect whatever exists in the world. (Not being surveyed)
2. Retailers in SA countries, not specializing in NPPs are similarly not surveyed. Simply accept their pricing and performance as elsewhere reported. One would presume that the size of their sector would be the residual of domestic consumption less imports and domestic production, excluding that sold by selected stallholders specializing in NPPs.

Selected Stallholder schedule (These are retailers in this context)

Basic descriptive information about these stallholders:

- no.
- location
- size – volume handled (physical & value), labor involved, etc.
- source of product
- form of product when received & price
- form of product when sold & price
- regulations &/or controls (govt.)
- customers (description of class or classes)
 - cost of doing that part of the business related to retailing of NPP, exclusive of - the product price of the raw material.
 - opportunities they perceive, e.g.
 - expand traditional market
 - new product configuration
 - change in technology
 - problems they perceive now and in the future
 - how they expect their entity to change over the next X years.

Since these stallholders currently exist, we may assume that they are currently economically viable, and depending upon quality of data one may be able to get a rough estimate of:

Gross receipts

- direct raw product costs
- other cost of doing business
- = net returns to business

This could provide some "feel" for the efficiency of the market – the presence or absence of excessive economic rent

III. Wholesaler/Consolidator of final product in the SA countries

- may be an exporter &/or importer of NPP

Stallholder, traders schedule (Pertains only to stallholders who sell some to other links in the market chain.)

Need to separate by those firms specializing in NPPs and those more general wholesalers.

The type of information needed to be gathered would be basically the same as that envisaged for the stallholders, but couched in the wholesaler role. Include any packaging done, but no processing costs since those doing processing would be another type of marketer representing an integration of functions. If lucky, one might have enough information to gain some insight into profitability.

IV. Processor/Packager

Stallholder/trader schedule

Same data as for the Wholesaler/Consolidator, except include processing function.

V. Intermediate consolidator/marketer

Stallholder/trader schedule

Same information needs as with Wholesaler, except dealing with raw product. This presumes that they are not importing, but do we know whether some may be importing?

VI. Primary (1st) marketer/consolidator

Stallholder/trader schedule

Same information needs as Intermediate Consolidator/marketer of raw product.

VII. Producer/Gatherer

Gatherers schedule

Need to separate those who are strictly producers, strictly gatherers, and those who do both

- number
- size, by volume of product
- location
- operations performed:
 - identify operations
 - labor used
 - non-labor costs
- relate the above requirements to quantity of product handled
- note any regulations/controls imposed on them and by whom
- quantity produced or gathered
- quantity sold and quantity consumed at home
- to whom sold, at what price at what time of year

Here and everywhere else that price and volume of business information is gathered, try to obtain expected levels of price and volume for that firm or individual X years hence.

-the opportunities, problems and where do they expect to be X years later information as gathered for others.

It is likely that you may have only one or a very few observations in any one category of a business subsector. This may be troublesome, but it seems that this study is only designed to gain a better understanding of the market for NPPs. It will provide useful guidance for early programs to assist members of the NPP sector to improve their incomes. Perhaps even more importantly, it will provide very useful help to those doing future research in this area.

Is it expected that enough information will be gathered that you can determine differences in markets, by country? If nothing else, what about government regulations, duties, license fees, etc.?

I then took this outline and compared the schedules with this outline to see if there were obvious issues. It appeared to me that the schedules, if interviewers pursue responses to get at what underlies some of the responses, do a pretty good job of providing a description of existing markets. Depending upon what you wish to be able to do with the results from the survey, the following might be of concern.

--The Gatherer schedule will provide a reasonable description of "gatherers" current and perceived future market environment. There is not enough detail to calculate a rough estimate of the gatherer's net income from gathering, unless one assumes labor is the only input. One might use the level of this income as some measure of the existence of any excessive economic rents. I keep bringing up "excessive economic rents" because that is one measure often used to look at the efficiency of markets. To the extent gathering is a "family" business, there may be troubles sorting out the appropriate costs to be charged to gathering of the particular item. There is no information secured on gatherers perception of limitations to increase volume of their business. Is the resource (supply) about fully harvested? What increase in effort will be required to increase harvest yield? I would presume that there is some kind of sustainable yield from these items produced on communal lands. As one approaches that level, the effort per unit gathered is likely to increase. The common fishery example. The gatherer schedule seems to assume it is a "family" activity. There is a need to make sure that the interviewer is getting responses for only the person being interviewed or for the entire family. If farmers, as producers of this NPP are to be included under this schedule and inputs other than operator and family labor are important, those non-labor costs are not included.

This approach seems to indicate that gatherers operate individually. Do we know whether there are any formal or informal groupings for either harvesting or marketing of the NPP?

The stallholder/trader/processor schedule seemed to secure most of the information. However, I don't know how you are going to handle situations in which the individual or firm handles multiple NPPs and perhaps several other items or is perhaps involved in one or more activities quite unrelated to NPPs. This sorting out could be extremely vexing in terms of any overheads.

Market Study

It has been difficult for me to capture an understanding of where MAFE is on its market work and what is expected of it in the remaining months of the MAFE contract. A phone conversation with Peter Wyeth on Friday, April 12 provided considerable clarification on some perspectives of the whole market study activity. Comments on the role of John Pratt during the remaining life of MAFE are contained in a later section of this report.

1. Linda Robison trip

The MAFE group in Malawi seemed somewhat at a loss as to what Ms. Robison was to be doing in Malawi. This uncertainty seemed to be heightened by the lateness of her planned trip in relation to the remaining life of MAFE.

In our phone conversation, Peter Wyeth and I agreed that, given the short time she will have in Malawi, she should focus on an area where she has particular expertise, pharmacological issues. Further, given Pratt's interest in and preliminary work on Neem, it would make sense for Ms. Robison to focus on Neem. If for some reason Neem isn't the NPP decided upon, a firm decision on plant product needs to be made sufficiently before her departure from the U.S. that she can do some preliminary work.

In order to capitalize upon her technical expertise in pharmacological/medical issues, she should conduct a literature search on Neem with primary emphasis on the chemical properties of Neem and the history of medicinal use of Neem, particularly for what ailments and where used.

Given the chemical characteristics of Neem, she is most likely to have a basis for speculating upon the relationship between the chemical properties of Neem and various ailments that afflict Malawians. That is, does there appear to be any "science" support for the use of Neem.

Armed with this information, she could then spend time with both healers and patients. The information of interest might include some of the following:

Healers:

- for what ailments do they recommend Neem
- how do healers diagnose problems that afflict patient clientele
- are different forms of Neem prescribed for different ailments or stages of ailment
- the quantity and timing of prescribed use of Neem
- what forms of Neem are used and how does the healer know the "strength" of product
- does the healer provide the Neem or have the patient obtain it elsewhere
 - if elsewhere, how do they control the product taken by patient
- what rate of success does the healer believe they have achieved
- how does the healer evaluate success
- presumably Ms. Robison will have innumerable relevant questions from her discipline

Patients:

- how would they describe the ailment that led them to the healer
- what form, quantity, how often, for how long, etc. did they take Neem
- their version of how their ailment responded to the treatment and any other side-effects

I don't know anything about Neem. However, U.S. doctors/pharmacists are quite concerned about patients taking all of the prescribed quantity of product for the prescribed time. If that appears to be an issue in Malawi, Ms. Robison might wish to pursue this topic.

An email from Peter Wyeth (April 17) provided a current terms of reference for the Linda Robison work. Apparently her activities are to produce a stand alone document based on these terms of reference.

2. John Pratt's efforts during the remainder of MAFE project

Peter appeared to be less concerned about what John does than about his getting enough focus to yield a product at the end of June. Further, Peter indicated that his group (USAID, Rutgers, etc.) weren't sure, in light of the "Web" review, whether the primary data collection activity was going to take place. Thus, he argued for putting no time on the regional survey.

It was my perception that Peter wants John to declare what he is going to finish/produce for MAFE prior to the end of his contract. This final product(s) should be the dominant, if not sole, focus of his work in order for him to complete it in the very limited time remaining. Peter was of the opinion that John's priority, by plant product, was Neem, Tephrosia, and Moringa. Peter has no problem with this ordering, if agreeable with MAFE personnel. A potential issue is how many of these three can be considered in the limited time. This depends to some degree upon what he expects to do with each product. Presumably, one might not envision doing the same with each product. The preliminary work by John on Neem and the consultancy by Ms. Robison would seem to indicate an emphasis on Neem. If so, there seems some consensus that the international markets belong to India. That would indicate a focus in Malawi on local/informal market use.

My comments to Peter on approach were somewhat as follows and Peter seemed to agree that some well defined strategy needs to be put in place to assure a definitive product.

My oversimplified position was somewhat as follows and, again, Peter seemed satisfied if MAFE agrees.

1. Clear understanding that a final product for MAFE must be defined.
2. Specify the "problem" that gives rise to the need for the final product. Not project termination, but what "Malawian problem"
3. What "model/approach" is to be used in resolving the problem?
-this should define the data/information needs and how they are to be used
4. Specify how the data/information is to be organized for use in the model
5. Analysis
6. Write report

Upon Trent's return on Monday, April 15, I discussed with him my phone conversation with Peter Wyeth. Trent then scheduled a meeting with John, Zwide, Trent and myself for that afternoon. The intent of the meeting was to secure resolution as to what John would do and deliver to MAFE during the remainder of the MAFE contract. I believe that the session was useful, but have no background on past experiences with John and this type of encounter.

It is my impression that we agreed that John would discontinue any active participation with the regional study. Additionally, it was decided that he would put no more effort into a set of crops that had been determined to not have any likely profitable markets for Malawi. He was anxious to have some more tests conducted by laboratories on various items. We urged that no more tests be conducted unless results could be provided to MAFE by no later than mid-May. Considerable time was spent on the issue of the trip to Malawi by Ms. Linda Robison. After considerable discussion, I am under the impression that John will have nothing to do with that visit other than to assist her to make the necessary contacts. Apparently, she will be working with Juliet Chiluwe (EDETA) in the Blantyre area. This brought up discussion of John's activities with Neem. I had been led to believe that John had conducted some interviews using the "Gatherer" schedule with some Neem producers. I am not sure but it seems this must have been very informal data gathering because John was unwilling to provide copies of schedules

he had taken. I had wanted to provide Peter with copies, hoping the information might be useful to Ms. Robison.

The conclusion of the meeting was an agreement that John would provide Trent with a draft statement of the specific product(s) that he would be delivering prior to his departure from the project. At the writing of this (Tuesday 4:15 pm). I have not received a draft of Johns. I left the meeting with the impression that his guaranteed product was likely to be physical/chemical characterizations of some set of seeds, oils and perhaps other plant parts. Additionally, he appears to have a fair amount of information, some anecdotal, about various processors and/or markets for the products of NPPs. This information might be of considerable use to Peter and his group in making decisions about future activities. In the hopes that the work by Juliet Chiluwe will be useful in at least describing some aspects of Neem healers/dealers, I believe that I convinced him to take responsibility for gathering up the schedules she collects and submitting them, or copies thereof, unedited to Trent. John should have nothing to do with any collating, editing, or anything else related to Ms. Chiluwe's work. John's draft of what he is to produce and deliver to MAFE was to be reviewed by the same four people and presumably emailed to WSU.

Trent provided me with a copy of John's memo about 4:45 and asked if I had any comments on it. Since that was the first time I had seen it, I could only take it for review. After review, it seemed to be little more than a list of things he was or was not going to do for the remainder of his tenure with MAFE. I initiated a memo to Trent outlining a possible structure for his end-of-tour report. Peter and Jan Noel called while I was working on that memo. They were interested to find out what had been resolved. I was under the impression that John had sent his memo to them, but it was only a draft indicating to whom it was to be sent after review and revision as needed. I told Peter and Jan that I was going to provide Trent with my illustrative version of what John might produce. Peter and Jan indicated that John had developed an earlier report somewhat along these lines (subsequently determined to be the mid-phase report which I had not seen). Although that report has gone through several revisions, it apparently is not considered a satisfactory product by Peter and Jan. This was a bit disconcerting to me as I knew of no other path to suggest for John. Jan and Peter seemed interested in making sure that John covered all of the plants that were of concern to MAFE. Additionally, they mentioned wanting to include whatever is available from some ASNAP survey, whatever that may be. Peter was clear that he wanted John's report to include the "strategy" that John had used in his MAFE work and also the "strategy" that he would suggest for future work on NPPs.

Given this phone conversation, I provided the following memo to Trent.

Trent

The following comments are largely based on my reading of John's memo. I had about completed my comments when Jan and Peter called at the hotel. They had not yet received John's email. They told me that John had followed something like I am suggesting in an earlier report. They apparently weren't all that satisfied after three revisions. However, they had no better suggestions.

Comments on John's memo:

I'm not sure what is meant by all the items 1 through 18. It seems to be a listing of things he is either going to do or not going to do. It doesn't represent a tight statement of what he is going

to deliver unto you prior to June 30. I fear you are going to have a number of activities in progress.

If you, Jan, and Peter are satisfied with this document, that is the important thing. I would be more comfortable if he told me what is known, as of now, from his work. I presume he will have to prepare an end-of-term report. I would think such a report would document whatever he knows from having been here for whatever term it has been.

If you are uneasy about what John's memo says he is going to deliver, it might be useful to have him develop an outline of his end-of-term report. The following represents my concept of what John has been doing and how he might organize a report that will provide an opportunity to deliver to you what John (MAFE) now knows about marketing of NPPs.

It is my impression that John's work has focused on three general areas. If there are other major areas of inquiry that better characterize his efforts, he can specify these efforts.

- Area 1. Characterization of certain NPPs physical/chemical properties
- Area 2. Some level of discussion/inquiry with processors, marketers, etc. of the trading or marketing aspects of NPPs.
- Area 3. Some level of investigation of Neem producers

These three areas could be a way by which he might organize his report. For example, the first area might be organized, by plant product, from the plant about which he is most informed to those about which they know essentially nothing.

I. Physical/chemical characterization of NPPs.

1. Marulla

- a. specific physical/chemical properties
- b. consequences of these properties in terms of market potential
- c. conclusions, based on this knowledge, of:
 - 1) market potential
 - 2) needed research

2. Moringa

- x. Might even list those NPPs about which nothing is known

II. Market characterization of NPPs.

1. Marulla

- a. volume, prices of traded products
- b. by who and where sold and bought
- c. costs of production, processing, marketing, etc.
- d. links in the marketing chain
 - describe
 - list problems and/or concerns
 - opportunities
- e. what traders, processors, etc say about:
 - 1) product availability
 - 2) prices--level and how determined
 - 3) potential markets
 - 4) problems
 - 5) role of government

- f. conclusions that can be drawn from this information for
 - 1) market development
 - 2) needed research

III. Neem investigations
--same general idea

- IV. Conclusion
- 1. A summarization of report
 - 2. A suggested "strategy" for future marketing work on NPPs.

Peter Wyeth is very keen on John reporting the "strategy" he used while at MAFE and, even more importantly, what strategy John would propose for future work in NPP marketing.

(end of memo)

Trent, Zwide and I met on Wednesday morning (April 17) to discuss John's memo (which had not been sent to WSU). They were equally dissatisfied with his memo in that it did not specify what he was going to deliver. Trent and Zwide seemed to like the general idea provided in my memo as to how John's final report could be outlined and that was what he should commit his remaining time to doing. To the extent that any of the things in his earlier draft memo could add to the results that would be embedded in this report that would be fine—time permitting. Trent agreed to take my memo and rewrite it to get at the specific points he wanted to make sure were covered in John's final report. Presumably Trent will then take this to John and some resolution will be forthcoming. There seemed to be agreement between the three of us that John now needed to commence preparation of his final report. It would seem to me that, if there is to be any time left for review and revision, the rough draft of John's final report needs to be submitted by May 15 at the latest. Trent ran his draft memo to John by me this morning. It looked good to me and I presume he will be copying it to Peter &/or Jan. I encouraged Trent to try and impress upon him that brevity was to be appreciated. A review of John's mid-phase report reveals some useful information, but it is hidden and appears in various seemingly unrelated sections of the draft report.

I presume that this is likely to be the last that I have to do with this issue. It is my intention to print out a copy of this report and discuss it with Trent prior to my departure from Malawi. If there is additional information, I will append it to this report.

G:\ipdc\Activities\MAFE 2002 Extension\Year 2002\Rogers rpt.doc

GM Price List

Annex 1

Item	Source	Unit	Price per unit
2001 Maize producer price	ADMARC	MK/kg	12.00
2000 Maize producer price	ADMARC	MK/kg	7.00
2001 Green maize cob price	Market	MK/cob	5.00
2001 Groundnuts producer price	ADMARC	MK/kg	30.00
2000 Groundnuts producer price	ADMARC	MK/kg	27.00
2001 Cabbage head price	Market	MK/head	10.00
Wood price	Survey data	MK/m ³	900.00
Pole price	Survey data	MK/pole	35.00
Transport cost	MITCO	MK per tonne kilometre	8.40
Hybrid maize seed	ADMARC	MK/kg	72.00
Groundnut seed	ADMARC	Mk/kg	45.00
Tephrosia seed	MAFE	MK/kg	222.00
Cabbage seed	ATC	Mk/g	150.00
Malathion	ATC	MK/g	0.55
Polythene tubes	MAFE	MK/1000	473.00
Compound D	ADMARC	MK/50kg	1375.00
Urea	ADMARC	MK/50kg	1350.00
CAN	ADMARC	MK/50kg	1000.00

GROSS MARGINS DETAILS

Labour Details (Days)

Maize	Undersowing	<i>T.vogelli</i>
Clearing	24.6	Planting 13
Ridging	52.4	Cutting 16
Planting	10.8	
Weeding	41.9	
Banking	43.8	
Basal Fert	8.9	
Top Fert	5.0	
Harvesting	46.0	
Manuring	45.5	

DSI	Days/tree	Yr	No Trees			
			Thinning	Pruning	No. Days	
Thinning	0.11	11	20	180	12	4
Pruning	0.27	12	20	160	19	
		13	20	140	25	
		14	20	120	28	
		15	20	100	29	
		16	20	80	24	
		17	20	60	18	
		18	20	40	13	
		19	15	25	8	
		20	-	25	7	

Own Labour Rate (MK/day)

55.81

Wood Price (MK/mt)

900.00

Wood Yields (MT/ha)

Year	DSI	Usowing
1	-	0.78
2	-	
3	-	
4	-	
5	-	
6	-	
7	-	
8	-	
9	-	
10	-	
11	0.44	
12	0.88	
13	1.32	
14	1.76	
15	2.20	
16	2.20	
17	2.20	
18	2.20	
19	2.20	
20	2.20	

Notes:-

- All labour details are compiled from 1995/96 survey data (Hayes 1999) and reported in 6 hr day equivalents.
- Undersowing labour data is estimated.
- Own labour rate is the return per day to unfertilised non-hybrid maize.
- The wood price is calculated from a limited wood price survey undertaken in Lilongwe district in September 1999 by the MAFE Project.
- Tephrosta* wood is assumed to be 1/3 of the calorific value of hard wood.
- Wood yield data: DSI yield data is sourced from Hayes (1991); undersowing yield data from MAFE Project Golf Club Trial data 1997; woodlot yield data adjusted from Bunderson and Hay

1. Local MAIZE DSI with *F.albida*
No Fertiliser Seedling Planted
HECTARE GROSS MARGIN BUDGET
2001

PRICES AND COSTS

Transport	Local	K8.40 per MT/km		
Maize Producer Price	ADMARC	K12.00 per kg	Own Labour	55.81 per day
Wood Price	Survey data	K900.00 per MT		
NH Maize Seed	Purchased	K7.00 per kg		
Tree seedling	Raised	K0.52 per plant		
Basal fert	Compound D	K1375.00 per 50 kg		
Topdressing	Urea	K1350.00 per 50 kg	Usual bag size	80.00 kg/bag

OUTPUT	Unit	Yr1		Yr2		Yr3		Yr4		Yr5		Yr10		Yr15		Yr20		
		Bags	Kg															
Maize Yield	Kg	11.66	1,050	11.66	1,050	11.66	1,050	11.66	1,050	11.66	1,050	14.80	1,314	19.04	1,713	23.47	2,112	
Wood Yield	MT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total Revenue	Kwacha	12,597		12,597		12,597		12,597		12,597		16,772		22,541		27,329		
VARIABLE COSTS	Unit	amount	cost															
Maize Seed	kg	25.0	175.00	25.0	175.00	25.0	175.00	25.0	175.00	25.0	175.00	25.0	175.00	25.0	175.00	25.0	175.00	
Tree seedling	no	200.0	103.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Basal fert	50kg bag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Topdressing	50 kg bag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Maize Labour	Clearing	Days	24.6	1,372.28	24.6	1,372.28	24.6	1,372.28	24.6	1,372.28	24.6	1,372.28	24.6	1,372.28	24.6	1,372.28	24.6	1,372.28
	Ridging	Days	52.4	2,923.07	52.4	2,923.07	52.4	2,923.07	52.4	2,923.07	52.4	2,923.07	52.4	2,923.07	52.4	2,923.07	52.4	2,923.07
	Planting	Days	10.8	600.98	10.8	600.98	10.8	600.98	10.8	600.98	10.8	600.98	10.8	600.98	10.8	600.98	10.8	600.98
	Weeding	Days	41.9	2,337.83	41.9	2,337.83	41.9	2,337.83	41.9	2,337.83	41.9	2,337.83	41.9	2,337.83	41.9	2,337.83	41.9	2,337.83
	Banking	Days	43.8	2,448.56	43.8	2,448.56	43.8	2,448.56	43.8	2,448.56	43.8	2,448.56	43.8	2,448.56	43.8	2,448.56	43.8	2,448.56
	Harvesting	Days	48.0	2,584.95	48.0	2,584.95	48.0	2,584.95	48.0	2,584.95	48.0	2,584.95	48.0	2,584.95	48.0	2,584.95	48.0	2,584.95
AF Labour	Nursery	Days	8.4	468.76	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Planting	Days	3.7	206.56	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Pruning/Thinning	Days	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total Labour	Days	232		219														
Output transport	km	20	176	-	-	-	-	-	-	219	176	219	176	248	288	228	366	
Total Variable Costs			13,375.34		12,697.01		12,697.01		12,697.01		12,697.01		12,841.47		14,328.41		13,149.52	
Gross Margin per ha			(778.33)		-		-		-		-		3,130.64		8,212.18		14,179.56	
Target Price to achieve	Break-even yield		1115 kg		1050 kg		1050 kg		1050 kg		1050 kg		1053 kg		1194 kg		1098 kg	
	85% return on VC		K21.02		K19.80		K19.80		K19.80		K19.80		K16.87		K13.80		K10.27	
	Total labour required(Days & Cost)	232	K12,921	219	K12,248	248	K13,868	228	K12,620									
	GM Return to Labour (MK/D)		K52.44		K55.81		K55.81		K55.81		K55.81		K70.07		K88.66		K118.51	
	GM Return to VC		-8%		0%		0%		0%		0%		0%		28%		108%	
	GM Return to VC excl labour		-171%		0%		0%		0%		0%		791%		1774%		2676%	

Sensitivity to drop in Output

Gross Margin if output drops by	10%	-K2,038	-K1,280														
Gross Margin if output drops by	25%	-K3,928	-K3,149														

Notes:-

- Assumed that yield and wood output reach maturity at 20 yrs with incremental benefits from Yr 11.
- Initial planting density of 200 trees ha⁻¹ thinned to 25.
- Maize yield from 1995/96 farmer survey.

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**2. NON HYBRID MAIZE No Fertiliser
HECTARE GROSS MARGIN BUDGET
2001**

PRICES AND COSTS

Maize Producer Price	ADMARC	K12.00 per kg	
NH Maize Seed	Purchased	K7.00 per kg	
Transport	Local	K8.40 per MT/km	
	Usual bag	90.00 kg/bag	

		Yr1	Yr2	Yr3	Yr4	Yr5	Yr10	Yr15	Yr20
OUTPUT		Bags	Kg						
Yield	Kg	11.66	1,050	1,050	1,050	1,050	1,050	1,050	1,050
Revenue	Kwacha	12,597	12,597	12,597	12,597	12,597	12,597	12,597	12,597
VARIABLE COSTS	Unit	amount	cost						
Maize Seed	kg	25.0	175.00	175.00	175.00	175.00	175.00	175.00	175.00
Maize Labour	Clearing	Days	24.6	-	-	-	-	-	-
	Ridging	Days	52.4	-	-	-	-	-	-
	Planting	Days	10.8	-	-	-	-	-	-
	Weeding	Days	41.9	-	-	-	-	-	-
	Banking	Days	43.8	-	-	-	-	-	-
	Fertilising-Basal	Days	-	-	-	-	-	-	-
	Fertilising-Top	Days	-	-	-	-	-	-	-
	Harvesting	Days	46.0	-	-	-	-	-	-
	Total Labour	Days	219	219	219	219	219	219	219
	Output transport	km	20	176	176	176	176	176	176
Total Variable Costs			351	571	571	571	571	571	571
Gross Margin per ha			12,246	12,026	12,026	12,026	12,026	12,026	12,026
	Break-even yield		29 kg	48 kg					
Target Price to achieve	65% return on VC		K0.55	K0.90	K0.90	K0.90	K0.90	K0.90	K0.90
	Total labour required(Days & Cost)		219	K0	K0	K0	K0	K0	K0
	GM Return to Labour (MK/D)		K55.81	K54.81	K54.81	K54.81	K54.81	K54.81	K54.81
	GM Return to VC		3485%	2107%	2107%	2107%	2107%	2107%	2107%
	GM Return to VC excl labour		3485%	2107%	2107%	2107%	2107%	2107%	2107%

Sensitivity to drop in Output

Gross Margin if output drops by 10%	K10,986	K10,767						
Gross Margin if output drops by 30%	K8,467	K8,247						

Notes:-

1. Maize yield sourced from 1995/96 survey data.

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3. HYBRID MAIZE ANNUAL UNDERSOWING WITH TEPHROSIA Fertilised

Direct Sown

HECTARE GROSS MARGIN BUDGET

2001

PRICES AND COSTS

Transport	Local	K8.40 per MT/km		
Maize Producer Price	ADMARC	K12.00 per kg	Own Labour	55.81 per day
Wood price	Retail rural	K900.00 per MT		
Hybrid Maize Seed	Purchased	K72.00 per kg		
Tephrosia seed	Purchased	K222.00 per kg		
Basal fert	Compound D	K1375.00 per 50 kg		
Topdressing	Urea	K1350.00 per 50 kg	Usual size of bag	90.00 kg/bag

OUTPUT	Land Prep	Hoe	Yr1		Yr2	Yr3	Yr4	Yr5	Yr10	Yr15	Yr20
	Kg	Bags	Kg								
Maize Yield		18.48	1,862	4,535	4,535	4,535	4,535	4,535	4,535	4,535	4,535
Wood Yield	MT		0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Revenue	Kwacha		20,843.13	55,124.72	55,124.72	55,124.72	55,124.72	55,124.72	55,124.72	55,124.72	55,124.72
VARIABLE COSTS	Unit	amount	cost								
Maize Seed	kg	25.0	1,800.00	1,800.00	1,800.00	1,800.00	1,800.00	1,800.00	1,800.00	1,800.00	1,800.00
Tree seed	kg	5.0	1,110.00	1,110.00	1,110.00	1,110.00	1,110.00	1,110.00	1,110.00	1,110.00	1,110.00
Basal fert.	50kg bag	0.8	1,100.00	1,100.00	1,100.00	1,100.00	1,100.00	1,100.00	1,100.00	1,100.00	1,100.00
Topdressing	50 kg bag	1.8	2,382.50	2,382.50	2,382.50	2,382.50	2,382.50	2,382.50	2,382.50	2,382.50	2,382.50
Maize Labour	Clearing	mandays	24.6	1,372.28	1,372.28	1,372.28	1,372.28	1,372.28	1,372.28	1,372.28	1,372.28
	Ridging	mandays	52.4	2,923.07	2,923.07	2,923.07	2,923.07	2,923.07	2,923.07	2,923.07	2,923.07
	Planting	mandays	10.8	600.98	600.98	600.98	600.98	600.98	600.98	600.98	600.98
	Weeding	mandays	41.9	2,337.83	2,337.83	2,337.83	2,337.83	2,337.83	2,337.83	2,337.83	2,337.83
	Banking	mandays	43.8	2,448.56	2,448.56	2,448.56	2,448.56	2,448.56	2,448.56	2,448.56	2,448.56
	Basal fertiliser	mandays	8.9	498.64	498.64	498.64	498.64	498.64	498.64	498.64	498.64
	Top dressing	mandays	5.0	278.50	278.50	278.50	278.50	278.50	278.50	278.50	278.50
	Harvesting	mandays	48.0	2,584.95	2,584.95	2,584.95	2,584.95	2,584.95	2,584.95	2,584.95	2,584.95
Undersowing Labour	Planting	mandays	13.5	751.22	751.22	751.22	751.22	751.22	751.22	751.22	751.22
	Cutting	mandays	18.0	892.88	892.88	892.88	892.88	892.88	892.88	892.88	892.88
Total Labour			262.8	-	-	-	-	-	-	-	-
Output transport	km	20	411	893	893	893	893	893	893	893	893
Total Variable Costs			21,448.09	21,930.83	21,930.83	21,930.83	21,930.83	21,930.83	21,930.83	21,930.83	21,930.83
Gross Margin per ha			(804.96)	33,193.89	33,193.89	33,193.89	33,193.89	33,193.89	33,193.89	33,193.89	33,193.89

4. HYBRID MAIZE ANNUAL UNDERSOWING WITH TEPHROSIA

No Fertiliser Direct Sown

HECTARE GROSS MARGIN BUDGET

2001

PRICES AND COSTS

Transport	Local	K8.40 per MT/km		
Maize Producer Price	ADMARC	K12.00 per kg	Own Labour	55.81 per day
Wood Price	Local market	K900.00 per MT		
Hybrid Maize Seed	Purchased	K72.00 per kg		
Tephrosia seed	Purchased	K222.00 per kg		
			Usual size of ba	90.00 kg/bag

		Management level							
		Type	Low						
		Total Arable	Input						
		Land Prep	Less than 10ha						
		Hoe		Yr1	Yr2	Yr3	Yr4	Yr5	Yr10
OUTPUT									
Maize Yield		Kg	Bags	Kg	Kg	Kg	Kg	Kg	Kg
Wood Yield		MT	15.78	1,420	1,720	1,720	1,720	1,720	1,720
Revenue		Kwacha		17,748.23	21,344.72	21,344.72	21,344.72	21,344.72	21,344.72
VARIABLE COSTS									
		Unit	amount	cost	cost	cost	cost	cost	cost
Maize Seed		kg	25.0	1,800.00	1,800.00	1,800.00	1,800.00	1,800.00	1,800.00
Tree seed		kg	5.0	1,110.00	1,110.00	1,110.00	1,110.00	1,110.00	1,110.00
Maize Labour	Clearing	mandays	24.6	1,372.28	1,372.28	1,372.28	1,372.28	1,372.28	1,372.28
	Ridging	mandays	52.4	2,923.07	2,923.07	2,923.07	2,923.07	2,923.07	2,923.07
	Planting	mandays	10.8	600.98	600.98	600.98	600.98	600.98	600.98
	Weeding	mandays	41.9	2,337.83	2,337.83	2,337.83	2,337.83	2,337.83	2,337.83
	Banking	mandays	43.8	2,446.56	2,446.56	2,446.56	2,446.56	2,446.56	2,446.56
	Harvesting	mandays	46.0	2,564.95	2,564.95	2,564.95	2,564.95	2,564.95	2,564.95
Undersowing Labour	Planting	mandays	13.5	751.22	751.22	751.22	751.22	751.22	751.22
	Cutting	mandays	16.0	892.88	892.88	892.88	892.88	892.88	892.88
	Total Labour		248.9	-	-	-	-	-	-
	Output transport	km	20	370	421	421	421	421	421
Total Variable Costs				17,169.92	17,220.27	17,220.27	17,220.27	17,220.27	17,220.27
Gross Margin per ha				578.31	4,124.45	4,124.45	4,124.45	4,124.45	4,124.45

Sensitivity to drop in Output

Gross Margin if output drops by	10%	-K1,197
Gross Margin if output drops by	30%	-K4,746

5. HYBRID MAIZE DSI with *F.albida*
No Fertiliser Seedling Planted
HECTARE GROSS MARGIN BUDGET
2001

PRICES AND COSTS

Transport	Local	K8.40 per MT/km		
Maize Producer Price	ADMARC	K12.00 per kg	Own Labour	55.81 per day
Wood Price	Survey data	K900.00 per MT		
Maize Seed	Purchased	K72.00 per kg		
Tree seedling	Raised	K0.52 per plant		
Basal fert	Compound	K1375.00 per 50 kg		
Topdressing	Urea	K1350.00 per 50 kg	Usual bag size	50.00 kg/bag

OUTPUT		Yr1		Yr2		Yr3		Yr4		Yr5		Yr10		Yr15		Yr20	
		Bags	Kg														
Maize Yield	Kg	15.78	1,420	15.78	1,420	15.78	1,420	15.78	1,420	15.78	1,420	22.28	2,003	34.50	3,105	46.75	4,207
Wood Yield	MT																
Total Revenue	Kwacha		17,044		17,044		17,044		17,044		17,044		24,038		39,242		52,467
VARIABLE COSTS	Unit	amount	cost														
Maize Seed	kg	25.0	1,800.00	25.0	1,800.00	25.0	1,800.00	25.0	1,800.00	25.0	1,800.00	25.0	1,800.00	25.0	1,800.00	25.0	1,800.00
Tree seedling	no	200.0	103.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Basal fert.	50kg bag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Topdressing	50 kg bag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maize Labour	Days	24.6	1,372.28	24.6	1,372.28	24.6	1,372.28	24.6	1,372.28	24.6	1,372.28	24.6	1,372.28	24.6	1,372.28	24.6	1,372.28
Clearing	Days	52.4	2,923.07	52.4	2,923.07	52.4	2,923.07	52.4	2,923.07	52.4	2,923.07	52.4	2,923.07	52.4	2,923.07	52.4	2,923.07
Ridging	Days	10.8	600.98	10.8	600.98	10.8	600.98	10.8	600.98	10.8	600.98	10.8	600.98	10.8	600.98	10.8	600.98
Planting	Days	41.9	2,337.83	41.9	2,337.83	41.9	2,337.83	41.9	2,337.83	41.9	2,337.83	41.9	2,337.83	41.9	2,337.83	41.9	2,337.83
Weeding	Days	43.8	2,446.56	43.8	2,446.56	43.8	2,446.56	43.8	2,446.56	43.8	2,446.56	43.8	2,446.56	43.8	2,446.56	43.8	2,446.56
Banking	Days	48.0	2,584.95	48.0	2,584.95	48.0	2,584.95	48.0	2,584.95	48.0	2,584.95	48.0	2,584.95	48.0	2,584.95	48.0	2,584.95
Harvesting	Days	8.4	466.76	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AP Labour Nursery	Days	3.7	206.56	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Planting	Days	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pruning/Thinning	Days	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Labour	Days	232		219		219		219		219		219		29.0	1,619.90	6.7	373.97
Output transport	km	20	239		239		239		239		239		337	248	225		707
Total Variable Costs			15,083		14,284		14,284		14,284		14,284		14,382		16,187		15,126
Gross Margin per ha			1,961		2,759		2,759		2,759		2,759		9,656		23,055		37,341
Sensitivity to drop in Output																	
Gross Margin if output drops by	10%		K277		K1,055		K1,055		K1,055		K1,055		K7,252		K19,131		K32,094
Gross Margin if output drops by	25%		-K2,280		-K1,502		-K1,502		-K1,502		-K1,502		-K3,646		-K13,245		-K24,224

HYBRID MAIZE DSI with *F.albida*
10 Fertiliser Seedling Planted
1 HECTARE GROSS MARGIN BUDGET
001

PRICES AND COSTS

Transport	Local	K8.40 per MT/km		
Maize Producer Price	ADMARC	K12.00 per kg	Own Labour	55.81 per day
Wood Price	Survey data	K900.00 per MT		
Maize Seed	Purchased	K72.00 per kg		
Tree seedling	Raised	K0.52 per plant		
Basal fert	Compound	K1375.00 per 50 kg		
Topdressing	Urea	K1350.00 per 50 kg	Usual bag size	80.00 kg/bag

OUTPUT	Unit	Yr1		Yr2		Yr3		Yr4		Yr5		Yr10		Yr15		Yr20		
		Bags	Kg	Bags	Kg	Bags	Kg	Bags	Kg	Bags	Kg	Bags	Kg	Bags	Kg	Bags	Kg	
Maize Yield	Kg	15.78	1,420	15.78	1,420	15.78	1,420	15.78	1,420	15.78	1,420	22.26	2,003	34.50	3,105	46.75	4,207	
Wood Yield	MT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total Revenue	Kwacha	17,044		17,044		17,044		17,044		17,044		24,038		39,242		52,467		
ARIABLE COSTS	Unit	amount	cost	amount	cost	amount	cost	amount	cost	amount	cost	amount	cost	amount	cost	amount	cost	
Maize Seed	kg	25.0	1,800.00	25.0	1,800.00	25.0	1,800.00	25.0	1,800.00	25.0	1,800.00	25.0	1,800.00	25.0	1,800.00	25.0	1,800.00	
Tree seedling	no	200.0	103.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Basal fert.	50kg bag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Topdressing	50 kg bag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Maize Labour	Clearing	Days	24.6	1,372.28	24.6	1,372.28	24.6	1,372.28	24.6	1,372.28	24.6	1,372.28	24.6	1,372.28	24.6	1,372.28	24.6	1,372.28
	Ridging	Days	52.4	2,923.07	52.4	2,923.07	52.4	2,923.07	52.4	2,923.07	52.4	2,923.07	52.4	2,923.07	52.4	2,923.07	52.4	2,923.07
	Planting	Days	10.8	600.98	10.8	600.98	10.8	600.98	10.8	600.98	10.8	600.98	10.8	600.98	10.8	600.98	10.8	600.98
	Weeding	Days	41.9	2,337.83	41.9	2,337.83	41.9	2,337.83	41.9	2,337.83	41.9	2,337.83	41.9	2,337.83	41.9	2,337.83	41.9	2,337.83
	Banking	Days	43.8	2,446.56	43.8	2,446.56	43.8	2,446.56	43.8	2,446.56	43.8	2,446.56	43.8	2,446.56	43.8	2,446.56	43.8	2,446.56
	Harvesting	Days	46.0	2,564.95	46.0	2,564.95	46.0	2,564.95	46.0	2,564.95	46.0	2,564.95	46.0	2,564.95	46.0	2,564.95	46.0	2,564.95
AF Labour	Nursery	Days	8.4	468.76	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Planting	Days	3.7	206.56	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Pruning/Thinning	Days	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Total Labour	Days	232	-	219	-	219	-	219	-	219	-	219	-	248	-	226	
	Output transport	km	20	239	-	239	-	239	-	239	-	239	-	337	-	522	-	
Total Variable Costs			15,063		14,284		14,284		14,284		14,284		14,382		16,187		15,126	
Gross Margin per ha			1,981		2,759		2,759		2,759		2,759		9,656		23,055		37,341	

Sensitivity to drop in Output																		
Gross Margin if output drops by	10%	K277		K1,055		K7,252		K19,131		K32,094								
Gross Margin if output drops by	25%	-K2,280		-K1,502		K3,646		K13,245		K24,224								

7. HYBRID MAIZE No Vetiver
HECTARE GROSS MARGIN BUDGET
2001

PRICES AND COSTS

Transport	Local	K8.40 per MT/km		
Maize Producer Price	ADMARC	K12.00 per kg	Own Labour	55.81 per day
Hybrid Maize Seed	Purchased	K72.00 per kg		
			Usual size of	90.00 kg/bag

OUTPUT	- 1.5%	Yr1		Yr2	Yr3	Yr4	Yr5	Yr10	Yr15	Yr20
		Yield	Bags	Kg						
Yield	Kg	15.78	1,420	1,399	1,378	1,357	1,337	1,240	1,149	1,068
Revenue	Kwacha		17,044	16,788	16,536	16,288	16,044	14,878	13,793	12,789
VARIABLE COSTS	Unit	amount	cost							
Maize Seed	kg	25.0	1,800.00	1,800.00	1,800.00	1,800.00	1,800.00	1,800.00	1,800.00	1,800.00
Maize Labour Clearing	Days	24.8	1,372.28	1,372.28	1,372.28	1,372.28	1,372.28	1,372.28	1,372.28	1,372.28
Ridging	Days	52.4	2,923.07	2,923.07	2,923.07	2,923.07	2,923.07	2,923.07	2,923.07	2,923.07
Planting	Days	10.8	600.98	600.98	600.98	600.98	600.98	600.98	600.98	600.98
Weeding	Days	41.9	2,337.83	2,337.83	2,337.83	2,337.83	2,337.83	2,337.83	2,337.83	2,337.83
Banking	Days	43.8	2,446.56	2,446.56	2,446.56	2,446.56	2,446.56	2,446.56	2,446.56	2,446.56
Fertilising-Basal	Days	-	-	-	-	-	-	-	-	-
Fertilising-Top	Days	-	-	-	-	-	-	-	-	-
Harvesting	Days	46.0	2,564.95	2,564.95	2,564.95	2,564.95	2,564.95	2,564.95	2,564.95	2,564.95
Total Labour	Days	219		219	219	219	219	219	219	219
Output transport	km	20	239	235	232	228	225	208	193	179
Total Variable Costs			14,284.26	14,500.12	14,496.60	14,493.12	14,489.70	14,473.35	14,458.20	14,444.14
Gross Margin per ha			2,759.24	2,287.73	2,039.44	1,794.87	1,563.97	402.81	(864.96)	(1,654.82)

Sensitivity to drop in Output

Gross Margin if output drops by	10%	K1,055	K809	K388	K168	-K50	-K1,085	-K2,044	-K2,934
Gross Margin if output drops by	30%	-K2,354	-K2,749	-K2,921	-K3,092	-K3,259	-K4,060	-K4,803	-K5,492

Notes:-

1. Maize assumed to fall by percentage each year in absence of vetiver

8. HYBRID MAIZE with Vetiver
HECTARE GROSS MARGIN BUDGET
2001

PRICES AND COSTS

Transport	Local	K8.40 per MT/km		
Maize Producer Price	ADMARC	K12.00 per kg	Own Labour	55.81 per day
Hybrid Maize Seed	Purchased	K72.00 per kg		
Thatching grass	Village	K2.00 bundle		
			Usual size of	90.00 kg/bag

		Yr1		Yr2	Yr3	Yr4	Yr5	Yr10	Yr15	Yr20
		Bags	Kg							
OUTPUT										
Maize Yield	Kg	15.78	1,420	1,420	1,420	1,420	1,420	1,420	1,420	1,420
Thatch	bundles			200	200	200	200	200	200	200
Revenue	Kwacha		17,044	17,444	17,444	17,444	17,444	17,444	17,444	17,444
VARIABLE COSTS	Unit	amount	cost							
Maize Seed	kg	25.0	1,800.00	1,800.00	1,800.00	1,800.00	1,800.00	1,800.00	1,800.00	1,800.00
Maize Lab	Clearing	Days	24.8	1,372.28	1,372.28	1,372.28	1,372.28	1,372.28	1,372.28	1,372.28
	Ridging	Days	52.4	2,923.07	2,923.07	2,923.07	2,923.07	2,923.07	2,923.07	2,923.07
	Planting	Days	10.8	600.98	600.98	600.98	600.98	600.98	600.98	600.98
	Weeding	Days	41.9	2,337.83	2,337.83	2,337.83	2,337.83	2,337.83	2,337.83	2,337.83
	Banking	Days	43.8	2,448.56	2,448.56	2,448.56	2,448.56	2,448.56	2,448.56	2,448.56
	Fertilising-Basal	Days	-	-	-	-	-	-	-	-
	Fertilising-Top	Days	-	-	-	-	-	-	-	-
	Harvesting	Days	48.0	2,564.95	2,564.95	2,564.95	2,564.95	2,564.95	2,564.95	2,564.95
Vetiver Lab	Nursery clearing	Days	0.5	27.45						
	Nursery planting	Days	2.0	111.61						
	Nursery Weeding	Days	0.8	46.76						
	Nursery trimming	Days	0.6	33.48						
	Nursery digging	Days	2.0	111.61						
	Slip prep and hedge planting	Days	10.0	558.05						
	Hedge trimming	Days	7.0	390.64	390.64	390.64	390.64	390.64	390.64	390.64
	Total Labour	Days	219		219	219	219	219	219	219
	Output transport	km	20	239	239	239	239	239	239	239
Total Variable Costs			15,563.86	14,894.34	14,894.34	14,894.34	14,894.34	14,894.34	14,894.34	14,894.34
Gross Margin per ha			1,479.65	2,549.17	2,549.17	2,549.17	2,549.17	2,549.17	2,549.17	2,549.17

Sensitivity to drop in Output

Gross Margin if output drops by	10%	-K225	K805						
Gross Margin if output drops by	30%	-K3,633	-K2,684						

9. Improved Groundnuts
HECTARE GROSS MARGIN BUDGET
2001

PRICES AND COSTS

Transport	Local	K8.40 per MT/km	
Gnuts Producer Price	Local market	K30.00 per kg	Own Labour #### per day
Seed	Purchased	K45.00 per kg	Bag size #### kg/bag

OUTPUT		Bags	Kg
Yield	Kg	12.22	1,100
Revenue	Kwacha		33,000
VARIABLE COSTS	Unit	amount	cost
Seed	kg	80.0	3,600.00
Labour Clearing	Days	24.6	1,372.81
Ridging	Days	52.4	2,924.20
Planting	Days	15.0	837.08
Weeding	Days	67.0	3,738.95
Banking	Days	81.0	4,520.23
Harvesting	Days	135.0	7,533.71
Total Labour	Days	375	
Output transport	km	20	185
Total Variable Costs			24,711.77
Gross Margin per ha			8,288.23

10. Local Groundnuts
HECTARE GROSS MARGIN BUDGET
2001
PRICES AND COSTS

Transport	Local	K8.40 per MT/km	
Groundnuts Producer Price	Local market	K30.00 per kg	Own Labour #### per day
Seed	Kept	K27.00 per kg	Bag size #### kg/bag

OUTPUT		Bags	Kg
Yield	Kg	4.60	414
Revenue	Kwacha		12,422
VARIABLE COSTS		Unit	amount cost
Seed	kg	80.0	2,160.00
Labour Clearing	Days	24.6	1,372.81
Ridging	Days	52.4	2,924.20
Planting	Days	15.0	837.08
Weeding	Days	67.0	3,738.95
Banking	Days	81.0	4,520.23
Harvesting	Days	135.0	7,533.71
Total Labour	Days	375	
Output transport	km	20	70
Total Variable Costs			23,156.54
Gross Margin per ha			(10,734.38)

11. TREE WOODLOT INDICATIVE GROSS MARGIN BUDGET

2001

PRICES AND COSTS

Fuelwood Price	Roadside	K900.00 per m ³					
Pole price	Roadside	K35.00 per pole					
Tree seedling	Raised	K0.52 each					
Spacing		2500 trees/ha					
Sustainable wood harvest	m ³ /ha per annum		Yr4	Yr5	Yr6	Yr7	Yr8
			2.8	4.2	5.6	7.0	8.8
Own labour		55.81 per day					
Transport	Local	K8.40 per tonne kilometre					

ALL FIGURES BASED ON ONE HECTARE

		Management level		Yr1		Yr2		Yr3		Yr4		Yr5		Yr10		Yr15		Yr20	
		Type	Low input																
		Total Arable Land Prep	Hoe																
OUTPUT																			
Fuelwood Yield	m ³	100%		m ³		m ³		m ³		m ³		m ³		m ³		m ³		m ³	
Pole Yield	Number	0%																	
Revenue	Kwacha																		
VARIABLE COSTS		Unit	amount	cost	amount	cost	amount	cost	amount	cost	amount	cost	amount	cost	amount	cost	amount	cost	
Tree seedlings	number		2,500	1,287.50	-	0	-	0	481	248	481	248	481	248	481	248	481	248	
Labour	Clearing	mandays	25	1,395.13	-	0	-	0	-	0	-	0	-	0	-	0	-	0	
	Planting	mandays	13	725.47	-	0	-	0	3	140	3	140	3	140	3	140	3	140	
	Weeding1	mandays	20.0	1,116.11	20	1,116	20	1,116	4	215	4	215	4	215	4	215	4	215	
	Weeding2	mandays	20.0	1,116.11	20	1,116	20	1,116	4	215	4	215	4	215	4	215	4	215	
	Cutting	mandays	-	-	-	0	-	0	3	172	3	172	3	172	3	172	3	172	
Total Labour	mandays		78.0		40.0		40.0		13.3		13.3		13.3		13.3		13.3		
Transport	km		25.0		25.0		25.0		25.0	341.0	25.0	511.8	25.0	1,071.8	25.0	1,071.8	29.0	1,071.8	
Total Variable Costs				5,840		2,232		2,232		1,329		1,500		2,060		2,060		2,060	
Gross Margin per ha				(5,840)		-2,232		-2,232		1,191		2,280		6,880		6,880		6,880	

Notes:-

1. Wood price based on survey data 1995/96

12. Irrigated Green Hybrid Maize Fertilised

HECTARE GROSS MARGIN BUDGET

2001 Prices

PRICES AND COSTS

Maize Cob Price	Local Market	K5.00 per cob	Own Labour	55.81 per day
Hybrid seed NSCM 51/31 price	Purchased	K72.00 per kg		
Basal fert	Comp D	K1375.00 per 50 kg		
Topdressing	CAN	K1000.00 per 50 kg	Planting stations	53,333 per ha
Transport	Local	K8.40 per MT/km		

OUTPUT	Unit	Year 1		Year 2
		% loss	Cobs	Cobs
Yield	Cobs	25%	40,000	40,000
Revenue	Kwacha		200,000	200,000
VARIABLE COSTS	Unit	amount	cost	cost
Maize Seed	kg	25.0	1,800.00	1,800.00
Basal fert: Comp D	50kg bag	2.2	3,025.00	3,025.00
Topdressing: CAN	50 kg bag	4.0	4,000.00	4,000.00
Interest (Annual Mze Seed + Fert)	50%		4,412.50	4,412.50
Interest (Treadle pump)	50%		45,000.00	
Pump depreciation	20 yrs		4,500.00	4,500.00
Maintenance cost	20%		18,000.00	18,000.00
Maize Labour Clearing	Days	24.6	1,372.81	1,372.81
Plot preparation	Days	52.4	2,924.20	2,924.20
Manuring	Days	45.5	2,536.98	2,536.98
Planting	Days	10.8	602.70	602.70
Weeding	Days	41.9	2,338.24	2,338.24
Fertilising-Basal	Days	8.9	496.67	496.67
Fertilising-Top	Days	5.0	279.03	279.03
Harvesting	Days	46.0	2,567.04	2,567.04
Irrigating	Days	100.0	5,580.53	5,580.53
Total Labour	Days	335		
Output transport	km	20	2,240.00	2,240.00
Total Variable Costs			101,675.69	56,675.69
Gross Margin per ha			98,324.31	143,324.31
Return/day			293.45	427.76

Notes:-

1. Interest payment included on pump and inputs as assumed issued under credit scheme

13. Irrigated Drumhead Cabbage
HECTARE GROSS MARGIN BUDGET
2001
PRICES AND COSTS

Cabbage Head Sale Price	Local Market	K10.00 per head	Own Labour	55.81 per day
Gloria Seed	Purchased	K150.00 per gm		
Pesticide	Malathion	K0.55 per gm		
Basal fert	Comp D	K1375.00 per 50 kg		
Topdressing	CAN	K1000.00 per 50 kg	Planting stations	##### per ha
Transport	Local	K8.40 per MT/km		

OUTPUT		% loss	Heads	Heads
Yield	Bunch	25%	17,857	17,857
Revenue	Kwacha		178,571	178,571
VARIABLE COSTS	Unit	amount	cost	cost
Cabbage Seed	gm	190.0	28,500.00	28,500.00
Basal fert: Comp D	50kg bag	5.3	7,342.50	7,342.50
Topdressing: CAN	50 kg bag	3.2	3,216.00	3,216.00
Malathion	gm	3,000.0	1,650.00	1,650.00
Interest (Annual Seed/Fert/Pesticide)	50%		20,354.25	20,354.25
Interest (Treadle pump)	50%		45,000.00	
Pump depreciation	20 yrs		4,500.00	4,500.00
Maintenance cost	20%		18,000.00	18,000.00
Cabbage Labour All cult prac	Days	350.0	19,531.84	19,531.84
Manuring	Days	45.5	2,536.98	2,536.98
Irrigating	Days	100.0	5,580.53	5,580.53
Total Labour	Days	495		
Output transport	km	20	6,000.00	6,000.00
Total Variable Costs			162,212.10	117,212.10
Gross Margin per ha			16,359.33	61,359.33
Return/day			33.02	123.84

Notes:-

1. Interest payment included on pump and inputs as assumed issued under credit scheme

Seedling Costs

Tree Seedling Costs (based on 7,500 seedling nursery)

	People	#/day	days	hrs/day	Tot Hrs	6hr days
Labour						
Pot Filling	1	200	37.5	4	150	25
Nicking	1	200	37.5	4	150	25
Sowing	1	200	37.5	4	150	25
Watering/Weeding/Root Pruning	4		90.0	4	1440	240
					Whole Nursery	315
					Per seedling	0.04
Materials					MK/1000	MK per seedling
Polytubes					473.00	0.473
					Total per seedling	0.52

Annex 2
**PROPOSAL TO SUSTAIN THE RESOURCE CENTER
BEYOND JULY 2002**

Prepared by

*Land Resources Conservation Department, Ministry of Agriculture and Irrigation
with Washington State University*

March 2002

INTRODUCTION

The Malawi Agroforestry Extension (MAFE) Project of the Land Resources Conservation Department (LRCD), implemented under the WSU Cooperative Agreement with USAID, is coming to a close July 31, 2002. This timing presents challenges to WSU, USAID and the Government of Malawi/Ministry of Agriculture and Irrigation to capitalize on the great momentum generated by the MAFE partnerships in achieving adoption of improved technologies and practices. Of particular concern is the sustainability of support services offered to partners through the Resource Center recently established through the MAFE Project.

This proposal presents recommendations on how best to meet this challenge with minimal disruption to the operation and financial integrity of the Resource Center. The proposal is to provide transitional bridging funds for 2 years under a mechanism that maintains the present leadership of LRCD in the Ministry of Agriculture and Irrigation (MAI) for the Resource Center and implementation support by WSU to:

- a) ensure the continuity of critical Resource Center services to prevent disruption of the rapidly expanding adoption of agroforestry and soil conservation technologies and practices; and
- b) test and validate options for sustaining the services of the Resource Center beyond this two-year bridging period.

Although only recently established, the Resource Center is already operating on a partial cost recovery basis. Bridging funds requested from USAID will exclude anticipated revenues received from services rendered to partners. This will substantially reduce USAID-requested support for operational costs. During this period, we will further test the hypothesis that the Resource Center as presently structured can be self-financing from revenues received for the services provided. If by the end of Year One the revenues do not support such potential for financial self-sufficiency, alternative models will be investigated and a new sustainability plan developed.

DESCRIPTION OF THE RESOURCE CENTER

The Resource Center is located on the ground floor of the Department of Land Resources Conservation, and offers the following facilities:

- Customer and Library Services for technical information, germplasm and extension-training materials.
- Training Classroom, fully equipped with audio-visual facilities.

- Seed Bank for cold and refrigerated storage of tree seed.
- Warehouse for storage of nursery supplies and tools.
- Offices for the Resource Center Coordinator and Manager.

SERVICES PROVIDED THROUGH THE RESOURCE CENTER

Objectives

The Resource Center established under the MAFE project supports the overall objective shared by USAID and the Government of Malawi to *improve food security, income levels and the use of natural resources among rural communities leading to sustainable increases in farm productivity*. To this end, the Resource Center serves as the central repository and disseminator of a broad range of agroforestry and soil conservation practices developed, tested and extended by the MAFE project and its partners with farmers across the country. The Resource Center promotes practices that add income and value to farm enterprises while sustaining the resource base. These include use of small-scale irrigation with the treadle pump, a technology for which MAFE has taken a lead role in evaluating and promoting in Malawi. Recent pilot efforts have also been initiated to identify markets for natural products from agroforestry species. Practices which have proved to be most effective and popular among farmers in Malawi are outlined below:

Small-scale Irrigation with the Treadle Pump

This technology has demonstrated its ability to rapidly improve food security, income and household nutrition in Malawi through the production of food, vegetable and cash crops such as maize, beans, tomatoes, cabbages, egg plant, and green peppers.

Soil and Water Conservation

Soil and water conservation focuses on three (3) key practices for sustainable increases in farm productivity by reducing soil erosion and water runoff:

- *Contour and tied ridging* through pegging and construction of marker ridges using a line level, followed by re-alignment of planting ridges. This will be augmented with tied/box ridges and raised footpaths and field boundaries.
- *Contour vetiver hedges* to serve as a barrier to runoff and erosion. A key element involves the establishment of communal and individual vetiver nurseries to provide planting material at the local level.
- *Gully control* with check dams of brushwood/stones and vetiver hedges.

Agroforestry

Three soil-improving agroforestry interventions improve food security in the longer term:

- *Undersowing of Tephrosia vogelii with maize*. This is a simple low cost technology that requires sowing *Tephrosia* seed as an intercrop at the same time as maize. The system has a striking effect on maize yields by improving the physical, chemical and biological

properties of soils due to *Tephrosia*'s dense canopy cover, biomass and deep N-fixing roots. *Tephrosia* has other beneficial properties such as erosion control, weed suppression and control of common crop pests and weevils in stored grain.

- **Improved fallows of *Tephrosia*.** Farmers with adequate land have the opportunity to leave *Tephrosia* as a fallow in year 2. Thereafter, maize cultivation is resumed with greatly increased yields. The cycle is repeated in the fourth season.
- **Systematic interplanting of soil improving trees.** This practice involves interplanting leguminous trees with crops to provide nutrient-rich leaves for soil fertility enrichment. The main trees involved include *Faidherbia albida*, *Acacia polyacantha*, and *Acacia galpinii*. Crop yields are commonly double beneath the canopy of these trees. Other products include fuelwood, building material, shade and fodder.

Multi-Purpose Tree Planting

- **Homestead/Boundary/Woodlot Planting** of multi-purpose trees for fuel, building material, shade, fruit, cash and medicine.
- **Roadside Tree Planting:** A new initiative involves planting avenues of trees along village roads. This is an initiative that has received broadbased support among many communities because of the limited space available for trees. Roadside planting also improves the aesthetics of the village environment, while offering shade and shelter to foot and animal traffic, windbreaks to bordering farms, protection of road verges from erosion, and wood products for use by the community.
- **Natural Tree Regeneration:** Apart from encouraging communities to plant new trees, MAFE also emphasizes the need to preserve natural woodlands and to protect other land areas and farms from indiscriminant tree cutting. The principle aim is to encourage natural regeneration of trees in a manner that is sustainable and compatible with other forms of land use, such as cultivation. Many communities have expressed strong interest in this concept, partly because indigenous trees and the products they produce are disappearing from their environment.

Partnership Model

To increase the adoption of the above technologies, the Resource Center utilizes the partnership model developed under MAFE to provide support services to better coordinate and expand outreach efforts among Government, Non-Government and private sector organizations. These services are offered on a demand-driven basis through the Resource Center. They include:

- Technical information on what practices to target based on the community and problems to be addressed, location and agro-environment.
- Training courses in technical subject areas defined by the partner, including Monitoring and Evaluation.
- Extension / training materials (e.g., field manuals, booklets, posters, and training kits).
- Planting material best suited to partner needs.

- Information on the production and marketing of key natural plant products.

With the exception of Government agencies, materials and services are currently provided on a semi-commercial basis to better meet real market demands and to build capacity for sustaining services in the future. A brief description is given below about services provided to partners in training, extension materials and germplasm.

Training Support

A key role of the Resource Center is to train partner institutions to increase self-reliance in implementing and sustaining programs with a focus on the following subjects:

1. Participatory rural appraisals (PRAs) to identify priority community needs and to develop community-based action plans based on available resources and interests.
2. Germplasm collection and handling.
3. Nursery production techniques and management.
4. Best-bet agroforestry, soil conservation and small-scale irrigation practices to build greater confidence in extending messages, emphasizing key management issues and problem solving.
5. Community-based monitoring and evaluation methodologies that are accurate, simple and low cost to document results and provide information to improve targeting of extension support services.

Training courses conducted to meet partner requests are summarized in Table 1.

Table 1: Training Provided for 2000/2001

Organization	Training Conducted 2000/01		
	Trainers/ Management Staff	Frontline Staff	Local Leaders/ Farmers
MAI/ADDs	40	30	0
Donor Funded Projects	103	57	4
Education Institutions	4	0	0
Forestry Department	55	0	0
NGOs	20	65	0
CBOs	21	8	57
Totals	243	160	61

Extension and Training Materials

A variety of up-to-date, user-friendly extension and training materials are available for purchase by different target audiences (see Table 2).

Table 2: Resource Center Extension/Training Materials

TYPE OF EXTENSION MATERIAL	Numbers	Language
1. Manuals		
A Field Manual for Agroforestry Practices in Malawi	5,000	English
Landcare Practices in Malawi (April 2002)	5,000	English
Field Manual for Treadle Pump Irrigation in Malawi (May 2002)	3,000	English
Community-Based Monitoring and Evaluation -3 systems	100 each	English
2. Booklets		
Best-bet Agroforestry & Soil Conservation Practices	6,000	English
Best-bet Agroforestry & Soil Conservation Practices	3,100	Chichewa
Common Agroforestry Tree Species in Malawi (April 2002)	3,000	English
Tree Seed Collection and Nursery Management (April 2002)	3,000	English
3. Training Kits (Includes Reference Manual + Overhead Transparencies)		
PRAs, Workplan Development & Agroforestry/Soil Conservation	100	English
Small-scale Irrigation with the Treadle Pump (April 2002)	100	English
4. Posters		
Construction/Management of Nurseries (series of 3)	10,000 each	Chichewa
Tree Spacing and Outplanting (series of 2)	10,000 each	Chichewa
Soil Fertility Practices (series of 3)	10,000 each	Chichewa
Soil & Water Conservation (series of 5)	10,000 each	Chichewa
5. Leaflets		
Contour Ridging with the Line Level	40,000	Chichewa
Planting and Managing Vetiver Hedgerows (April 2002)	20,000	Chichewa
Dispersed Systematic Tree Interplanting (April 2002)	20,000	Chichewa
Undersowing <i>Tephrosia vogelii</i> with Maize	4,000	English
Undersowing <i>Tephrosia vogelii</i> with Maize (April 2002)	20,000	Chichewa
Treadle Pump Irrigation - series of 8 (April 2002)	5,000 each	Chichewa
6. Videos (used by extension service providers)		
Land-use problems and practices to address them	100 each	English & Chichewa

Distribution of Extension and Training Materials and Other Inputs

Extension materials and other inputs distributed to partners and clients are summarized in Table 3.

Table 3: Extension Materials Distributed in 2000/01

Organization	Extension and Other Materials Distributed in 2000/01					
	Field Manuals	English Booklets	Chichewa Booklets	Posters in Caichewa	Polytubes/Pots	Line Levels
MAI/ADDs	1	106	1	1125	5,443,730	160
Donor Funded Projects	1	164	1	531	1,350,100	43
Education Institutions		39	0	324	0	4
Forestry Department	1	62	120	2259	1,095,000	35
NGOs		37	14	1895	4,489,750	1,259
CBOs		63	0	481	544,800	34
Others	2	0	0	18	16,300	0
Totals	5	471	136	6633	12,939,680	1,535

Germplasm

Provision of quality tree planting material is a vital service as without it there is no field program. The distribution of germplasm in 2000/01 is shown in Table 4.

Table 4: Distribution of Germplasm in 2000/01

Organization	Type of Germplasm Distributed in 2000/01					
	<i>General Tree Seed</i>		<i>Tephrosia vogelii</i>		<i>Faidherbia albida</i>	
	No. of Partners	Seed (kg)	No. of Partners	Seed (kg)	No. of Partners	Seed (kg)
MAI/ADDs	8	2215	8	3840	8	722
Donor Funded Projects	10	1683	8	3609	13	203
Education Institutions	1	5	0	0	1	1
Forestry Department	7	625	0	0	8	64
NGOs	16	2676	17	1714	17	408
CBOs	13	296	5	332	12	24
Others	2	13	1	2	2	1
Totals	57	7,513	39	9,497	61	1,423

PROPOSED PLANS

Transitional Funding from USAID

Bridging funds are needed for a transitional period of two (2) years to meet the high and growing demand for the services of the Resource Center and to permit testing and adjustment of its services under real market conditions. Present and projected demands demonstrate that the RC has the potential to become self-supporting and to attract additional external investment. MAFE has committed to further explore the financial and economic feasibility of sustaining the RC during the final months of the project, but a thorough assessment will be needed during the proposed bridging period to help ensure that this becomes a reality. The failure to obtain bridging funding will not only lead to serious curtailing of agricultural and natural resource benefits to farmers in Malawi but will also jeopardize the credibility of the Resource Center as a major partner with farmers in efforts to expand food production. The Center itself is gaining maturity in its operations and experiences as an agricultural service provider poised to serve not only Malawi, but also other countries in Southern Africa. To date USAID has been seen as a much-valued and dependable partner in these efforts, and its continued support to the Resource Center will further strengthen its reputation in the Region.

Providing limited funding to the Resource Center for a two-year period to supplement its own revenue generation while it consolidates and potentially expands its "product line" offers the opportunity to form such a bridging mechanism. Bridging funds requested from USAID will thus exclude funds projected to be received from services offered to partners. These latter funds will help meet a significant portion of the RC's operational costs (see Budget below, and *Annex B.1.*)

During this transition period, the RC will:

1. Continue key services to partners, capitalizing on the momentum of the extension and adoption efforts. These services include provision of germplasm, training of trainers, and dissemination of training and extension materials. The RC can also facilitate focused collaborative research activities for information to help partners and other clients respond to emerging needs and opportunities. An example is the marketing research for natural resource-based products initiated on a pilot basis by MAFE.
2. Serve as a model for further development of USAID's Global Development Alliance initiative, demonstrating a new mechanism to build-on and sustain partnerships with a wide variety of entities in the public, donor, NGO and private sector.
3. Serve as a framework of community-oriented partners that can be mobilized and used for agricultural and natural resource development efforts.

Bridging funds will also be used for short-term technical assistance to assess the feasibility (financial, technical, institutional and other factors) for the RC to sustain its services beyond the bridging period. At the end of a 12-month period, we will assess results to date and use this to develop specific recommendations for use by USAID, LRCD and other stakeholders. This assessment and resulting recommendations will take into consideration the emerging strategies and programming by Government, donors, and the private and non-governmental sectors engaged in sustainable agriculture, trade and economic development in Malawi.

Operational Structure and Cost

The Resource Center will continue to be based on the ground floor of the LRCD, under the oversight of LRCD, with implementation support provided at the request of LRCD/MAI by Washington State University under a Cooperative Agreement with USAID.

- The Ministry has requested that the present Director of MAFE provide leadership for the WSU implementation support of the Resource Center on a part-time, cost-sharing arrangement, utilizing administrative and financial support systems proven effective under MAFE.
- Existing RC staff will be retained due to their experience and skills in running the Center.
- All funds received for services will be re-invested in the Resource Center to maintain the core activities described above to meet partner needs and demands.
- Services will be documented according to date, customer, the type of service rendered, costs incurred, and funds received.
- The Resource Center will provide reports of its activities and financial operations on a monthly basis to LRCD/MAI and USAID through WSU.

Staff Required in Malawi

Malawian staff to manage and implement services of the Resource Center are as follows:

- 1 Full-time RC Coordinator – Senior technical specialist responsible for coordinating the full range of RC services and supervising personnel on a daily basis. Reports to WSU Project Director (see below).
- 1 Full-time office administrator – responsible for providing administrative and financial support services; tracks all incoming and outgoing inputs/services and funds.
- 1 Full-time Trainer/Librarian – responsible for implementing RC training; works closely with RC Coordinator for design and implementation of RC training and technical support.
- 1 Full-time Field Technician – Responsible for seed collection, processing and stock control, assists in training.
- 1 Full-time Driver¹.
- 3 casual labor – to assist in implementation of the above RC services (e.g. seed processing and storage).

Staff Required at WSU

- 1 Part-time Director from WSU (15% Full-time Equivalent-FTE) – responsible for overall administrative, technical and financial management of the WSU Cooperative Agreement.

¹ Note that a second full-time driver is desirable (one for each RC vehicle), but this position has been eliminated from the proposal at this time based upon budgetary considerations.

- 1 Part-time Project Associate (15% FTE) - responsible to the Part-time WSU Director for provision of technical and administrative backstopping to the RC from the US, on a daily basis.
- 2 Short-term Technical Assistants - TDY consultants to periodically assess and evaluate the financial and economic viability and sustainability of the RC and to identify alternative options and business plans, as appropriate.

The WSU International Programs/Development Cooperation (IP/DC) office will provide additional program support from resources external to this Cooperative Agreement. (See *Annex B-2.*)

Resource Center Budget and Customer Targets

The budget for the RC over the next 2 years assumes payment for services based on conservative estimated customer demand for tree seed, extension materials and training. This demand estimate is based on MAFE experience over the past two seasons. Additional details are included in *Annexes B.1.* and *B.2.*

Tree seed - targets (see Table 5) are based on the number of farmers targeted by RC customers to plant trees for soil fertility and wood, and to undersow maize with *Tephrosia vogelii*.

Table 5: Resource Center Tree Seed Targets

	Year 1	Year 2
Target trees planted for wood (# million)	6.8	8.4
Cumulative		15.2
Farmers targeted per annum	100,000	125,000
Target trees planted for soil fertility (ha)	3,125	3,906
Cumulative		7,031
Farmers targeted per annum	100,000	125,000
Target undersowing with <i>T. vogelii</i> (ha)	1,500	1,750
Farmers targeted per annum	15,000	17,500
Germplasm to meet targets		
Tree seed (MT)	6	7
<i>Tephrosia vogelii</i> seed (MT)	8	9

Extension materials and other inputs - targets are as follows per annum split by category:

- Field Manuals - 2,500
- Booklets - 4,500
- Poster/Leaflets - 25,000
- Training Kits - 100
- Line Levels - 2,000
- Polythene tubes - 15 million

Training - targets are as follows split by category:

- Trainers/Management staff -- 100
- Front-line Staff -- 200
- Community Leaders/Farmers -- 100

Allocation of Existing RC Facilities, Equipment and Supplies

The budget also assumes commitment by the LRCD of the RC facilities, equipment and supplies procured under the MAFE Project. A list of capital equipment and accessories currently projected to be donated by LRCD is included as *Annex A*. This list will be finalized with the LRCD and USAID/Malawi prior to implementation of the bridging period.

Resource Center Pricing Structure

The RC is to become financially self-sustaining over the 2-year period. This will require passing on the full cost of products and services supplied to customers over a phased period. Due to the large differential between the current MAFE subsidized prices and break-even (see *Table 6*), phased price increases are recommended over the two transitional years. This will minimize the impact on customers, particularly those with limited resources.

Table 6: Current MAFE Prices and Break-Even Costs (excluding capital items)

Products/Services	Current Partner Price MK	Proposed New Partner Price MK	% Increase over Current	% of Break-even Cost
Tree seed (kg):	50.00	250.00	400%	41%
Tephrosia Seed	20.00	25.00	325%	39%
Polytubes ('000):	520.00	520.00	0%	100%
Line levels (#)	120.00	255.00	113%	100%
Training Fee per Participant/Day	300.00	750.00	150%	19%
Training kits (#)	5,000.00	5,000.00	0%	25%
Posters /Leaflets(#)	30.00	125.00	317%	102%
Booklets (#)	200.00	600.00	200%	71%
Manuals (#)	350.00	1,000.00	186%	84%

Budget Summary

A proposed full-cost bridging budget is summarized in *Table 7*, below, with additional details provided in *Annexes B.1* and *B.2*. This includes projected cost recoveries from RC services rendered (see *Annex B.1* for details). It includes reinvestment in the RC of all revenues generated by the RC and allocation by LRCD to the RC of renovated facilities and equipment and supplies procured or collected under the MAFE project, as previously indicated in this proposal. These resources would be overseen by LRCD, under custody and control of the WSU Cooperative Agreement for implementation.

The budget is much lower in Year 1 than in Year 2, as the LRCD has agreed to allocate and leave in place the MAFE equipment, vehicles, seed, nursery supplies and extension materials to fully equip the Resource Center. These will be nearly adequate to meet the demands for the 2002/03 season. This is necessary to ensure services are not interrupted, since there will not be time for this by a follow-on organization after MAFE closes. The increased costs for Year 2 reflect the needs for new collection, procurement and storage of germplasm and nursery materials.

Depreciation and replacement of vehicles and equipment are not reflected in this bridging budget, due to the short time period. These will be factors considered in the ongoing assessment of the sustainability of the RC as envisioned herein, and in assessing options and developing alternative business and organizational plans. These will be based upon progress reached at the end of Year 1 toward the RC operating on a self-sustaining basis through revenue generation and/or external investment.

WSU plans to provide additional support services from other sources not included in the Cooperative Agreement budget. These are therefore not included in Table 7 but are illustrated as a potential cost share in *Annex B.2*.

Table 7: Two-Year Budget Summary (US\$)

Itemization	Year 1	Year 2	Total
I. Salaries	76,685	87,993	164,678
II. Fringe Benefits	19,305	20,711	40,016
III. Travel	6,510	13,541	20,051
IV. Technical Support/Training	0	76,500	76,500
V. Equipment/Commodities/Supplies	1,500	97,524	99,024
VI. Operations/Administration Support	27,341	28,434	55,775
VII. Indirect Costs (Facilities & Administration)	36,183	86,539	122,823
Total Project	167,523	411,243	578,867
Minus Sales Revenue Generated	130,762	145,599	276,361
Balance Required from USAID	36,761	265,644	302,506

Note that we request full funding of this 2-year Cooperative Agreement budget in Year 1. This is based upon our previous experience in Malawi, the limited level of total funding and the very short duration of the activity. This will allow planning and implementation of RC support services and associated oversight activities to continue without interruption should revenue streams lag behind the projections.

Annex A

**Donation of Capital and Other Resources from MAFE to the Resource Center
(Includes Current Resource Center Stock)**

Type of Equipment	Quantity
7 Ton Truck	1
4 x 4 Landcruiser Station Wagon	1
4 x 4 Landcruiser Pickup	1
Desktop Computers & Accessories	3
Laptop + monitor	1
HP Laser Printer	1
HP Color Printer	2
LCD Projector (3M MP 7760)	1
Kodak Digital Camera	1
Scanner	2
Photocopier	1
Panasonic Fax Machine	1
Binding Machine	1
Paper cutter	1
Laminator	1
Desks	4
Isotemp drying oven	1
Refridgerator	1
Chairs (offices)	4
Chairs (Training Room)	28
Tables (Training Room)	8
Filing Cabinets	4
Book Shelves	5
Shelving and bins for seed/warehouse	As in stock
Projection Screens	2
Overhead Projectors (3M)	2
Air conditioners	3
Compact Disk (CD) Writer	1
Cold Room	1
22 KVA Generator	1
Balance Scales	4
Heat sealer	1

Annex B.1.
Resource Center Summary Budget and Revenue Generation Projections

RC SUMMARY BUDGET (US\$)		MK : US\$	
		70.00	
Itemization	Year 1	Year 2	Total
I. Salaries	76,685	87,993	164,678
II. Fringe Benefits	19,305	20,711	40,016
III. Travel	6,510	13,541	20,051
IV. Technical Support/Training	0	76,500	76,500
V. Equipment/Commodities/Supplies	1,500	97,524	99,024
VI. Operations/Administration Support	27,341	28,434	55,775
VII. Indirect Costs	36,232	86,591	122,823
Total Project Exclusive of WSU Cost Share	167,572	411,295	578,867
Minus Sales Revenue Generated	130,762	145,599	276,361
Balance Required from USAID	36,810	265,696	302,506

REVENUE GENERATION PROJECTIONS

Break-Even Unit Cost Calculation (Based on Yr2 costs)

Products	Quantity	Direct Costs		ID Cost		Total Cost	Total Unit Cost	
		Unit	Total	Allocation	Amount		US\$	MK
Tree seed (kg)	6,921	1.29	8,940	22.5%	53,386	62,326	9.01	630
T.v. seed (kg)	8,750	0.46	4,024	10.0%	23,727	27,751	3.17	222
Polytubes ('000)	15,625	5.24	81,857	10.0%	23,727	105,584	6.76	473
Line levels (#)	2,000	1.35	2,704	2.0%	4,745	7,449	3.72	261
Total participant training days	600			15.0%	35,591	35,591	59.32	4,152
Training kits	100	100.00	10,000	8.0%	18,982	28,982	289.32	28,287
Posters/leaflets (#)	25,000	0.60	15,000	12.5%	29,659	44,659	1.79	125
Booklets (#)	4,500	4.50	20,250	15.0%	35,591	55,841	12.41	869
Manuals (#)	2,500	12.50	31,250	5.0%	11,864	43,114	17.25	1,207
				100.0%		411,295		

Resource Center Price List

Products/Services	Actual Cost		Current Partner Price	Proposed New Partner Price	% Increase over	% of Full Cost
	USD	Mk.	MK	MK		
Tree seed (kg):	9.01	630	50.00	250.00	400%	40%
Tephrosia Seed	3.17	222	20.00	85.00	325%	38%
Polytubes ('000):	6.76	473		520.00		110%
Line levels (#)	3.72	261	120.00	255.00	113%	98%
Training Fee per Participant/Day	59.32	4,152	300.00	750.00	150%	18%
Training kits (#)	289.32	20,287	5,000.00	5,000.00	0%	25%
Posters/Leaflets(#)	1.79	125	30.00	125.00	317%	100%
Booklets (#)	12.41	869	200.00	600.00	200%	69%
Manuals (#)	17.25	1,207	350.00	1,000.00	186%	83%

Products/Services % sold	Sales		Sales Revenue (MK)		Sales Revenue (USD)		
	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2	
Tree seed (kg):	2,768	3,460	692,057	865,071	9,887	12,358	
Tephrosia Seed (kg)	3,750	4,375	318,750	371,875	4,554	5,313	
Polytubes ('000):	6,250	7,813	3,250,000	4,062,500	45,429	58,036	
Line levels (#)	1,000	1,000	255,000	255,000	3,643	3,643	
Training Fee per Participant/Day	300	300	225,000	225,000	3,214	3,214	
Training kits (#)	50	50	250,000	250,000	3,571	3,571	
Posters/Leaflets(#)	12,500	12,500	1,562,500	1,562,500	22,321	22,321	
Booklets (#)	2,250	2,250	1,350,000	1,350,000	19,286	19,286	
Manuals (#)	1,250	1,250	1,250,000	1,250,000	17,857	17,857	
Percentage Sold 50%			Sub-Total	19,153,307	10,191,946	130,762	145,599
			Grand-Total	19,345,253		276,361	

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Annex B.2. Resource Center Detailed Budget

Itemization	Unit Cost	Unit	Year 1		Year 2		TOTAL	Comments
			Aug 2001 - Sep 2002		Oct 2002 - Sep 2003			
I. Salaries								
Coordinator	1460	mth	17,520	12	18,221	12	35,741	Previous history with similar technical duties in Malawi Previous history with similar technical duties in Malawi Previous history with similar technical duties in Malawi Previous history with similar duties in Malawi Previous history with similar duties in Malawi current base rate + 10% overseas stipend + 4% inflation current rate + 4% inflation current rate + 4% inflation + 10% overseas stipend Roger's current consultancy rate (emeritis faculty)
Admin Officer	500	mth	6,000	12	6,240	12	12,240	
Trainer/Librarian	920	mth	11,040	12	11,482	12	22,522	
Technician	625	mth	7,500	12	7,800	12	15,300	
Drivers x 1	230	mth	2,760	12	2,870	12	5,630	
Casual staff x 3	450	mth	5,400	12	5,616	12	11,016	
WSU Faculty								
WSU Coordinator (T. Bunderson)	91466	yr	13,720	15%	14,269	15%	27,989	
WSU On-campus Project Asst (D. Hardesty)	43612	yr	6,542	15%	6,803	15%	13,345	
WSU TDY (P. Wyeth)	282	days	6,203	22	6,451	22	12,654	
WSU TDY (R. Rogers)	375	days	0		8,241	22	8,241	
Sub-Total I			76,685		87,993		164,678	
II. Fringe/Medical Benefits								
A. Local/Third Country	26%		13,057		13,579		26,637	Bunderson (19%), Hardesty (31%), Wyeth (26%), Rogers (7.7%)
A. WSU Faculty (actual rates applied)			6,248		7,132		13,379	
Sub-Total II			19,305		20,711		40,016	
III Travel								
International Airfare (Pullman/Lilongwe)	2000	Rt	2,000	1	4,160	2	6,160	Year 1 = Wyeth 1 trip; Year 2 = Wyeth & Roger 1 trip each 3 week for each of the trips above
Per Diem (Lilongwe)	205	day	4,510	22	9,381	44	13,891	
Sub-Total III			6,510		13,541		20,051	
IV. Technical Support/Training								
Field Manuals x 2500/yr	12.50	each	0		31,250		31,250	Yr 1 supplied by MAFE, Yr2 & 3 based on historical records Yr 1 supplied by MAFE, Yr2 & 3 based on historical records Yr 1 supplied by MAFE, Yr2 & 3 based on historical records Yr 1 supplied by MAFE, Yr2 & 3 based on historical records
Booklets x 4500/yr	4.50	each	0		20,250		20,250	
Training kits x 100/yr	100	each	0		10,000		10,000	
Posters/leaflets x 25000/yr	0.6	each	0		15,000		15,000	
Sub-Total IV			0		76,500		76,500	
V. Equipment/Commodities/Supplies								
A. Germplasm (see Annexes 2,3,4)								
General tree seed collection/storage	1.05	kg	0		7,547	1.09	7,547	Yr 1 supplied by MAFE
Tephrosia seed collection/storage	385	MT	0		3,504	400.40	3,504	
Sub-Total V-A			0		11,050		11,050	
B. Nursery/Packing Inputs								
Tree seed packing	0.09	pack	1,071		1,393	0.09	2,464	Based on historical records
Tephrosia seed packing	0.03	pack	429		520	0.03	949	Based on historical records
Polythene planting tubes	5.71	1000's	0		81,857	5.94	81,857	Yr 1 supplied by MAFE
Line levels	1.3	each	0		2,704	1.35	2,704	
Sub-Total V-B			1,500		86,474		87,974	

Annex B.2. Resource Center Detailed Budget

Itemization	Unit Cost	Unit	Year 1		Year 2		TOTAL	Comments
			Aug 2001 - Sep 2002		Oct 2002 - Sep 2003			
C. Vehicles								
4x4 S/Wagon x 1	25000	each	0				0	Transferred from MAFE Project
4x4 Single-cab x 1	20000	each	0				0	Transferred from MAFE Project
Sub-Total V-C			0		0		0	
D. Computer/Audiovisual								
Computers/Printers/Accessories			0				0	Transferred from MAFE Project
Audiovisual			0				0	Transferred from MAFE Project
Office equipment/furniture			0				0	Transferred from MAFE Project
Field equipment			0				0	Transferred from MAFE Project
Sub-Total V-D			0				0	
E. Other equipment								
Generator x 1	11800	each	0				0	Transferred from MAFE Project
Warehouse storage equipment	10900	each	0				0	Transferred from MAFE Project
Seed cold store x 1	15000	each	0				0	Transferred from MAFE Project
Sub-Total V-E			0				0	
Sub-Total V			1,500		97,524		99,024	
VI. Operations/Administrative Support								
Local per diem	300	nth	3,600		3,744		7,344	Based on historical records/planned activities
Vehicle operations/maintenance (see Annexes 5&6)			8,141		8,466		16,607	Based on historical records/planned activities
Resource Center office admin/utilities (see Annex 7)			13,200		13,728		26,928	
WSU on-campus operation	200	nth	2,400	12	2,496	12	4,896	
Sub-Total VI			27,341		28,434		55,775	
Total Direct Costs			131,340		324,704		456,044	
VII. WSU Indirect Costs (F&A)								
On-Campus	Y 1 base	Y 2 base						
	\$10,970	\$11,409	4,936	45%	5,134	45%		
Off-Campus	\$120,370	\$313,295	31,296	26%	81,457	26%		
Sub-Total VII. Indirect Costs			36,232		86,591		122,823	
GRAND TOTAL PROJECT COSTS EXCLUSIVE OF WSU COST SHARE			167,572		411,295		578,867	
WSU Cost Share Alternative								
IP/DC Dir. Salaries & Benefits	109758	nth	16,464	15%	17,122	15%	33,586	IP/DC Dir. J. Nool salary/benefits
Dan's Salaries & Benefits	55387	nth	8,308	15%	8,640	15%	16,948	IP/DC Deputy D. Hardesty salaries/benefits
Indirect Costs (45%)			11147		11593		22740	
Total Cost Share			35,919		37,355		73,274	