Agriculture, Natural Resources and Rural Enterprise
Office of Sustainable Development
Bureau for Africa
U.S. Agency for International Development

Comparative Economic Advantage in Agricultural Trade and Production in Malawi

T.O. Nakhumwa
D.H. Ng'ong'ola
I.J. Minde
V. Lungu
H.E. Mapemba
Agricultural Policy Research Unit, University of Malawi, Bunda College of Agriculture

Technical Paper No. 93
September 1999

Publication services provided by **AMEX International, Inc.**
pursuant to the following USAID contract:

Project Title:	Policy, Analysis, Research, and Technical Support Project
Project Number:	698-0478
Contract Number:	AOT-C-00-96-90066-00

Contents

Foreword

Southern Africa was characterized by a heavily regulated agricultural market before the late 1980s, but, since then, countries in the region followed a strategy to remove restrictive measures from the agriculture sector. The deregulation process has taken place within the context of worldwide liberalization of agriculture. These changes have meant that Malawi, and the entire southern African region, will have to compete internationally in a more open agricultural market. In order to be competitive, southern African countries have to use resources more efficiently by exploiting their comparative advantages. Policy decision-makers should be guided so as to implement policies and strategies that will enhance the competitiveness of agricultural producers.

Various studies have shown that countries can improve their welfare by opening up their borders to freer trade. Furthermore, there is a worldwide move toward economic integration; the European Union being the most prominent example. Southern Africa is no exception with the region's move toward a Free Trade Area under the auspices of the Southern African Development Community (SADC). Not only is it foreseen that this movement will improve welfare in the whole region, but the region's competitiveness could also improve. Within the framework of economic integration in southern Africa, countries will only reap benefits by exploiting comparative advantages that exist within the region.

Malawi is one of seven countries in SADC participating in the Research Program on Regional Agricultural Trade and Changing Comparative Advantage in Southern Africa. The comparative economic analysis (CEA) study in Malawi, therefore, forms part of a larger activity to determine comparative advantages in the region. These studies not only examine the existing comparative advantages, but also provide a means to evaluate the impact of different agricultural policies on comparative advantage. This proves to be an especially valuable tool to guide policymakers in the region.

Comparative economic analysis found that Malawi does not have a comparative advantage in the export of local maize or soya beans. Although additional market information is needed, the authors recommend that Malawi review its policy of emphasizing attention on two major crops (tobacco and maize) and instead focus attention on the promotion of paprika, cotton, macadamia and ground nuts as primary crops. If the correct policies are pursued, the authors believe that regional trade could achieve food security in Malawi.

This study is one in a series of studies on Africa's regional trade and comparative advantage, a joint activity of USAID Africa Bureau's Office of Sustainable Development, Agriculture, Natural Resources and Rural Enterprise (ANRE) Division and the Regional Economic Development Services Office for Eastern and Southern Africa (REDSO/ESA).

Dennis Weller, Chief
Agriculture, Natural Resources and Rural Enterprise
Office of Sustainable Development
Bureau for Africa
U.S. Agency for International Development

Dennis McCarthy, Chief
Office of Agriculture, Engineering, and Environment
Regional Economic Development Support Office,
Eastern and Southern Africa
U.S. Agency for International Development

Acknowledgments

This study was financed wholly by USAID, through the REDSO/UNISWA Cooperative Agreement Project No.: 623-0478.23-00-4092-00. The authors would like to commend the Centre for Agricultural Research and Policy Analysis (CARPA) of the University of Swaziland for the effective coordination of this study. We would like to extend our appreciation to Mrs. Rose Ali for her untiring efforts and support which enabled us to honor the proposed time period for this study.

This report is a result of numerous interactive engagements from both the private and public sectors, to all of whom the authors of this paper remain indebted. We would like to single out Dr. Todd Benson, geographer/social economist, and Mr. Sam Chimwanza, Famine Early Warning System (FEWS) project coordinator, for providing data which was used for demarcating the agro-ecological zones. Special thanks should also go to Dr. Rashid Hassan and Dean Fairbanks for providing equipment and the Graphic Information Systems (GIS) training for the country team.

The Agricultural Policy Research Unit (APRU) enjoys and appreciates the supportive and collaborative environment accorded by the Ministries of Agriculture and Irrigation and the National Economic Council. The country team was comprised of two economists from the aforementioned ministries and three researchers from the APRU.

Finally, we would like to sincerely acknowledge the great work and impeccable vision of the late Prof. Glen Magagula, who, until his sudden death, was the director of CARPA-UNISWA and the regional coordinator for this project. He was a man with a sense of purpose, and the vision he had for eastern and southern Africa, as expressed in this project, will remain with us.

Dedication

Dedicated to the memory of the late Professor Glenn Themba Magagula, formerly Deputy Vice Chancellor of the University of Swaziland, whose vision, foresight and leadership led to the development and implementation of the “Regional Trade and Comparative Economic Advantage in Southern Africa” activity.

Executive Summary

An approach of Comparative Economic Advantage (CEA) was employed to evaluate the economic efficiency of the country's resources in producing some crops: tobacco, paprika, macadamia, tea, cotton, hybrid and local maize, groundnuts, phaseolous beans and soyabeans. These crops were selected using a multiple objective table. The following is a list of objectives from which the research team's scores were based: area covered by the crop, tolerance to drought, employment generation, contribution to nutrition, contribution to foreign income generation and value to land ratio. The crops were ranked based on the scores accorded and the top ten were selected for the study.

As part of the trade studies in eastern and southern Africa, this study was conducted to investigate the comparative economic advantage in agricultural trade and production. The study was aimed at achieving the following specific objectives:

- Evaluate the CEA of alternative agricultural production activities in the various agro-ecological zones, different technological levels and land tenure systems in Malawi;
- Analyze the potential impact of removing the existing price and policy distortions on the economic efficiency of the alternative productive uses of the country's resources;
- Identify areas of policy, technology and institutional intervention to enhance economic efficiency and direct agricultural resources to their most productive uses; and
- Build the Malawi country data component needed for conducting the regional analysis of CEA and trade of agricultural commodities from southern Africa.

The study considered two levels of production technology: low input and high input technologies. Low input technology included smallholder farmers operating mainly under customary land tenure. High input technology was comprised of large estates operating exclusively under leasehold or free hold land tenure system. The study utilized GIS to generate the agro-ecological zones for the various crops. The agro-ecological zones were placed in their respective Agricultural Development Divisions (ADD) to facilitate estimation of the domestic transport costs. Three major market nodes were identified: Blantyre in the south, Lilongwe in the center and Mzuzu in the north. The eight ADDs were thus linked to these market nodes based on their distance from a particular node.

It has been demonstrated in this study that most of the zones have a comparative advantage in production of most of the crops which were selected for study. In the areas of production, the following crops have exceptionally strong domestic resource cost ratios: cotton, paprika, macadamia, tobacco and groundnuts in all areas of production. These crops, with exception of tobacco which is now experiencing declining world demand due to the anti-smoking campaigns, need to be emphasized as the country's major export crops. All these crops have a very strong demand on the world market and exceptionally attractive social prices (world market prices). Therefore, it would be worthy to invest in these commodities as a viable option to widen the export basket of the country.

There is a reasonable comparative economic advantage in the production of hybrid maize with domestic resource cost ratios ranging between 0.35 and 0.88; 0.42 and 0.76, growing under high and low input technological levels, respectively. However, the comparative advantage in hybrid maize production is lost in zones far from the exit/entry port, i.e., Nacala, due to huge transportation costs borne in those areas. There is no comparative advantage in local maize and soyabean production in most zones. Only Ngabu has a comparative advantage in soyabeans produced as an export crop. Lack of comparative advantage in these crops are traced from low world market prices, especially for soyabeans, and low productivity (yield per hectare) on the world market.

The study also revealed that efficiency in production of most of the crops can greatly be increased with increased productivity. The domestic resource cost ratios for most of the crops were strengthened when computations were done using potential yields. Sensitivity analysis on price has demonstrated that changes in input prices impact on the domestic resource cost ratios, hence influence the comparative economic advantage. Note, however, the fact that crops which utilize different inputs, such as fertilizer and chemicals, were more impacted upon due to input price changes. It has been noted that not all crops would benefit from input price decreases unless such a reduction translates in increased application of inputs to the recommended levels. If farmers take advantage of input price reductions and apply the recommended levels of inputs, crop productivity will increase. Crops such as cotton, paprika and tobacco would benefit from such policies.

Comparison of the net private and social profits was done, and sources of disparity between the two were traced. The study revealed output transfers as being a major influence in the net policy effect in the agricultural sector. Thus, the wider gap between net social and net private profitability is mainly the result of low commodity market prices. Since the net private profits for all cash crops (low and high input) are far below the net social profits, the government may be taxing away a portion of the social profits for the commercial farmers. This taxation acts as a hindrance to efforts aimed at increasing agricultural production. The low (suppressed) commodity market prices are a result of several factors, some of which are policy-related but also due to market imperfections, *inter alia*. Commodities like tobacco and tea, are exposed to export taxes and cess collection. There is lack of competition in marketing certain commodities leading to low prices offered by the dominant buyers. Collusion in price setting cannot be overruled especially in commodity markets dominated by only a few buyers, such as in cotton and paprika markets.

Glossary of Acronyms and Abbreviations

ACP	African, Caribbean and Pacific
ADD	Agricultural Development Division
ADMARC	Agricultural Development and Marketing Corporation
APRU	Agricultural Policy Research Unit
ARET	Agricultural Research and Extension Trust
CA	Comparative Advantage
CDC	Commonwealth Development Corporation
CDR	Cost of Domestic Resource
CEA	Comparative Economic Advantage
CFA	Communaute Francophone D'Afrique
CIF	Cost Insurance and Freight
DRC	Domestic Resource Cost Ratio
EC	European Community
EIU	Economist Intelligence Unit
EPC	Effective Protection Coefficient
EPZ	Export Processing Zones
ESA	East and Southern Africa
FOB	Free on Board
GATT	General Agreement on Tariff and Trade
GDP	Gross Domestic Product
GIS	Geographic Information System
LREP	Land Resource Evaluation Project
MIPA	Malawi Investment Promotion Agency
MK	Malawi Kwacha (Malawi Currency)
MOA	Ministry of Agriculture
MOALD	Ministry of Agriculture and Livestock Development
MRFC	Malawi Rural Finance Company
MUSCCO	Malawi Union of Savings and Credit Cooperatives
NPC	Nominal Protection Coefficient

NPP	Net Private Profitability
NSCM	National Seed Company of Malawi
NSP	Net Social Profitability
OECD	Organization for Economic Cooperation and Development
PAM	Policy Analysis Matrix
RCR	Resource Cost Ratio
REDSO	Regional Economic Development Services Office (USAID)
SACA	Smallholder Agricultural Credit Association
SADC	Southern African Development Community
SEDOM	Small Enterprise Development Organization of Malawi
SSA	Sub-Saharan Africa
TAM	Tea Association of Malawi
TCC	Tobacco Control Commission of Malawi
UNISWA	University of Swaziland
USAID	United States Agency for International Development
US$	United States Dollar
VAD	Value Added

1. Introduction

Most countries in Sub-Saharan Africa (SSA) have economies which are highly dependent upon agriculture. Agriculture is the dominant sector in Africa contributing an average of 34 percent of the GDP, compared to 20 percent in all developing countries. It generates 75 percent of employment and 40 percent of exports. Cash crops account for at least 60 percent of export earnings in more than half of the countries (Abdulai, 1995). However, the agricultural sector has not realized its potential; productivity is neither competitive internationally nor compensating for the use of the natural resource base. Food growth rate of approximately 1.4 percent per annum is not keeping up with a population growth rate of about 3 percent per annum. This difference is making the region more dependent on food imports forcing expenditures of limited foreign exchange and/or incurring greater international debt, all of which amount to negative development. Low productivity is a reflection of marginalized access to resources, use of traditional technologies (usually low input) and poor policies being pursued by the various governments in the region. Transforming agriculture and expanding its productive capacity is, therefore, a prerequisite for improving the living standards in SSA. It is not surprising that the policy action in Malawi,both agriculturally and economy-wide, is largely based on influencing the dynamism of the agricultural sector.

1.1 THE CASE FOR REGIONAL TRADE COOPERATION

Due to the narrow and fairly unstable markets that characterize agriculture in many parts of the Africa, effective use of regional trade as a stabilizing device is essential. It is dangerous to consider institutionally based regional trade schemes that work through external tariff barriers as first steps in regional economic integration, especially where national policies undermine the competitiveness of regional markets (Badiane,1995). Regional integration in the context of distorted macroeconomic and trade policies is likely to fail for four reasons:

- export sectors in the countries of the region (SADC) are not competitive on regional markets compared with countries outside the region;
- countries with distorted policies grow slowly, if at all. This slow growth constrains regional demand for imports from regional trade partners;
- foreign exchange shortages associated with distorted trade and macroeconomic policies induce national governments to adopt licencing and other control measures that unavoidably disrupt border crossing trade flows; and
- national policies biased against agriculture reduce and limit the role agriculture can play in regional economic development.

It is important to note that promotion of regional trade and integration through multinational institutions and regional regulations, is not a viable alternative to the necessity of eliminating the biases in the country's macroeconomic and sector policies, if regional trade is to grow. Malawi is an active participant in regional organization being a member of COMESA, and SADC. The member states are urged to deepen the process of economic integration within the region to create new investment opportunities, production and trade.

1.1.1 Potential for Intra-regional Trade

One-third of the countries of the world are in Africa, but these countries hold only 10 percent of the world's population. Most African countries have only 5 to 15 million people. Regional cooperation schemes have proliferated in Africa because African countries are too small to meet the requirements of modern economic development on their own.

Nevertheless, trade among the SADC countries has been minimal, largely because of trade barriers.

trade, which was estimated at about MK44.1m (approximately US$3 million) (Minde and Nakhumwa,1996). Informal cross-border trade therefore contributes significantly to food security. A simple explanation to the flourishing of this trade *inter alia* is that some countries are more efficient producers than others, i.e., have a comparative economic advantage in production of particular commodities. This revelation challenges the scenario that SADC countries have same basket of export crops and therefore cannot trade among themselves. Informal traders are in this case only utilising the potentials in trade within the region, otherwise neglected by the government central planning units.

Table 1.2 also shows that intra-regional trade as a percentage of the total trade (for both imports and exports) is very low. In the table, column 2 shows percentage contribution to the value of SADC total exports by a particular country. For example, the Angolan value of exports to the total regional exports was US$6.6 million. Only 0.7 percent of this $6.6 million in exports was exported to SADC countries. From Table 1.2, Lesotho had the lowest proportion of exports to the region while Zimbabwe had the highest proportion of exports to the member countries.

1.2 MALAWI'S TRADE PROSPECTS IN THE SADC REGION

Malawi increased its exports to the SADC region by 94 percent from MK582.94 million (US$38.86 million) in 1994 to MK1,129.94 million (US$75.32 million) in 1995 (Banda,1996). In spite of this notable increase in value of export, its general performance as compared against exports from other member states does not appear to be impressive. Apart from Angola and Mozambique in 1994 and Tanzania in both 1994 and 1995, Malawi has been registering a negative balance of trade with the rest of the SADC member states. The trade imbalance has been worsening from -MK1,568.78 million (-US$104.6 million) in 1994 to -MK2,249.1 million (-US$149.94 million) in 1995. This is a clear signal that Malawi has not produced and marketed its export commodities aggressively enough. Products exported to the region include tobacco, tea, coffee, sugar, rice, textiles and garments, chilies, etc. There is a high potential for increasing the agriculture export base of the country. Regional markets for agricultural goods such as beans, soyabeans, paprika,

Table 1.2. SADCC: Intra-regional Exports and Imports, 1989

Country	Exports $ million	% of total Intra-regional	Imports $ million	% of total Intra-regional
Angola	6.6	0.7	36.7	3.7
Botswana	164.4	17.3	180.0	18.4
Lesotho	1.0	0.1	6.0	0.5
Malawi	103.7	10.9	105.3	10.9
Mozambique	30.4	3.2	121.3	12.4
Swaziland	14.3	1.5	11.8	1.2
Tanzania	13.8	1.4	65.2	6.7
Zambia	155.6	16.4	172.8	17.7
Zimbabwe	460.7	48.5	277.9	28.5

Source: SADC: Macroeconomic survey, 1989.

trate on production of commodities that they have a comparative advantage in, and import the rest. Thus, countries will have to primarily rely on their trade opportunities and financial reserves to off-set fluctuations in their production.

1.4 PURPOSE AND OBJECTIVES OF THIS STUDY

1.4.1 Purpose

Through a cooperative agreement between the University of Swaziland and the USAID/REDSO/ESA, this research activity was launched in the SADC region to investigate Comparative Advantage in Agricultural Production and Trade in Southern Africa, as part of the trade studies in SSA. The Agricultural Policy Research Unit (APRU) at Bunda College, University of Malawi, was contracted to conduct the study in Malawi.

1.4.2 Objectives

Under the overall objective of the Regional Agricultural Trade and Changing Comparative Advantage in Southern Africa Project, the study attempted to achieve the following specific objectives:

- Evaluate the CEA of alternative agricultural production activities in the various agro-ecological zones, different technological levels and land tenure systems in Malawi;
- Analyse the potential impact of removing the existing price and policy distortions on the economic efficiency of the alternative productive uses of the country's resources;
- Identify areas of policy, technology and institutional intervention to enhance economic efficiency and direct agricultural resources to their most productive uses; and
- Build the Malawi country data component needed for conducting the regional analysis of CEA and trade in agricultural commodities for southern Africa.

2. Review of Some Macroeconomic Policies

2.1 MACROECONOMIC REFORMS

Macroeconomic reforms focus on increasing the competitiveness of exports and the efficiency of industrial and public enterprises, as well as improving public resource utilization. To this end, reforms in the management of trade or external sector and public finances are implemented.

2.1.1 Trade/External Sector Policy

Trade policy in Malawi has gone through a number of strategies since the early 1970s. Between 1973 and 1980, trade was virtually unimpeded and characterized by free movement of goods and services and lower tariffs. Between 1980 and 1987, due to fiscal imbalance and balance of payments problems, the economy adapted protectionist measures through rationing of foreign exchange and higher tariffs. Since 1985, the country has been implementing trade liberalization measures to restore the open economy environment. The economy has since undergone transformation from a controlled economy to a much more liberal economy. Trade liberalization aims at improving resource allocation, expanding the economy's output and accelerating economic growth. Trade liberalization in Malawi has been implemented in the form of removal of import prohibitions, price controls and tax liberalization.

2.1.2 Import and Export Licencing

Malawi operates a liberal import and export licencing system under which at present only 30 commodities require an export licence. The reasons for exposing the selected goods to licencing are varied. On the importing side, they include consideration of protection of industries, ensuring security as is the case with procurement of some chemicals and other items which could be lethal, health reasons as is the case with salt imports, monitoring the supply of crucial items such as staple foodstuffs and the conservation of foreign exchange. On the exporting side, the reasons are principally to conserve raw materials for local manufacturing or processing industries.

2.1.3 Tariff Reforms

All imports to Malawi, except animals, are subject to one or more of a variety of customs duties. Malawi is a member-nation of the General Agreement of Tariffs and Trade (GATT) and goods are classified for customs duty purpose under the standard Brussels SITC system of nomenclature, and the basis for valuation follows recommended basis of fair value added cost, i.e., including the very high freight element of most exports to Malawi. All associates of the European Community (EC), Lome Convention of African, Caribbean and Pacific countries (ACP), the member countries of SADC, Common Market for Eastern and Southern Africa (COMESA), GATT, all existing and former Common Wealth countries and the Organization for Economic Cooperation and Development (OECD) countries qualify for the most favored-nation status. The vast majority of Malawi's imports attract duty discounts at varying levels. Reimports are mostly exempt from duty but lead to reimbursement of any duty drawback claimed at the time of export. Excise duty is not chargeable on imports and on small range of goods. This can result in comparative advantage.

2.1.4 Export Incentives

To promote exports, the government introduced a tax allowance for exports. No customs duty of any form is imposed on exports. A cess and export levy is, however, collected on certain exported goods and placed in a special fund, which was created to stimulate and encourage growth of the industry concerned. For instance, a tobacco cess, hide and skin cess and tung cess are collected. The Investment Promotion Act of 1991 provided for special incentives for export manufacturing in the proposed Export Processing Zones (EPZ) and general ones for the non-traditional exports (mainly manufacturing).

2.2 REVIEW OF SOME FOOD AND AGRICULTURAL POLICIES IN MALAWI

The food and agricultural policies have been divided into: farm level and market level policies.

2.2.1 Farm Level Policies

2.2.1.1 Cash Crop Allocation and Production Quotas

Only tobacco is restricted by the government, through a quota system. Tobacco is the dominant traditional cash crop for Malawi, accounting for over 30 percent of the GDP and nearly 70 percent of the total domestic export earnings. Before 1990/1991, flue-cured and burley quotas were allocated only to estate farms where tenant farmers were usually utilized to produce the crop. In 1990, a smallholder burley scheme was initiated that allocated licences for production of 1,500 tons of burley for smallholders on customary land. The allocation increased to 3,000 tons in 1991, 7,000 tons by 1992. The objective of the scheme is to allow smallholders access to a broader means of increasing their incomes in order to reduce poverty. The smallholder burley program has been a success. Smallholder farmers have demonstrated their ability to produce high quality tobacco at low cost.

2.2.1.2 Input Subsidies/Credit and Distribution

Fertilizer and hybrid maize seed for smallholder farmers have in the past been subsidised. All subsidies were phased out in 1994/1995 season and thus input market was liberalized. The Smallholder Agricultural Credit Administration (SACA), a government organization established by the Ministry of Agriculture and Livestock Development (MoALD) in 1988, was the only agency involved in supplying smallholder farmers with credit through farmers' clubs. SACA was faced with serious problems of credit default. The worst credit default problem was in 1992/1993 when only 16 percent of the MK144.3 million (US$32 million) loans were recovered. Factors identified contributing to this problem include: the breakdown in the recovery system, credit design and administration, low gross margins, political dispensation, the 1992/1993 drought and the delinkage of extension and credit activities. To overcome some of the above problems, SACA was converted to the Malawi Rural Finance Company (MRFC), a limited liability finance company, thereby eliminating heavy dependence on government support and accelerating privatization of the rural credit system. MRFC started its operation on 1 October 1994. SACA was charging the smallholder farmers lower interest rates than the market rates, thereby subsidizing the smallholder credit rates. The MRFC on the other hand, instituted a market-determined interest rate to ensure availability of credit and adequate profitability for the financial intermediary. In the period of this study, the 1996/1997 agricultural season, MRFC charges an interest rate of 35 percent. Interest rates were decontrolled in 1987 to make it possible for banks to cover full costs of their rural operations (Ng'ong'ola,1996).

Other sources of credit available to smallholder sub-sector include the following: Smallholder Crop Authorities which provide funds to finance inputs for some particular crops (coffee, tea, sugar and tobacco); Small Enterprise Development Organization (SEDOM) which provides loans for development of Small scale rural industries and agro-industries; Malawi Union of Savings ans Credit Cooperatives (MUSCCO); and informal sources such as local money lenders. Smallholder farmers have not been receiving credit from commercial banks. The main financial institutions providing credit to the estate sub-sector are the two commercial banks: the National Bank of Malawi and the Commercial Bank of Malawi. The Investment Development Bank (INDEBANK) also provides loans to agricultural estates and agro-processing.

2.2.1.3 Land Reform Measures

Equitable access to land resources and security of tenure constitute key factors to improved agricultural productivity. However, since independence, agricultural land-use policy has remained strongly divided between freehold or leasehold and customary tenure. Freehold being principally dominated by export crop production, and customary tenure falling under subsistence farming by smallholder farmers. Over the past years, the government permitted the estate sub-sector to expand rapidly, leasing large areas of what had been customary land at low rentals. Often the new estate owners did not have the management or financial resources to exploit their holdings. In 1989, an estimated 32 percent of leasehold land was not cultivated (cropped or under short-term

fallow), although half of this was cultivable. The result has been, therefore, that in some areas increasing pressure on the remaining customary land exists next to heavily underutilized estate lands. Land available to smallholder households, especially in the southern and central regions, is decreasing as high population growth rates and transfers of land to the sub-sector continue. Immediately after coming to power in 1994, the present and first democratically elected government in Malawi, amended the "Control of Land (Agricultural Leases) Order." The amendment stipulates that conversion of customary land to agricultural estates can only be done under special cases. Realising the lack of a comprehensive land policy in relation to land acquisition, land use and environmental protection in Malawi, the government in 1996 officially launched a Presidential Commission of Inquiry of Land Policy Reform. The Commission is specifically mandated to the following:

- Correct inequalities and insecurity in distribution of land rights which have led to falling agricultural production and incomes, unemployment, as well as rising levels of poverty and national household food insecurity, and
- Recommend the main principles of new land policy which will facilitate high levels of sustainable agricultural production and incomes and ensure efficient operation of the market forces and increase the standard of living of the majority of the people.

2.2.2 Market Level Policies

2.2.2.1 Parastatal Trading or Marketing Boards

The Agricultural Development and Marketing Corporation (ADMARC) has been responsible for the distribution of agricultural inputs (fertilizer, hybrid seed) to smallholder farmers, managing Malawi's strategic reserves of maize and marketing strategic crops based on floor and ceiling prices. Though the produce markets were liberalized in 1994, ADMARC still plays a dominant role especially in the maize market. In the past, the parastatal also had an effective monopoly over retailing fertilizer to smallholder farmers. Since pricing and marketing policies were liberalized, the role of ADMARC has been refined as a buyer and seller of last resort for staple food crops.

2.2.2.2 Output Marketing and Pricing

During the 1980s, the government progressively liberalized its pricing and marketing policies for smallholder crops. Since 1987, private traders have been allowed to buy and sell all smallholder crops, except cotton and tobacco. The market restriction for cotton were lifted in 1991 (World Bank,1993). Lack of infrastructure and credit *inter alia* are nevertheless the factors that continue to constrain growth of private agricultural trading in Malawi. The government liberalized marketing of all tobacco grown by smallholder farmers including burley tobacco. Smallholder farmers are now free to sell their tobacco directly on auction floors or through any other intermediate buyer in addition to ADMARC.

The official policy of the Ministry of Agriculture and Livestock Development has been "progressive decontrol" of prices. Currently, the government sets floor and ceiling prices for smallholder maize only, but all other crops have been descheduled. Maize producer prices are determined primarily with the objective of stimulating production as part of Malawi's food security efforts and to equate supply and demand (Ng'ong'ola, 1996). Before descheduling the other crops, their prices were supposed to be determined on the basis of export parity principles. This was not the case. For instance, nominal protection coefficients show that smallholder producer price for rice, groundnuts, and cotton were further from their export parity price levels in 1991/1992 than they were in 1988/1989. Although the situation had improved with respect to tobacco, producer prices were still some way from the export parity level.

2.2.2.3 Restrictions on Commodity Movement and Trade

Only maize is restricted, i.e., cannot be exported by private sector, because of its strategic importance. Until 1994, export bans were placed on groundnuts, beans and pulses on an ad hoc basis, but the restrictions on these crops have now been removed.

2.2.2.4 Labor Market

The government is committed to the implementation of the 1993 Labour Market Review recommendation with

the view to stabilize the labor market conditions and facilitate investment response in labor intensive activities. The most important components of the action plan are:

- Reduction of the minimum wage structure to two levels (a rural minimum wage and urban minimum wage) which has already been implemented;
- Support of developments in collective employer-employee wage bargaining as a step to give autonomy to decentralized labor negotiations; and
- Support of economic activities and policies to increase the productivity of labor, especially policies that enhance economic activity in the informal and rural sectors.

3. Methods and Analytical Framework

3.1 COMPARATIVE ECONOMIC ADVANTAGE

The theory of comparative advantage is generally attributed to Ricardo (1817), who first extended the optimization principle defining efficient choice of output by firms into the arena of international trade. Ricardo pointed out that a country can achieve net welfare gains by concentrating productive capacity on goods and services of which it is a relatively efficient producer and importing the rest. Knowledge of comparative advantage is important for developing countries, because potential welfare gains from specialization and trade can be used to foster economic growth. National income often can be increased through policies encouraging farmers to produce commodities that exploit existing patterns of comparative advantage.

One practical difficulty with using comparative advantage for designing agricultural policies or allocating research resources is that comparative advantage is not easy to determine empirically. Simply comparing production costs between two regions or countries is often inconclusive, because comparative advantage is not directly related to absolute production costs. Even if relative production costs are known, frequently these are distorted by government policies or market failures. It was against this background that the domestic resource cost (DRC) methodology is used in this exercise. The DRC framework generates quantitative indicators of the efficiency of using the domestic resources to produce a given commodity as measured against the possibilities of trade. These quantitative indicators provide an empirical measure of comparative advantage. At the same time, the analytical framework also allows measurement of the distortionary effects of government policies. Relative efficiency in production and hence comparative advantage depends on three factors: 1) technology (which determines production possibilities and influences rate of product transformation); 2) the resource endowment (which determines the value of domestic resources e.g., land, labor, capital and water); and 3) international prices (which determines the value of all other inputs and outputs) (Morris, 1990). Zyl (1996) summarized CEA as being a function of institutions, physical and human capital and agro-potential which is basically a synopsis of the aforementioned characteristics.

3.2 AGRICULTURAL DIVERSIFICATION IN MALAWI USING THE APPROACH OF COMPARATIVE ECONOMIC ADVANTAGE

In a bid to achieve sustainable growth and poverty reduction in Malawi, a few studies on comparative economic advantage in agricultural trade and production have been conducted in trying to unlock the country's diversification potential. The country has been trying ways of reducing its heavy reliance on tobacco for export earnings, thereby lowering the risk attached to a crop with less than buoyant demand prospects. It has been essential also to decrease reliance on low valued maize as the predominant crop in terms of area planted. The World Bank (1994) produced a working paper with an objective of providing an operational and quantifiable methodology for assessing Malawi's agro-based comparative advantage and for assessing the impact of government policies on potential diversification of commodities or activities. The study focussed on 32 activities which were grouped in separate sections of oilseeds, grains, pulses, tree nuts, horticultural products and livestock. Malawi, according to the results of this study, has a comparative advantage in production of a number of crops including cotton, pigeon peas, phaseolus beans, macadamia, cashew nuts, and tobacco. The results also indicate a comparative advantage in maize (hybrid using high analysis fertilizer) while wheat had no comparative advantage. Nakhumwa (1995) reported that Malawi has an unimpressive comparative advantage in production of

complete shift from this crop due to its heavy implication on the country's food security.

In Malawi, there have been differences in policies governing agricultural production in the estates and smallholder sub-sectors (Nakhumwa,1995). Comparison of private and social profitability in smallholder production indicated that of the agricultural policies in Malawi, tradable input price transfer policies were meant to provide incentives for subsistence farming. Supported by other government support services and market infrastructure (ADMARC), crops like maize have been grown in unsuitable areas. The major disincentive to subsistence farming accrued from the output price transfer policies (suppressed commodity market prices). Agricultural policies have nevertheless provided disincentives for commercial farming apart from the fact that big tobacco and tea estate farmers were given access to international markets (auction floors). The pricing policy for commercial farmers in Malawi for cash crops other than tobacco, tea, coffee and sugar–crops which have been dominated by large white farmers and the Malawian elites–has not been clear. To a larger extent, prices for all other crops excluding the aforementioned, have been determined by ADMARC. Hence, big estates in Malawi are rarely involved in production of alternative cash crops such as cotton, groundnuts, and beans, commodities bought mainly ADMARC.

According to Nakhumwa (1995), an analysis of policy incentives in Malawian agriculture indicated that private profitability is too low compared to the social profitability for most of the cash crops. In other words, the government has been taxing away a portion of the social profits for the commercial farmers. From the late 1980s until the present, the environmental policy has changed greatly with most of the restrictive agricultural policies eliminated. The country completely phased out the subsidies on the agricultural inputs by 1994/1995 season and a detailed analysis to portray the effects of the newly instituted policies is therefore desirable. Noteworthy, all the studies on comparative economic advantage in agricultural trade and production in the country have been done without due consideration of agro-ecological zones. This particular research may be especially enlightening since agro-ecological zones and market nodes have been considered to capture aspects of production differentials due to weather, soil and transport.

3.2.1 Problems in the Implementation of Domestic Resource Cost Results in Malawi

In trying to diversify the Malawian agriculture, implementing recommendations from the various studies on the method of comparative economic advantage as a viable approach has not been easy. Agricultural diversification has been resisted in the face of enormous empirical evidence which has suggested that other crops have a comparative advantage in their production unlike crops such as maize which have been over-emphasized by the government in pursuance of the self-food security policy option. Agricultural diversification in the country has moved at a slow pace due to the following:

- Malawian agriculture is rain-fed. Further, most of the smallholders farmers have plots of land which are less than a hectare. Food production is therefore a priority for most of the smallholder farmers. Most smallholder farmers produce for subsistence and would rather continue to use their primitive technologies and traditional crops, which over the years have proved reliable even under stressed conditions (e.g., drought and production without the use of inputs such as fertilizer) rather than risk adopting modern agricultural technologies, even when the profits thereof are quite substantial. Most of the crops, which offer comparative advantage, require use of modern technologies, e.g., hybrids and inorganic fertilizers, which the majority of farmers in the country cannot afford due to limited capital.

- Lack of capital and credit is one major culprit for the limited adoption of modern agricultural technologies most of which demand a lot of inputs. The commercial banks in Malawi only lend to large estates, while smallholder farmers fail to supply the proper collateral. Furthermore, there are ineffective lending institutions in the country, inadequate marketing institutions and poor infrastructure (poor road networks).

- Intra-regional trade cooperation has been very low in the Sub-Saharan Africa. The inadequate marketing institutions, poor road infrastructure and high transportation costs, have in most cases undermined the competitiveness of Malawian exports to the world and regional markets.
- Regional markets which would offer market opportunities to most of Malawian agricultural commodities, have not been fully exploited. Cross-border trade with neighboring countries and other African countries within the region has not flourished due the insistence of the government (small economies) to trade in more stable currencies such as the U.S. dollar. But governments restrict this hard earned foreign exchange (US$), limiting cross-border trade, a viable option for expanding the agricultural market.
- In third world countries, particularly Africa, food is regarded as a political weapon. As such, most governments do not risk relying on food imports for fear of creating internal instability. Most countries within the region have self-food security policies in place limiting trade, especially on food commodities, across their borders. Furthermore, the political instability and wars in the Sub-Saharan Africa has also hampered cross-border trade within the region.
- African products have had difficulties penetrating the world markets. Small economies like Malawi have lacked aggressiveness in market research due to various reasons, and it has therefore been difficult for such countries to identify new markets, especially for non-traditional exports. With the environment of such uncertainty, there has been some reluctance by most African governments to diversify away from some established traditional exports like tobacco (in the case of Malawi), considering the adverse implications such a move would have on the economy in the short-run.

3.3 THE DOMESTIC RESOURCE COST METHOD

The domestic resource cost developed simultaneously in 1967 by Bruno and Krueger is defined as the shadow value of non-tradable factor inputs used in an activity per unit of tradable value added. Bruno was seeking to measure the gain from expanding profitable projects, while Krueger wanted to measure the cost of maintaining unprofitable activities through trade protection. In both cases they needed a ratio counter-part to the concept of net social profit (Masters and Winter-Nerson,1995).

The domestic resource cost method generates several measures of the relative economic efficiency of production alternatives. The most important are: Net Social Profitability (NSP), which indicates the net contribution of each production alternative to national income, measured in terms of social net returns to the land. A second measure, the Resource Cost Ratio (RCR) indicates the efficiency of each production alternative in using domestic resources to earn (or save) one unit of foreign exchange. Since both measures capture the ability of production alternatives to contribute to the national income, comparison of social profitability and/or RCRs provides an empirical measure of the underlying pattern of comparative advantage.

3.4 COMPARATIVE ECONOMIC ADVANTAGE AND POLICY ANALYSIS MATRIX (PAM)

Based on objectives 1 through 3 of this study, it will be useful to place the CEA concept within the framework of the policy analysis matrix (PAM). The PAM is a product of two accounting identities. The first defines profitability as the difference between revenue and costs. The other measures the effects of government intervention or divergences (market failures) as the difference

between observed parameters and parameters that would exist if the divergences were removed. By filling in the elements of PAM for agricultural activities, an analyst can measure both the extent of policy effects and the inherent economic efficiency (or comparative advantage) of the activity.

PAM is based on the familiar equation:

Profit=Revenue-Cost

PAM, as presented in Table 3.1, has five columns. The first is for revenue, the second, third and fourth is for costs, and the last is for profitability. The first cost PAM column is for tradable inputs and the two are for domestic factors, i.e., capital, labor and land. The distinction between tradable inputs and domestic resources is vital because domestic exchange rate policies affect the former and also certain measures of efficiency require the distinction. Intermediate inputs—including fertilizer, pesticides, purchased seeds, electricity, transportation and fuel—are divided into their tradeable-input and domestic factor components.

PAM has three rows. The first two rows represent the two different versions of the profit equation above, with the first row evaluated using actual observed (market) prices and the row below it evaluated at shadow or social prices. The effect of government policy (or market failure) is measured in the third row, for which each entry is simply the difference between its value in the first row and in the second row.

Definitions and Ratio Indicators

E-F = Value added (VAD)

G+H = Cost of domestic resources (CDR)

NPP = (A-B)-(C+D)

NSP = (E-F)-(G+H) or VAD-CDR

O = NPP-NSP or (K-L)-(M+N) (Net transfers)

DRC = (G+H)/(E-F) or CDR/VAD

EPC = (A-B)/(E-F) or (A-B)/VAD

NPC = A/E (Nominal protection coefficient on tradable outputs)

3.4.1 Net Private Profitability (NPP)

The data entered in the first row of Table 3.1 provide a measure of private profitability. The term private refers to observed revenue and costs, reflecting actual market prices received or paid by farmers, traders or processors. The private, or actual market prices, thus incorporate the underlying economic costs and valuations plus the effects of all policies and market failures. Private profits NPP, are the difference between revenues (A) and costs (B+C+D). All five entries in the top row are measured in observed prices. The components of these budgets are usually entered in the PAM as local currency per physical unit (MK/hectare) but for purposes of this study, the local currency was converted to U.S. dollars to accommodate regional comparison.

Table 3.1. Policy Analysis Matrix

	Revenues	Tradable Input Costs	Capital/Labor Cost	Land Cost	Profits
Private prices	A	B	C	D	NPP
Social prices	E	F	G	H	NSP
Policy effects (or transfers)	K	L	M	N	O

Source: Pearson, S.R., and E.A. Monke (1989)

3.4.2 Net Social Profitability (NSP)

The second row of PAM uses social prices as indicated in Table 3.1. These valuations measure comparative advantage or efficiency in the agricultural activity. Efficient outcomes are realized when resources are used in activities which create the highest levels of output or incomes. Social profits (NSP) are an efficiency measure because outputs, E, and inputs, F+G+H, are revalued in prices that reflect scarcity values or social opportunity costs. Social profits like private profits, are the difference between revenues and costs, all measured in social prices. That is, NSP = (E-F-G-H). For outputs (E) and inputs (F) that are traded internationally, the appropriate social valuations are given by world prices. World prices represent the government's choice to permit consumers and producers to import or export or produce services and goods domestically. The social value of additional domestic output is thus the foreign exchange saved by reducing imports or gained by expanding exports. Because of global output fluctuations or distorting policies abroad, the appropriate world prices might not be those that prevail during the base year chosen for the analysis. Instead, expected long run values serve as social valuations for tradeable outputs and inputs.

The services provided by domestic factors such as land, labor and capital do not have world prices because the markets for these factors are considered to be domestic. The social valuations for these factors are determined by the estimation of the net income forgone because the factor is not employed in the best alternative use. A distinction is made between mobile and fixed factors of production. Mobile factors, usually capital and labor, are factors that can move from agriculture to other sectors of the economy, such as industry, services and energy. For mobile factors, prices are determined by aggregate supply and demand forces. Because alternative uses for these factors are available throughout the economy, the social values of capital and labor are determined at a national level, not solely within the agricultural sector.

Fixed, or immobile factors of production are those whose private or social opportunity cost are determined within a particular sector of the economy. The value of agricultural land, for example, is usually determined by the land's worth in growing alternative crops. But the social opportunity cost of farm land is often times difficult to estimate. For this reason it is convenient in assessing agricultural activities to re-interpret crop profits as rents to land and other fixed factors (for example, management and the ability to bear risk) per hectare of land used. This re-interpretation includes private (and social) returns to land as part of NPP (and NSP). Profitability per hectare is then interpreted as the ability of the agricultural activity to cover its long run variable costs, in either private or social prices or as a return to fixed factors such as land, management skill and water resources.

3.4.3 Domestic Resource Cost Ratio (DRC)

Social profits measure efficiency or comparative advantage. When systems producing different outputs are compared for relative efficiency, the Domestic Resource Cost Ratio (DRC), defined as (G+H)/(E-F) or CDR/VAD, serves as a proxy measure for social profits. By elemen-

Table 3.2. Interpretation of Resource Cost Ratio (RCR)

Value of RCR	Interpretation
0<RCR<1	Value of domestic resources used in production is less than value of foreign exchange earned or saved = comparative advantage
RCR>1	Value of domestic resources used in production is greater than value of foreign exchange earned or saved = No comparative advantage
RCR<0	More foreign exchange used in the production of commodity than the commodity is worth= No comparative advantage

Source: Morris (1990)

tary algebra, it follows that the ratio equals one if NSP is zero, is greater than one if NSP is negative and is less than one if NSP is positive. Minimizing domestic resource cost ratio is thus equivalent to maximizing net social profits. In cross-commodity comparison, domestic resource cost ratios replace social profit measures as indicators of relative degrees of efficiency. Efficient activities can be defined as those for which NSP is positive or for which the domestic resource cost ratio is less than one. Efficiency and non-efficiency ratios as indicative of the comparative advantage are interpreted from the resource cost ratios as shown in Table 3.2, below.

3.5 MEASURES OF POLICY EFFECTS (K, L, M AND N)

Whenever discrepancies exist between market and social prices, the interest of farmers and of the nation can diverge (Monke, 1989). A crop can be profitable to farmers, e.g.,because of output or input subsidies, even though its production may not represent an efficient use of resources from the point of view of the country. Conversely, a crop can be unprofitable to farmers, e.g., because of output or input taxation, even though its production represents an efficient use of the nation's resources. Hence, by comparing private and social profitabilities not only can the overall effect of government policies be measured, but the influence of individual policies can be quantified by disaggregating the overall discrepancy into its constituent parts (Tables 5.4, 5.5 and 5.6).

The second identity of PAM concerns the difference between private and social valuations of revenues, costs and profits. For each entry in the matrix measured vertically—any divergence between the observed private (actual market) and the estimated social efficiency price must be explained by the effects of policy—policies that lead to inefficient use of resources. These policies often are introduced because decision makers are willing to accept some inefficiencies (and thus lower total social income) in order to further non-efficiency objectives, such as re-distribution of income or the improvement of domestic food security.

Only government policy[2] (and market imperfections, here assumed to be policy related) can cause divergence between private and social prices. Unless the government enacts a protection policy for example, each importable output and input will be available at its CIF import price, which will in turn become the domestic price, so that A will equal to E, and B will be the same as F in Table 3.1. Consequently, any difference between A and E or between B and F is caused by some combination of trade restrictions, price control, tax/subsidy or exchange rate policies. If A exceeds E, either domestic consumers are forced to pay higher than world prices or

Table 3.3. Policy Effect Measurements

INDICATOR	FORMULA	DESCRIPTION
Net Effect	O=NPP-NSP or O=(K-L)-(N+M)	Net effects of government policies
Output Effect	K=A-E	Effects generated by domestic private/border price differences
Input Cost Effect	L=F-B	Effects generated by domestic price/border differences
Factor Cost Effect	M=G-C and N=H-D	Effects generated by actual price/shadow price differences

the government treasury is directly subsidizing production, causing an output transfer (K) equal to (A-E). Similarly, if B is less than F, tradeable inputs are subsidized, resulting in an input transfer (L) or (F-B). For domestic factors, the transfer (M, capital/labor and N, land) amounts to (G-C) and (H-D).

The net effect (net transfer) caused by policy and market failures (O) is the difference between effects on output (K) and on costs (L and M and N) thus O=(K-L)-(M+N). The net effect can also be found by comparison of private and social profits. These measures of net effect must by definition be identical in the double-entry accounting matrix, O=(K-L)-(M+N) or NPP-NSP (Table 3.3).

3.5.1 Nominal Protection Coefficient (NPC)

The nominal protection coefficient (NPC) is the ratio which contrasts the observed (private) commodity price with a comparative world (social) price. This ratio indicates the impact of policy (and of any market failures not corrected by efficient policy) that causes divergence between the two prices. The NPC on tradeable outputs, defined as A/E, indicates the degree of output transfer. An NPC greater than one indicates that policies are increasing the market price above the world (social) price, thus providing a positive incentive to the producer. Likewise, an NPC less than one indicates a negative incentive (or disincentive) to the producer.

3.5.2 Effective Protection Coefficient (EPC)

The effective protection coefficient (EPC) is another indicator of incentives, and is the ratio of value added in private prices (A-B) to value added in world prices (E-F), or EPC = (A-B)/(E-F) (Table 3.1). This coefficient measures the net effect resulting from product market-output and tradeable input-output policies. But, like the NPC, EPC ignores the effects of factor market policies. Hence it is not a complete indicator of incentives.

4. Empirical Study and Data Collection

4.1 PHYSICAL AND ENVIRONMENTAL RESOURCES

The soils of Malawi have been described by Young and Brown (1962). The soil are categorized into four main groups. First are the shallow and stony soil, lithosols, which occupy large areas of dissected steeply sloping land particularly in the Rift Valley and Escarping Zones as well as numerous mountains and hills. The second are the hydro-morphic soils, also known locally as dambo soils. These are water logged for substantial part of the year. They are mottled or black soils which occupy valley floors at all altitudes. The third group are the calcimorphic soils consisting the greyish brown alluvial soils with a mottled lower horizon, which are mainly found along the lake shore plain. The fourth and the largest group for agricultural production are the latosols. These consist of red, reddish brown and yellow red soils with free drainage (no mottling), and occupy the gently sloping areas in the north, central and southern highlands. There is nevertheless a minor group, the vertisols (black cotton soil). Significant areas of vertisols exist in the Shire and Bwanje valleys where cotton is mostly grown in the country. These soils contain about 50 percent clay, the major component being montmorillonites (welling clays) with very weak micro-structure. As a result, they become slippery when wet and develop cracks upon drying.

Two main types of soil texture exist in the country and these are the clay soils found on the basic parent material such as the ferruginous soils and the other is the loamy sands to sandy loams which are derived from acidic parent material found in the ferrallic soils. From an agricultural view point, the red and brown clay soils have a strongly developed, relatively stable granular micro-structure (made by aluminum sesquioxide), good moisture retention properties and can be highly productive if managed moderately well. Fertilizer response is generally limited to nitrogen and phosphorous. The sandy soils have generally a less developed and less stable micro-structure (fewer aluminum sesquioxides), and are consequently more prone to structural damage under poor management. Due to the generally lower fertility, higher levels of nitrogen and phosphorous fertilizers are required for optimal yields.

Average rainfall in the country varies from 650 mm to 2,000 mm. But for the principal agricultural areas such as Lilongwe and Dedza districts, it is mainly in the range of 750 to 1,200 mm. Less than five percent of the total land receives less than 750 mm (Lower Shire Valley, the Southern lake shore and Mzimba-Rumphi) and less than four percent of the land receives over 1,600 mm (the very high plateaux) (MOA,1984).

4.2 STRUCTURE OF THE AGRICULTURAL SECTOR

Agriculture in Malawi, as in most SSA economies, has been characterized by a degree of dualism that has dichotomized the sector into smallholder and estate sub-sectors. The dichotomy is essentially limited to the tenurial system under which land is cultivated and, previously, due to the marketing system, employed. Agricultural production occurring on the traditional tenured or customary land is defined as smallholder, whereas estate production occurs only on the leasehold (and free hold) land. Noteworthy, before the prevalence of structural adjustment and marketing liberalization especially, the other distinction was the different pricing and marketing policies which were pursued in each sub-sector. Estates were selling direct to the final markets hence price setting depended on the forces of supply and demand. On the other hand, smallholder farmers were required to sell their produce through ADMARC, hence, commodity prices were pre-determined by this parastatal organization. The major source of capital for smallholder farmers

is the government, while commercial banks are the main source of finance for estates since the title to land provides acceptable collateral (Mkandawire,1990). The smallholder farmers have in the past benefitted from subsidized inputs, government controlled extension services and these factors have in a way influenced the agricultural production structure in the country.

4.3 DETERMINANTS OF COMPARATIVE ECONOMIC ADVANTAGE

Several factors determine comparative economic advantage. Among the most important are the following:

- Biophysical conditions. These include the physical climate (rainfall, temperature, number and length of sunny days, etc.), physical and chemical soils characteristics, terrain, etc. Being a biological process, the importance of these factors to agriculture production does need not to be emphasized as they determine suitability and biological potential (yield) of agricultural production activities.
- Level of technology and production systems. Traditional farming methods, including land tenure and cropping systems, are being used. The yield potential as well as net economic gains from farming vary significantly with variations in these factors.
- Markets and infrastructure. Proximity to major consuming centers (markets) may be a key determinant of CEA, especially when transportation costs are high or the road infrastructure is poor. Regional as well as international demand and supply forces determine market prices and hence the costs and value of traded outputs and inputs.
- Resource endowments. The relative abundance or scarcity of non-traded productive resources such as land, water, labor etc. determine their availability and hence their relative costs or value. Labor intensive activities, for instance, will have a disadvantage in labor- scarce countries.

Accordingly, DRC measures of CEA will be calculated for various commodity groupings in order to capture and analyze the impacts of the above described determinants. The following convention was adopted to group commodities according to the above factors:

- Agro-ecological zonation approach was adopted as the framework for classifying production environments according to biophysical conditions.
- Variations within agro-ecological zones (AEZ) due to variations in technology, tenure, etc. were captured by coding every production system as distinct activity.
- Variations in market and infrastructural factors were reflected in prices and transport costs. These variations were captured by defining a central market node for every zone at which all trade was assumed to take place. Consequently, prices and transport costs between these market centers (nodes) reflected the opportunity of producing a commodity locally versus importing it from another region/ zone or from outside country.
- Variations in resource endowment were reflected in the relative rental values of those resources in the different market centers.

4.3.1 Agro-Ecological Zones and Central Market Nodes

4.3.1.1 Agro-Ecological Zones

Agro-ecological zones are areas that are relatively homogeneous with respect to the biophysical conditions needed for agricultural production. In this study, a geographic information system (GIS) was used to generate agro-ecological zones by overlaying a climatic map with a generalized soil map. The GIS was then used to capture a crop's biophysical requirements with corresponding areas on the agro-ecological zone map. The resulting map defined areas in Malawi that are biologically suitable for growing a specified crop. A separate biologic suitability map was generated for each crop considered by the Malawi CEA study.

The Land Resources Evaluation Project in 1991 produced an agro-climatic zone map of Malawi at a 1:250,000 scale. The map sub-divides Malawi into 149 unique zones based on: 1) length of growing period[3] (LGP), 2) mean temperature during the growing season, 3) mean annual precipitation, 4) mean annual tem-

perature, 5) mean number of dry months per year and 6) mean minimum temperature in the coolest month. This map (in a digital format) provided the climate information for agro-ecological zoning. The LREP (1991) study produced a soil map—possibly the most detailed soil survey of Malawi—at a scale of 1:250,000. Although efforts are ongoing to digitize the LREP soil map, the map is in the interim not available in digital format and was therefore not used in this study. Hence, a generalized soil map produced by Young and Brown (1962) was used. This map does not have sufficient detail to determine the soil's capacity for producing a given crop. However, this map provided a basis for identifying regions that would not support crop production. The soil map was therefore reclassified into three groups. The first group included regions where lithosols and/or steep slopes generally precluded crop cultivation. The second group included areas where the potential exists for growing perennial crops such as coffee and tea. The default group included all regions that did not fall into the first two categories. It was assumed that these areas had the potential for crop production.

A spatial overlay between the agro-climatic map and the reclassified soils map produced a detailed agro-ecological zone map. Although visual inspection of this map does not provide useful information, the database query operations of the GIS allows identification of zones meeting specified crop requirements. Table 4.2 lists the biophysical conditions required for each crop in the CEA study. These requirements were then used to produce a separate suitability map for each crop (Appendices 1-7) illustrating potential growing areas in Malawi. In some cases, two maps for each crop were produced. The first map illustrates the zones whose characteristics match the crop's optimum growing conditions. The second map illustrates those zones that were within the crop's full range of bio-physical conditions.

4.3.1.2 Central Market Nodes

Three central market nodes have been used in this study and these are Blantyre in the south, Lilongwe in the center and Mzuzu in the north. After identifying the agro-ecological zones suitable for the production of particular crops, the other task was to align them with the ADD. The ADDs were linked to particular central market nodes and thus the domestic transport cost for outputs and inputs were calculated based on the distance from the ADD to the central market node in question. The cost insurance and freight (CIF) and free on board (FOB) prices were also calculated based on these central market nodes. Most of the forwarding agents are using the Nacara route. The Northern Corridor needs serious road maintenance, hence, it is quite expensive to export or import commodities using this route at the moment. All the computations on FOB and CIF values were therefore done using either Nacara as major outlet /inlet external ports.

4.3.2 Tenurial Systems and Technology

It is difficult to isolate issues of tenancy and technology in Malawian agriculture. The agricultural sector dichotomized into smallholder and estate subsectors, has to a large extent used the land tenure system in question as a dividing line. Though not entirely true, smallholder subsector in Malawi has usually been associated with peasant farming, use of primitive tools and slow adoption of advanced agricultural technologies. Estate farming has on the other hand been associated with use of advanced technologies in the form of hybrid seed, required fertilizer and chemical input use and advanced machinery/ equipment to certain extent.

In this study, enterprises were evaluated under three different yield levels obtained from low input use, high input use and potential yield. In this context, low input included smallholder farmers and the small estates with technology limited to a hoe and minimal use of inputs. The high input category was comprised of the highly mechanized large estates. The smallholder subsector is exclusively under customary land tenure while high input estates are under leasehold/freehold. Low input estates oscillate between the two. Malawi heavily relies on rain-fed agriculture. Among the selected crops, tea is the only exception because its production in the country is both rain-fed in the smallholder subsector and under irrigation using high input technology.

Table 4.1. Agro-Climatic Requirements for Different Crops

Crop	Condition	LGP (days)	TGP (c^o)	PAN (mm)	TAN (C^0)	TMIN (C^0)	DM (mons)
Tobacco[4]	Full Range	120-240	18-35	-	-	-	-
	optimum	120-165	20-25				
Tea	Full Range	-	-	1,200-3,500	12-23	>8	1-5
Coffee	Full Range	-	-	1,200-3,500	15-25	>5	1-5
Cotton[4]	Full Range	105-300	18-32	-	-	-	-
		150-210	25-30				
Maize[4] (Local)	Full Range	105-300	18-32	-	-	-	-
PigeonP[4]	Full Range	105-300	18-35	-	-	-	-
		150-225	23-33				
Soya	Full Range	105-300	18-32	-	-	-	-
Beans[4]		150-180	22-27				
Phaseolus Beans		70-90	19-26	-	-	-	-
G/nuts[4]	Full Range	105-300	20-33	-	-	-	
		150-225	23-28				

4.4 ENTERPRISE SELECTION CRITERIA

A total of nine enterprises were selected for the study by use of the multiple objective table. The research team came up with six objectives as criteria for selection. The objectives for enterprise selection included area covered by the crop, drought tolerance, employment generation, nutritional contribution, foreign exchange contribution and value to land ratio. Maximum of five points were allowed for each objective per any enterprise, and zero was the minimum score (Table 4.2). It follows, therefore, that at most an enterprise would score a total of 30 points. The initial proposal on the number of enterprises for the study was five but this would have meant that some of the major crops would not qualify. Hence, other objectives were considered highly in such cases. Objectives such as the total hectarage of a particular crop and the enterprise's contribution to the national economy and food security as understood in the self-sufficiency objectives were therefore emphasized. The enterprises that were selected for the study are tobacco, paprika, soyabeans, groundnuts, tea, phaseolus beans, cotton, macadamia, hybrid and local maize (Table 4.2). A total of 29 enterprises were considered for selection.

4.5 DATA REQUIREMENT

The project heavily relied on secondary data existing in the ADDs and the Ministry of Agriculture and Livestock Development (MoALD). Other sources of secondary data were the Reserve Bank of Malawi, Agricultural Research and Extension Trust (ARET), Tobacco Control Commission (TCC), Tea Association of Malawi, Naming'omba Tea Estate, Bunda College of Agriculture, Cheetah Limited, Manica and Press Agriculture Limited. Primary data on commodity prices was collected from a nation-wide survey carried out by the Ministry of Agriculture and other input from the Informal Cross-border Trade Study. Data collected for the study included the list below:

- production coefficients per hectare for each crop per ecological zone and per production technology.

Table 4.2. Multiple Objective Table

Objective	Enterprise Scores [value (0-5)]								
	Burley Tobac	Paprik	Macad	Tea	Cotton	Beans	G/nut	Soya Beans	Hybird Maize
Area covered	4	3	2.4	3.5	2.5	2.2	2.1	2	3
Drought resistance	2	2	3.4	3	3.5	1.7	1.6	2.1	2.4
Employ generation	4	3.8	3	3.6	3.4	1	1	1	2
Nutrition contribution	0	2	3	0.5	3	4.5	4	4	3
Forex contribution	5	4.5	3.8	3.9	3	2	2	2	1
Value to land ratio	5	5	3	3	4	4	3	3	2
Total	20	20.7	18.6	17.5	19.4	15.4	13.7	14.1	13.4

Note : The values are based on averages of individual opinions of the team members on each objective.

- input use in each technology
- labor use
- capital use
- minimum wage rate
- interest rate
- ocean freight and insurance costs
- port charges and rail freight
- domestic and international prices for inputs and commodities
- exchange rate and domestic rate of inflation
- average domestic transportation costs for the inputs and outputs
- retailing margin including packaging for both inputs and outputs
- sales tax on inputs/agrochemicals

4.6 PROBLEMS AND ASSUMPTIONS MADE IN THIS STUDY

Determining Social Prices for Primary Factors

A recurring problem in DRC analysis involves the estimation of social prices for primary factors. Social prices, supposedly to be a true economic value of these factors in the economy, are usually estimated as the opportunity cost value i.e., as value of the factor in the next most profitable use. While the concept of alternative use value is straight forward in principle, in practice each type of primary factor presents its own problems (Fitzgerald, 1989)

- Land is unique because it is the only truly fixed factor in agriculture. In sub-urban locations, prices and rental values of land will also be influenced by off-farm opportunities as agriculture might not be the only use of land. In most areas though, the only alternative to agricultural use is no use at all (if forestry is used as agricultural activity). In these cases, land acts as a residue claimant on the profits from farming. In Malawi, land is a scarce commodity and definitely it has a value. Lack of well developed land markets in the country posed a great challenge for the project. A government instituted land rent of almost US$3.3 per hectare per year was used for the computation of the NPP. This value lacks viable economic justification and grossly underestimates the true value for the agricultural land in the country. It should be pointed out that this land rent is uniform irrespective of locality and crop enterprise grown. Nevertheless, for the computations of the social profitability, gross margins of local maize were used as land rent. The value for land in this case varied according to the ADD under consider-

ation. Gross margins for maize, although not the crop with the highest profitability, were used because of the crop's importance in food security of the country and the large agricultural land it occupies in the country. Farmers' decisions pertaining to land allocation to a certain extent, not exclusively though, evolves around this crop.

- This study acknowledges the fact that the minimum wage being offered on the market is not a true value of labor in the country. The labor market is not well developed in the country and admittedly, the minimum wage rate has been suppressed for a long period. Nevertheless, due to limited sources of information in this aspect, the government's instituted minimum wage rates were adopted in the private profitability computation, accordingly. The wage rate between urban and rural areas is different and also varies between estates and smallholder subsectors. The average gross margins per man-hour for each technology were used as value for labor in the social profitability calculations. The gross margins per man-hour were computed from the enterprise budgets and an average value from all crops grown in each ADD and for a specific technology was adopted as wage rate (social cost for labor). The greatest complication for labor market evaluation involves the recognition of the many types of labor, and choices of private market prices to represent differences in sex, age, and skills. In this study, such categorization was not done.

Production Values of Crops per Hectare

The production coefficients per hectare of the various crops for low input technology, synonymous to smallholder in this study, and the values for the potential yield were adopted from the Ministry of Agriculture Crop Estimates for 1995/1996 season and also from the Guide to Agriculture Production Publications. The production per hectare values for the high input technology were collected from various sources including Press Agriculture Limited, ARET, Cheetah Limited, Bunda College of Agriculture, Naming'omba Tea Estate, Tobacco Control Commission of Malawi, Tea Association of Malawi, etc. The production coefficient values for each crop and technology were decomposed for a particular ADD.

Estimating an Equilibrium Exchange Rate

This study adopted an average exchange rate of MK15 to a U.S. dollar (US$1). The assumption was that the fluctuation of the Malawi Kwacha to a US$ oscillated around this value during the period of the study. The researchers of this study further assumed that there were no worrisome distortions with the exchange rate since the Malawi Kwacha was floated. The exchange rate was therefore market determined and not government controlled.

Capital was computed as a percentage of total value of direct inputs per an enterprise adopting a 35 percent Malawi Rural Finance Company (MRFC) interest rate for borrowing.

5. Results and Discussions

5.1 DOMESTIC RESOURCE COST RATIO RESULTS AND DISCUSSIONS

5.1.1 Tobacco

Tobacco provides a cash income for over 60,000 smallholder farmers licensed by ADMARC as well as large estates. Smallholder tobacco varieties were primarily fire and sun/air-cured which were sold to ADMARC at a guaranteed minimum price. Estate-grown flue cured and burley tobacco are sold directly by auction. Production of burley has doubled since 1987 and the crop now accounts for over 65 percent of the total country agricultural export earnings. Tobacco production in Malawi is split between the two sub-sectors; the smallholder and the estate. With regard to tobacco, these groups were differentiated in terms of regulations concerning production, marketing and pricing. In the past, smallholders were licensed to grow dark-fire, sun-air cured and oriental tobaccos, with the estate sub-sector having a monopoly on burley and flue-cured tobacco production. Until recently, smallholder farmers had no direct access to the auction floors and were required to sell all their tobacco to ADMARC. In an effort to improve the incomes of smallholder farmers, the growing of burley tobacco on customary land was introduced during the 1990/1991 season. Smallholder farmers were allowed to sell burley tobacco to the Auction Floors since 1991/1992.

Agronomic Potential

Average national yields of burley have remained relatively static over the recent years suggesting the lack of application of improved technology and the effects of drought. However, of more concern is the fact that the prevailing technology is inefficiently managed. Marginal yield increases, stimulated by improved management without additional resource use, would improve net returns substantially (Malawi Govt., 1984). Management is the principal constraint to increased smallholder and estate productivity (Malawi Govt., MOA, 1993).

Market Prospects

The demand for tobacco is basically a function of cigarette consumption. The growth in tobacco consumption is declining. With the anti-smoking campaigns in major, developed and industrialized countries, the future of tobacco production industry in Malawi is not clear. Whenever there is an increase in demand, it is because of quality issues such as lighter tar particularly in burley tobacco. Burley continues to be the most rapidly growing component of tobacco export for Malawi (EIU, 1993). Malawi is the fifth largest exporter of burley tobacco and has a market share of about 10 percent, but this share has been on the decline (Simons et al, 1993). Malawi is particularly well suited for the production of a thin, light cigarette-type burley (as opposed to the more common dark burley) for which demand is likely to remain stronger, in the view of the trend toward lighter cigarettes. However, the world demand prospects for tobacco is seriously threatened by massive anti-smoking campaigns by the United States and other European nations, which have been major buyers.

Comparative economic advantage

The study results indicate that Malawi has a very strong comparative advantage in burley tobacco production using both the low and high input technologies. The domestic resource cost ratios are quite low ranging between 0.23 and 0.32 for the high input estates in seven ADDs. These estates are Kasungu, Karonga, Lilongwe, Blantyre, Mzuzu, Salima and Liwonde. The DRC for the Ngabu ADD is unimpressive, 0.88 (Table 5.1). This high ratio is attributed to very hot weather conditions in the Shire Valley (Ngabu ADD) which does not favor burley tobacco production, hence, the production coefficients per hectare were very low. The farmer return for the high input tobacco estates averaged US$2,300, the highest value of all crops considered (Table 5.1).

Table 5.1. Summary Indictors for Activities Analysed (Sorted by DRC According to Technology and Crop)

Zone	Crop	Prices	Technology	DRC	Farmer Return US$	Output Transfer (K) (L)	Tradable Input Transfer (M)	Capital/ Labor Transfer	Land Transfer (N)	Net Policy Effect (O)	NPC= A/E	EPC= (A-B)/ (E-F)	SRP= O/E
KU ADD	Burley tobacco	Export	High input	0.23	3152.90	(499.97)	(50.13)	(143.05)	69.88	(623.27)	0.92	0.86	(0.10)
KA ADD	Burley tobacco	Export	High input	0.23	3069.03	(332.50)	(24.86)	(143.29)	25.70	(474.95)	0.94	0.90	(0.08)
LL ADD	Burley tobacco	Export	High input	0.24	2806.23	(516.33)	(58.03)	(143.24)	61.42	(656.18)	0.91	0.84	(0.12)
BT ADD	Burley tobacco	Export	High input	0.27	2299.03	(521.33)	(266.01)	(137.28)	71.17	(853.45)	0.90	0.76	(0.17)
MZ ADD	Burley tobacco	Export	High input	0.29	2327.03	(344.67)	(40.00)	(143.42)	26.05	(502.04)	0.93	0.87	(0.10)
SL ADD	Burley tobacco	Export	High input	0.30	2197.56	(429.67)	(350.14)	(143.05)	53.21	(569.81)	0.91	0.83	(0.12)
NG ADD	Burley tobacco	Export	High input	0.88	359.16	(476.67)	(141.22)	(141.22)	54.22	(621.17)	0.90	0.80	(0.13)
LN ADD	Burley tobacco	Export	High input	0.32	1967.03	(210.00)	(57.51)	(141.83)	37.90	(420.49)	0.90	0.65	(0.16)
MZ ADD	Hybrid Maize	Import	High input	0.11	439.84	(1997.57)	(6.47)	13.40	26.05	(1964.59)	0.29	0.20	(0.70)
SL ADD	Hybrid Maize	Import	High input	0.11	592.51	(2051.10)	(6.57)	20.39	53.21	(1984.07)	0.32	0.24	(0.66)
LL ADD	Hybrid Maize	Import	High input	0.12	628.37	(1936.67)	(6.46)	13.40	61.42	(1868.31)	0.33	0.26	(0.65)
KA ADD	Hybrid Maize	Import	High input	0.12	331.17	(1872.00)	(6.46)	13.40	25.70	(1839.36)	0.28	0.18	(0.71)
KU ADD	Hybrid Maize	Import	High input	0.13	513.57	(1839.83)	(6.47)	13.40	69.88	(1763.02)	0.32	0.24	(0.65)
LN ADD	Hybrid Maize	Import	High input	0.13	540.91	(1639.84)	(5.13)	13.86	54.22	(1576.89)	0.35	0.27	(0.62)
NG ADD	Hybrid Maize	Import	High input	0.16	387.84	(1292.53)	(6.46)	13.40	37.90	(1247.69)	0.35	0.26	(0.63)
BT ADD	Hybrid Maize	Import	High input	0.16	473.11	(1389.47)	(6.46)	13.40	71.17	(1311.36)	0.35	0.28	(0.61)
LN ADD	Hybrid Maize	Export	High input	0.35	540.91	(243.76)	(5.13)	13.86	54.22	(180.81)	0.78	0.71	(0.16)
LL ADD	Hybrid Maize	Export	High input	0.38	628.37	(116.67)	(6.46)	13.40	61.42	(48.31)	0.89	0.85	(0.05)
BT ADD	Hybrid Maize	Export	High input	0.39	473.11	(262.87)	(6.46)	13.40	71.17	(184.76)	0.74	0.67	(0.18)
NG ADD	Hybrid Maize	Export	High input	0.44	387.84	(192.13)	(6.46)	13.40	37.90	(147.29)	0.78	0.69	(0.17)
SL ADD	Hybrid Maize	Export	High input	0.50	592.51	23.85	(13.50)	20.39	53.21	110.95	1.03	1.06	0.12
KU ADD	Hybrid Maize	Export	High input	0.56	513.57	21.39	(6.47)	13.40	69.88	98.20	1.03	1.03	0.12
MZ ADD	Hybrid Maize	Export	High input	0.89	439.84	203.83	(6.47)	13.40	26.05	236.81	1.33	1.65	0.39
KA ADD	Hybrid Maize	Export	High input	1.64	331.17	234.00	(6.46)	13.40	25.70	266.64	1.48	2.37	0.55
BT ADD	Macadamia	Export	High input	0.13	1044.00	(1750.00)	(12.40)	27.66	71.17	(1663.57)	0.44	0.40	(0.53)
LL ADD	Paprika	Export	High input	0.26	2037.23	(595.33)	(158.27)	26.53	61.42	(666.32)	0.85	0.76	(0.17)
KU ADD	Paprika	Export	High input	0.28	1965.24	(550.00)	(164.99)	24.17	69.88	(620.94)	0.86	0.76	(0.16)
BT ADD	Paprika	Export	High input	0.29	1985.70	(342.00)	(175.95)	20.57	71.17	(426.21)	0.91	0.81	(0.12)
MZ ADD	Phaseolous beans	Export	High input	0.22	815.24	(494.85)	(12.78)	29.33	26.05	(452.25)	0.70	0.62	(0.28)

Table 5.1. Con't. Summary Indictors for Activities Analysed (Sorted by DRC According to Technology and Crop)

Zone	Crop	Prices	Technology	DRC	Farmer Return US$	Output Transfer (K) (L)	Tradable Input Transfer (M)	Capital/ Labor Transfer	Land Transfer (N)	Net Policy Effect (O)	NPC= A/E	EPC= (A-B)/ (E-F)	SRP= O/E
SL ADD	Phaseolous beans	Export	High input	0.26	825.17	(339.75)	(12.63)	25.91	53.21	(273.26)	0.77	0.71	(0.19)
LL ADD	Phaseolous beans	Export	High input	0.28	765.51	(349.35)	(12.16)	26.08	61.42	(274.01)	0.75	0.69	(0.20)
LN ADD	Phaseolous beans	Export	High input	0.33	592.64	(334.97)	(12.48)	29.44	54.22	(263.79)	0.72	0.64	(0.22)
KU ADD	Phaseolous beans	Export	High input	0.33	672.41	(291.60)	(12.66)	25.90	69.88	(208.48)	0.77	0.70	(0.16)
BT ADD	Phaseolous beans	Export	High input	0.41	587.67	(200.00)	(12.09)	26.10	71.17	(99.82)	0.82	0.76	(0.10)
KA ADD	Phaseolous beans	Export	High input	0.54	506.47	5.17	(11.37)	29.12	25.70	48.62	1.01	0.99	0.06
MZ ADD	Phaseolous beans	Import	High input	0.13	815.24	(1422.70)	(12.78)	29.33	26.05	(1380.10)	0.45	0.37	(0.54)
SL ADD	Phaseolous beans	Import	High input	0.17	825.17	(996.60)	(12.63)	25.91	53.21	69.89	0.53	0.46	0.03
LL ADD	Phaseolous beans	Import	High input	0.19	765.51	(883.65)	(12.16)	26.08	61.42	(808.31)	0.54	0.47	(0.42)
LN ADD	Phaseolous beans	Import	High input	0.24	592.64	(704.50)	(12.48)	29.44	54.22	(633.32)	0.56	0.46	(0.40)
KA ADD	Phaseolous beans	Import	High input	0.27	506.47	(548.33)	(11.37)	29.12	25.70	(504.88)	0.59	0.49	(0.37)
BT ADD	Phaseolous beans	Import	High input	0.30	1072.04	(500.00)	(12.09)	26.10	71.17	(414.82)	0.63	0.55	(0.31)
KU ADD	Phaseolous beans	Import	High input	0.21	672.41	(855.36)	(12.66)	25.90	69.88	(772.24)	0.53	0.45	(0.42)
NG ADD	Soyabeans	Import	High input	0.20	288.04	(694.87)	(7.44)	34.83	37.90	(629.58)	0.51	0.45	(0.45)
KA ADD	Soyabeans	Import	High input	0.20	199.37	(972.50)	(7.10)	33.00	25.70	(920.90)	0.25	0.19	(0.71)
MZ ADD	Soyabeans	Import	High input	0.22	207.91	(854.63)	(7.44)	33.00	26.05	(803.02)	0.28	0.22	(0.68)
KU ADD	Soyabeans	Import	High input	0.25	387.41	(686.80)	(7.43)	29.33	69.88	(595.02)	0.44	0.38	(0.49)
SL ADD	Soyabeans	Import	High input	0.25	344.91	(658.63)	(7.44)	29.33	53.21	(583.53)	0.42	0.36	(0.51)
LL ADD	Soyabeans	Import	High input	0.27	283.21	(568.80)	(7.43)	29.33	61.42	(485.48)	0.47	0.42	(0.45)
LN ADD	Soyabeans	Import	High input	0.28	288.04	(639.83)	(7.43)	33.00	54.22	(560.04)	0.39	0.33	(0.53)
BT ADD	Soyabeans	Import	High input	0.34	238.21	(551.00)	(7.43)	29.33	71.17	(457.93)	0.39	0.33	(0.51)
NG ADD	Soyabeans	Export	High input	0.40	288.04	(34.07)	(7.44)	34.83	37.90	31.22	0.95	0.93	0.04
LN ADD	Soyabeans	Export	High input	0.57	288.04	(143.83)	(7.43)	33.00	54.22	(64.04)	0.74	0.68	(0.11)
BT ADD	Soyabeans	Export	High input	0.66	238.21	(153.50)	(7.43)	29.33	71.17	(60.43)	0.70	0.63	(0.12)
LL ADD	Soyabeans	Export	High input	0.68	283.21	27.20	(7.43)	29.33	61.42	110.52	1.06	1.05	0.23
KU ADD	Soyabeans	Export	High input	0.81	387.41	81.20	(7.43)	29.33	69.88	172.98	1.18	1.21	0.39
SL ADD	Soyabeans	Export	High input	0.82	344.91	61.37	(7.44)	29.33	53.21	136.47	1.15	1.17	0.32
MZ ADD	Soyabeans	Export	High input	1.04	207.91	15.37	(7.44)	33.00	26.05	66.98	1.05	1.03	0.21
KA ADD	Soyabeans	Export	High input	1.35	199.37	60.00	(7.10)	33.00	25.70	111.60	1.23	1.30	0.42
BT ADD	Tea	Export	High input	0.21	2530.93	(2700.00)	(725.04)	68.14	71.17	(1835.65)	0.58	0.58	(0.28)

Table 5.2 Summary Indicators for Activities analysed (Sorted by DRC According to Technology and Crop)

Zone	Crop	Prices	Technology	DRC	Farmer Return US$	Output Transfer (K)	Tradable Input Transfer (L)	Capital/ Labor Transfer (M)	Land Transfer (N)	Net Policy Effect (O)	NPC= A/E	EPC= (A-B)/ (E-F)	SRP= O/E
KA ADD	Burley tobacco	Export	Low input	0.18	2267.58	(217.00)	(21.03)	(176.98)	25.70	(389.31)	0.94	0.91	(0.10)
LL ADD	Burley tobacco	Export	Low input	0.21	1887.68	(320.76)	(41.06)	(212.00)	61.42	(512.40)	0.91	0.86	(0.15)
LN ADD	Burley tobacco	Export	Low input	0.26	1707.20	(330.15)	(47.18)	(151.16)	54.22	(474.27)	0.90	0.84	(0.15)
KU ADD	Burley tobacco	Export	Low input	0.21	1922.48	(290.62)	(36.61)	(186.90)	69.88	(444.25)	0.92	0.87	(0.13)
SL ADD	Burley tobacco	Export	Low input	0.23	1689.08	(281.84)	(36.61)	(133.58)	53.21	(398.29)	0.91	0.86	(0.12)
MZ ADD	Burley tobacco	Export	Low input	0.21	1917.71	(237.31)	(29.93)	(153.34)	26.05	(394.53)	0.93	0.89	(0.12)
BT ADD	Burley tobacco	Export	Low input	0.25	1431.52	(309.40)	(52.36)	(170.50)	71.17	(461.09)	0.90	0.82	(0.16)
NG ADD	Burley tobacco	Export	Low input	0.58	416.79	(172.25)	(47.15)	(51.49)	37.90	(232.79)	0.90	0.74	(0.14)
NG ADD	Cotton	Expor	Low input	0.16	82.87	(1102.17)	(7.96)	34.01	37.90	(1038.22)	0.20	0.14	(0.75)
KA ADD	Cotton	Export	Low input	0.16	76.53	(1016.67)	(8.02)	33.99	25.70	(965.00)	0.22	0.15	(0.74)
SL ADD	Cotton	Export	Low input	0.17	70.60	(1068.17)	(7.96)	21.75	53.21	(1001.17)	0.21	0.14	(0.74)
LN ADD	Cotton	Export	Low input	0.18	70.87	(1037.33)	(7.64)	34.13	54.22	(956.62)	0.20	0.14	(0.73)
BT ADD	Cotton	Export	Low input	0.19	63.93	(1037.33)	(7.63)	21.86	71.17	(951.93)	0.20	0.14	(0.73)
KU ADD	Groundnuts	Export	Low input	0.19	265.00	(608.00)	0.00	20.67	69.88	(517.45)	0.40	0.41	(0.51)
LL ADD	Groundnuts	Export	Low input	0.22	220.00	(478.83)	0.00	20.67	61.42	(396.74)	0.42	0.44	(0.48)
LN ADD	Groundnuts	Export	Low input	0.24	146.67	(440.00)	0.00	31.00	54.22	(354.78)	0.38	0.41	(0.50)
KU ADD	Groundnuts	Import	Low input	0.19	265.00	(840.00)	74.00	50.07	69.88	(646.05)	0.32	0.32	(0.52)
LN ADD	Groundnuts	Import	Low input	0.27	146.67	(555.50)	74.00	56.90	54.22	(370.38)	0.33	0.34	(0.45)
LL ADD	Groundnuts	Import	Low input	0.23	220.00	(647.83)	74.00	50.07	61.42	(462.34)	0.35	0.36	(0.46)
KA ADD	Hybrid Maize	Import	Low input	0.11	88.31	(872.41)	0.00	13.40	25.70	(833.31)	0.26	0.12	(0.71)
MZ ADD	Hybrid Maize	Import	Low input	0.12	104.07	(778.33)	0.00	13.40	26.05	(738.88)	0.28	0.15	(0.69)
SL ADD	Hybrid Maize	Import	Low input	0.13	149.61	(858.60)	0.00	8.94	53.21	(796.45)	0.29	0.18	(0.66)
LN ADD	Hybrid Maize	Import	Low input	0.16	135.05	(691.34)	0.00	13.40	54.22	(623.72)	0.32	0.20	(0.62)
KU ADD	Hybrid Maize	Import	Low input	0.16	122.21	(770.10)	0.00	8.94	69.88	(691.28)	0.29	0.17	(0.64)
LL ADD	Hybrid Maize	Import	Low input	0.17	145.23	(649.73)	0.00	8.94	61.42	(579.25)	0.33	0.22	(0.60)
NG ADD	Hybrid Maize	Import	Low input	0.18	98.36	(530.99)	0.00	15.64	37.90	(477.45)	0.33	0.20	(0.60)
BT ADD	Hybrid Maize	Import	Low input	0.21	137.57	(555.74)	0.00	8.94	71.17	(475.63)	0.35	0.24	(0.56)
LN ADD	Hybrid Maize	Export	Low input	0.42	135.05	(132.95)	(6.83)	10.99	54.22	(74.57)	0.71	0.55	(0.16)
NG ADD	Hybrid Maize	Export	Low input	0.50	98.36	(91.03)	(6.83)	13.23	37.90	(46.73)	0.74	0.57	(0.13)

Table 5.2 Con't Summary Indicators for Activities Analysed (Sorted by DRC According to Technology and Crop)

Zone	Crop	Prices	Technology	DRC	Farmer return US$	Output Transfer (K)	Tradable Input Transfer (L)	Capital/ Labor Transfer (M)	Land Transfer (N)	Net Policy Effect (O)	NPC= A/E	EPC= (A-B)/ (E-F)	SRP= O/E
BT ADD	Hybrid Maize	Export	Low input	0.51	137.57	(105.14)	(8.29)	6.03	71.17	(35.93)	0.74	0.61	(0.09)
SL ADD	Hybrid Maize	Export	Low input	0.58	149.61	(28.62)	(5.36)	7.03	53.21	26.26	0.92	0.85	0.07
LL ADD	Hybrid Maize	Export	Low input	0.60	145.23	(39.13)	(6.83)	7.03	61.42	22.49	0.89	0.80	0.06
KU ADD	Hybrid Maize	Export	Low input	0.76	122.21	(25.67)	(5.36)	7.03	69.88	45.88	0.92	0.84	0.14
MZ ADD	Hybrid Maize	Export	Low input	1.28	104.07	62.27	(3.91)	11.99	26.05	96.40	1.27	1.72	0.41
KA ADD	Hybrid Maize	Export	Low input	2.30	88.31	81.53	(2.92)	12.39	25.70	116.70	1.37	2.73	0.53
NG ADD	Local Maize	Export	Low input	1.00	74.52	(47.75)	0.00	13.40	37.90	71.23	0.75	0.70	0.38
BT ADD	Local Maize	Export	Low input	1.00	47.47	(35.93)	0.00	8.93	71.17	44.17	0.74	0.71	0.32
LN ADD	Local Maize	Export	Low input	1.00	33.67	(37.25)	0.00	13.40	54.22	30.37	0.71	0.65	0.24
LL ADD	Local Maize	Export	Low input	1.00	59.00	(14.65)	0.00	8.93	61.42	55.70	0.89	0.87	0.42
KU ADD	Local Maize	Export	Low input	1.00	74.71	(11.87)	0.00	13.40	69.88	71.41	0.92	0.90	0.46
SL ADD	Local Maize	Export	Low input	1.00	59.63	(10.28)	0.00	13.40	53.21	56.33	0.92	0.90	0.42
MZ ADD	Local Maize	Export	Low input	1.00	47.49	24.19	0.00	13.40	26.05	44.19	1.27	1.41	0.49
KA ADD	Local Maize	Export	Low input	1.00	54.70	36.33	0.00	13.40	25.70	51.40	1.37	1.67	0.52
LL ADD	Paprika	Export	Low input	0.18	1295.50	(430.67)	(23.40)	20.08	61.42	(372.57)	0.85	0.81	(0.13)
KU ADD	Paprika	Export	Low input	0.18	1340.17	(408.33)	(14.91)	19.78	69.88	(333.58)	0.86	0.83	(0.11)
BT ADD	Paprika	Export	Low input	0.19	1248.50	(451.00)	(37.51)	25.41	71.17	(391.93)	0.84	0.80	(0.14)
SL ADD	Phaseolous beans	Export	Low input	0.19	391.67	(135.90)	0.00	14.00	53.21	(68.69)	0.77	0.76	(0.12)
LN ADD	Phaseolous beans	Export	Low input	0.23	321.60	(110.92)	0.00	14.00	54.22	(42.70)	0.77	0.76	(0.09)
KA ADD	Phaseolous beans	Export	Low input	0.33	67.37	(68.93)	0.00	14.00	25.70	(29.23)	0.73	0.71	(0.49)
BT ADD	Phaseolous beans	Export	Low input	0.46	169.20	(64.39)	0.00	9.33	71.17	16.110.77	0.77	0.06	
KU ADD	Phaseolous beans	Export	Low input	0.50	150.50	(59.55)	0.00	14.00	69.88	24.33	0.77	0.76	0.09
MZ ADD	Phaseolous beans	Export	Low input	0.53	67.37	(47.97)	0.00	14.00	26.05	144.06	0.70	0.69	0.90
LL ADD	Phaseolous beans	Export	Low input	0.55	124.87	(44.55)	0.00	9.33	61.42	26.20	0.80	0.79	0.12
NG ADD	Soyabeans	Export	Low input	0.37	258.37	81.07	0.00	12.83	37.90	131.80	1.30	1.33	0.48
LN ADD	Soyabeans	Export	Low input	1.08	67.53	37.87	0.00	11.00	54.22	103.09	1.30	1.39	0.81
SL ADD	Soyabeans	Export	Low input	1.23	90.70	77.00	0.00	7.33	53.21	137.54	1.67	1.91	1.19
KU ADD	Soyabeans	Export	Low input	1.26	109.83	84.65	0.00	7.33	69.88	161.86	1.67	1.88	1.27
LL ADD	Soyabeans	Export	Low input	1.39	62.47	50.16	0.00	7.33	61.42	118.91	1.46	1.62	1.09
BT ADD	Soyabeans	Export	Low input	1.43	102.00	49.33	0.00	7.33	71.17	127.83	1.43	1.58	1.12

Table 5.2 Con't Summary Indicators for Activities Analysed (Sorted by DRC According to Technology and Crop)

Zone	Crop	Prices	Technology	DRC	Farmer return US$	Output Transfer (K)	Tradable Input Transfer	Capital/ Labor Transfer	Land Transfer (N)	Net Policy Effect (O)	NPC= A/E	EPC= (A-B)/ (E-F)	SRP= O/E
MZ ADD	Soyabeans	Export	Low input	1.67	35.57	56.70	0.00	11.00	26.05	93.75	1.74	2.22	1.22
KA ADD	Soyabeans	Export	Low input	3.66	8.73	57.53	0.00	11.00	25.70	94.23	2.07	3.74	1.75
NG ADD	Soyabeans	Import	Low input	0.17	258.37	(116.53)	9.66	(4.30)	37.90	(73.27)	0.75	0.75	(0.16)
MZ ADD	Soyabeans	Import	Low input	0.27	35.57	(132.30)	9.66	(6.13)	26.05	(102.72)	0.50	0.46	(0.39)
KA ADD	Soyabeans	Import	Low input	0.30	8.73	(134.47)	7.33	(3.80)	25.70	(105.24)	0.45	0.38	(0.43)
SL ADD	Soyabeans	Import	Low input	0.36	90.70	(88.00)	9.66	(9.80)	53.21	(34.93)	0.69	0.67	(0.12)
KU ADD	Soyabeans	Import	Low input	0.37	109.63	(105.82)	9.66	(9.80)	69.88	(36.08)	0.67	0.65	(0.11)
LN ADD	Soyabeans	Import	Low input	0.49	67.53	(54.43)	9.66	(6.13)	54.22	3.32 0.75	0.75	0.02	
LL ADD	Soyabeans	Import	Low input	0.50	62.47	(66.12)	12.00	(12.14)	61.42	(4.84)	0.71	0.71	(0.02)
BT ADD	Soyabeans	Import	Low input	0.74	102.00	(16.67)	12.00	(12.14)	71.17	54.36	0.91	0.97	0.30

Table 5.3 Summary Indicators for Activities Analysed (Sorted by DRC According to Technology and Crop)

Zone	Crop	Prices	Technology	DRC	Farmer return US$	Output Transfer (K)	Tradable Input Transfer	Capital/ Labor Transfer	Land Transfer (N)	Net Policy Effect (O)	NPC= A/E	EPC= (A-B)/ (E-F)	SRP= O/E
BT ADD	Burley tobacco	Export	Potential	0.10	5106.73	(906.67)	(742.02)	(413.19)	71.17	(1990.71)	0.90	0.76	(0.23)
LN ADD	Burley tobacco	Export	Potential	0.10	5071.81	(866.67)	(734.40)	(361.10)	54.22	(1907.95)	0.90	0.76	(0.22)
MZ ADD	Burley tobacco	Export	Potential	0.10	5120.26	(587.00)	(728.00)	(355.15)	26.05	(1643.77)	0.93	0.80	(0.20)
LL ADD	Burley tobacco	Export	Potential	0.10	5096.21	(786.67)	(735.77)	(383.13)	61.42	(1844.15)	0.91	0.78	(0.02)
SL ADD	Burley tobacco	Export	Potential	0.10	5065.55	(746.67)	(730.96)	(358.90)	53.21	(1783.32)	0.91	0.78	(0.21)
KU ADD	Burley tobacco	Export	Potential	0.11	5067.17	(707.00)	(727.50)	(356.20)	69.88	(1720.49)	0.92	0.78	(0.20)
KA ADD	Burley tobacco	Export	Potential	0.11	4905.31	(467.00)	(719.38)	(354.15)	25.70	(1514.50)	0.94	0.81	(0.18)
NG ADD	Burley tobacco	Export	Potential	0.16	3286.32	(541.67)	(148.75)	(179.99)	37.90	(832.35)	0.90	0.83	(0.15)
NG ADD	Cotton	Export	Potential	0.07	1030.74	(4674.00)	(21.56)	78.32	37.90	(4579.34)	0.25	0.21	(0.74)
KA ADD	Cotton	Export	Potential	0.07	1099.74	(4408.00)	13.33	77.90	25.70	(4291.07)	0.26	0.21	(0.72)
SL ADD	Cotton	Export	Potential	0.07	1120.47	(4522.00)	(21.57)	66.05	53.21	(4424.31)	0.25	0.21	(0.73)
LN ADD	Cotton	Export	Potential	0.08	1030.74	(4305.00)	(20.10)	103.37	54.22	(4167.51)	0.25	0.21	(0.73)
BT ADD	Cotton	Export	Potential	0.09	1042.14	(4305.00)	(20.11)	82.10	71.17	(4171.84)	0.25	0.21	(0.73)
KU ADD	Groundnuts	Import	Potential	0.18	774.41	(2900.00)	(348.26)	157.50	69.88	(1524.36)	0.32	0.33	(0.49)
LL ADD	Groundnuts	Import	Potential	0.18	858.14	(1994.00)	(360.27)	169.96	61.42	26.99	0.35	0.37	0.01
LN ADD	Groundnuts	Import	Potential	0.18	785.07	(2020.00)	(358.92)	177.76	54.22	(1429.10)	0.33	0.35	(0.47)
LN ADD	Groundnuts	Export	Potential	0.22	785.07	(1600.00)	358.94	177.76	54.22	(1009.08)	0.38	0.41	(0.39)
KU ADD	Groundnuts	Export	Potential	0.23	774.41	(1520.00)	348.28	157.50	69.88	(944.34)	0.40	0.42	(0.37)
LL ADD	Groundnuts	Export	Potential	0.23	858.14	(1474.00)	360.27	169.96	61.42	(882.35)	0.42	0.46	(0.35)
BT ADD	Hybrid Maize	Export	Potential	0.28	759.57	(373.33)	41.81	31.27	71.17	(229.08)	0.74	0.71	(0.16)
NG ADD	Hybrid Maize	Export	Potential	0.28	707.52	(293.33)	38.81	38.41	37.90	(178.21)	0.78	0.75	(0.13)
LN ADD	Hybrid Maize	Export	Potential	0.29	707.96	(293.33)	38.81	28.59	54.22	(171.71)	0.78	0.75	(0.13)
LL ADD	Hybrid Maize	Export	Potential	0.34	759.57	(133.33)	36.81	31.27	61.42	(3.83)	0.89	0.89	(0.00)
SL ADD	Hybrid Maize	Export	Potential	0.44	706.63	26.67	38.81	37.52	53.21	156.21	1.03	1.10	0.15
KU ADD	Hybrid Maize	Export	Potential	0.47	706.74	26.67	38.81	37.97	69.88	173.33	1.03	1.10	0.17
MZ ADD	Hybrid Maize	Export	Potential	0.71	653.52	266.67	38.81	38.41	26.05	369.94	1.33	1.79	0.46
KA ADD	Hybrid Maize	Export	Potential	2.99	598.74	506.67	38.81	37.96	25.70	609.14	1.90	6.98	1.09
KA ADD	Local Maize	Import	Potential	0.11	1056.86	(936.00)	6.41	37.21	25.70	(866.68)	0.28	0.07	(0.67)

Table 5.3 Con't. Summary Indicators for Activities Analysed (Sorted by DRC According to Technology and Crop)

Zone	Crop	Prices	Technology	DRC	Farmer return US$	Output Transfer (K)	Tradable Input Transfer (L)	Capital/ Labor Transfer (M)	Land Transfer (N)	Net Policy Effect (O)	NPC= A/E	EPC= (A-B)/ (E-F)	SRP= O/E
MZ ADD	Local Maize	Import	Potential	0.11	183.68	(882.00)	(17.89)	39.15	26.05	(834.69)	0.29	0.20	(0.67)
NG ADD	Local Maize	Import	Potential	0.15	200.79	(666.00)	(7.79)	37.79	37.90	(598.10)	0.35	0.26	(0.58)
SL ADD	Local Maize	Import	Potential	0.15	200.79	(774.00)	(3.12)	37.47	53.21	(686.44)	0.32	0.24	(0.61)
LL ADD	Local Maize	Import	Potential	0.15	212.53	(747.00)	(24.83)	28.87	61.42	(681.54)	0.33	0.24	(0.62)
LN ADD	Local Maize	Import	Potential	0.15	200.79	(666.00)	(2.93)	27.56	54.22	(587.15)	0.35	0.26	(0.57)
KU ADD	Local Maize	Import	Potential	0.16	201.23	(774.00)	(0.15)	38.02	69.88	(666.25)	0.32	0.24	(0.59)
BT ADD	Local Maize	Import	Potential	0.18	217.00	(666.00)	(8.30)	32.83	71.17	(570.30)	0.35	0.28	(0.56)
NG ADD	Local Maize	Export	Potential	0.39	201.68	(99.00)	(7.79)	37.79	37.90	(31.10)	0.78	0.69	(0.07)
LN ADD	Local Maize	Export	Potential	0.41	200.79	(99.00)	(2.93)	27.56	54.22	(20.15)	0.78	0.70	(0.04)
BT ADD	Local Maize	Export	Potential	0.42	217.00	(126.00)	(8.30)	32.83	71.17	(30.30)	0.74	0.66	(0.06)
LL ADD	Local Maize	Export	Potential	0.50	212.53	(45.00)	(24.83)	28.87	61.42	20.46	0.89	0.77	0.05
SL ADD	Local Maize	Export	Potential	0.64	200.79	9.00	(3.12)	37.47	53.21	96.56	1.03	1.03	0.28
KU ADD	Local Maize	Export	Potential	0.72	201.23	9.00	(0.15)	38.02	69.88	116.75	1.03	1.04	0.33
MZ ADD	Local Maize	Export	Potential	0.83	183.68	90.00	(17.89)	39.15	26.05	137.31	1.33	1.48	0.51
KA ADD	Local Maize	Export	Potential	1.52	165.23	117.00	6.41	37.21	25.70	186.32	1.48	2.55	0.77
LN ADD	Phaseolous beans	Export	Potential	0.21	1148.14	(570.00)	80.15	45.67	54.22	(389.96)	0.72	0.71	(0.19)
BT ADD	Phaseolous beans	Export	Potential	0.21	1178.67	(570.00)	80.81	42.43	71.17	(375.59)	0.72	0.71	(0.18)
LL ADD	Phaseolous beans	Export	Potential	0.21	1172.01	(510.00)	80.14	42.20	61.42	(276.24)	0.75	0.74	(0.14)
MZ ADD	Phaseolous beans	Export	Potential	0.22	921.47	(360.00)	79.48	45.44	26.05	(209.03)	0.81	0.80	(0.11)
SL ADD	Phaseolous beans	Export	Potential	0.22	1141.34	(450.00)	79.81	42.09	53.21	(274.89)	0.77	0.76	(0.14)
KU ADD	Phaseolous beans	Export	Potential	0.23	1141.34	(450.00)	79.81	42.09	69.88	(258.22)	0.77	0.76	(0.13)
KA ADD	Phaseolous beans	Export	Potential	0.32	678.14	25.00	78.81	45.20	25.70	174.71	1.02	1.10	0.12
NG ADD	Soyabeans	Export	Potential	0.56	647.04	186.67	63.61	34.83	37.90	323.01	1.30	1.56	0.51
BT ADD	Soyabeans	Export	Potential	0.56	664.87	151.67	63.60	29.33	71.17	315.77	1.23	1.42	0.47
LN ADD	Soyabeans	Export	Potential	0.59	645.21	186.67	63.61	33.00	54.22	337.50	1.30	1.56	0.54
LL ADD	Soyabeans	Export	Potential	0.68	664.87	256.60	63.60	29.33	61.42	411.02	1.46	1.80	0.73
SL ADD	Soyabeans	Export	Potential	0.86	641.54	326.67	63.61	29.33	53.21	472.82	1.67	2.26	0.96
KU ADD	Soyabeans	Export	Potential	0.91	641.54	326.67	63.61	29.33	69.88	489.49	1.67	2.26	1.27
MZ ADD	Soyabeans	Export	Potential	1.32	621.87	431.67	63.60	33.00	26.05	554.32	2.12	3.74	1.44
KA ADD	Soyabeans	Export	Potential	2.72	598.54	501.67	63.60	33.00	25.70	623.97	2.59	7.47	1.98

With low input technology, the domestic resource cost ratios fluctuated between 0.22 and 0.32 for the same zones (Table 5.2). Low input technology (smallholder), could be said to be more efficient because same results as those in the high input technology were achieved by applying low levels of input. The farmer returns per hectare in the low input technology averaged US$1,700 (Table 5.1).

There is tremendous improvement in the domestic resource cost ratios when computations are done using the potential yields as indicated by research studies. Ratios are between 0.1 and 0.16 for the seven zones (Table 5.3) except Ngabu ADD. This entails that improvement in productivity of tobacco in both estate and smallholder sub-sectors will strengthen the country's comparative economic advantage. Further, sensitivity analysis on price indicate that an increase in input price will increase the domestic resource cost ratios but not weaken the country's comparative economic advantage in the production of this crop. For example, a price increase of 15 percent, increased the domestic resource cost ratios to a range of 0.23 and 0.31. This range still signals a strong comparative economic advantage in the production of this crop. Nevertheless, DRC for the Ngabu ADD increased to a ratio of 1.59, an indication that there is no comparative advantage in production of burley tobacco in this zone with such a price increase. A decrease in price by the same percentage (15 percent) indicates a slight improvement in the comparative advantage of burley tobacco. The ratios reduce to the range of 0.22 and 0.31 for the seven ADDs. The domestic resource cost ratio for Ngabu ADD reduced to 0.81 from 0.88. Still, this ratio signals a weak comparative advantage for production of this crop in this zone. From the results, it is clear that price increases viz á viz decreases, will impact on the comparative advantage of tobacco because of the crop's high demand for inputs, e.g., chemicals and inorganic fertilizers. Nevertheless, if the crop's productivity was improved to achieve potential yield levels (improve the agronomic/crop husbandry management), the comparative economic advantage in production of burley tobacco would greatly be strengthened.

5.1.2 Paprika

Agronomic Potential

Paprika belongs to the chili family, but has an advantage over other chilies in that it is not pungent and as a result it causes no harm to growers when handling. Paprika grows best in fertile soils and has similar ecological growing conditions to those of tobacco. All areas under tobacco cultivation are therefore suitable for growing paprika. In Malawi, paprika is a relatively new crop and was commercially introduced about two years ago by Cheetah Limited and Press Agriculture Limited. It is basically used for food seasoning.

Market Potential

The U.S. and Spain are the major markets for paprika. Currently, international prices depend on the asta content of the crop, but can reach up to US$5 per kilogram. Major exporters are offering smallholder farmers between US$1.2 (MK18) and US$2.33 (MK35) per kilogram depending on quality. The main exporters of paprika in Malawi are Cheetah, Press Agriculture Limited and Tunney. There is quite a stable export for this crop as Malawi can produce up to 10 million kilograms (10,000 metric tons) without affecting the market (Banda and Mndalasini,199). Paprika yields around 1,500 kilogram per hectare for smallholder farmers who apply average amount of inputs. Yields may reach 2,500 kilogram per hectare for high input technology.

The major problems which could hamper the development of paprika in Malawi are lack of seed and extension services. Paprika requires new certified seed to be used each year. Any attempt to use recycled seed increases the pungency of paprika which reduces quality. Presently, certified seed is purchased from South Africa and USA at about US$2.5 per kilogram. One kilogram is enough for a hectare. Secondly, there is no built-in extension system for paprika in Malawi. Paprika is a crop which requires knowledge of agronomic practices among the growers and indeed for yields to increase there is need to train field assistants who will in turn provide extension services to the growers. The main producers and exporters, Press Agriculture Limited and Cheetah Limited, are growing this crop using smallholders under the tenancy system or farmers clubs.

Comparative Economic Advantage

The country is an efficient producer of paprika. Production of this crop, using low input technology, indicates a very strong comparative advantage with domestic resource cost ratios ranging between 0.18 and 0.19. High input producers have DRCs between 0.26 and 0.29. It is therefore deduced from the results that though the country has a comparative advantage in production of paprika at both technologies, low input producers are more efficient than high input producers. There is not much difference in crop yield per hectare between low input and high input producers.

The crop is new to the country and growers are at the learning stage. Most producers have little knowledge of the agronomic practices and management of this crop. Such knowledge could improve the yield levels. The farmer returns per hectare averaged US$1,300 and US$2,000 using low and high input technologies, respectively (Tables 5.1 and 5.2). Sensitive analysis on input prices for the crop indicate that varying the input prices impacts on the comparative advantage of producing paprika. Reducing the input prices by 15 percent improved the DRCs to an average of 0.18 from 0.19 for low input and a range of 0.25 and 0.28 from a range of 0.26 and 0.29 for high input technology. Increasing the input price by the same percentage will reduce the comparative advantage to an average domestic resource ratio of 0.19 for low input producers and a range of between 0.27 and 0.30 for high input producers. The domestic resource cost ratios are very strong for paprika such that increasing the input prices will not substantially weaken the country's comparative advantage. The combination of attractive world prices and cheap labor, such as the country has, will give Malawi a comparative advantage in the production of this crop for a lengthy period.

Paprika is viewed as a viable alternate crop to tobacco and has bright market prospects. The country tends to benefit more if it invests more resources in this crop other than tobacco which now faces constrained demand because of the heavy anti-smoking campaigns in Europe and America, major buyers of the country's tobacco. Already, most estates including Press Agriculture Limited are shifting to large scale production of paprika in what previously were tobacco fields. Nevertheless, the crop is still new to most growers and there is dire need to improve management of the crop if productivity is to increase.

5.1.3 Tea

Agronomic Potential

The growing and production of tea in Malawi is largely confined to the areas of Mulanje, Thyolo and Nkhata Bay. Tea grows well in medium to high altitude areas with well-distributed annual rainfall exceeding 1,250mm. The crop grows well in deep, acidic, well-drained soils and thrives in escarpment areas which receive some amount of rainfall (Chiperoni) in otherwise dry months (May to November). Average yield is 6,000 kilogram per hectare of green leaf per year. Potential yields of 10,000 kilogram per hectare of green leaf may be achieved per annum.

Comparative Economic Advantage

Tea is the country's second largest export crop. The study indicates that Malawi is reasonably efficient in tea production. The domestic resource cost ratio of 0.39 means the country has a strong comparative economic advantage in tea production (Table 5.1). The farmer returns are around US$2,000, but this value can significantly increase with improvement in productivity and the domestic producer prices. Sensitivity analysis on prices indicate that the comparative advantage in the production of tea will not improve even if input prices were reduced by 15 percent. Nevertheless, price increases will affect the country's efficiency in tea production. A 15 percent increase in input prices will increase the domestic resource cost ratio for tea from 0.39 to 2.79. It means that the country will not have any comparative economic advantage in tea production if input prices continue to rise without an increase in tea prices on the world market. Tea prices on the world market are not improving because of stiff competition from, among other factors, its close substitutes, e.g., coffee. The crop is facing remarkable competition for land from other emerging crops like macadamia, which seem to have better prices on the world market. Naming'omba, one of the big tea companies in the country, is replacing some of its tea bushes with macadamia.

5.1.4 Macadamia Nuts

Macadamia nuts are mostly grown by the estates. An attempt which had been made to encourage small-

holder farmers to grow macadamia, but was not been successful as exemplified by the almost constant production of five metric tons a year. The smallholder farmers lacked expertize in handling the crop, particularly when it came to pest control. As a result, most of the crop was destroyed by termites before reaching maturity. National production is estimated at slightly over 1,300 metric tons of nuts in shell. The Commonwealth Development Corporation's (CDC) Mzenga Estate in Nkhata-bay, Naming'omba Tea Estates, Eastern Produce and Central Africa Company are the major producers. Naming'omba has a comparative advantage in the processing of macadamia. Factory figures for the estate indicates that an average of 30 percent is achieved as saleable-nut for export after processing.

Market Potential

In the past all macadamia nuts produced in the country, including nuts from ADMARC, were sold to Naming'omba, the only firm which had a processing plant. This gave Naming'omba a monopoly as far as macadamia trading was concerned. The situation changed when CDC bought the macadamia estate from ADMARC. Common Wealth Development decided to build their own processing plant and immediately stopped selling their nuts to Namang'omba. They also offered to buy the nuts from other producers in the southern region. This led to a reduction in the nuts which were being sent to Naming'omba for processing from over 1,200 metric tons to less than 900 tons in 1991.

In an attempt to get good quantities of macadamia nut, CDC offered to pay US$4.75 per kilogram for raw nuts and this forced Naming'omba to increase its producer price to US$4.60 per kilogram. Demand for the crop on the international market is firm with prices ranging from US$8 and US$11 per kilogram. This is the main reason why the major growers have embarked on an expansion program, though it will take some years before the fruits of such efforts can be realized.

Comparative Economic Advantage

The crop has reasonable prices on the world market. Malawi has quite an impressive domestic resource cost ratio of 0.13, hence the country is a very efficient producer of this crop. Farmer return on saleable nut proceeds is around US$1,000, but this value varies substantially depending on the maturity of the trees (Table 5.1). Input price changes will, to certain extent, not affect the performance of the macadamia industry. An increase or decrease in input prices by 15 percent did not have any effect on the domestic resource cost ratio. Probably, it will take quite a remarkable input price changes for the effects to be felt on the comparative economic advantage in production of the crop. Macadamia has a relatively low demand for inputs such as fertilizer and chemicals. Macadamia is an upcoming crop on the country's export crop list. Sound agricultural policies especially aimed at encouraging increased production and productivity of the crop, coupled with viable trade and marketing policies, will definitely work to exploit the country's full potential in macadamia production.

5.1.5 Maize

This crop forms a staple food for about 93 percent of the population and currently provides 65 to 70 percent of the food energy in the Malawian diet. Approximately 85 percent of the smallholder land is devoted to maize production. About 80 percent of this land is allocated to the production of local maize, which is low yielding and primarily used for subsistence. There has not been any significant increase per unit area in maize production due to low adoption of the high yielding varieties. The main attribute to the increase in maize production has therefore been increased land allocated for this crop (Simler, 1993). This situation underscores the need for diversification and for the adoption of a hybrid maize by smallholders as an important part of the domestic diversification strategy. Estimates of estate maize production are almost non-existent although it is approximated that 42 percent of total cropped estate area is devoted to maize production (both local and hybrids) (Jansen and Hayes, 1994). While emphasis is on the encouraging smallholder farmers to adopt hybrid maize varieties, the high input demand by these varieties cannot be ignored. The key constraint to adoption of higher-yielding maize varieties are the exorbitant cost of inputs, especially fertilizers and hybrid seed. There are problems with the extension of credit to smallholder farmers and this compounds the problem further.

Agronomic Potential

Yields of maize vary widely from less than 1,000 kilogram to over 4,000 kilogram depending upon variety, fertilizer use, management levels, location *inter alia.* The crop is well suited to most parts of Malawi except for the drier areas of the Shire Valley and lake shore. The production potential is very high as the average yield of fertilized hybrid maize is more than triple the unfertilized local maize (Malawi Govt. MOA, 1990).

Market Potential

Maize has been a high-priced, responsive crop, indicating that it is perceived to be not only as subsistence crop but a cash crop as well [Economist Intelligence Unit (EIU), 1994]. There is nevertheless little potential for maize export as the export market is limited to neighboring countries where transport costs are relatively low. It should be noted that in recent years, Malawi has not been able to produce enough maize to meet the domestic consumption requirements. This is attributed to drought and the collapse of the smallholder agricultural credit system (EIU, 1993). The other problem with maize is that almost all countries in the sub-Saharan region have self sufficiency policies in place, maize being the dominant targeted crop. It does not appear feasible to export maize outside this region due to the very high transport costs (EIU, 1993). The domestic demand for maize will continue to expand consistent with population increases as maize will remain a dominant food grain. A small amount of maize is also used in the brewing industry, such as Chibuku Products (Nakhumwa, 1992).

5.1.5.1 Hybrid Maize

Comparative Economic Advantage

The crop is quite bulky and has relatively low price on the world market. The impact of the country's high transport cost is felt significantly as demonstrated by this study's results. It has been shown that using the export parity price at farm gate, and using the high input technology, only Liwonde (Machinga), Lilongwe, Blantyre, Ngabu, Salima and Kasungu, in that order, have a relative efficiency in hybrid maize production. The domestic resource ratios for these ADDs range between 0.35 and 0.50. Due to heavy domestic transport costs borne using Nacelle routes, domestic resource cost ratios for Mzuzu and Karonga ADDs are unimpressive, 0.88 and 1.64, respectively (Table 5.1). It is inefficient for the country to produce hybrid maize as an export crop in Karonga if the country's outlet to the world markets is the Nacelle corridor. Maize has nevertheless demonstrated to suite a wider scope of climate and soils in the country. Hence Karonga and Mzuzu ADDs should resemble the other ADDs, i.e., should have a comparative advantage in hybrid maize production, if the northern corridor is used as an outlet to the World Market because domestic transport costs will be greatly reduced using this route. Sensitivity analysis of prices indicate that hybrid maize production in the country will not benefit much from input price decreases. An input price decrease of 15 percent did not result in any improvement of the domestic resource cost ratios. The weak comparative advantage in hybrid maize production of most zones will nevertheless worsen with input price increases. An increase in input prices by 15 percent resulted in increased domestic resource cost ratio of between 0.36 and 0.93 and 0.35 and 0. 50 for Liwonde (Machinga), Lilongwe, Blantyre, Ngabu, Salima, and Kasungu and Mzuzu ADDs in that order. The domestic resource cost ratios do not improve with a 15 percent input price reduction and worsen with an increase in input price by the same percentage because the output price of maize on the world market in relatively small. It requires a remarkable decrease in input price for such an adjustment to result in any improvement in the domestic resource cost ratios. The narrow social output prices of hybrid maize will not cushion the negative effects due to input price increases, hence the already weak comparative advantage in some zones will easily be lost with price increases.

The domestic resource cost ratios for hybrid maize using low input technology (smallholder) range between 0.42 and 0.76 for Liwonde, Ngabu, Blantyre, Salima, Lilongwe and Kasungu, in that order. The domestic resource cost ratios for Mzuzu and Karonga are 1.28 and 2.30, (Table 5.2) respectively, showing no comparative advantage for these regions in maize production. Thus, the export parity prices at farm gate are used, even though the Nacelle route is the outlet to the world market. The trend of results agree with those for the high input technology, though the ratios are slightly higher for the low input technology. The high domestic resource

cost indicators for low input technology suggest that smallholders are less efficient in hybrid maize production especially due to low input use. The low levels of fertilizer used by smallholders is mainly attributed to lack of capital. Farmers cannot afford to buy enough fertilizer to meet the recommended requirements. It is argued that some smallholder farmers growing maize alongside tobacco, will give fertilizer priority to the latter.

Low yields, apart from the low social prices of the crop, contribute significantly to the struggling domestic resource cost ratios the country has in production of hybrid maize in most of the zones. The ratios drop to a range of 0.28, and 0.47 if potential yields were attained (Table 5.3). This means that increased hybrid maize productivity among smallholder farmers will result in a tremendous improvement in the use of the domestic resources i.e., improved comparative economic advantage in production. Domestic resource cost ratios drop to a range of 0.41 and 0.72 for Liwonde, Ngabu, Blantyre, Salima, Lilongwe and Kasungu ADDs. Mzuzu and Karonga ADDs have DRC ratios of 1.13 and 1.84 hence still no comparative advantage in these zones even after input price reduction. Thus, an input price decrease does not significantly improve the comparative advantage in hybrid maize in low input production. Input price increases, nevertheless, further weaken the comparative advantage in production of the crop. Domestic resource cost ratios increase to a range of 0.44 and 0.81 for the six ADDs, 1.48 and 3.05 for Mzuzu and Karonga ADDs, respectively.

The crop has meager farmer returns of about US$500 and US$150 for high and low input technologies, respectively (Tables 5.1 and 5.2). Farmer returns increase to about US$700 if potential yields are attained. Low farmer returns definitely dissuade big estate farmers from seriously engaging in maize production as an export crop, especially in the regions where more lucrative crops like tobacco, and paprika are being grown.

5.1.5.2 Local Maize

This is exclusively a smallholder crop and is grown for food. The production coefficients (yield per hectare) are quite low as compared to hybrid maize. The study results indicate that the country does not have any comparative economic advantage in local maize production in all the eight ADDs. The domestic resource cost indicators range between 1.0 and 1.44 (Table 5.2), thus using the export parity price at farm gate. The low productivity, low social price of maize on the world market and the high domestic transport costs the country incurs, completely erode any comparative advantage the country could have in local maize production.

The country would be efficient in local maize production if potential yields were attained. The domestic resource indicators improve significantly to a range of 0.39 and 0.83, excluding Mzuzu and Karonga ADDs, if computations are done using potential yields for local maize. Further, the country has a comparative advantage for all the zones if local maize is grown for import substitution (Table 5.1). The crop has very low farmer returns averaging US$56. The returns may rise to US$200 if potential yields were attained (Table 5.3).

5.1.6 Soyabeans

Agronomic Potential

Soya is a leguminous annual plant, grown primarily in temperate zones. Best yields are obtainable between the latitudes of 30 degrees and 45 degrees on either side of the equator. Cold periods adversely affect the development of flowers but have little effect once the flowers have opened. The oil content of soya beans is relatively low, varying between 17 percent and 19 percent. Over 80 percent of the beans consist of protein meal and hull. Most other oil seeds have oil content of over 60 percent.

Market Potential

Soyabeans farmers derive the greater part of their income from soya meal. The overall demand for soyabeans is therefore largely dependent on the demand for meal used as feedstuff derived from the demand for livestock products (meat and dairy). World trade in oil seeds, vegetable oils and protein meals has been dominated by soyabean-based products for a number of years now. The main reasons for this dominance are the favorable agronomic characteristics, relatively good returns offered to farmers and processors, high quality edible oils and protein meals yielded, and the plentiful and dependable supply of the crop at competitive prices. The soyabean crop ranks as one of the principal factors affecting the

supply of and demand for oil seeds in the international market. During the period 1985-1987 soybeans accounted for 76 percent of the oil seed tonnages traded world-wide, and 21 percent of total trade in vegetable oils is soya bean oil (second only to palm oil). Furthermore, soya bean meals and cakes represent about 70 percent of the international trade in meals and cakes.

The major problem now is low producer prices, especially considering the high cost of inputs coupled with low yields per hectare. Currently, soya is selling locally at as low as US$0.17 (MK2.50) per kilogram. On the international scene, prices have plummeted to around US$0.30 (MK4.50) per kilogram. These low prices are principally due to overproduction in the USA. In order to maximize returns and avert consequences of low international prices, there is need for investment in solvent extraction machinery which would enable the processors to extract not only oils but also to develop other products such as synthetic milk, meat and livestock feed (Banda and Mndalasini, 1996).

Comparative Economic Advantage

Soyabeans have very low social prices as compared to most of the crops which were studied. The low social prices and the country's high domestic transport costs severely severely the competitiveness of soyabeans on the world markets. This is evidenced by the high domestic resource costs ratios for the various ADDs. Only Ngabu ADD had a small ratio of 0.37 for a low input production technology, with the rest of the ADDs being in between 1.08 and 3.36 (Table 5.2). The domestic resource cost ratios greater than one means that the country is inefficient in the production of soyabeans in those regions, i.e., more primary factor resources are required for production of soyabeans than the foreign exchange earned thereafter. Low productivity (yield per hectare) of soyabeans is one major culprit for the country's lack of comparative advantage in the production zones. Furthermore, the social prices of soyabeans, have not been attractive lately due to over-production in major producing countries, such as the U.S. Sensitivity analysis on input prices, indicate that input price increases will further reduce the efficiency of producing the crop. Thus, the DRC ratio for Ngabu still stagnate at 0.37, but there are worsening DRCs for the rest of the ADDs ranging between 1.12 and 4.31. The study reveals that by reducing the input prices by 15 percent will not improve the efficiency in production of soyabeans in the growing areas. The DRC ratios are high, ranging between 1.05 and 3.17, with an exception of Ngabu which has a ratio of 0.36. Soyabeans does not demand a lot inputs, as such they are not a major factor influencing the domestic resource cost ratios for the crop. It is thus concluded, that comparative economic advantage in production of soyabeans can be improved in the producing areas if the prevailing low productivity (yield per hectare) of the crop was improved. The low world market price of soyabeans is a major hindrance which may block efforts to improve productivity of the crop in the country, unless local processing industries are established to reduce the transport cost. The high transport costs render the country's soyabeans prices uncompetitive across the borders.

By using a high input technology to produce there is a relative comparative advantage for Ngabu, Liwonde, Blantyre, Lilongwe, Kasungu and Salima ADDs. Domestic resource cost ratios for these regions range between 0.4 and 0.82 (Table 5.1). Mzuzu and Karonga ADDs carry a significant burden of the domestic transport cost and have no comparative advantage in soyabeans production with high input technology (Table 5.1). Sensitivity analysis on price indicate that reducing input price by 15 percent will not improve the domestic resource cost ratios significantly. The domestic resource cost ratios fall to a range of 0.4 and 0.81 from 0.4 and 0.82, while Mzuzu and Karonga ADDs still lack the comparative advantage in production of soyabeans (DRC of 1.02 and 1.32 respectively). Increasing input price by 15 percent, results in a marginal negative impact on the domestic resource cost ratios. The DRCs slightly increase to a range of 0.41 and 0.83 for the six ADDs and 1.05 and 1.38 for Mzuzu and Karonga ADDs respectively. The farmer returns per hectare for soyabeans are quite low, US$90 and US$300 for low and high input technologies, respectively (Tables 5.1 and 5.2). The low farmer return entails that large estates may be reluctant to invest in soyabean production, especially with the prevailing low social prices on the world market.

5.1.7 Groundnuts

Until the early 1980s groundnuts ranked second in importance to maize in terms of land use. Groundnuts are a good source of protein and energy. This crop has largely been grown in the country at smallholder subsector. When grown in rotation with other crops such as maize or tobacco, groundnuts improve soil fertility. The national aim is to substantially increase production of both confectionery and oil groundnuts, in order to meet the local and export demand and to provide raw materials for the domestic oil industry (Malawi Govt., MOA, 1993). Three types of groundnuts are produced in Malawi. Chalimbana, a large confectionery nut, is grown on the higher plateaus in all three regions and comprises the bulk (90 percent) of ADMARC purchases. The smaller, but also pleasant tasting, Malimba nut is used both for oil and roasting and is grown in Karonga and the Lower Shire Valley. The Manipinter nut contains a higher oil content and is produced primarily along the lake shore for the vegetable oil market.

Groundnuts have traditionally been produced by smallholder farmers and are used extensively for household consumption. This crop is traditionally cultivated by women and require relatively high labor input. The high labour demand could be one of the constraints that has influenced smallholder farmers to reallocate their time in favor of other major crops, consequently reducing the area allocated to groundnut production. Groundnuts have been a relatively minor estate crop but with recent price increases a few estates adopted the production of groundnuts as an enterprise.

Agronomic Potential

Nationwide, groundnut yields in Malawi are low and have remained static over time. This outcome is attributed to poor husbandry standards, a general decline in seed quality and supply (Malawi Govt., MOA, 1993). Inadequate producer prices and hence low returns to labour have also contributed to this production decline (Hyman, 1993). For optimum groundnut production, temperature should range between 25 and 28 degrees Celsius and rainfall between 500 and 1,200 mm. Sandy soils are preferable with well drained sandy loam. Yields are particularly sensitive to soil acidity and soil pH between 6 and 6.5 is recommended. Under good management, yields reach up to 1,000 to 1,500 kilograms, but results at the research stations indicate that yields up to 2,000 kilograms are possible if good seed is used and a balanced fertilizer (including a nitrogen starter or rhizobium) and fungicide are applied (Malawi Govt., MOA, 1994).

Market Prospects

There is market potential for both oil and confectionery groundnut varieties. Domestically, Lever Brothers are chief buyers of groundnuts. In prevalence of adequate production, most groundnuts sales are for export with the bulk destined for Europe and to a lesser extent India and Zimbabwe (Jansen and Hayes, 1994). Much of the groundnut export market has gradually been lost due to irregularly shaped kernels, considerable variation in nut size, and unpredictable delivery times resulting from transport delays. Another important constraint to increased groundnut exports is the increasingly stringent aflatoxin regulations operative in a number of important countries (Jansen and Hayes, 1994). The potential for expansion of Malawi's confectionery groundnut exports is good but high priority must be given to improving the crop's marketing system and to reduction of aflatoxin contamination.

Comparative Economic Advantage

Groundnut is one legume crop the country has a very strong comparative economic advantage in its production. The domestic resource cost ratios are between 0.19 and 0.24 (Table 5.2). The producing areas considered were Kasungu, Lilongwe and Liwonde. All of these ADDs have a very strong comparative advantage in groundnut production as an export crop at low input technology. Groundnut has largely been a smallholder crop. The crop has an average domestic resource cost ratio of 0.22 if potential yields are used for computations. Sensitivity analysis of price revealed that input price change will result in marginal changes of the domestic resource cost ratios for groundnuts grown under low input technology. A 15 percent increase in input price will push up the DRC ratios to a range of 0.21 and 0.24 from 0.19 and 0.24. Input price decrease by the same percentage will not affect, i.e., improve, the domestic resource cost ratios. Groundnuts do not require much inputs, especially if grown in areas with fewer groundnut pests and diseases.

The results indicate that the crop has a farmer return of about US$200 and this may be raised to US$800 (Table 5.3) if potential yields are realized. The present yield levels are too low especially considering the fact that groundnuts have a reasonably high social price, an incentive for increased productivity and production. The private prices have, nevertheless, remained suppressed for a long time. Furthermore, the export restriction, which has been in place for the last decade, has impacted negatively on the domestic prices. Minde and Nakhumwa, (1996), reported that though official exports were restricted, informally the crop was being exported to neighboring countries. Informal exports for Malawi to neighboring countries for 1995/1996 amounted to almost US$0.25m while the registered value for groundnut formal export was US$300 only. This is a clear signal that although similar crops are being grown, comparative economic advantages exist in production and trade within the region which informal traders have spotted over the years and were already exploiting.

5.1.8 Phaseolous Beans

Agronomic Potential

Beans are a good source of protein and cash income. The crop is grown throughout the country mostly in cool plateaus areas. Beans can also be grown in low altitude areas during the winter months, April to July, under residual moisture. The average yields are 250 kilograms and 700 kilograms per hectare for interplanted and pure stands, respectively. Yields of up to 2,500 kilograms per hectare can be obtained from pure stands under good management. The objective, therefore, is to increase production by improving yields towards the potential. Where it is not possible for farmers to plant beans in pure stands, beans can be planted with suitable crops, such as maize, or be grown as a relay crop, thereby maximizing production from the same piece of land (MOA,1994).

Relay crops which are planted in February or March between rows, have higher yields than intercrop beans. Once the maize has been harvested, they are equivalent to pure stands. The major constraint to increased phaseolus bean production in Malawi are twofold. First, improved seed supplies are limited as seed suppliers have not found it profitable to stock them because beans are self-pollinating thus allowing farmers to save planting seed from the previous harvest. Secondly, beans are very susceptible to insect pests and diseases requiring use of expensive agro-chemicals (Jansen and Hayes, 1994).

Comparative Economic Advantage

The production of beans is dominated by smallholder farmers. There is a comparative advantage in the production of beans in all the ADDs with exception of Ngabu (Shire Valley) where the crop marginally grows due to hot weather conditions. The domestic resource cost ratios using export parity prices at farm gate, range between 0.19 and 0.53 for low input technologies and 0.22 and 0.54 for high input technologies. Thus, the country is relatively efficient in bean production at both technological levels. Sensitivity analysis of price indicates that changes in input price will have a marginal impact on the domestic resource cost ratios due the crop's low demand for inputs, unless growing in areas susceptible to pests and diseases. A 15 percent input price decrease will marginally improve the domestic resource cost ratios to a range of 0.21 to 0.51 for high input technology. An input price increase by the same percentage will narrowly increase the DRCs to a range of 0.19 and 0.55 in the high input technology. Input use in low input (smallholder in this case) bean production is almost insignificant and the effects due input price changes are unobservable.

The normal farmer returns for a low input bean producer in Malawi averaged US$190 and exceeded US$ 1,050 at potential yield (Table 5.3). The country's bean producers have a lot of unexploited potential as their productivity is far lower than the potential yields. Incentives in form of attractive producer prices can influence farmers to treat beans as a cash crop, hence improve the crop's productivity. Good management will also play a key role.

5.1.9 Cotton

Agronomic Potential

This crop is generally grown in hot lowland areas in the Shire Valley, Mwanza/ Neno, Phalombe Plain, Zomba West, Machinga, Mangochi West, Bwanje Valley, along the lake shore areas, the Henga Valley and the Nkhamanga plain. In an effort to increase

production, Makoka Research Station produced cotton varieties suitable for specific ecological zones. Unfortunately, due to buying policies of the major players in the field, particularly ADMARC, who bought cotton in one zone and got it ginned in another zone, there has been a lot of variety mixing resulting in the scarcity of pure area specific varieties. This trend has adversely affected the production quality of cotton. Related to this is the problem of seed where in some cases farmers have been using seeds left over from the previous season as opposed to using fresh seed every year. Furthermore, some farmers are reluctant to follow recommendations by the researchers on pest management techniques. The agronomic potential for increased cotton production is very high as a smallholder crop, as an estate crop and as a nucleus estate crop with associated smallholder production. The potential for increased smallholder production is dependent upon the introduction of labour saving technology and improved yields. Pest control accounts for about 80 percent of all cash costs. The exorbitant prices of the agro-chemicals dissuade other farmers from undertaking the recommended pest control measures. Additional research focussing on the major smallholder problems, such as earlier land preparation, alternative pest control measures and integration of cotton with other crops, especially food crops is needed.

Market Prospects

A very small proportion of raw cotton produced in Malawi is exported. This is partially attributed to declining production (due to bad weather and lower producer prices which act as a disincentive) and partially attributable to the fact that exports are increasingly in the form of textiles. Nevertheless, Malawi cotton has a reputation for high quality, and if supported by increased production that will even allow excess for export, the export market for cotton lint can easily be revived (Jansen and Hayes, 1994).

Comparative Economic Advantage

Malawi grows cotton especially at smallholder scale. The results of this study indicate that Malawi has a very strong comparative economic advantage which needs to be fully exploited. The domestic resource cost ratios range between 0.16 and 0.19, a clear indication that the country is an efficient producer of cotton, i.e., less factor inputs are utilized in production than the foreign exchange earned. There is enough evidence from the study results to support the fact that all producing areas of cotton in the country have a strong comparative economic advantage which still needs to be exploited. The gap between actual and potential yields is too wide suggesting that the comparative economic advantage can be further strengthened by increasing the crop's productivity in those areas. There is a tremendous improvement of domestic resource cost ratio to an average of 0.07 if computations were done using the potential yields (Table 5.3). A sensitivity analysis of price indicates that domestic resource cost ratios of cotton would be affected with price changes. A 15 percent input price decrease would improve the DRCs by a range of 0.15 to 19. Cotton is a crop which demands a lot of inputs, in the form of chemicals. In spite of the crop's high demand for chemicals, the effect on the domestic resource cost ratio due to input price changes has been minimal, probably because cotton production in Malawi is dominated by smallholder farmers who often times do not apply the recommended levels of inputs.

The farmer returns are nevertheless quite low, averaged at around US$72 for low input and US$1,000 at potential yield (Tables 5.2 and 5.3). The major obstacle to increased cotton production and productivity is the marketing and meager producer prices being offered at the domestic market. The financial prices for this crop have been suppressed for quite a long time and are still as low as US$0.30 (MK4.5) per kilogram, even after market liberalization. The low private prices being offered for cotton have scared away large scale producers and is responsible for the low and the slow growing production of this crop. Cotton has quite reasonable social prices on the world market, and with the very low domestic resource ratios the country has in production, the crop is a viable investment option. Despite being a reliable export crop for the country and its importance to the domestic manufacturing industry, cotton production has been dominated by smallholder subsector. The extremely low market prices for the crop in the past three decades, have scared a way both local and external investors in this crop, hence production has remained static if not dwindled over the years.

5.2 REVEALING DISTORTING EFFECTS OF GOVERNMENT POLICIES (ANALYSIS BY CROP)

5.2.1 Introduction

This chapter essentially seeks to compare the net private (NPP) and net social profitability (NSP) and discover the sources of any difference that may exist between them. Whenever discrepancies exist between market and social prices, the interest of farmers and of the nation can diverge. A crop can be profitable to farmers, e.g., because of output or input subsidies, even though its production may not represent an efficient use of resources from the point of view of the country. Conversely, a crop can be unprofitable to farmers (e.g., because of output or input price taxation), even though its production represents an efficient use of the nation's resources (Tsakok,1989). Hence, by comparing private profitability with social profitability not only can the overall effect of government policies be measured, but the influence of individual policies can be quantified by disaggregating the overall discrepancy into its constituent parts as shown in Tables 5.4, 5.5 and 5.6.

The effects of policy on producer incentives appear as the difference between the price of a particular product or input valued at market prices and at social prices. The effect of a tariff on imports of commodity or the effect of price control, is indicated by K. The effect of a subsidy on fertilizer or other tradable inputs is indicated by L. The effect of labor and capital market distortion is indicated by M. The indirect effects of policies on competing enterprises that lead to distortions in the market value of land are indicated by N (assuming that these effects are reflected residually in net returns to land). Total net policy effects are indicated by the difference between private and social net profitability (NPP-NSP) with a positive value indicating that the government policies on the whole decrease private profitability.

5.2.2 Tobacco

The net policy effect (o) is negative, an indication that overall policies are reducing net private profitability below net social profitability in tobacco production. Tracing the major source of this difference, the output price transfers are a major influencing factor. Although tobacco is one of the country's cash crops with high market prices, the prices are lower relative to the equivalent social prices. The output price transfers show a significant gap between social and private (market) producer prices, with private prices being much lower (Tables 5.4 and 5.5).

There is an indication that private prices for inputs are marginally higher than their equivalent social prices on the world markets. The minor gap is attributed to shipment costs and profit mark-up for retailers. This study coincided with the time the country's input market was completely liberalized (1994/1995 season), thus, input subsidies on smallholder sub-sector were completely phased out. Fertilizer prices were exorbitant because at this period, the Malawi Kwacha was experiencing some major devaluations. Further, private traders participating in the fertilizer market were quite few and this scarcity created remarkable competition. Being the first year of the input market liberalization, it is believed that traders had limited sources of supply most of which were expensive. The gap between private and social prices of inputs, fertilizer in particular, should reduce as the input market paves to perfect competition with time. Significant reduction in market (private) prices of inputs may be achieved if there is a substantial development of the transport market.

The capital/labor transfer policy indicates that private valuation of capital and labor is much lower than the equivalent social prices. Using both low and high input technologies, the capital/labor transfer policy in tobacco contribute greatly to the gap in the net transfer policy between social and private prices. In this study, capital was calculated as a percentage of input use, adopting the MRFC borrowing rate of 35 percent. Hence, capital is more of a reflection of the tradable input transfer policy.

The average price for labor in low input technology was US$0.60 (MK9) being the private price and US$0.73 (MK11) the economic price. While for high input estates it was US$0.93 (MK15) being the private price, as compared to US$1.13 (MK17), the social price. This indicates a policy bias in favor of producers as they offer private price for labor which

Table 5.4. Nominal Protection and Effective Protection Coefficients and the Sources of Difference Between the Private and Social Profitability of Crops

Zone	Crop	Prices	Technology	DRC A/E	NPC= (A-B)/ (E-F)	EPC= NPP	Profitabiltiy NSP	Private Profitabiltiy NSP)	Social Profitabiltiy (O=NPP-(K=A-E)	Net Policy Effect Policy (L=F-B)	Prod. Price Price (M=G-C)	Trad. Input Policies	Labor Credit (N=H-D)	Land Policy
KU ADD	Burley tobacco	Export	High input	0.23	0.92	0.86		2415.83	3039.10	(623.27)	(499.97)	(50.13)	(143.05)	69.88
KA ADD	Burley tobacco	Export	High input	0.23	0.94	0.90		2331.08	2806.03	(474.95)	(332.50)	(24.86)	(143.29)	25.70
LL ADD	Burley tobacco	Export	High input	0.24	0.91	0.84		2069.17	2725.35	(656.18)	(516.33)	(58.03)	(143.24)	61.42
BT ADD	Burley tobacco	Export	High input	0.27	0.90	0.76		1568.55	2422.00	(853.45)	(521.33)	(266.01)	(137.28)	71.17
MZ ADD	Burley tobacco	Export	High input	0.29	0.93	0.87		1589.31	2091.35	(502.04)	(344.67)	(40.00)	(143.42)	26.05
SL ADD	Burley tobacco	Export	High input	0.30	0.91	0.83		1460.00	2029.81	(569.81)	(429.67)	(350.14)	(143.05)	53.21
LN ADD	Burley tobacco	Export	High input	0.32	0.90	0.65		(313.00)	107.49	(420.49)	(210.00)	(57.51)	(141.83)	37.90
NG ADD	Burley tobacco	Export	High input	0.88	0.90	0.80		1232.11	1853.28	(621.17)	(476.67)	(141.22)	(141.22)	54.22
LN ADD	Hybrid maize	Export	High input	0.35	0.78	0.71		371.31	552.12	(180.81)	(243.76)	(5.13)	13.86	54.22
LL ADD	Hybrid maize	Export	High input	0.38	0.89	0.85		459.90	508.21	(48.31)	(116.67)	(6.46)	13.40	61.42
BT ADD	Hybrid maize	Export	High input	0.39	0.74	0.67		304.64	489.40	(184.76)	(262.87)	(6.46)	13.40	71.17
NG ADD	Hybrid maize	Export	High input	0.44	0.78	0.69		217.32	364.61	(147.29)	(192.13)	(6.46)	13.40	37.90
SL ADD	Hybrid maize	Export	High input	0.50	1.03	1.06		421.98	311.03	110.95	23.85	(13.50)	20.39	53.21
KU ADD	Hybrid maize	Export	High input	0.56	1.03	1.03		342.81	244.61	98.20	21.39	(6.47)	13.40	69.88
MZ ADD	Hybrid maize	Export	High input	0.89	1.33	1.65		268.84	32.03	236.81	203.83	(6.47)	13.40	26.05
KA ADD	Hybrid maize	Export	High input	1.64	1.48	2.37		159.95	106.69	266.64	234.00	(6.46)	13.40	25.70
BT ADD	Macadamia	Export	High input	0.13	0.44	0.40		902.20	2565.77	(1663.57)	(1750.00)	(12.40)	27.66	71.17
LL ADD	Paprika	Export	High input	0.26	0.85	0.76		1611.85	2278.17	(666.32)	(595.33)	(158.27)	26.53	61.42
KU ADD	Paprika	Export	High input	0.28	0.86	0.76		1516.33	2137.27	(620.94)	(550.00)	(164.99)	24.17	69.88
BT ADD	Paprika	Export	High input	0.29	0.91	0.81		1560.31	1986.52	(426.21)	(342.00)	(175.95)	20.57	71.17
MZ ADD	Phase. beans	Export	High input	0.22	0.70	0.62		606.50	1058.75	(452.25)	(494.85)	(12.78)	29.33	26.05
SL ADD	Phase. beans	Export	High input	0.26	0.77	0.71		616.91	890.17	(273.26)	(339.75)	(12.63)	25.91	53.21
LL ADD	Phase. beans	Export	High input	0.28	0.75	0.69		559.11	833.12	(274.01)	(349.35)	(12.16)	26.08	61.42
LN ADD	Phase. beans	Export	High input	0.33	0.72	0.64		384.95	648.74	(263.79)	(334.97)	(12.48)	29.44	54.22
KU ADD	Phase. beans	Export	High input	0.33	0.77	0.70		464.05	672.53	(208.48)	(291.60)	(12.66)	25.90	69.88
BT ADD	Phase. beans	Export	High input	0.41	0.82	0.76		381.51	481.33	(99.82)	(200.00)	(12.09)	26.10	71.17
KA ADD	Phase. beans	Export	High input	0.54	1.01	0.99		295.64	274.02	48.62	5.17	(11.37)	29.12	25.70
NG ADD	Soyabeans	Export	High input	0.40	0.95	0.93		402.00	370.78	31.22	(34.07)	(7.44)	34.83	37.90
LN ADD	Soyabeans	Export	High input	0.57	0.74	0.68		138.35	202.39	(64.04)	(143.83)	(7.43)	33.00	54.22
BT ADD	Soyabeans	Export	High input	0.66	0.70	0.63		88.51	148.94	(60.43)	(153.50)	(7.43)	29.33	71.17
LL ADD	Soyabeans	Export	High input	0.68	1.06	1.05		238.51	127.99	110.52	27.20	(7.43)	29.33	61.42
KU ADD	Soyabeans	Export	High input	0.81	1.18	1.21		237.71	64.73	172.98	81.20	(7.43)	29.33	69.88
SL ADD	Soyabeans	Export	High input	0.82	1.15	1.17		195.21	58.74	136.47	61.37	(7.44)	29.33	53.21
MZ ADD	Soyabeans	Export	High input	1.04	1.05	1.03		58.21	8.77	66.98	15.37	(7.44)	33.00	26.05
KA ADD	Soyabeans	Export	High input	1.35	1.23	1.30		49.68	61.92	111.60	60.00	(7.10)	33.00	25.70
BT ADD	Tea	Export	High input	0.21	0.58	0.58		1861.65	3697.30	(1835.65)	(2700.00)	(725.04)	68.14	71.17

Table 5.5. Nominal Protection and Effective Protection Coefficients and the Sources of Differences Between the Private and Social Profitability of Crops

Zone	Crop	Prices	Technology	DRC	NPC= A/E	EPC= (A-B)/ (E-F)	Private Profitabiltiy NPP US$/ha	Social Profitabiltiy NSP US$/ha	Net Policy Effect (O=NPP-NSP)	Prod. Price Policy	Trad. Input Price (K=A-E)	Labor Credit Policies (L=F-B)	Land Policy (N=H-D) (M=G-C)
KA ADD	Burley tobacco	Export	Low input	0.18	0.94	0.91	1835.06	2224.37	(389.31)	(217.00)	(21.03)	(176.98)	25.70
MZ ADD	Burley tobacco	Export	Low input	0.21	0.93	0.89	1517.73	1912.26	(394.53)	(237.31)	(29.93)	(153.34)	26.05
LL ADD	Burley tobacco	Export	Low input	0.21	0.91	0.86	1478.06	1990.46	(512.40)	(320.76)	(41.06)	(212.00)	61.42
KU ADD	Burley tobacco	Export	Low input	0.21	0.92	0.87	1507.77	1952.02	(444.25)	(290.62)	(36.61)	(186.90)	69.88
SL ADD	Burley tobacco	Export	Low input	0.23	0.91	0.86	1301.95	1700.24	(398.29)	(281.84)	(36.61)	(133.58)	53.21
BT ADD	Burley tobacco	Export	Low input	0.25	0.90	0.82	1053.35	1514.44	(461.09)	(309.40)	(52.36)	(170.50)	71.17
LN ADD	Burley tobacco	Export	Low input	0.26	0.90	0.84	1318.97	1793.24	(474.27)	(330.15)	(47.18)	(151.16)	54.22
NG ADD	Burley tobacco	Export	Low input	0.58	0.90	0.74	119.25	352.04	(232.79)	(172.25)	(47.15)	(51.49)	37.90
NG ADD	Cotton	Export	Low input	0.16	0.20	0.14	51.68	1089.90	(1038.22)	(1102.17)	(7.96)	34.01	37.90
KA ADD	Cotton	Export	Low input	0.16	0.22	0.15	45.11	1010.11	(965.00)	(1016.67)	(8.02)	33.99	25.70
SL ADD	Cotton	Export	Low input	0.17	0.21	0.14	39.42	1040.59	(1001.17)	(1068.17)	(7.96)	21.75	53.21
LN ADD	Cotton	Export	Low input	0.18	0.20	0.14	40.85	997.47	(956.62)	(1037.33)	(7.64)	34.13	54.22
BT ADD	Cotton	Export	Low input	0.19	0.20	0.14	33.92	985.85	(951.93)	(1037.33)	(7.63)	21.86	71.17
KU ADD	Groundnuts	Export	Low input	0.19	0.40	0.41	282.37	799.82	(517.45)	(608.00)	0.00	20.67	69.88
LL ADD	Groundnuts	Export	Low input	0.22	0.42	0.44	237.37	634.11	(396.74)	(478.83)	0.00	20.67	61.42
LN ADD	Groundnuts	Export	Low input	0.24	0.38	0.41	174.36	529.14	(354.78)	(440.00)	0.00	31.00	54.22
LN ADD	Hybrid maize	Export	Low input	0.42	0.71	0.55	104.57	179.14	(74.57)	(132.95)	(6.83)	10.99	54.22
NG ADD	Hybrid maize	Export	Low input	0.50	0.74	0.57	67.89	114.62	(46.73)	(91.03)	(6.83)	13.23	37.90
BT ADD	Hybrid maize	Export	Low input	0.51	0.74	0.61	107.10	143.03	(35.93)	(105.14)	(8.29)	6.03	71.17
SL ADD	Hybrid maize	Export	Low input	0.58	0.92	0.85	119.14	92.88	26.26	(28.62)	(5.36)	7.03	53.21
LL ADD	Hybrid maize	Export	Low input	0.60	0.89	0.80	114.77	92.28	22.49	(39.13)	(6.83)	7.03	61.42
KU ADD	Hybrid maize	Export	Low input	0.76	0.92	0.84	91.74	45.86	45.88	(25.67)	(5.36)	7.03	69.88
MZ ADD	Hybrid maize	Export	Low input	1.28	1.27	1.72	73.59	(22.81)	96.40	62.27	(3.91)	11.99	26.05
KA ADD	Hybrid maize	Export	Low input	2.30	1.37	2.73	57.83	(58.87)	116.70	81.53	(2.92)	12.39	25.70
NG ADD	Local maize	Export	Low input	1.00	0.75	0.70	71.23	0.00	71.23	(47.75)	0.00	13.40	37.90
BT ADD	Local maize	Export	Low input	1.00	0.74	0.71	44.17	0.00	44.17	(35.93)	0.00	8.93	71.17
LN ADD	Local maize	Export	Low input	1.00	0.71	0.65	30.37	0.00	30.37	(37.25)	0.00	13.40	54.22
LL ADD	Local maize	Export	Low input	1.00	0.89	0.87	55.70	0.00	55.70	(14.65)	0.00	8.93	61.42
KU ADD	Local maize	Export	Low input	1.00	0.92	0.90	71.41	0.00	71.41	(11.87)	0.00	13.40	69.88
SL ADD	Local maize	Export	Low input	1.00	0.92	0.90	56.33	0.00	56.33	(10.28)	0.00	13.40	53.21

Table 5.5. Con't. Nominal Protection and Effective Protection Coefficients and the Sources of Differences Between the Private and Social Profitability of Crops

Zone	Crop	Prices	Technology	DRC	NPC= A/E	EPC= (A-B)/ (E-F)	Private Profitabiltiy NPP US$/ha	Social Profitabiltiy NSP US$/ha	Net Policy Profitabiltiy (O=NPP-NSP)	Prod. Effect Policy	Trad. Price Price (K=A-E)	Labor Input Policies (L=F-B)	Land Credit Policy (N=H-D) (M=G-C)
MZ ADD	Local maize	Export	Low input	1.00	1.27	1.41	44.19	0.00	44.19	24.19	0.00	13.40	26.05
KA ADD	Local maize	Export	Low input	1.00	1.37	1.67	51.40	0.00	51.40	36.33	0.00	13.40	25.70
LL ADD	Paprika	Export	Low input	0.18	0.85	0.81	1614.94	1987.51	(372.57)	(430.67)	(23.40)	20.08	61.42
KU ADD	Paprika	Export	Low input	0.18	0.86	0.83	1680.18	2013.76	(333.58)	(408.33)	(14.91)	19.78	69.88
BT ADD	Paprika	Export	Low input	0.19	0.84	0.80	1551.94	1943.87	(391.93)	(451.00)	(37.51)	25.41	71.17
SL ADD	Phase. beans	Export	Low input	0.19	0.77	0.76	388.37	457.06	(68.69)	(135.90)	0.00	14.00	53.21
LN ADD	Phase. beans	Export	Low input	0.23	0.77	0.76	318.30	361.00	(42.70)	(110.92)	0.00	14.00	54.22
KA ADD	Phase. beans	Export	Low input	0.33	0.73	0.71	132.04	161.27	(29.23)	(68.93)	0.00	14.00	25.70
BT ADD	Phase. beans	Export	Low input	0.46	0.77	0.77	165.90	149.79	16.11	(64.39)	0.00	9.33	71.17
KU ADD	Phase. beans	Export	Low input	0.50	0.77	0.76	147.20	122.87	24.33	(59.55)	0.00	14.00	69.88
MZ ADD	Phase. beans	Export	Low input	0.53	0.70	0.69	64.07	79.99	144.06	(47.97)	0.00	14.00	26.05
LL ADD	Phase. beans	Export	Low input	0.55	0.80	0.79	121.57	95.37	26.20	(44.55)	0.00	9.33	61.42
NG ADD	Soyabeans	Export	Low input	0.37	1.30	1.33	285.73	153.93	131.80	81.07	0.00	12.83	37.90
LN ADD	Soyabeans	Export	Low input	1.08	1.30	1.39	94.90	(8.19)	103.09	37.87	0.00	11.00	54.22
SL ADD	Soyabeans	Export	Low input	1.23	1.67	1.91	118.06	(1948.00)	137.54	77.00	0.00	7.33	53.21
KU ADD	Soyabeans	Export	Low input	1.26	1.67	1.88	137.19	(24.67)	161.86	84.65	0.00	7.33	69.88
LL ADD	Soyabeans	Export	Low input	1.39	1.46	1.62	87.50	(31.41)	118.91	50.16	0.00	7.33	61.42
BT ADD	Soyabeans	Export	Low input	1.43	1.43	1.58	91.23	(36.60)	127.83	49.33	0.00	7.33	71.17
MZ ADD	Soyabeans	Export	Low input	1.67	1.74	2.22	62.93	(30.82)	93.75	56.70	0.00	11.00	26.05
KA ADD	Soyabeans	Export	Low input	3.66	2.07	3.74	38.43	(55.80)	94.23	57.53	0.00	11.00	25.70

Table 5.6. Nominal Protection and Effective Protection Coefficients and the Sources of Difference Between the Private and Social Profitability of Crops

Zone	Crop	Prices	Technology	DRC	NPC= A/E	EPC= (A-B)/ (E-F)	Private Profitabiltiy NPP US$/ha	Social NSP US$/ha	Net Policy Profitabiltiy (O=NPP-NSP)	Prod. Effect Policy (K=A-E)	Trad. Price Price (L=F-B)	Labor Input Policies (M=G-C)	Land Credit Policy (N=H-D)
BT ADD	Burley tobacco	Export	Potential	0.10	0.90	0.76	4248.30	6239.01	(1990.71)	(906.67)	(742.02)	(413.19)	71.17
LN ADD	Burley tobacco	Export	Potential	0.10	0.90	0.76	4211.88	6119.83	(1907.95)	(866.67)	(734.40)	(361.10)	54.22
MZ ADD	Burley tobacco	Export	Potential	0.10	0.93	0.80	4257.50	5901.27	(1643.77)	(587.00)	(728.00)	(355.15)	26.05
LL ADD	Burley tobacco	Export	Potential	0.10	0.91	0.78	4234.10	6078.25	(1844.15)	(786.67)	(735.77)	(383.13)	61.42
SL ADD	Burley tobacco	Export	Potential	0.10	0.91	0.78	4203.44	5986.76	(1783.32)	(746.67)	(730.96)	(358.90)	53.21
KU ADD	Burley tobacco	Export	Potential	0.11	0.92	0.78	4205.06	5925.55	(1720.49)	(707.00)	(727.50)	(356.20)	69.88
KA ADD	Burley tobacco	Export	Potential	0.11	0.94	0.81	4042.54	5557.04	(1514.50)	(467.00)	(719.38)	(354.15)	25.70
NG ADD	Burley tobacco	Export	Potential	0.16	0.90	0.83	2613.40	3445.75	(832.35)	(541.67)	(148.75)	(179.99)	37.90
NG ADD	Cotton	Export	Potential	0.07	0.25	0.21	934.39	5513.73	(4579.34)	(4674.00)	(21.56)	78.32	37.90
KA ADD	Cotton	Export	Potential	0.07	0.26	0.21	898.70	5189.77	(4291.07)	(4408.00)	13.33	77.90	25.70
SL ADD	Cotton	Export	Potential	0.07	0.25	0.21	922.12	5346.43	(4424.31)	(4522.00)	(21.57)	66.05	53.21
LN ADD	Cotton	Export	Potential	0.08	0.25	0.21	835.89	5003.40	(4167.51)	(4305.00)	(20.10)	103.37	54.22
BT ADD	Cotton	Export	Potential	0.09	0.25	0.21	838.40	5010.24	(4171.84)	(4305.00)	(20.11)	82.10	71.17
LN ADD	Groundnuts	Export	Potential	0.22	0.38	0.41	643.83	1652.91	(1009.08)	(1600.00)	358.94	177.76	54.22
KU ADD	Groundnuts	Export	Potential	0.23	0.40	0.42	629.44	1573.78	(944.34)	(1520.00)	348.28	157.50	69.88
LL ADD	Groundnuts	Export	Potential	0.23	0.42	0.46	716.70	1599.05	(882.35)	(1474.00)	360.27	169.96	61.42
BT ADD	Hybrid maize	Export	Potential	0.28	0.74	0.71	594.11	823.19	(229.08)	(373.33)	41.81	31.27	71.17
NG ADD	Hybrid maize	Export	Potential	0.28	0.78	0.75	536.99	715.20	(178.21)	(293.33)	38.81	38.41	37.90
LN ADD	Hybrid maize	Export	Potential	0.29	0.78	0.75	537.90	709.61	(171.71)	(293.33)	38.81	28.59	54.22
LL ADD	Hybrid maize	Export	Potential	0.34	0.89	0.89	589.11	592.94	(3.83)	(133.33)	36.81	31.27	61.42
SL ADD	Hybrid maize	Export	Potential	0.44	1.03	1.10	536.10	379.89	156.21	26.67	38.81	37.52	53.21
KU ADD	Hybrid maize	Export	Potential	0.47	1.03	1.10	536.10	362.77	173.33	26.67	38.81	37.97	69.88
MZ ADD	Hybrid maize	Export	Potential	0.71	1.33	1.79	482.76	112.82	369.94	266.67	38.81	38.41	26.05
KA ADD	Hybrid maize	Export	Potential	2.99	1.90	6.98	427.63	(181.51)	609.14	506.67	38.81	37.96	25.70
NG ADD	Local Maize	Export	Potential	0.39	0.78	0.69	181.30	212.40	(31.10)	(99.00)	(7.79)	37.79	37.90
LN ADD	Local Maize	Export	Potential	0.41	0.78	0.70	180.41	201.56	(20.15)	(99.00)	(2.93)	27.56	54.22
BT ADD	Local Maize	Export	Potential	0.42	0.74	0.66	196.62	226.92	(30.30)	(126.00)	(8.30)	32.83	71.17
LL ADD	Local Maize	Export	Potential	0.50	0.89	0.77	174.15	153.69	20.46	(45.00)	(24.83)	28.87	61.42
SL ADD	Local Maize	Export	Potential	0.64	1.03	1.03	180.41	83.85	96.56	9.00	(3.12)	37.47	53.21
KU ADD	Local Maize	Export	Potential	0.72	1.03	1.04	180.85	64.10	116.75	9.00	(0.15)	38.02	69.88

Table 5.6. Con't. Nominal Protection and Effective Protection Coefficients and the Sources of Difference Between the Private and Social Profitability of Crops

Zone	Crop	Prices	Technology	DRC	NPC= A/E	EPC= (A-B)/ (E-F)	Private Profitabiltiy NPP US$/ha	Social Profitabiltiy NSP US$/ha	Net Policy Effect (O=NPP-NSP)	Prod. Price Policy (K=A-E)	Trad. Input Price (L=F-B)	Labor Credit Policies (M=G-C)	Land Policy (N=H-D)
MZ ADD	Local Maize	Export	Potential	0.83	1.33	1.48	163.30	25.99	137.31	90.00	(17.89)	39.15	26.05
KA ADD	Local Maize	Export	Potential	1.52	1.48	2.55	144.85	(41.47)	186.32	117.00	6.41	37.21	25.70
LN ADD	Phase. beans	Export	Potential	0.21	0.72	0.71	930.08	1320.04	(389.96)	(570.00)	80.15	45.67	54.22
BT ADD	Phase. beans	Export	Potential	0.21	0.72	0.71	965.51	1341.10	(375.59)	(570.00)	80.81	42.43	71.17
LL ADD	Phase. beans	Export	Potential	0.21	0.75	0.74	956.51	1232.75	(276.24)	(510.00)	80.14	42.20	61.42
MZ ADD	Phase. beans	Export	Potential	0.22	0.81	0.80	901.08	1110.11	(209.03)	(360.00)	79.48	45.44	26.05
SL ADD	Phase. beans	Export	Potential	0.22	0.77	0.76	922.11	1197.00	(274.89)	(450.00)	79.81	42.09	53.21
KU ADD	Phase. beans	Export	Potential	0.23	0.77	0.76	922.11	1180.33	(258.22)	(450.00)	79.81	42.09	69.88
KA ADD	Phase. beans	Export	Potential	0.32	1.02	1.10	872.07	697.36	174.71	25.00	78.81	45.20	25.70
NG ADD	Soyabeans	Export	Potential	0.56	1.30	1.56	522.14	199.13	323.01	186.67	63.61	34.83	37.90
BT ADD	Soyabeans	Export	Potential	0.56	1.23	1.42	539.97	224.20	315.77	151.67	63.6	29.33	71.17
LN ADD	Soyabeans	Export	Potential	0.59	1.30	1.56	520.31	182.81	337.50	186.67	63.61	33.00	54.22
LL ADD	Soyabeans	Export	Potential	0.68	1.46	1.80	539.97	128.95	411.02	256.60	63.60	29.33	61.42
SL ADD	Soyabeans	Export	Potential	0.86	1.67	2.26	516.64	43.82	472.82	326.67	63.61	29.33	53.21
KU ADD	Soyabeans	Export	Potential	0.91	1.67	2.26	516.64	27.15	489.49	326.67	63.61	29.33	69.88
MZ ADD	Soyabeans	Export	Potential	1.32	2.12	3.74	496.97	(57.35)	554.32	431.67	63.60	33.00	26.05
KA ADD	Soyabeans	Export	Potential	2.72	2.59	7.47	473.64	(150.33)	623.97	501.67	63.60	33.00	25.70

is lower than the true economic value. This is especially true for tobacco producers since the crop's gross margin exceeds the adopted average of US$1.13 (MK17), which has been used as the economic price for labor.

Government instituted a land rent of MK50.00 (US$3.3) per annum; this rent is uniform country-wide. Realizing the imperfections in the country's land market, agricultural activities were in this study assessed to re-interpret crop profits as land rent and other fixed factors (for example, management and the ability to bear risk) per hectare of land used. The computed rent value is supposedly to act as an opportunity cost for the next best alternative use of the land. The computed land values for each ADD were far much higher compared to the government instituted land rents. This signals a gross under-estimation of land rent especially in estates where high valued crops such as tobacco and paprika are being grown. Land is a scarce production factor in Malawi and use of economic principles when instituting land rentals will not only encourage efficient use of land in estates, but will also allow variation in the value of the land to reflect profitability and scarcity. The present land policy, which is based on uniform land rentals, penalizes other producers in areas where poor land quality and precarious weather conditions prevail. Therefore, these producers can only grow less profitable crops.

The nominal protection coefficient ratios in tobacco using high input technology were averaged at 0.9 (reasonably closer to one) an indication that tradable output price transfers for tobacco suffer from some minor market or policy distortions. Nevertheless, tobacco private prices are competitive but are on average 10 percent below the equivalent social prices. The difference between private (market) output and social output prices could be *inter alia* due to quality issues, policy and market distortions i.e., cess by Tobacco Control Commission (TCC) and ARET (for providing extension services) and export taxes imposed on this crop.

The combined influence of the output transfers and tradable input transfers as affecting tobacco industry were captured by the effective protection coefficient. The effective protection coefficient ratios resemble the nominal protection coefficient ratios but are slightly lower, 0.85 (Tables 5.4 and 5.5). Tradable input transfers in high input tobacco indicate a disincentive to producers as private prices of inputs, e.g. fertilizer, are slightly greater than their equivalent social prices. The high tradable input market prices can be attributed to market imperfections in both input and transport markets. The tradable output transfers in tobacco indicate that private prices are slightly lower than their equivalent social prices, this is also a disincentive to producers (lower market prices are also due to taxes, among others). The combined disincentives from tradable input transfers and tradable output transfers have resulted in the effective protection coefficient ratios to be slightly lower than nominal protection coefficient ratios (tradable output transfers). Nevertheless, the effective protection coefficient ratios are closer to one, an indication that private prices in tobacco are still competitive, irrespective of the existing minor market distortions.

5.2.3 Paprika

Net policy transfers in paprika production have reduced private profitability below the social profitability (Tables 5.4 and 5.5). The gap is wide and is largely attributed to output transfers which indicate that private producer prices are quite low as compared to their equivalent social prices. There are only a few buyers in paprika market in the country. Some paprika exporting companies are also growing paprika using smallholder farmers. These companies, e.g., Press Agriculture Limited, provide inputs to the smallholders and in-turn the farmers are obliged to sell to the companies limiting market options. Evidently, there exist some price distortions in paprika domestic market due to limited number of buyers as the crop is just new.

The tradable input transfers provide a disincentive to the producer just as in tobacco and other crops which use substantial amount of inputs (fertilizers and chemicals). Private prices of inputs are above their equivalent social prices. The high market input prices are due to high transportation costs and limited number of private traders participating in the input market. Some big companies like Optichem may still be enjoying monopoly in the input market, hence acting as price setters using some monopolistic tendencies.

The nominal protection coefficient ratio is about 0.85. This is an indication that the output transfers

are setting market producer prices below the equivalent social (world market) price. This acts as a disincentive to producers. The private producer prices are about 15 percent lower than the equivalent world market. The low private prices could also be a sign of lack of competition in terms of buyers and limited external markets for the crop. The few buyers that are available may decide on prices they will offer giving less room for bargaining, especially when they are dealing with small producing countries.

The effective protection coefficient ratio falls even lower than the nominal protection coefficient because the tradable input transfers provides a further disincentive to the producers. The effective protection coefficient ratio is 0.76.

5.2.4 Tea

The net policy transfers indicate that overall, agricultural policies are increasing net social profitability above the private profitability in tea production. The major source of this disparity is the output price transfer policy which indicates that private output prices for tea are lower than the equivalent social price. Both the capital/labour and land policies indicate that private prices are lower than the equivalent social prices. The tradable input transfers show that just as is the case with other crops, private prices are above the social prices, a disincentive to production.

The nominal protection coefficient ratio is about 0.58 (Table 5.4), an indication that private prices are considerably lower than the equivalent social prices. The effective protection coefficient ratio is again 0.58 and this reflects the joint effects of output price transfer and tradable input price transfers. It is quite obvious that for tea production and productivity to increase there is an urgent need to boost the crop's private prices which are quite low. The crop, just as is the case with other major export crops, is exposed to a some percentage of export tax and this may even squeeze and paralyse the already struggling tea industry.

5.2.5 Macadamia

The net policy transfers in macadamia production result in a wide gap between net social profitability and net private profitability. The major contributors to this disparity are the output transfers and the tradable input transfers. Private producer prices are much lower than the equivalent social price and this is penalising producers of this crop.

The nominal protection coefficient ratios are as low as 0.44 (Table 5.4), a clear indication that output transfers are responsible for the wide gap between the net social profitability and the private profitability. The joint output transfers and tradable input transfers lowers the effective protection coefficient further to a ratio of about 0.40. This means that the private input price which is slightly above the equivalent social price, provides a further disincentive to the production of macadamia. The country has a very strong comparative advantage in production of this crop and policies aimed at improving the producer prices will definitely improve production (increased hectarage) and productivity of this crop.

5.2.6 Maize

The net policy transfer for hybrid maize is negative, an indication that private profitability is lower than the social profitability. This is true only for the southern region and some parts of the central region which do not experience huge transport costs. The northern region of Malawi experience very high transportation costs if exporting through the Nacara corridor. The net policy transfer for maize in this region is positive, implying that private profitability is higher than social profitability. The export parity prices for maize in this region are low due to the high domestic transport costs which cannot be compensated by the already low world prices of maize. It should be noted also that due to the maize policy bias, the financial price for maize has often times been held in between the export and import parity prices respectively. Since the government still maintains price bands for maize, i.e., partial liberalization, private prices of maize do not differ much between regions despite the major differences in transport costs borne. The study results show that the output transfers (producer price) is a major contributor to the net policy effect (Tables 5.4 and 5.5). Private output prices are lower than equivalent social price for ADDs in the southern region and some parts in the central region e.g., Lilongwe ADD. Nevertheless, private output prices are above equivalent social prices for the northern region and the northern parts of the central region.

The nominal protection coefficients for ADDs in the southern and central regions averaged 0.84. Although this ratio is slightly lower than one, it is clear that the maize bias policies which have been pursued by the Malawi government over the years, increased market (private) prices closer to the equivalent social prices. However, the nominal protection coefficient for ADDs in the northern region averaged above one. This means that the market price of maize in the northern region is above the equivalent social price. It is should not be assumed that the private price of maize in the north is higher than other parts of the country. The huge domestic transport costs borne in the northern region, if either Nacala is used as an outlet route, impact negatively on the farm gate export parity prices of maize.

5.2.7 Soyabeans

The net policy transfers in soyabeans are increasing the net private profitability above the equivalent social prices. Output transfers are traced to be a major source of this disparity. Evidently, private prices for soyabeans are, in some producing areas, above their equivalent social prices. The social prices for soyabeans are quite low. The high cost of transporting this crop impairs farther the competitiveness of soyabeans price on the world market. The country cannot therefore efficiently produce this crop for export. Exporting the crop through Nacelle, Lilongwe, Kasungu, Salima, Mzuzu and Karonga ADDs shoulder huge transportation costs as such lose efficiency i.e., no comparative advantage, in soyabeans production. This situation can be reversed if the crop's productivity is remarkably increased and transport cost effectively reduced.

The nominal protection coefficient ratio of 1.10 (Tables 5.4 and 5.5) means that private prices are on the average higher than their equivalent social prices. Alternatively, the protectionist policies have raised the private price of soyabeans by 10 percent above the social price for importing the product. Malawi could benefit from an open trade in this case by importing more of this commodity and producing less, concentrating production only in those areas which seem to have a comparative economic advantage. Nevertheless, the economic inefficiency and the losses accruing by foregoing benefits of trade, must first be weighed against the gains from other government policies e.g., food security and income distribution especially among soyabeans producers.

5.2.8 Groundnut

The study results reveal that the net policy transfers in groundnut production have resulted in the net private profitability being lower than the net social profitability. The major source of this difference are the output transfers, capital/labour and the land transfers. The tradable input transfers have private prices higher than social, but the effects are not hard felt due to low utilization of inputs (fertilizer and chemicals) by this crop.

The nominal protection coefficient ratio of about 0.41(Table 5.5) clearly shows that the output transfers strongly influence the gap between private and social profitability in the net transfers. The private prices of groundnuts are too low compared to the equivalent social prices. The prices of groundnuts have been suppressed for a long time as the government in pursuance of food self-sufficiency policy, supported maize production by deliberately offering it a relatively high market price while simultaneously suppressing prices (implicit taxes) of other competing crops. There was an on and off export ban imposed on the crop which meant that beans would only be grown for domestic consumption exposing it continuously to low prices. Only ADMARC was allowed to export the crop. The export ban was justified by the government claiming that private traders lacking adequate knowledge in processing groundnuts for export, were exporting low quality nuts without observing the recommended moisture content levels. High levels of aflatoxin were therefore being recorded in such groundnut export. Although the ban was lifted in the wake of output market liberalization, prices have not increased enough to attract large scale producers especially from those areas where more lucrative crops like tobacco are being grown. The productivity of the crop remains low and production levels still struggling. This crop demands less chemicals and is therefore not hazardous to the environment. With its reasonably high social price on the world market and the strong domestic resource cost ratios the country has, groundnuts are one crop the government can seriously consider for diversification.

5.2.9 Phaseolous Beans

The net policy effect indicates that overall, agricultural policies increase the net social profitability over the private profitability. The major source of difference is the output transfer which shows lower private price than equivalent social prices. The lower output market prices are attributed *inter alia* to lack of organization of smallholder producers who are scattered all over the country. This means that private traders bear huge transport costs in assembling and transporting the crop to the final markets. Otherwise, this is one of the crops experiencing a remarkable rise in price due to its demand in the country and within the region.

The nominal protection coefficient ratio of 0.75 (Table 5.5) entails that the output transfers have resulted in reduced output market prices by almost 25 percent below the equivalent social prices. What is being observed may be a result of past restrictive agricultural policies which are still haunting and dictating the performance of agriculture even though the output-market has been liberalized. Phaseolous beans marketing has been very restrictive due to the crop's nutritional importance in smallholder households. Hence, for the past decade, formal exports have been very minimal. Domestic prices for the crop were severely suppressed, and thus, the effects of such long time distortions cannot be over-turned within this short period of output market liberalization.

5.2.10 Cotton

Although the production cotton is one of the crops the country has a very strong comparative advantage, this study indicates that the crop's net private profitabilities are far below the net social profitabilities. The major discrepancy causing this wide difference is traced to the output transfers. There is convincing evidence (Table 5.5) to indicate that market prices of cotton are far below the equivalent social price. This is a major disincentive which has dissuaded potential investors from the estate sub-sector in spite of having very strong domestic resource cost ratios, signalling efficiency in the use of the scarce factor inputs, e.g., land. There has been a deliberate government policy that restricted private traders from participating in the marketing of cotton, giving autonomy to ADMARC as an exclusive buyer. ADMARC also bought cotton on behalf of David Whitehead and Sons, the only cloth manufacturing industry in Malawi. This protectionist policy was tailored to support what was believed to be an infant clothing industry. The nominal protection coefficient ratio of cotton was found to be around 0.2. This means that the protectionist policy i.e., providing cheap raw materials for this infant clothing industry by implicitly taxing producers (suppressing domestic prices) and restricting exports of cotton, resulted in cotton private prices being almost 80 percent below the equivalent social price. Though the commodity market has been liberalized, cotton prices remain suppressed because there is lack of competition in the market which ADMARC still dominates. ADMARC and National Seed Company of Malawi (NSCM) are the only major buyers with well-developed infrastructure for storage and processing, giving them a comparative advantage in the marketing of cotton. Government policies aimed at encouraging private sector participation in cotton marketing will not only boost market prices of cotton through market competition, but also attract large investment from the estate sub-sector. Eventually, both cotton productivity and production levels would tremendously improve.

Tradable input transfer indicate that private prices of agricultural inputs are slightly above social prices. Cotton producers, and those of crops using a lot of chemicals in their production, e.g., tobacco and paprika, are paying higher market prices for the tradable inputs than the equivalent social prices. This is attributed to the high transport cost but also due to other market imperfections and marketing policies, e.g., 10 percent sales tax on chemicals.

Capital/labour transfers are overall providing an incentive to producers, i.e., market prices for capital are higher than the equivalent social prices. Capital valuation was based on a percentage of tradable inputs. Tradable input prices due to the high cost of transporting, *inter alia*, were relatively above the equivalent social price and therefore influencing a higher market (private) price of capital. Wage rate valued at market price for both low and high input technologies is lower than the equivalent social price. This is an incentive to producers as they buy labor cheaper than its equivalent social price.

6. Summary and Conclusion

This study has demonstrated that there is a comparative advantage in most of the zones (ADDs) for production of most of the crops which were selected for this study. The following crops have exceptionally strong domestic resource cost ratios: cotton, paprika, macadamia, tobacco and groundnuts in all the areas of production. These crops, with exception of tobacco which is now experiencing declining world demand due to the anti-smoking campaigns, need to be emphasized as the country's major export crops. All these crops have a very strong demand on the world market, exceptionally attractive social prices (world market prices) and it would therefore be worthwhile to invest in these commodities as an viable option to widen the export basket of the country. There is a reasonable comparative economic advantage in production of hybrid maize as indicated by the domestic resource cost ratios, ranging between 0.35 and 0.88; 0.42 and 0.76, growing under high and low input technological levels, respectively. However, the comparative advantage in hybrid maize production is lost in zones far of from the outlet, i.e., Nacala, due to huge transport costs borne in those areas. There is no comparative advantage in local maize and soybeans production in most of the zones. Only Ngabu has a comparative advantage in soyabeans, produced as an export crop. Lack of comparative advantage in these crops is traced from low world market prices especially for soyabeans, and low productivity (yield per hectare), major determinants of comparative advantage. These bulky crops also suffer from high transportation costs, hence export prices are uncompetitive on the world market.

The study has also revealed also that production efficiency of most of the crops can greatly be increased with increased productivity. The domestic resource cost ratios for most of the crops were strengthened when computations were done using potential yields. Sensitivity analysis on price has demonstrated that changes in input prices impact on the domestic resource ratios, hence influence the comparative economic advantage. To note, however, is the fact that crops which utilize a lot of inputs such as fertilizer and chemicals felt the impact due to input price changes more. Some crops demand a lot of inputs, but presently, farmers, especially smallholders, are applying low levels. In such instances, the impacts were less felt. It was noted that not all crops would benefit from input price decreases unless such a reduction translates in increased application of inputs to the recommended levels. If farmers take advantage of input price reductions to apply recommended levels of inputs, and thus in-turn increase productivity of the crop, crops like cotton, paprika and tobacco would benefit from such policies. In the absence of input subsidies, a viable avenue to offer reasonable input prices is to encourage private sector participation in the input market through loans, provision of proper and adequate infrastructure in the form of market and storage facilities. There is a great need for the restructuring of the transportation market to improve the efficiency of service delivery and offer competitive price for such services. Efficiency in the transport sector will effectively reduce the burden which has been mostly shouldered by producers and consumers through exorbitant input and commodity prices respectively.

It is believed that market input prices were extremely unbearable (exorbitant) especially at the beginning of this study (1996) because the Malawi currency (Malawi Kwacha) had not yet regained from the major successive devaluations of 1994/1995 and the previous years, hence importing costs were quite high. This is the period (1994) that a managed float system was adopted with the Malawi Kwacha being floated against the U.S. dollar. Also, the input market was liberalized in 1995 and only few private traders were in play. With this background, input prices, although high during the study period, are expected to be competitive, assuming there is more participation of private traders in the market to encourage effective competition, cheaper supply sources of inputs are discovered, and an effective reduction in transportation costs.

This study focused on low input producers (smallholders) and high input producers. Previously,

these two sub-sectors which are distinctively identified by the land tenurial systems, smallholder being exclusively customary and estates falling under leasehold, followed different marketing and pricing policies before the input and commodity market liberalization in 1995. In the prevalence of market liberalization, it means that these two sub-sectors are now exposed to the same policy environment. The impact of different policies, e.g., the pricing and marketing policies may nevertheless vary between the different technologies (smallholder and estate) and between crops due to differences in the scales of operation. It is being argued in this study that although the country has a new policy environment, the previous agricultural policies are still impacting on the performance of the different agricultural sub-sectors. For example, the effect of the protectionist policy in support of maize production in the country, i.e., suppressing output prices for other competing crops, may take some time to be corrected by the benefits from output market liberalization. After three years of market liberalization, other traditional export crops like cotton and groundnuts, still have nominal protection coefficients as low 0.2 and 0.41, respectively. This means that cotton market prices are 80 percent below the equivalent social price. while groundnuts prices were about 60 percent below the social price. This is a clear indication of suppression mainly due to the previous protectionist policies which implicitly taxed producers. The low private sector participation in both input and commodity markets also leaves room for some well established companies and parastatals like ADMARC and Optichem to employ monopoly tendencies in setting prices. Furthermore, most private traders are operating with minimal capital and as such fail to effectively challenge these giant organizations. It will therefore require some time for crops like cotton, whose market is dominated by the National Seed Company of Malawi (NSCM) and ADMARC, to benefit from market liberalization. As long as there is minimal competition in the market, and there are limited market outlets for producers, prices for most of the commodities will still remain low. This is the case of such crops like cotton, where ADMARC is still the major buyer and price leader.

The study compared the net private and social profitabilities, and sources of disparity between the two were traced. The study revealed output transfers as being a major influence in the net policy effect in the agricultural sector. Thus, the wider gap between net social and net private profitability is mainly a result of low commodity market prices. The low or suppressed commodity market prices are a result of several factors some of which are not policy related but rather due to market imperfections *inter alia*. Commodities like tobacco and tea are exposed to export taxes and cess. There is lack of competition in marketing of certain commodities leading to low prices offered by the dominant buyers. In the commodity market where only few buyers are in play, such as in cotton and paprika, collusion in price setting cannot be over-ruled. It is often said that producers, especially smallholders, are highly scattered and lack organization. This means that private traders incur high transport costs in the assembling of commodities from these small and scattered pockets of production. To compensate for the high transport costs, private traders usually offer lower market prices. Since the study results indicate that private profitabilities for most of the cash crops are far below the social profitability, it can be concluded that the government is taxing away a portion of the social profits for the commercial farmers (both smallholder and estate). This acts as a hindrance of efforts at aimed increasing production.

7. Policy Recommendations

- Although input and output markets have been liberalized, effects from the past government restrictive policies are still being felt especially in the smallholder sub-sector. Both input and commodity markets lack meaningful competition due to low private sector participation, lack of perfect market information, poor market infrastructure, etc. Efforts have to be made in order to facilitate more and effective participation of the private sector in the market to create an effective competition hence offer more competitive prices (input and commodity prices).
- The few private traders operating in the commodity market insist that the low prices offered to smallholder farmers are intended as compensation for the huge transport costs borne in assembling the commodities and transporting to final markets. Smallholder farmers are producing usually in small pockets and are geographically scattered and unorganized. Formation of smallholder farmer associations is seen as a workable solution, to assist and protect these vulnerable farmers who individually cannot influence price. The associations should also aim at organizing the farmers and even take the lead in the assembling of smallholder produce. The government can only act as a facilitator, eg., provide loans, to the associations for major necessities like vehicles.
- The country does not have any comparative economic advantage in production of local maize and soybeans. The following are suggested as alternative policy avenues:

Soybeans production should only be concentrated in areas of efficiency, i.e., where there is comparative advantage, and import the deficit from other parts of the country and beyond the borders to suffice needs. Thus, the country should encourage open trade policies which aim at exploiting the underlying comparative economic advantage within the region. Production of soybeans for domestic consumption should be supported by the establishment of local agro-processing industries bearing in mind that the crop cannot be efficiently produced for export. Also, it requires extensive processing and therefore cannot be locally handled by farmers.

Most zones (ADDs) have a reasonable comparative economic advantage in hybrid maize production. This crop, unlike local maize which dominates most of the smallholder land, is high yielding and is therefore a viable option for diversification. High adoption levels of hybrid maize varieties, especially among smallholder farmers, entails increased maize productivity (yield per hectare) and production levels without opening new land for cultivation. Past maize production increases were based on land increase. It is believed in this study that if smallholder maize productivity is increased, i.e., by high adoption of hybrid varieties, some of the land tied under local maize production will be released for other crops without necessarily threatening production.

- There are lying comparative economic advantage in agricultural production and trade within the region. This has been demonstrated by the recent studies on informal cross-border trade covering Eastern and Southern Africa, commissioned by TechnoServe in Kenya. According to Malawi study results, Minde and Nakhumwa (1996) reported that a significant trade volume of about 21,000mt in food commodities alone took place informally across the borders of Malawi and her neighbors (Tanzania, Zambia and Mozambique) during the 1995/1996 agricultural season only. The study also revealed that some of the commodities being extensively traded are the ones which are usually subjected to intermittent export bans, such as pulses and maize grain. Governments within the region may need to learn that issues of food security cannot be dealt with single handedly as the in-ward orientation trade policies, which emphasized self-food sufficiency, seemed to suggest. Rather, food security must have a regional approach.

- The country should target and intensify production of paprika, cotton, macadamia and groundnuts as major export crops because of the crops' high and stable demand in the foreseeable future on the world market, and also due to their high social prices and profit (paprika) which would match that of tobacco considering all production and marketing costs involved.
- High transport costs frustrate any effort to improve efficiency in trade, both at national and regional levels. A lot of Malawian agricultural commodities can have competitive domestic and export parity prices if the transport cost component is effectively reduced in the cost of production. Hence, government should seriously consider improving the road infrastructure and transportation market as a whole in a move to facilitate trade within and across the borders. A regional approach to the transportation problem would be a most viable option in order to remove the unnecessary delays which impinge on trade between countries. Unnecessary checks of cargo (physical opening) from neighboring countries not only delays trade but also creates mistrust and sometimes result in pilferage. Hence, regional trade protocols should not overlook the importance of having friendly transport policies in place across the countries of southern and eastern Africa.
- The current government instituted a land rent policy, which is based on uniform price country-wide. In principle, this policy favors the estates especially those producing lucrative export crops like tobacco. This land rent policy lacks economic justification and is therefore not aimed at promoting efficiency in land use. In absence of a well-established land market, crop enterprise budgets would provide a reasonable alternative based on principle of opportunity cost ie., best alternative use to land being the land rent. Land rent would take due consideration of crops grown in the area and types of soil. The result would be variations in rent across country. This approach to land rent determination would encourage producers to allocate land to high valued crops and also avoid cases of keeping land idle.
- The government and private sector should seriously consider investing in market research. Regional markets should also be explored, as often times African governments have rushed to markets beyond the region, shouldering huge transport costs in the process.

8. Endnotes

[1] By 1989 the countries were Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zambia, and Zimbabwe. Currently, South Africa, Namibia, and Mauritius, and Democratic Republic of Congo are on the list, making a total of twelve countries.

[2] Market failures in Malawian agriculture have been mostly a result of government policies, either directly due to explicit policies or indirectly due to market imperfections.

[3] Defined as the time period in which rainfall exceeds ½ the potential evapotranspiration.

[4] From the Land Resource Evaluation Project, Field Document #30 (1991).

9. Bibliography

Ackello-Ogutu, C., (1996). Methodologies for estimating informal cross-border trade in eastern and southern Africa. SD Publication series, office of sustainable development bureau for Africa, USAID, 1995.

Badiane, O. and Delgado C., (1995) Macroeconomic Policies and the Contribution of Agriculture to Regional Economic Development.

Banda, G.C., and Mndalasini, A.C.,(1996) Supply Survey of Malawian Products with Potential for Export Development.

Clements, K.W. and Sjaastad, L.A. "How Protection Taxes Exporters." Thames Essay 39. Trade Policy Centre, London, U.K., 1984.

Derosa, D.A. Protection and Export Performance in Sub-Saharan Africa. Weltwirt Scheftliches Archives. 128(1): 88-129, 1992.

Dornbush, R. "Tariffs and Non-Traded Goods." Journal of International Economics 4: 177-187, 1974.

Edwards S. Real Exchange Rates, Devaluation and Adjustment. Exchange Rate Policy in Developing Countries. Cambridge, Mass., U.S.: MIT Press, 1989.

Economist Intelligence Unit (EIU), (1993). Country Profile Malwi. 15 Regent Street, London, United Kingdom.

Economist Intelligence Unit, Second Quarter, (1994). Country Profile Mozambique and Malwi. 15 Regent Street, London, United Kingdom.

Economist Intelligence Unit, Fourth Quarter, (1994). Country Profile Mozambique and Malwi. 15 Regent Street, London, United Kingdom

Fitzgerald, E.V.K.,(1985) Public Sector Investment Planning for Developing Countries. Higher and Further Education Division Macmillan Publishers LTD. Houndmills,Basingstoke, Hampshire RG 21 2XS and London.

Hyman, E.L.,(1993) Agricultural Diversification in Malawi. World Bank. July 20,1993.

Jansen D., and Hayes, I., (1994) Agricultural Diversification Part I, Methodological Framework and Indicative Results Part II: Analysis of Diversification Options and Constraints.

Krueger, A.O., Schiff M., and Valdes A. Agricultural Incentives in Developing Countries. Measuring the effects of sectoral and economy wide policies: World Bank Economic Review 2 (3): 225-271, 1988.

Koester, U. (1986) Regional Cooperation Among Developing Countries to Improve Food Security in Southern and Eastern African Countries. International Food Policy Research Institute. Research Report No.53, Washington, DC.

Malawi Government, (1984). Malawi Agricultural Diversification. Agriculture Communication Branch, Ministry of Agriculture. Lilongwe, Malawi.

Malawi Government, (1990).Guide to Agricultural Production in Malawi. Agriculture Communication Branch, Ministry of Agriculture. Lilongwe, Malawi.

Malawi Government, (1993). Guide to Agricultural Production in Malawi. Agriculture Communication Branch, Ministry of Agriculture. Lilongwe, Malawi.

Masters and Winter-Nelson, (1995) Comparative Advantage and Government Policy in Zimbabwean Agriculture.

Minde I.J.,and Nakhumwa T.O., (1996) Informal Cross-Border Trade between Malawi and her neighbors. Final Report February, 1997.

Study conducted for TechnoServe Inc. by the Agricultural Policy Research Unit, Bunda College of Agriculture.

Ministry of Agriculture, (1994) in World Bank report, Malawi Agricultural Diversification, (1993). Agricultural Sector Study under TAF/ADF Grant. Final Report Vol.1. Main report CODA and Partners, Nairobi, Kenya.

Mkandawire, R., Jaffee, S., and Bertoli, S., (1990). "Beyond Dualism: The Changing Face of Leasehold Estate Sub-Sector of Malawi." Lilongwe, Bunda College of Agriculture and Institute of Development Anthropology, Binghampton, New York State, USA.

Morris, M.L., (1990). Determining Comparative Advantage Through Domestic resource Cost (DRC) Analysis: Guidelines emerging from CIMMYT's experience. CIMMYT Economics Paper No.1 Mexico, D.F.: CIMMYT.

Nakhumwa, T.O., (1994) Marketing Margins for Private Traders in Malawi: The Case of Lilongwe and Dedza Districts. Agricultural Economics Analysis and Rural Development, Vol 4, No. 2, Journal for the University Departments of Agricultural Economics in Southern Africa.

Nakhumwa T.O., (1995). Methodology of Comparative Advantage in Malawian Agriculture. MSc Thesis in Agricultural Economics, submitted to the Faculty of Agriculture, University of Malawi.

Ng'ong'ola D.H., (1996) Analysis of Policy Reform and Structural Adjustment programs in Malawi with Emphasis on Agriculture, and Trade. Washiton DC: United States Agency for Development, 1996(Xviii,84p) SD Publication Series; Office of Sustainable Development, Bureau for Africa; Technical Paper No. 33

Pearson, S.R., and Monke, E.A.(1989), The Policy Analysis Matrix for Agricultural Development. Cornell University Press,1989.

Ricardo, D.(1821). The Principles of Political Economy and Taxation, 3rd Edition, Johan Murray, London

Salinger B.L. and Stryker J.D. Exchange Rate Policy and Implications for Agricultural Market Integration in West Africa. Cambridge, Mass., USA: Associates for International Resources and Development, 1991.

Simler, Kenneth (1993) Sources of Growth in Malawi. Past Trends and Future Prospects : Cornell University, 1993. Working paper prepared for World Bank, Malawi Agricultural Sector Memorandum(Structural Adjustment- Economic Policy)

Simons, S.,(1994). Analysis of Policy Options and Impacts for Phase II of the Agricultural sector Assistant program. Prepared under the Agricultural Policy Analysis Project for USAID/ Malawi.

Tsakok Isabelle (1990), Agricultural Price Policy and Practitioner's Guide to Partial Equilibrium Analysis. Cornell University Press.Ithaca and London

World Bank, (1989). "Malawi Food Security Report". World Bank Washington DC.

World Bank, (1993). Malawi Agricultural Diversification. Agricultural Sector Study under TAF/ ADF Grant. Final Report Vol.1. Main report CODA and Partners, Nairobi, Kenya.

Young, A., and Brown P., (1962) The Physical Environment of Northern Nyasaland with Special Reference to Soils and Agriculture. Government Print, Zomba, Nyasaland.

Appendix A

Establishing Economic (Social) Prices for Outputs, 1996 Season

Table A.1 Burley Tobacco

	Blantyre ADD	Ngabu ADD	Liwonde ADD	Lilongwe ADD	Salima ADD	Kasungu ADD	Mzuzu ADD	Karonga ADD
FOB Bombey	2176.50	2176.50	2176.50	2176.50	2176.50	2176.50	2176.50	2176.50
Plus freight /insurance/ handling to Nacala(US$/t)	93.33	93.33	93.33	93.33	93.33	93.33	93.33	93.33
Equals CIF Nacala(US$/t)	2269.83	2269.83	2269.83	2269.83	2269.83	2269.83	2269.83	2269.83
Plus freight to Blantyre(US$/t)	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00
Equals CIF Blantyre(US$/t)	2314.83	2314.83	2314.83	2314.83	2314.83	2314.83	2314.83	2314.83
Plus handling charge/domestic transport(US$/t)	16.00	21.73	21.73	45.07	58.40	61.60	94.00	120.00
Import parity price(US$/110kg bale)	256.14	256.77	256.77	259.33	260.79	261.15	264.71	267.56
Import parity price(US$/kg)	2.33	2.33	2.33	2.36	2.37	2.37	2.41	2.43
Minus freight /insurance to Blantyre(US$/t)	138.33	138.33	138.33	138.33	138.33	138.33	138.33	138.33
Equals FOB Blantyre(US$/t)	2176.50	2176.50	2176.50	2176.50	2176.50	2176.50	2176.50	2176.50
Equals FOB Blantyre (US$/110kg bale)	239.18	239.18	239.18	239.18	239.18	239.18	239.18	239.18
Equals FOB Blantyre(US$/kg)	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17
Minus handling charge/domestic transport(US$/t)	16.00	21.73	21.73	45.07	58.40	61.60	94.00	120.00
Equals export parity at farm gate(US$/110 kg bag)	237.42	236.79	236.79	234.22	232.76	232.41	228.85	225.99
Equals export parity at farm gate(US$/kg)	2.16	2.15	2.15	2.13	2.12	2.11	2.08	2.05

Table A.2 Maize

	Blantyre ADD	Ngabu ADD	Liwonde ADD	Lilongwe ADD	Salima ADD	Kasungu ADD	Mzuzu ADD	Karonga ADD
CIF Rotterdam	363.00	363.00	363.00	363.00	363.00	363.00	363.00	363.00
Minus freight/insurance/handling from Blantyre via Beira	169.83	169.83	169.83	169.83	169.83	169.83	169.83	169.83
Equals FOB Blantyre(US$/t)	193.17	193.17	193.17	193.17	193.17	193.17	193.17	193.17
Minus port charge/domestic transport(US$/t)	16.00	21.73	21.73	45.07	58.40	61.60	94.00	120.00
Equals export parity at farm gate(US$/t)	177.17	171.43	171.43	148.10	134.77	131.57	99.17	73.17
Equals export parity at farm gate (US$/kg)	0.18	0.17	0.17	0.15	0.13	0.13	0.10	0.07
Equals FOB Blantyre (US$/t)	193.17	193.17	193.17	193.17	193.17	193.17	193.17	193.17
Plus freight/insurance/handling to Rotterdam	169.83	169.83	169.83	169.83	169.83	169.83	169.83	169.83
Equals CIF Blantyre(US$/t)	363.00	363.00	363.00	363.00	363.00	363.00	363.00	363.00
Plus handling charge/domestic transport(US$/t)	16.00	21.73	21.73	45.07	58.40	61.60	94.00	120.00
Equals import parity farm gate(US$/t)	379.00	384.74	384.74	408.07	421.40	424.60	457.00	483.00
Equals import parity farm gate(US$/kg)	0.38	0.38	0.38	0.41	0.42	0.42	0.46	0.48

Table A.3 Groundnuts

	Blantyre ADD	Ngabu ADD	Liwonde ADD	Lilongwe ADD	Salima ADD	Kasungu ADD	Mzuzu ADD	Karonga ADD
CIF Tiburry	1488.00	1488.00	1488.00	1488.00	1488.00	1488.00	1488.00	1488.00
Minus freight/insurance/handling from Blantyre via Beira	169.83	169.83	169.83	169.83	169.83	169.83	169.83	169.83
Equals FOB Blantyre(US$/t)	1318.17	1318.17	1318.17	1318.17	1318.17	1318.17	1318.17	1318.17
Minus port charge/domestic transport(US$/t)	16.00	21.73	21.73	45.07	58.40	61.60	94.00	120.00
Equals export parity at farm gate(US$/t)	1302.17	1296.43	1296.43	1273.10	1259.77	1256.57	1224.17	1198.17
Equals export parity at farm gate (US$/kg)	1.30	1.30	1.30	1.27	1.26	1.26	1.22	1.20
Equals F.O.B Blanyre(US$/t)	1318.17	1318.17	1318.17	1318.17	1318.17	1318.17	1318.17	1318.17
Plus freight/insurance from Tiburry	169.83	169.83	169.83	169.83	169.83	169.83	169.83	169.83
Equals C.I.F Blantyre(US$/t)	1488.00	1488.00	1488.00	1488.00	1488.00	1488.00	1488.00	1488.00
Plus handling charge/domestic transport(US$/t)	16.00	21.73	21.73	45.07	58.40	61.60	94.00	120.00
Equals import parity farm gate(US$/t)	1504.00	1509.74	1509.74	1533.07	1546.40	1549.60	1582.00	1608.00
Equals import parity farm gate(US$/kg)	1.50	1.51	1.51	1.53	1.55	1.55	1.58	1.61

Table A.4 Beans

	Blantyre ADD	Ngabu ADD	Liwonde ADD	Lilongwe ADD	Salima ADD	Kasungu ADD	Mzuzu ADD	Karonga ADD
CIF Tiburry	880.00	880.00	880.00	880.00	880.00	880.00	880.00	880.00
Minus freight/insurance/handling from Blantyre via Beira	169.83	169.83	169.83	169.83	169.83	169.83	169.83	169.83
Equals FOB Blantyre (US$/t)	710.17	710.17	710.17	710.17	710.17	710.17	710.17	710.17
Minus port charge/domestic transport (US$/t)	16.00	21.73	21.73	45.07	58.40	61.60	94.00	120.00
Equals export parity at farm gate (US$/t)	694.17	688.43	688.43	665.10	651.77	648.57	616.17	590.17
Equals export parity at farm gate (US$/kg)	0.69	0.69	0.69	0.67	0.65	0.65	0.62	0.59
Equals F.O.B Blantyre(US$/t)	710.17	710.17	710.17	710.17	710.17	710.17	710.17	710.17
Plus freight/insurance/handling to Tiburry	169.83	169.83	169.83	169.83	169.83	169.83	169.83	169.83
Equals C.I.F Blantyre	880.00	880.00	880.00	880.00	880.00	880.00	880.00	880.00
Plus handling charge/domestic transport(US$/t)	16.00	21.73	21.73	45.07	58.40	61.60	94.00	120.00
Equals import parity farm gate(US$/t)	896.00	901.74	901.74	925.07	938.40	941.60	974.00	1000.00
Equals import parity farm gate(US$/kg)	0.90	0.90	0.90	0.93	0.94	0.94	0.97	1.00

Table A.5 Tea

	Blantyre ADD	Ngabu ADD	Liwonde ADD	Lilongwe ADD	Salima ADD	Kasungu ADD	Mzuzu ADD	Karonga ADD
CIF Rotterdam	1920.00	1920.00	1920.00	1920.00	1920.00	1920.00	1920.00	1920.00
Minus freight/insurance/handling from Blantyre via Beira	186.50	186.50	186.50	186.50	186.50	186.50	186.50	186.50
Equals FOB Blantyre (US$/t)	1733.50	1733.50	1733.50	1733.50	1733.50	1733.50	1733.50	1733.50
Minus port charge/domestic transport (US$/t)	16.00	21.73	21.73	45.07	58.40	61.60	94.00	120.00
Equals export parity at farm gate (US$/t)	1717.50	1711.77	1711.77	1688.43	1675.10	1671.90	1639.50	1613.50
Equals export parity at farm gate (US$/kg)	1.72	1.71	1.71	1.69	1.68	1.67	1.64	1.61

Table A.6 Soyabeans

	Blantyre ADD	Ngabu ADD	Liwonde ADD	Lilongwe ADD	Salima ADD	Kasungu ADD	Mzuzu ADD	Karonga ADD
CIF Rotterdam	285.00	285.00	285.00	285.00	285.00	285.00	285.00	285.00
Minus freight/insurance/handling from Blantyre via Beira	116.25	116.25	116.25	116.25	116.25	116.25	116.25	116.25
Equals F.O.B Blantyre (US$/t)	168.75	168.75	168.75	168.75	168.75	168.75	168.75	168.75
Minus port charge/domestic transport (US$/t)	16.00	21.73	21.73	45.07	58.40	61.60	94.00	120.00
Equals export parity farm gate (US$/t)	152.75	147.02	147.02	123.68	110.35	107.15	74.75	48.75
Equals export parity farm gate (US$/kg)	0.15	0.15	0.15	0.12	0.11	0.11	0.07	0.05
Equals FOB Blantyre (US$/t)	168.75	168.75	168.75	168.75	168.75	168.75	168.75	168.75
Plus freight/insurance/handling to Tiburry	116.25	116.25	116.25	116.25	116.25	116.25	116.25	116.25
Equals CIF Blantyre	285.00	285.00	285.00	285.00	285.00	285.00	285.00	285.00
Plus handling charge/domestic transport (US$/t)	16.00	21.73	21.73	45.07	58.40	61.60	94.00	120.00
Equals import parity farm gate (US$/t)	301.00	306.73	306.73	330.07	343.40	346.60	379.00	405.00
Equals import parity farm gate (US$/kg)	0.30	0.31	0.31	0.33	0.34	0.35	0.38	0.41

Table A.7 Cotton

	Blantyre ADD	Ngabu ADD	Liwonde ADD	Lilongwe ADD	Salima ADD	Kasungu ADD	Mzuzu ADD	Karonga ADD
FOB Rotterdam	1650.00	1650.00	1650.00	1650.00	1650.00	1650.00	1650.00	1650.00
Plus freight/insurance/handling to Blantyre via Beira	333.33	333.33	333.33	333.33	333.33	333.33	333.33	333.33
Equals CIF Blantyre (US$/t)	1983.33	1983.33	1983.33	1983.33	1983.33	1983.33	1983.33	1983.33
Plus handling charge/domestic transport (US$/t)	16.00	21.73	21.73	45.07	58.40	61.60	94.00	120.00
	1999.33	2005.06	2005.06	2028.40	2041.73	2044.93	2077.33	2103.33
Import parity price (US$/kg)	2.00	2.01	2.01	2.03	2.04	2.04	2.08	2.10
Equals CIF Blantyre(US$/t)	1983.33	1983.33	1983.33	1983.33	1983.33	1983.33	1983.33	1983.33
Minus freight/insurance/handling to Blantyre (US$/t)	333.33	333.33	333.33	333.33	333.33	333.33	333.33	333.33
Equals FOB Blantyre (US$/t)	1650.00	1650.00	1650.00	1650.00	1650.00	1650.00	1650.00	1650.00
Minus port charge/domestic transport (US$/t)	16.00	21.73	21.73	45.07	58.40	61.60	94.00	123.33
Equals export parity at farm gate (US$/t)	1634.00	1628.27	1628.27	1604.93	1591.60	1588.40	1556.00	1526.67
Equals export parity at farm gate (US$/kg)	1.63	1.63	1.63	1.60	1.59	1.59	1.56	1.53

Appendix B

Establishing Economic (Social) Price for Inputs

Table B.1 Calcium Ammonium Nitrate(CAN)

	Blantyre ADD	Ngabu ADD	Liwonde ADD	Lilongwe ADD	Salima ADD	Kasungu ADD	Mzuzu ADD	Karonga ADD
CIF, Blantyre(US$/t)	280.4	280.4	280.4	292.75	292.75	292.75	314.04	314.04
Price(US$/50kg bag)	14.02	14.02	14.02	14.6375	14.6375	14.6375	15.702	15.702
Plus retailing margin/packaging 25%	3.505	3.505	3.505	3.659375	3.659375	3.659375	3.9255	3.9255
Equals social price retail price,Bt.	17.525	17.525	17.525	18.296875	18.296875	18.296875	19.6275	19.6275
plus transport to farm(US$/50kg bag)	1.33	2.00	2.00	1.33	2.00	2.00	1.33	2.67
Equals on-farm social price	18.86	19.53	19.53	19.63	20.30	20.30	20.96	22.29
Actual price paid on market (US$/50 kg bag)	22.8	22.8	22.8	22.8	22.8	22.8	22.8	22.8
Conversion ratio market to social price	0.83	0.86	0.86	0.86	0.89	0.89	0.92	0.98

Table B.2 23:21:0+4S

	Blantyre ADD	Ngabu ADD	Liwonde ADD	Lilongwe ADD	Salima ADD	Kasungu ADD	Mzuzu ADD	Karonga ADD
CIF, Blantyre(US$/t)	347.4	347.4	347.4	359.75	359.75	359.75	381.04	381.04
Price (US$/50kg bag)	17.37	17.37	17.37	17.99	17.99	17.99	19.05	19.05
Plus retailing margin/packaging 25%	4.34	4.34	4.34	4.50	4.50	4.50	4.76	4.76
Equals social price retail price,Bt.	21.71	21.71	21.71	22.48	22.48	22.48	23.82	23.82
Plus transport to farm (US$/50kg bag)	1.33	2.00	2.00	1.33	2.00	2.00	1.33	2.67
Equals on-farm social price	23.05	23.71	23.71	23.82	24.48	24.48	25.15	26.48
Actual price paid on market (US$/50 kg bag)	23.14	23.14	23.14	23.14	23.14	23.14	23.14	23.14
Conversion ratio market to social price	1.00	1.02	1.02	1.03	1.06	1.06	1.09	1.14

Table B.3 Sulphate of Ammonia

	Blantyre ADD	Ngabu ADD	Liwonde ADD	Lilongwe ADD	Salima ADD	Kasungu ADD	Mzuzu ADD	Karonga ADD
CIF, Blantyre(US$/t)	226.4	226.4	226.4	238.75	238.75	238.75	260.04	260.04
Price (US$/50kg bag)	11.32	11.32	11.32	11.94	11.94	11.94	13.00	13.00
Plus retailing margin/packaging 25%	2.83	2.83	2.83	2.98	2.98	2.98	3.25	3.25
“Equals social price retail price,Bt.”	14.15	14.15	14.15	14.92	14.92	14.92	16.25	16.25
Plus transport to farm (US$/50kg bag)	1.33	2.00	2.00	1.33	2.00	2.00	1.33	2.67
Equals on-farm social price	15.48	16.15	16.15	16.26	16.92	16.92	17.59	18.92
Actual price paid on market (US$/50 kg bag)	18.93	18.93	18.93	18.93	18.93	18.93	18.93	18.93
Conversion ratio market to social price	0.82	0.85	0.85	0.86	0.89	0.89	0.93	1.00

Table B.4 Super “D” Compound

	Blantyre ADD	Ngabu ADD	Liwonde ADD	Lilongwe ADD	Salima ADD	Kasungu ADD	Mzuzu ADD	Karonga ADD
CIF, Blantyre(US$/t)”	371.4	371.4	371.4	383.75	383.75	383.75	405.04	405.04
Price (US$/50kg bag)	18.57	18.57	18.57	19.1875	19.1875	19.1875	20.252	20.252
Plus retailing margin/packaging 25%	4.6425	4.6425	4.6425	4.796875	4.796875	4.796875	5.063	5.063
“Equals social price retail price,Bt.”	23.2125	23.2125	23.2125	23.984375	23.984375	23.984375	25.315	25.315
Plus transport to farm (US$/50kg bag)	1.33	2.00	2.00	1.33	2.00	2.00	1.33	2.67
Equals on-farm social price	24.55	25.21	25.21	25.32	25.98	25.98	26.65	27.98
Actual price paid on market (US$/50 kg bag)	28.13	28.13	28.13	28.13	28.13	28.13	28.13	28.13
Conversion ratio market to social price	0.87	0.90	0.90	0.90	0.92	0.92	0.95	0.99

Table B.5 Urea

	Blantyre ADD	Ngabu ADD	Liwonde ADD	Lilongwe ADD	Salima ADD	Kasungu ADD	Mzuzu ADD	Karonga ADD
CIF, Blantyre (US$/t)	356.40	356.40	356.40	368.75	368.75	368.75	390.04	390.04
Price (US$/50kg bag)	17.82	17.82	17.82	18.44	18.44	18.44	19.50	19.50
Plus retailing margin/packaging 25%	4.46	4.46	4.46	4.61	4.61	4.61	4.88	4.88
“Equals social price retail price,Bt.”	22.28	22.28	22.28	23.05	23.05	23.05	24.38	24.38
Plus transport to farm (US$/50kg bag)	1.33	2.00	2.00	1.33	2.00	2.00	1.33	2.67
Equals on-farm social price	23.61	24.28	24.28	24.38	25.05	25.05	25.71	27.04
Actual price paid on market (US/50kg bag)	22.80	22.80	22.80	22.80	22.80	22.80	22.80	22.80
Ratio market to social price	1.04	1.06	1.06	1.07	1.10	1.10	1.13	1.19

Appendix C

Enterprise Budgets (Economic Prices) 1996 Season Export Parity Prices (Farm Gate)

Table C.1 High Input Burley Tobacco

Item	BT ADD	LN ADD	NG ADD	LL ADD	SL ADD	KU ADD	MZ ADD	KA ADD
Yield	2300	2200	1200	2630	2300	2830	2350	2850
Price(US$/kg)	2.16	2.15	2.15	2.13	2.12	2.11	2.08	2.05
Gross Returns(US$/ha)	4968.00	4730.00	2580.00	5601.90	4876.00	5971.30	4888.00	5842.50
VARIABLE COSTS								
Nursery								
Seed (US$/pack	7.47	7.47	7.47	7.47	7.47	7.47	7.47	7.47
Fertilizer(4.5kgx2beds) comp S	4.15512	4.2984	4.2984	4.4064	4.50432	4.50432	4.6512	4.84704
Lands								
Nematode/Chemicals (16.5l EDB)	173.25	173.25	173.25	173.25	173.25	173.25	173.25	173.25
Fertilizers								
400kgSD	184.67	191.04	191.04	195.84	200.19	200.19	206.72	215.42
100kg Urea	41.33	45.60	47.47	45.60	45.60	45.60	47.47	47.47
300kg CAN	87.98	98.38	98.38	99.07	102.53	102.53	105.98	112.90
sub-total	498.86	520.04	521.91	525.64	533.54	533.54	545.54	561.35
Credit charges	11.64	12.13	12.18	12.26	12.45	12.45	12.73	13.10
Total Labor (243 days)	275.40	275.40	275.40	275.40	275.40	275.40	275.40	275.40
Depreciation	138.00	138.00	138.00	138.00	138.00	138.00	138.00	138.00
Insurance	16.67	16.67	16.67	16.67	16.67	16.67	16.67	16.67
AHLcharges/levies (5% of sales)	375.00	375.00	312.53	375.00	375.00	375.00	375.00	375.00
sub-total	816.71	817.20	754.78	817.33	817.52	817.52	817.80	818.16
Own Tractor								
Diesel (7lx8.4x5.5hrs)	15.09	15.09	15.09	15.09	15.09	15.09	15.09	15.09
Lubricants (15% of fuel)	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26
Repairs&maintainance	478.27	478.27	478.27	478.27	478.27	478.27	478.27	478.27
Baling Material (Hessian 10m/MK25	16.67	16.67	16.67	16.67	16.67	16.67	16.67	16.67
Baling Material (10m/MK11.5	7.67	7.67	7.67	7.67	7.67	7.67	7.67	7.67
18 rolls of Poly wrap 218m/US$26	468.00	468.00	468.00	468.00	468.00	468.00	468.00	468.00
Transport	368.00	494.00	166.67	480.00	450.67	520.00	416.00	640.00
sub-total	1355.96	1481.96	1154.62	1467.96	1438.62	1507.96	1403.96	1627.96
Total Variable Costs	2130.21	2277.39	1951.93	2268.99	2247.56	2316.90	2224.89	2464.71
Gross Margin (US$/ha)	2837.79	2452.61	628.07	3332.91	2628.44	3654.40	2663.11	3377.79
Gross Margin/manhr	1.46	1.26	0.32	1.71	1.35	1.88	1.37	1.74

Table C.2 Low Input Burley Tobacco

AREA	BT ADD	LN ADD	NG ADD	LL ADD	SL ADD	KU ADD	MZ ADD	KA ADD
Yield	1365	1521	795	1631	1507	1645	1618	1860
Price (US$/kg)	2.16	2.15	2.15	2.13	2.12	2.11	2.08	2.05
Gross Returns(US$/ha)	2948.40	3270.15	1709.25	3474.03	3194.84	3470.95	3365.44	3813.00
Variable Costs								
Nursery								
seed(MK/6g/2beds	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13
Nematode/Chemicals (16.5l EDB)	173.25	173.25	173.25	173.25	173.25	173.25	173.25	173.25
Fertilizer (4.5kgx2beds) comp S	4.16	4.30	4.30	4.41	4.50	4.50	4.65	4.85
LANDS								
Fertilizers								
400kgSD	184.67	191.04	191.04	195.84	200.19	200.19	206.72	215.42
100kg Urea	41.33	45.60	47.47	45.60	45.60	45.60	47.47	47.47
200kg CAN	30.43	30.43	30.43	30.43	30.43	30.43	30.43	30.43
sub-total	435.98	446.76	448.62	451.66	456.11	456.11	464.65	473.55
Credit charges	10.17	10.42	10.47	10.54	10.64	10.64	10.84	11.05
Total Labor (386 days)	283.07	283.07	283.07	283.07	283.07	283.07	283.07	283.07
Structure	33.33	21.33	21.33	30.00	23.00	33.33	230.00	350.00
AHLcharges/levies (5% of sales)	9.83	10.90	5.70	11.58	10.65	11.57	11.22	12.71
sub-total	336.40	325.72	320.57	335.19	327.36	338.61	535.13	656.83
Baling materials (20 bales)	326.53	326.53	326.53	326.53	326.53	326.53	326.53	326.53
Transport cost	161.00	199.33	92.00	189.00	199.33	207.00	168.00	286.00
sub-total	487.53	525.87	418.53	515.53	525.87	533.53	494.53	612.53
Total Variable Costs	1206.58	1255.69	1150.22	1250.26	1265.05	1272.71	1242.25	1369.15
Gross Margin (US$/ha)	1741.82	2014.46	559.03	2223.77	1929.79	2198.24	2123.19	2443.85
Gross Margin/manhour	0.56	0.65	0.18	0.72	0.62	0.71	0.69	0.79

Table C.3 High Input Hybrid Maize

AREA	BT ADD	LN ADD	NG ADD	LL ADD	SL ADD	KU ADD	MZ ADD	KA ADD
Yield	5633	6648	5240	7000	7155	6418	6115	5400
Price (US$/kg)	0.18	0.17	0.17	0.15	0.13	0.13	0.10	0.09
Gross Returns (US$/ha)	1013.94	1130.16	890.80	1050.00	930.15	834.34	611.50	486.00
VARIABLE COSTS								
Seed (25kg)	28.83	28.83	28.83	28.83	48.80	28.83	28.83	28.83
Basal/Top Fert	48.80	53.33	54.67	48.80	54.67	55.33	56.00	56.67
sub-total	77.63	82.17	83.50	77.63	103.47	84.17	84.83	85.50
Credit charge	27.17	28.76	29.23	27.17	36.21	29.46	29.69	29.93
Labor (67 days)	75.93	75.93	75.93	75.93	75.93	75.93	75.93	75.93
Depreciation	138.00	138.00	138.00	138.00	138.00	138.00	138.00	138.00
sub-total	241.11	242.69	243.16	241.11	250.15	243.39	243.63	243.86
Own Tractor								
Fuel (7lx8.4x5.5hrs)	15.092	15.092	15.092	15.092	15.092	15.092	15.092	15.092
Lubricants(15% of fuel)	3.234	3.234	3.234	3.234	3.234	3.234	3.234	3.234
Transport and packaging	113.00	177.33	140.00	140.00	190.67	170.67	203.33	216.00
sub-total	131.33	195.66	158.33	158.33	208.99	188.99	221.66	234.33
Total Variable Costs	284.89	353.76	317.76	311.89	388.39	349.09	382.43	395.76
Gross Margin (US$/ha)	729.05	776.40	573.04	738.11	541.76	485.25	229.07	90.24
Gross Margin/manhr	1.36	1.45	1.07	1.38	1.01	0.91	0.43	0.17

Table C. 4 Low Input Hybrid Maize

Item	BT ADD	LN ADD	NG ADD	LL ADD	SL ADD	KU ADD	MZ ADD	KA ADD
Yield	2253.00	2659.00	2096.00	2348.00	2862.00	2567.00	2335.00	2446.00
Price (US$/kg)	0.18	0.17	0.17	0.15	0.13	0.13	0.10	0.09
Gross Returns (US$/ha)	405.54	452.03	356.32	352.20	372.06	333.71	233.50	220.14
VARIABLE COSTS								
Seed(25kg)	28.83	28.83	28.83	28.83	28.83	28.83	28.83	28.83
Basal/Top Fert	40.50	41.97	41.97	41.97	43.43	43.43	44.90	45.87
Transport and Packaging	45.00	70.67	56.00	50.00	76.00	68.00	78.33	100.00
sub-total	114.34	141.47	126.80	120.80	148.27	140.27	152.06	174.71
Credit charges	24.27	24.78	24.78	24.78	25.29	25.29	25.81	26.15
Labor (67 manday or 536manhours)	49.133	49.133	49.133	49.133	49.133	49.133	49.133	49.133
Sub-total	73.401	73.914	73.9138	73.9138	74.4262	74.426	74.9386	75.280
Total Variable Costs	163.471	190.601	175.935	169.935	197.399	189.399	201.196	223.839
Gross Margin (US$/ha)	242.069	261.429	180.385	182.265	174.661	144.311	32.304	-3.670
Gross Margin/manhr	0.452	0.488	0.337	0.340	0.326	0.269	0.060	0.007

Table C.5 Local Maize Smallholder

Item	BT ADD	LN ADD	NG ADD	LL ADD	SL ADD	KU ADD	MZ ADD	KA ADD
Yield	770.00	745.00	1102.00	879.00	1028.00	1187.00	907.00	1090.00
Price (US$/kg)	0.18	0.17	0.17	0.15	0.13	0.13	0.10	0.09
Gross Returns (US$/ha)	138.60	126.65	187.34	131.85	133.64	154.31	90.70	98.10
VARIABLE COSTS								
Seed (25kg)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Basal/Top Fert	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Transport and Packaging	15.00	20.00	29.33	18.00	28.00	32.00	31.67	44.00
sub-total	15.00	20.00	29.33	18.00	28.00	32.00	31.67	44.00
Credit charges	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Labor (67 day or 536 manhours)	49.13	49.13	49.13	49.13	49.13	49.13	49.13	49.13
sub-total	49.13	49.13	49.13	49.13	49.13	49.13	49.13	49.13
Total Variable Costs	64.13	69.13	78.47	67.13	77.13	81.13	80.80	93.13
Gross Margin (US$/ha)	74.47	57.52	108.87	64.72	56.51	73.18	9.90	4.97
Gross Margin/manhr	0.14	0.11	0.20	0.12	0.11	0.14	0.02	0.01

Table C.6 High Input Soyabeans

Area	BT ADD	LN ADD	NG ADD	LL ADD	SL ADD	KU ADD	MZ ADD	KA ADD
Item	2650.00	3100.00	4130.00	2980.00	3000.00	3200.00	2900.00	2950.00
Price (US$/kg)	0.19	0.18	0.18	0.16	0.14	0.14	0.11	0.09
Gross Returns(US$/ha)	503.50	558.00	743.40	476.80	420.00	448.00	319.00	265.50
VARIABLE COSTS								
Seed (80kg)	21.33	21.33	21.33	21.33	21.33	21.33	21.33	21.33
4 satchets innoculum	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67
sub-total	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00
Credit charges	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40
Labor (55 days)	62.33	62.33	62.33	62.33	62.33	62.33	62.33	62.33
Depreciation	138.00	138.00	138.00	138.00	138.00	138.00	138.00	138.00
sub-total	208.73	208.73	208.73	208.73	208.73	208.73	208.73	208.73
Own Tractor								
Fuel(7lx8.4x5.5hrs)	15.09	15.09	15.09	15.09	15.09	15.09	15.09	15.09
Lubricants(15% of fuel)	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26
Transport and Packaging	30.00	48.00	81.33	34.00	54.67	60.00	48.33	48.00
Sub-total	47.36	65.36	98.69	51.36	72.02	77.36	65.69	65.36
Total Variable Costs	133.69	151.69	185.02	137.69	158.36	163.69	152.02	151.69
Gross Margin(US$/ha)	369.81	406.31	558.38	339.11	261.64	284.31	166.98	113.81
Gross Margin/manhour	0.84	0.92	1.27	0.77	0.59	0.65	0.38	0.26

Table C.7 Low Input Soyabeans

Item	BT ADD	LN ADD	NG ADD	LL ADD	SL ADD	KU ADD	MZ ADD	KA ADD
Yield	600	710	1520	684	825	907	700	600
Price (US$/kg)	0.19	0.18	0.18	0.16	0.14	0.14	0.11	0.09
Gross Returns(US$/ha)	114.00	127.80	273.60	109.44	115.50	126.98	77.00	54.00
VARIABLE COSTS								
Seed (80kg)	21.33	21.33	21.33	21.33	21.33	21.33	21.33	21.33
Basal/Top fert	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Herbi/Pesti/Fungicide	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Transport and Packaging(15bags)	7.00	9.33	9.33	7.00	9.33	9.33	9.33	11.67
sub-total	28.33	30.67	30.67	28.33	30.67	30.67	30.67	33.00
Credit	7.47	7.47	7.47	7.47	7.47	7.47	7.47	7.47
Labor (55 days)	40.33	40.33	40.33	40.33	40.33	40.33	40.33	40.33
sub-total	47.80	47.80	47.80	47.80	47.80	47.80	47.80	47.80
Total Variable Costs	68.67	71.00	71.00	68.67	71.00	71.00	71.00	73.33
Gross Margin(US$/ha)	45.33	56.80	202.60	40.77	44.50	55.98	6.00	-19.33
Gross Margin/manhours	0.10	0.13	0.46	0.09	0.10	0.13	0.01	-0.04

Table C.8 High Input Phaseolous Bean

Item	BT ADD	LN ADD	NG ADD	LL ADD	SL ADD	KU ADD	MZ ADD	KA ADD
Yield	1500	1763.00		2055	2265	1944	2651	1350
Price(US$/kg)	0.69	0.69		0.67	0.65	0.65	0.62	0.59
Gross Returns(MK/ha)	1035.00	1216.47		1376.85	1472.25	1263.60	1643.62	796.50
VARIABLE COSTS								
Seed (90kg)	90.00	90.00		90.00	90.00	90.00	90.00	90.00
Fert(200kg:23:21:0)	48.67	49.33		48.67	49.33	49.33	49.33	49.33
Herbi/Pesti/Fungicide	42.00	45.30		42.60	46.80	47.04	48.00	53.40
sub-total	180.67	184.63		181.27	186.13	186.37	187.33	192.73
Credit	63.23	64.62		63.44	65.15	65.23	65.57	67.46
Labor (52 days)	58.93	58.93		58.93	58.93	58.93	58.93	58.93
Depreciation	138.00	138.00		138.00	138.00	138.00	138.00	138.00
sub-total	260.17	261.56		260.38	262.08	262.16	262.50	264.39
Own Tractor								
Fuel(7lx8.4x5.5hrs)	15.092	15.092		15.092	15.092	15.092	15.092	15.092
Lubricants(15% of fuel)	2.2638	2.2638		2.2638	2.2638	2.2638	2.2638	2.2638
Transport	21.00	46.67		20.00	60.00	52.00	88.33	44.00
sub-total	38.36	64.02		37.36	77.36	69.36	105.69	61.36
Total Variable Costs	277.96	307.59		277.56	322.42	314.66	351.96	313.02
Gross Margin(US$/ha)	757.044	908.881		1099.294	1149.828	948.938	1291.664	483.478
Gross Margin/manhr	1.82	2.18		2.64	2.76	2.28	3.10	1.16

Table C.9 Low Input Phaseolous Bean

Item	BT ADD	LN ADD	NG ADD	LL ADD	SL ADD	KU ADD	MZ ADD	KA ADD
Yield	411	708		326	906	397	257	440
Price(US$/kg)	0.69	0.69		0.67	0.65	0.65	0.62	0.59
Gross Returns(US$/ha)	283.59	488.52		218.42	588.90	258.05	159.34	259.60
VARIABLE COSTS								
Seed (90kg)	0.00	0.00		0.00	0.00	0.00	0.00	0.00
Transport and Packaging	8.00	18.67		7.00	24.00	10.67	6.67	18.00
sub-total	8.00	18.67		7.00	24.00	10.67	6.67	18.00
Credit	0	0		0	0	0	0	0
Labor (70 days)	51.33	51.33		51.33	51.33	51.33	51.33	51.33
sub-total	51.33	51.33		51.33	51.33	51.33	51.33	51.33
Total variable costs	59.33	70.00		58.33	75.33	62.00	58.00	69.33
Gross Margin(US$/ha)	224.26	418.52		160.09	513.57	196.05	101.34	190.27
Gross Margin/manhour	0.40	0.75		0.29	0.92	0.35	0.18	0.34

Table C.10 Low Input Groundnuts (Chalimbana)

Item	BT ADD	LN ADD	NG ADD	LL ADD	SL ADD	KU ADD	MZ ADD	KA ADD
Yield		550		650		800		
Price(US$/kg)		1.30		1.27		1.26		
Gross Returns(US$/ha)		715.00		825.50		1008.00		
VARIABLE COSTS								
Seed(90kg)		0.00		84.00		84.00		
Transport and Packaging		14.67		13.00		21.33		
sub-total		14.67		97.00		105.33		
Credit charges		0.00		29.40		29.40		
Labor (155 days)		113.67		113.67		113.67		
sub-total		113.67		143.07		143.07		
Total variable costs		14.67		97.00		105.33		
Gross Margin(US$/ha)		700.33		728.50		902.67		
Gross Margin/manhour		0.56		0.59		0.73		

Table C.11 High Input Paprika

Item	BT ADD	LN ADD	NG ADD	LL ADD	SL ADD	KU ADD	MZ ADD	KA ADD
Yield	2100			2300		2300		
Price (US$/kg)	1.74			1.72		1.70		
Gross Returns(US$/ha)	3654.00			3956.00		3910.00		
VARIABLE COSTS								
Seed	25.00			25.00		25.00		
Fertilizer	470.61			487.62		487.62		
Chemicals	132.18			132.18		132.18		
Fumigation	65.52			65.52		126.00		
sub-total	693.31			710.32		770.80		
Credit	242.66			248.61		269.78		
depreciation	138.00			138.00		138.00		
Labor (310 days)	351.33			351.33		351.33		
sub-total	731.99			737.95		759.11		
Own Tractor								
Fuel (7lx8.4x5.5hrs)	30.184			30.184		30.184		
Lubricants (15% of fuel)	4.5276			4.5276		4.5276		
Packaging materials	79.00			78.80		76.93		
Electricity	8.67			8.67		8.00		
Transport	45.33			42.67		50.00		
sub-total	167.71			164.84		169.64		
Total Variable Costs	1212.35			1226.50		1291.78		
Gross Margin(US$/ha)	2441.65			2729.50		2618.22		
Gross Margin/manhour	1.23			1.38		1.32		

Table C.12 Low Input Paprika

Item	BT ADD	LN ADD	NG ADD	LL ADD	SL ADD	KU ADD	MZ ADD	KA ADD
Yield	1650			1700		1750		
Price (US$/kg)	1.74			1.72		1.70		
Gross Returns(US$/ha)	2871.00			2924.00		2975.00		
VARIABLE COSTS								
Seed	25.00			25.00		25.00		
Fertilizer	316.51			327.95		333.11		
Chemicals	66.09			66.09		66.09		
Transport	34.67			37.33		46.67		
Packaging materials	41.40			41.40		41.40		
sub-total	483.66			497.77		512.26		
Credit	142.66			146.66		148.47		
Labor (310 days)	227.33			227.33		227.33		
sub-total	369.99			374.00		375.80		
Total Variable Costs	711.00			725.10		739.60		
Gross Margin(US$/ha)	2160.00			2198.90		2235.40		
Gross Margin/manhour	1.09			1.11		1.13		

Table C.13 High Input Tea

Item	BT ADD	LN ADD	NG ADD	LL ADD	SL ADD	KU ADD	MZ ADD	KA ADD
Yield	3750							
Price(US$/kg)	1.72							
Gross Returns(US$/ha)	6450.00							
VARIABLE COSTS								
Fertilizer	373.50							
Chemicals	44.10							
“Running costs(fuels,oils,repairs)”	212.38							
Electricity	153.33							
Transport	100							
sub-total	883.31							
Credit	130.73							
Depreciation	491.33							
Pruning/Plucking-labour(243manhrs)	275.40							
sub-total	897.46							
Total Variable Costs	1158.71							
Gross Margin(US$/ha)	5291.29							
Gross Margin/manhr	2.72							

Table C.14 High Input Macadamia

Item	BT ADD	LN ADD	NG ADD	LL ADD	SL ADD	KU ADD	MZ ADD	KA ADD
Yield	350							
Price(US$/kg)	9.00							
Gross Returns(US$/kg)	3150.00							
VARIABLE COSTS								
Fertilizer	16.60							
Chemicals	81.00							
Electricity	86.67							
Transport	10							
sub-total	194.27							
Credit	34.16							
Labor (160 days)	181.33							
Depreciation	100.00							
sub-total	315.49							
Total Variable Costs	375.60							
Gross Margin(US$/ha)	2774.40							
Gross Margin/manhour	2.17							

Table C.15 Low Input Cotton

Item	BT ADD	LN ADD	NG ADD	LL ADD	SL ADD	KU ADD	MZ ADD	KA ADD
Yield	800	800	850		850			850
Price(US$/kg)	1.63	1.63	1.63		1.59			1.53
Gross Returns(US$/ha)	1304.00	1304.00	1385.50		1351.50			1300.50
VARIABLE COSTS								
Seed	0.00	0.00	0.00		0.00			0.00
Fertilizer	0.00	0.00	0.00		0.00			0.00
Chemicals	68.70	68.70	71.70		71.70			72.30
Transport and Packaging	16	21.333	22.667		22.667			28.333
sub-total	84.70	90.03	94.37		94.37			100.63
Credit	24.05	24.05	25.10		25.10			25.31
Labor (184 days)	134.933	134.933	134.933		134.933			134.933
sub-total	158.98	158.98	160.03		160.03			160.24
Total Variable Costs	219.63	224.97	229.30		229.30			235.57
Gross Margin(US$/ha)	1084.37	1079.03	1156.20		1122.20			1064.93
Gross Margin/manhour	0.74	0.73	0.79		0.76			0.72