AN ANALYSIS OF THE MYANMAR EDIBLE OIL CROPS SUB-SECTOR

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 2009

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Preface

Oil crops play an important role in the rural economy of Myanmar, being second only to rice in terms of overall relevance. But despite its importance, the sector has been facing a series of challenges that have constrained its performance. These include a lack of productivity growth, reduced oil extraction levels and quality, increased net foreign exchange costs, limited efficiency of current oil crop processing operations and lack of national standards for edible oils. To address these problems, the Government of the Union of Myanmar (GoUM) requested the collaboration of the Food and Agriculture Organization of the United Nations (FAO) to design a project aimed at the sustainable development and competitiveness of its oil crops sector. A development project was prepared and submitted to the OPEC Fund for International Development, which approved a loan to GoUM providing funds to execute a series of activities and investments aimed at increasing oil crop productivity and output, increasing efficiency and quality of edible oil extraction, and providing policy, management and institutional support.

Following the approval of the loan, FAO was asked to continue collaborating with GoUM in the implementation of the oil crops development project, providing technical assistance and advisory support.

The present sub-sector appraisal has been developed as part of FAO's technical assistance. It builds on previous studies conducted during the formulation of the project. This study contributed to the updating and expansion of the information base on issues of relevance to the oil crops subsector; it also provided an analysis of the country's oil crop economy, with findings validated through stakeholder consultations. Its major goal was to provide an updated review of the structure and performance of the oil crops sector of Myanmar, so as to provide guidance to the project management unit on implementation aspects and support decision-making on oil crops related issues at both the private and public sector levels.

The document is subdivided into four main parts. The context of Myanmar's edible oil crop sub-sector is initially analyzed, covering aspects such as the economic situation, national and international markets and prevailing policies. The second section provides an in-depth analysis of the edible oil crop value chains, considering all stakeholders and their constraints and opportunities. The institutional environment and its policies are discussed in the third section, while the last section is devoted to the results and recommendations deriving from the study.

The results and recommendations of the study have been instrumental in leading into adjustments in the scope of project activities and their implementation priorities. It is hoped that with the present publication a wider audience can also benefit from the information and analysis hereby provided.

Carlos A. da Silva Leon Gouws

Yangon, March of 2009

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Acknowledgements

The authors wish to express their gratitude to the many institutions and individuals who collaborated in the development of this study.

The support of Carlos A. da Silva, Agribusiness Economist, Rural Infrastructure and Agro-Industries Division (AGS) FAO and Lead Technical Officer of the Myanmar Oil Crops Development Project, was instrumental in the conceptualization of the study and in the development of the methodological aspects of its execution. Dr. Da Silva also contributed extensively in the review of the manuscript and in coordinating the preparation of this publication.

Gratitude goes to Mr. Leon Gouws, Project Technical Advisor and to all FAO colleagues in Yangon, for their invaluable administrative and logistic support, without which field work and the necessary contacts with all stakeholders would not have been possible. Special thanks go to the FAO Representative at the time when the study was underway, Mr. Tang Zhengping, for his support. Thanks also to Phyo May Win, for her efficient secretarial support in the editorial revision.

The support of U Tin Htut Oo, Director General of the Department of Agricultural Planning of the Ministry of Agriculture and Irrigation, was essential in 'opening doors' for successful implementation. Without his assistance from the new capital Nay Pyi Taw, this study would not have been possible.

We are grateful to colleagues in the Project Management Unit in Yangon and Mandalay, for their support in facilitating the execution of the study within the very tight schedule available. Special thanks go to the National Project Directors U Saw Jackson and subsequently U San Hla Baw as well as to Daw San San Mya, who digitized data collated from the field, statistical books and official records.

We also thank:

- Larissa D'Aquilio who provided coordination for the post-production process, Madeline Grimoldi for editing the document, Martin Hilmi for providing technical editing, proofreading and managing the post-production process, while Marianne Sinko provided desktop publishing for the document.

- The researchers at Yezin University who contributed to the study with agricultural information on oil crops production, in particular U John Ba Maw, Daw Aung May Than and Daw Khin Mar Mar

- The officials and professionals at various Departments and Divisions of the Ministry of Agriculture and Irrigation, Ministry of Livestock and Fisheries and the Ministry of Commerce for sharing official data and references on the oil crops sub-sector.

- The Union of Myanmar Federation of Chambers of Commerce and Industry and the various associations (e.g. MPBSSMA, MEDA) related to the oil crops sub-sector for sharing their in-depth knowledge of the sub-sector enabling environment.

- Oil millers, exporters, traders, wholesalers, commission agents, brokers, crop exchange centres members, service providers and other private stakeholders for sharing their invaluable observations and know-how at different levels of the oil-crops value chain.

- E-Trade for their invaluable market price data which was generously shared with the study team.

- CP Group of Companies, SGS, Caterpillar official dealer, for sharing important observations from their business operation perspectives.

- The many individuals who collaborated in different capacities, including Daw Daphne Khin Swe Swe Aye, Daw Hnin Oo, Daw Khin Mar Tin, Daw Myint Myint Yi, Daw Nan Mya Oo Sar, Daw Ni Ni Tun, Daw Pike, Daw Saw One, Daw Than Than Yi, Daw Wah Wah, Daw Wynn Lei Lei Than, Daw Yee Yee Htwe, Daw Yee Yee Win, Dr. Cho Cho Su Mon, Dr. Khin Hlaing, Dr. Ko Ko Htwe, Dr. Myint Thaung, Dr. Pye Tin, Dr. Soe Lwin, Dr. Toe Aung, Daw Toe Nandar Tin, Dr. Wah Wah Han, Dr. Yi Yi Htwe, Mr. Heniz Ludi, Mr. Jean Pichon, Ko Htay Aung, Ko Kham Sint, Ko San, Ko Tun Sein, Ko Tun Tun Oo, Ma Ah Si, Maw Oat Shaung, Ms. Sonsak Sae Ngow, U Aung Aung Lay, U Aung Hlaing, U Aung Htun Naing, U Aung Kyaw Htoo, U Aung Kyaw Oo, U Aung Min, U Aung Thun, U Bo Saing, U Bunny Hline, U Han Myint, U Hla Kyaw, U Hla Shwe, U Hla Than, U Hla Thein, U Htay Myint, U Htay Win Aung, U Htein Lin, U Htin Linn, U Htun Aye, U Htun Htun Naing, U Htun Sein, U John Ba Maw, U Khin Htay Lin, U Khin Maung Myint, U Khin Myo Thit, U Khin Soe, U Ko Gyi, U Kyaw Hla, U Kyaw Than, U Kyaw Thura, U Kyaw Tin, U Kyawt Maung, U Kyi Myint, U Maung Maung Aye, U Maung Maung Thein, U Moe Kyaw, U Moe Kyaw, U Mya Maung, U Mya Thein, U Myint Aung, U Myint Kyu, U Myo Myint, U Myo Oo, U Nyan Wai, U Nay Lin, U Ne Lin, U Ohn Than, U Sai Ba Nyan, U San Htike, U San Nyunt, U Saw Win, U Sein Than, U Sein Win Hlaing, U Than Aung, U Than Htay, U Thant Zaw, U Thaung Tint, U Thein Han, U Thin Lin, U Thun Thun Oo, U Thura Aung, U Tin Aung, U Tin Moe Myint, U Tin Ngwe, U Tin Win, U Tun Aung, U Ye Myat Soe, U Zaw Min, U Zaw Min Win.

Last but not least, we thank the hundreds of farmers who are maintaining the sub-sector vibrant and who had generously given their time to share information on oil crops production and marketing.

All Photos by Raphy Favre.

Executive summary

This study is part of the Food and Agriculture Organization of the United Nations (FAO) technical assistance provided to the Government of the Union of Myanmar (GoUM) for the implementation of an oil crops development project. The development of edible oils is recognized as a national priority by the GoUM, which requested FAO to formulate a project aimed at developing the sector. The Oilcrops Development Project (FAO/TCP/MYA/2904) preparation report was completed in 2004 and subsequently funded by the Organization of Petroleum Exporting Countries (OPEC) through a project loan agreement signed mid-2004.

Conducting a sub-sector analysis in the Myanmar context required adjusting methodologies to better respond to the specific needs of the government, the private actors at all levels of the chain and the Oilcrops Development Project Management Unit (PMU). In a context of centralized policy decision mechanisms in which self-sufficiency and tight controls over international trade are paramount, considerations of the oil crops sub-sector competitiveness compared to international actors were often seen as secondary. Given the market distortions resulting from government policies, the actors involved in policy debates in the oil crops sub-sector have other priorities to address than pure competitiveness. Addressing these considerations had to be taken into account while designing the study methodology.

Although literature on the sub-sector is abundant, the report presents new insights into the oil crops sub-sector in Myanmar, reflecting first-hand observations and 200+ interviews conducted over 6.5 weeks of field work with actors at all levels of the chain. The study provides an information base to support policy-makers, project planners and implementers in the oil crops sub-sector. This information base includes baseline data on edible oil supply and demand, crop budget analysis by type of land, data on existing processing plants, international benchmarks, trade flows, marketing associations and institutions engaged in the sector. The study provides general and specific policy recommendations to the GoUM, a strategic approach to address the most pressing weaknesses in the oil crops sub-sector while capitalizing on the sub-sector strength and discusses opportunities and potentials, both on the international and domestic markets.

The Myanmar Government is heavily involved in regulating the oil crops sub-sector at all levels of the chain resulting in severe distortions. The two main policy objectives in Myanmar, namely self-sufficiency and edible oil price control are self-defeating. Myanmar has adopted restrictive policies on import and export of oilseeds and oilseeds products in a bid to achieve self-sufficiency objectives, but relatively open policies to the import of large quantities of cheap palm oil in an attempt to maintain palm oil prices at low level on the domestic retail market. As a result, Myanmar is increasingly dependant on palm oil import while domestic production is stagnating. In this context, the self-sufficiency policy objective will remain elusive and it is anticipated that the uncovered edible oil deficit will reach approximately 434 000 tonnes in 2015/16 from a current 340 000 tonnes.

The global oil market is dominated by soybean and palm oils which both account for 51 percent of the global supply (26 percent and 25 percent respectively). Soybean competitiveness comes from its dual purpose as cake and oil, whereas oil palm competitiveness comes from its highest edible oil productivity per unit of area compared to all other oil crops. With the emergence of these two crops over the past three decades on the international market, other oil crops which are cultivated in Myanmar such as sesame and groundnut have lost their competitive edge. Global markets for these oil crops have evolved toward higher value products such as edible/snack groundnut, processed white and black sesame or high quality oils such as cold pressed sesame oil. These trends were accompanied by agroprocessing developments that add value to these commodities. Existing global market opportunities have important development potential as Myanmar is the world's third largest producer for sesame and the world's sixth largest producer for groundnut. Myanmar benefits from abundant land and water resources, exceptional genetic diversity in indigenous sesame varieties and good assortment of ground-nut varieties. However, restrictive policies and market distortions have meant that the edible oil crops sub-sector in Myanmar has not followed the trends of the global market. Myanmar missed out exciting market opportunities in Southeast Asia, to the advantage of neighbouring countries. The People's Republic of China appears to be the main beneficiary of these global and regional oil crops opportunities. The agroprocessing industry on oil crops remains largely undeveloped, compared to regional standards. Capturing higher value from domestic oil crops production would not only require changes of government policies, but also agroprocessing technology transfer in order to add value in-country and meet regional market requirements.

The most severe bottlenecks along the oil crops chain are at production level and specifically the supply of farm inputs. Interventions at production level need to be given the highest priority. Farmers in Myanmar have proved exceptionally skilful and entrepreneurial in optimizing the uses and maximizing the impact of limited resources available to them. Together with local traders, farmers have managed to maintain yields despite extremely low supply of quality seeds and the rapid and complete collapse of the formal fertilizer supply system in 2003.

The institutional environment in Myanmar is a complex maze of institutions with often overlapping responsibilities and little coordination between agencies. Overlapping of responsibilities occurs in particular at processing levels of the oil crops chain, with a variety of institutions involved (Myanmar Agricultural Produce Trading [MAPT], Ministry of Industry-1, Myanmar Cotton and Sericulture Enterprise [MCSE], Myanmar Perennial Crop Enterprise [MPCE,] Myanmar Industrial Development Committee [MIDC], Myanmar Agricultural Service [MAS] and other authorities). Restructuring of these responsibilities into one institution responsible for all aspects of oil processing, including policy, is advisable. At present, various institutions follow opposite policies (e.g. MAPT privatizes while MAS plans to build new solvent extraction plants). Lack of coordination occurs at all levels of the oil crops chain, particularly between Ministries, Departments and Divisions within Ministries and the private sector. Coordination mechanisms should be put in place at policy, programme design and implementation levels.

Farmers in particular are not represented in any form of independent institutions. The creation of farmer's interest groups through a bottom up approach should be seen as a priority.

The Ministry of Agriculture and Irrigation (MoAI) initiatives to appoint farmers' leader as recipient of extension activities is a good starting point for policy.

The effective provision of support to the oil crops sub-sector cannot be achieved by the public sector alone with responsibilities fragmented in different institutions. In many countries there is a fruitful collaboration between public entities, the private sector and farmers in such tasks. Private and public sector partnership can be achieved through the creation of a 'Myanmar Oil Crops Promotion Committee (MOCPC)' or 'Myanmar Oil Crops Coordination Committee (MOCCC)'. Such a Committee would be particularly needed in the following key areas:

- Facilitate policy formulation through dialogue amongst all stakeholders, considering all diverging interests along the chain.
- Enhance coordination in designing, planning and implementing programmes and activities.
- Advocate for equal participation of all stakeholders of the oil crops chain, including farmers.
- Facilitate the harmonisation of trade standards and measures and the systematic oil crops and edible oils quality and food safety control.
- Coordinate the implementation of market research and development activities on the international market.
- Develop Myanmar brands on oil crops and oil crops products.
- Coordinate the allocation of Technical Assistance to the private sector and regulate the level of subsidies provided to the private sector by the OPEC funded oil crops development project.
- Support the PMU in implementing the OPEC funded oil crops development project.

The analysis of the oil crops sub-sector essentially demonstrated that the chain is characterised by an astonishing efficiency in areas where the oil crops sub-sector participants are allowed to operate freely. This efficiency originates from the outstanding entrepreneurship displayed by the Myanmar private sector. Yet, policy constraints at all levels of the chain, poor infrastructures and support services are thwarting the sub-sector by impeding efficient use of agricultural and human resources and excessively increasing transactions costs along the chain. These constraints constitute the main points of leverage in the oil crops sub-sector in Myanmar. Policy reforms in the oil crops sub-sector should aim at 'increasing national welfare' by increasing the profitability of private sector operations along the chain as opposed to 'self-sufficiency' and 'price control' policies. Sensible policy reforms would have large impacts and are the most cost effective of all interventions recommended.

The report provides specific policy, strategy and intervention recommendations at critical levels of the value chain.

Acronyms

ADB	Asian Development Bank
AMD	Agricultural Mechanization Department
CDZ	Central Dry Zone
CEXC	Crop Exchange Centre
CPO	Crude Palm Oil
CPSC	Commodity Price Supervision Committee
CSO	Central Statistical Organisation
DAP	Department of Agricultural Planning
DAR	Department of Agriculture Research
DISSPRO	District Seeds Self-Sufficiency Program, Nepal
DoBT	Department of Boarder Trade
DP	Demonstration Programme
DT	Directorate of Trade
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FDA	Food and Drug Administration (Under the authority of the Ministry of Health, Myanmar)
FDI	Foreign Direct Investment
FFA	Free Fatty Acid
FFB	Fresh Fruit Bunch
FFS	Farmer Field School
FOB	Free On Board
FYM	Farmyard Manure
GDP	Gross Domestic Product
GOUM	The Government of the Union of Myanmar
HACCP	Hazard Analysis and Critical Control Points
ISO	International Organization of Standardization
KWH	Kilowatt Hour
KYAT	Myanmar Currency
MADB	Myanmar Agriculture Development Bank
MAPT	Myanmar Agricultural Produce Trading
MAS	Myanmar Agricultural Service
MCSE	Myanmar Cotton and Sericulture Enterprise
MEDA	Myanmar Edible Oil Dealer Association
MFI	Myanmar Foodstuff Industries
MICDD	Myanmar Industrial Crops Development Department
MICDE	Myanmar Industrial Crops Development Enterprise
MIDC	Myanmar Industrial Development Committee
MIS	Market Information Service
MoAI	Ministry of Agriculture and Irrigation

MoC	Ministry of Commerce
MOCCC	Myanmar Oil Crops Coordination Committee
MOCDP	Myanmar Oil Crops Development Project
MoCoo	Ministry of Co-operatives
MOCPC	Myanmar Oil Crops Promotion Committee
MoE	Ministry of Energy
MoH	Ministry of Health
MoLF	Ministry of Livestock and Fisheries
MPCE	Myanmar Perennial Crop Enterprise
MPE	Myanmar Petrochemical Enterprise
MPOB	Malaysian Palm Oil Board
MT	Metric Tonne
NARC	Nepal Agriculture Research Centre
OECD	Organisation of Economic Co-operation and Development
OFID	OPEC Fund for International Development
OP	Open Pollinated
OPEC	Organization of Petroleum Exporting Countries
PMU	Project Management Unit
PPD	Plant Protection Department
PPP	Public-Private Partnership
RBD	Refined Bleached Deodorized
SGS	Société Générale de Surveillance
SLRD	Settlements and Land Record Department
SMS	Short Message Service
SPDC	State Peace and Development Council
TC	Trade Council
UA	Ureic Acid
UMEH	Union of Myanmar Economic Holding
UMFCCI	Union of Myanmar Federation of Chambers of Commerce and Industry
UNDP	United Nations Development Programme
UTF	Unilateral Trust Fund
WB	World Bank
WRUD	Water Resource and Utilization Department
WUA	Water Users' Association
YAU	Yezin Agricultural University, Myanmar

In this document the exchange rate of US$1 = Kyats 1 250 is used.

Weights and Measures are converted as 1 Viss = 1.63 Kg and 1 Acre = 4 047 m^2

1. Introduction and background of the study

The development of edible oils is recognized as a national priority by the Government of the Union of Myanmar (GoUM), which requested the Food and Agriculture Organization of the United Nations (FAO) to formulate a project aimed at developing the sector. The *Oilcrops Development Project* (FAO/TCP/MYA/2904) preparation report was completed in 2004[1] and subsequently funded by the Organization of Petroleum Exporting Countries (OPEC) through a project loan agreement signed on 12th May 2004. The original design did not anticipate the need for technical assistance for the implementation of the project. However, in 2005 the GoUM solicited FAO's technical assistance for the project implementation. To this end, a Unilateral Trust Fund (UTF) agreement was signed in March 2006, which became operational in September 2006. This study is part of the technical assistance provided to the GoUM for the implementation of the oil crops development project.

FAO plays an active role in rural development efforts in Myanmar. The Organization was commissioned to undertake a wide-ranging review of the agriculture sector performance to determine sector potentials and constraints, as well as identify future investment strategies. The results of the study are contained in a number of volumes, covering the agricultural sector review (Volume I), the sector investment strategy (Volume 2), supporting papers (Volumes 3 and 4), and a separate Agricultural Atlas of Myanmar.

Conducting a sub-sector analysis in the Myanmar context required the adjustment of methodologies to better respond to the specific needs of the government, the private actors at all levels of the chain and the Project Management Unit (PMU). In a context of centralized policy decision mechanisms in which self-sufficiency and tight controls over international trade are paramount, considerations of the oil crops sub-sector competitiveness compared to international actors were often seen as secondary. Given the market distortions resulting from these policies, the actors involved in policy debates on the oil crops sub-sector have other priorities to address than pure competitiveness. These realities had to be taken into consideration while designing the study methodology.

The edible oil crops sub-sector analysis presented in this report gave careful consideration to previously existing studies and information. However, two observations made at an early stage of the study led the study team to invest substantial time and resources in gathering new information through extensive fieldwork:

1 FAO. 2004. *Myanmar Oilcrops Development Project (FAO/TCP/MYA/2904), Preparation Report. Volume I – Main Report*, Investment Centre Division, Rome, and FAO. 2004. *Myanmar Oilcrops development Project (FAO/TCP/MYA/2904). Preparation Report. Volume II – Annexes* Investment Centre Division, Rome.

1. The situation in the oil crops sub-sector in Myanmar has significantly evolved since 2004 (e.g. international market, domestic oil crops trade flow).

2. A number of essential official statistics proved to lack reliability (e.g. national edible oil supply and demand) and key information were missing in earlier documents (e.g. data on solvent plants, oil crops trade flow).

Therefore, although all available references have been widely consulted, this report presents new insight into the oil crops sub-sector in Myanmar, reflecting first-hand observations and over 200 interviews conducted with actors at all levels of the chain. It provides an information base to support policy-makers, project planners and implementers in the oil crops sub-sector. This information base includes baseline data on edible oil supply and demand, crop budget analysis by type of land, data on existing processing plants, international benchmarks, trade flows, marketing associations and institutions engaged in the sector. It provides general and specific policy recommendations to the GoUM, a strategic approach to address the most pressing weaknesses in the oil crops sub-sector while capitalizing on the sub-sector strength and discusses opportunities and potentials, both on the international and domestic markets.

This report is divided into four parts:

Part I: Context, major policies and international and domestic markets analysis

Chapter 3 provides a description of Myanmar's context and its economic settings. Chapter 4 discusses major policies prevailing in the oil crops sub-sector. An analysis of international markets of the main oil crops is presented in Chapter 5, including a discussion on the recent upward global price trends. Myanmar scenarios are compared with the international market, and prices of edible oils in Myanmar are benchmarked with international market quotations. Finally, the domestic edible oil market is discussed and estimates of edible oil demand and supply are made in Chapter 6, providing a new information base for planners and policy-makers. Chapter 7 provides the main findings and recommendations.

Part II: Analysis of the oil crops chain

Chapter 8 presents the value chain maps of edible oil crops in Myanmar and discusses marketing channels. Chapter 9 provides a detailed discussion on the production of oil crops, including a discussion of the opportunities and constraints by type of land and agro-ecological zones that contextualize production within the natural environment of Myanmar. Crop budget analysis is presented by type of land. This chapter also discusses in detail the situation of farm input supply (seeds, fertilizers and rhizobium), as well as rural finance, which are major constraints to the development of the sector. Chapter 10 analyses the edible oil processing industry, with particular attention to the competition of two main technologies: expeller and solvent extraction. Data on expellers and solvent extraction capacity are discussed and compared to the availability of oil crops for crushing, as estimated in Chapter 6. Chapter 11 analyses marketing

and distribution of oil crops, edible oils and oilcakes, including a discussion on a market information system, trade flows and marketing infrastructure.

A detailed discussion of import/export policies and procedures is presented with a case study of black sesame exports illustrating the effects of trade policies. Chapter 12 presents trade standards, quality control and food safety issues. International certification and industrial zones are also discussed. Chapter 13 analyses conclusions and recommendations at the production level.

PART III: INSTITUTIONAL ENVIRONMENT

Chapter 14 presents a mapping of institutions engaged in the oil crops sub-sector at various levels of the chain: production, processing and marketing. A brief discussion on the need for a Myanmar Oil Crops Promotion Committee (MOCPC)[2] representing all stakeholders along the chain and with coordination and policy formulation responsibilities is presented. Chapter 15 discusses the management style used by government institutions and its impact on the delivery of public services. Chapter 16 presents main findings and recommendations.

PART IV: LEVERAGE POINTS AND RECOMMENDATIONS

Chapter 17 presents leverage points where policy changes and interventions can positively affect the largest numbers of participants in the sub-sector. Strategy recommendation to the development of the oil crops sub-sector and specific interventions at production, processing, marketing and trade standards, quality control and food safety issues are presented.

The present study represents a modest contribution towards addressing weaknesses and seizing opportunities in the oil crops sub-sector in Myanmar.

It is recognized that the implementation of the recommendations hereby presented will require a challenging, concerted effort of all sub-sector stakeholders. The information collected and analysis carried out in the study should thus be seen as an instrument to facilitate this process.

2 Or 'Myanmar Oil Crops Council'.

2. Study objectives and methodology

2.1 Objectives

The scope of the study is broad, as it covers five oil crops (sesame, groundnut, sunflower, soybean and oil-palm), and considerations to niger and mustard crops were made whenever possible. Because of time constraints, oil-palm plantation and processing areas in the south could not be visited. The study had to address specific requirements of the Department of Agricultural Planning (DAP) of the Ministry of Agriculture and Irrigation (MoAI), the PMU of the oil crops development project and FAO technical assistance requirements.

The specific objectives were the following:

- Provide a qualitative description of the oil crops sub-sector in Myanmar.
- Provide a quantitative information base on which oil crops activities could be planned.
- Benchmark Myanmar on international markets.
- Provide general recommendations on the institutional and policy environment.
- Provide specific recommendations at production, processing and marketing levels of the oil crops chain.
- Advise on the implementation of the Myanmar Oil Crops Development Project (MOCDP)
- Contribute to permanent dialogue among the chain actors.

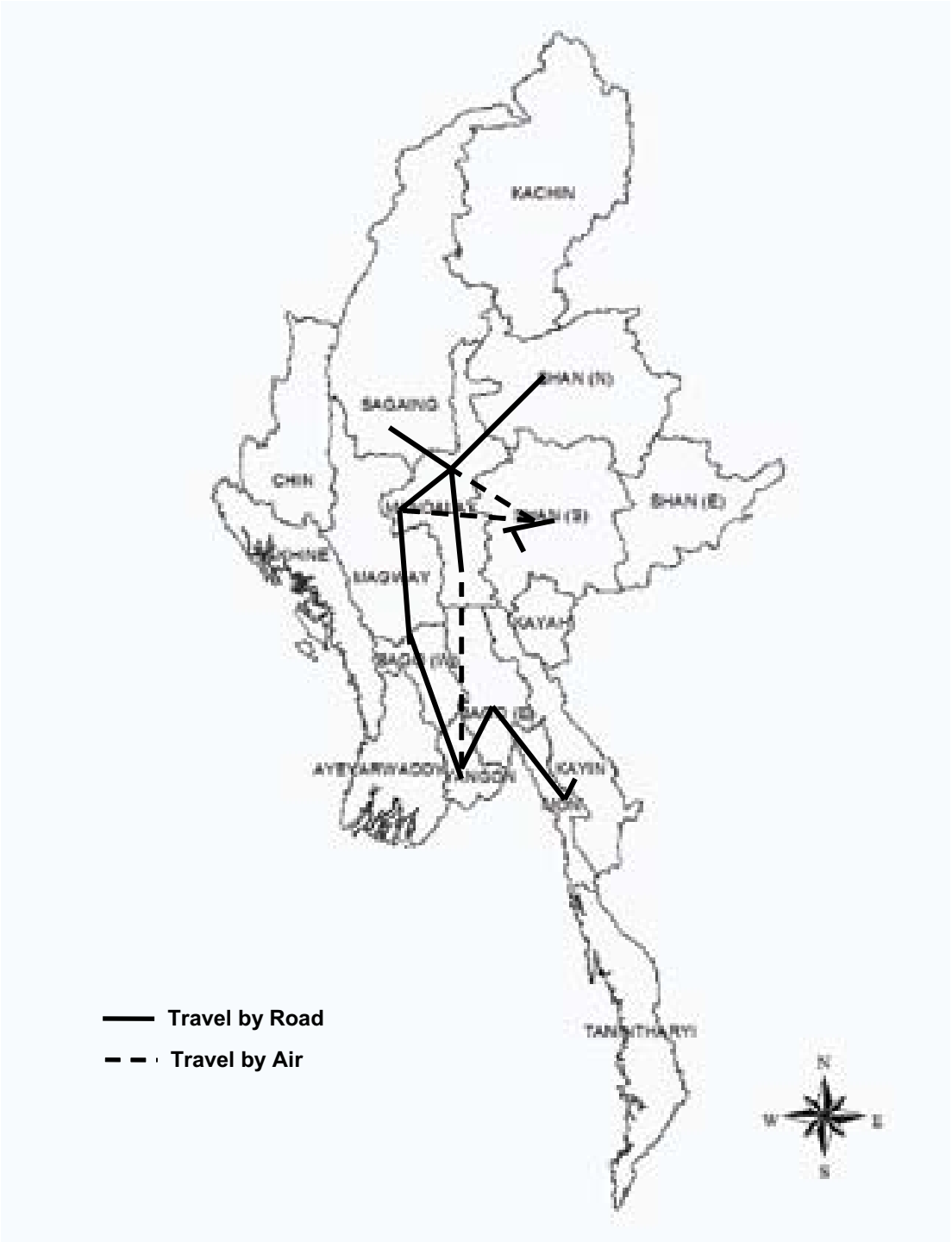
As related objectives, the authors used the opportunity of this study to hold a training workshop on sub-sector chain analysis for government officials, academic and private sector actors of the oil crops sub-sector.

2.2 Methodology

Perhaps the most salient feature of the methodological approach of this study is the substantial time spent in the field, conducting informal one-to-one interviews with actors at all levels of the chain, despite the fact that the time allocated to the study was rather limited; out of 3.5 months, 6.5 weeks were spent in the field and 2 weeks were used to organize and conduct

workshops. Literature review, writings and analysis were done mostly off-hours and during the five remaining weeks. Map 1 illustrates the field trip itinerary. A step by step approach was adopted for the implementation of the study.

Map 1: Oil crops sub-sector analysis field trips itinerary



Source: FAO. 2005. Agricultural Atlas of the Union of Myanmar, Agricultural Year 2001-2002, Rome.

A step by step approach was adopted for the implementation of the study.

Step I: Training workshop

A training workshop on sub-sector analysis was conducted on the 3rd and 4th May 2007. During the first day, participants benefited from a detailed training on general concepts and methodologies on sub-sector analysis. During the second day, practical discussion and exercises on methodological approaches to conduct an oil crops sub-sector analysis in Myanmar were held. Therefore, the workshop also served as a preparatory phase for the present study. The general conceptual and methodological framework followed is based on da Silva & de Souza Filho (FAOa. 2007).

Step II: Definition of objectives and chain delimitation

The definition of objectives was partly made at the training workshop, while the chain delimitation was initially set to four oil crops: sesame, groundnut, sunflower and soybean. However, palm oil had to be included, given the profound impact it has on the edible oil crops sub-sector. In terms of branching, the analysis includes oil crops, edible oil and oilcakes. The Central Dry Zone (CDZ) is the main oil crops producing and processing area and therefore focus was given to this zone. However, given the limited potential for production increase in the CDZ, the geographical coverage of the study was extended to areas with higher potential, such as the Shan hills and the delta region.

Step III: Identification of the team

The identification of the team had been a major challenge for the implementation of the study as, unfortunately, the production and processing experts employed by the PMU were not available for the study. Given the very limited time available, the study was carried out with a limited team, comprised of an international sub-sector analyst and a national counterpart. Researchers at Yezin Agricultural University (YAU), Myanmar, contributed to the study with specific technical and historical information on oil crops production. FAO back-stopping officers in Rome and the project Chief Technical Adviser participated in the planning and oversight of the study, as well as in the analysis of results and recommendations.

Step IV: Capacity building of team members

Given the small team which participated in the study, on-the-job training was provided. Most field visits and interviews were conducted jointly by the team members.

Step V: Literature review

Given time constraints, the literature review was conducted throughout the study period outside of interview hours. Both international (e.g. FAO, World Bank [WB], United Nations Development Programme [UNDP], Asian Development Bank [ADB], United States Department of Agriculture [USDA], Oil World, The Public Ledger) and national sources were consulted (e.g. Central Statistical Organization [CSO], MoAI, Ministry of Livestock and Fisheries [MoLF], Ministry of Commerce [MoC], Ministry of Health [MoH]).

Step VI: Preparation of field data collection

Field interviews were conducted using semi-structured questionnaires, or information checklists, which were adjusted daily to reflect increased understanding of the oil crops sub-sector by the team.

Step VII: Field visits

The study team visited ten States and Divisions: Mandalay, Magway, Monywa, northern and southern Shan states, Yangon, East and West Bago, Mon and Kayin states (see Map 1). Three weeks of field visits were conducted in Yangon and 3.5 weeks in the CDZ, Shan hills and Eastern Myanmar. In total, 6.5 weeks were invested in field-work.

One-to-one informal interviews were conducted with all actors along the oil crops chain: farmers, primary collectors, traders, wholesalers, commission agents, Crop Exchange Centres (CEXCs), exporters, millers, government staff (MoAI, MoLF, MoC, MoH and YAU) in Nay Pyi Taw and at Division, District and Township levels. In total, over 200 interviews were conducted. Minutes of the most relevant meetings were documented. Most interviews were conducted on-site, where production, processing, marketing and delivery of support services were (and are) taking place. Therefore, first-hand observations could be made at all levels of the edible oil crops chain.

Along with one-to-one interviews, extensive phone interviews were conducted after the field visits, following up on contacts the study team had established. Through phone interviews, clarification of data collected in the field, further triangulation and new data were gathered. International networking through e-mail allowed benchmarking the Myanmar scenario on international markets for all oil crops covered by this study.

Step VIII: Analysis and writing

After the data was collected, analyses were done and the final report was prepared in Yangon.

Step IX: Stakeholder workshop

On 27 July 2007, a national edible oil workshop was conducted in Yangon with stakeholders invited at various levels of the chain. A good balance between actors from both the private and the public sectors was sought. Participants met during the study were invited and traders from the CDZ (Mandalay, Monywa and Magway) travelled to Yangon to participate.

The workshop validated the study findings that are presented in this report. Furthermore, as stakeholders at various levels of the chain were present, the need for better coordination along the chain was experienced in practice through the active contributions of stakeholders to the findings presented at the workshop. A discussion on the creation of an independent institution aiming at increasing coordination was initiated.

AN ANALYSIS OF THE MYANMAR EDIBLE OIL CROPS SUB-SECTOR

PART I

CONTEXT, MAJOR POLICIES AND INTERNATIONAL AND DOMESTIC MARKETS ANALYSIS

3. National context

3.1 NATURAL SETTINGS

Myanmar covers a total area of 678 000 km^2 and has lengthy borders with Bangladesh, India, the People's Republic of China, the Lao People's Democratic Republic, and Thailand. A coastline of 1 900 km extends along the Bay of Bengal and the Andaman Sea, bordering an estimated 500 000 ha of coastal mangrove swamp and extensive delta region fed by the Ayeyarwady and Sittoung rivers. A narrow coastal strip backed by mountains forms a southern extension of the county, reaching as far as 10°North, where there is an approach to equatorial conditions. The centre of the country comprises extensive alluvial lowlands, bisected by forested hills reaching 1 000 metres above sea level or more, which stretch more than 800 km northwards from the delta region, reaching approximately 25°North. Known as the 'dry zone', this central region of the country is characterized by a semi-arid climate with a lengthy dry season and is enclosed to the north, east and west by highlands and mountains, which reach as much as 6 000 metres above sea level towards the Indo-Chinese border in the north.[3]

3.2 ECONOMIC SETTINGS

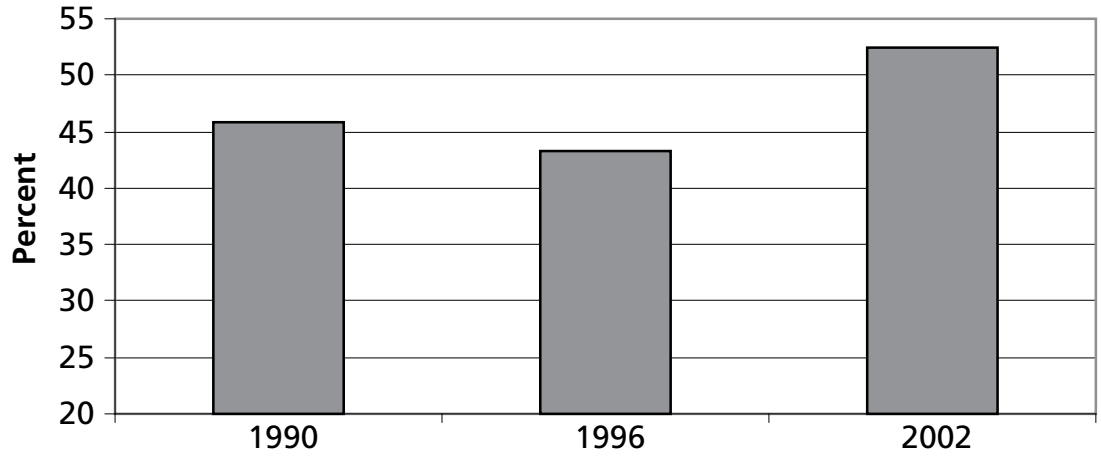
Accurately portraying national macroeconomic performance is made difficult by a number of factors related to the availability and reliability of official statistics. Data on gross domestic product (GDP) and other economic statistics have not been published since 2002/03. Yet, Myanmar's economy shows some significant differences from those of its neighbours in Southeast Asia. In contrast to the rest of the region, it is characterized by a continuing dominance of the agricultural sector, higher official GDP growth rates, lower government revenues and expenditures, lower use of energy, and high and increasing levels of inflation[4].

According to government sources, the importance of agriculture[5] to Myanmar's economy has increased in recent decades from 43.3 percent GDP in 1996/97 to 52.4 percent GDP in 2002/03[6].

The official economy in Myanmar benefits from a healthy trade balance position with a positive US$2.296 billion in 2006/07 (see Table 1). Government share in official import and export trade has increased in 2006/07 (see Table 2). Main exports are gas, agriculture/forest products and minerals/gems. These exclude, however, substantial quantities of informal imports (e.g. fertilizers, fuel, palm oil) and informal exports (e.g. edible groundnut).

3 FAO. 2004. *Myanmar Oil crops Development Project. Volume I Main Repor*t, FAP/TCP/MYA/2904.
4 FAO, *Ibid.*
5 Agriculture and livestock included.
6 GoUM. 2006. *Myanmar Agricultural Statistics (1992–1993 to 2004–05),* CSO, Nay Pyi Taw.

Figure 1: Share of agriculture in GDP between 1990 and 2002



Source: CSO, Agricultural Statistics

Table 1: Myanmar trade balance 2005/06 and 2006/07

		2005/06	2006/07
Export	Oversea	3 127.73	4 585.47
	Border	430.30	647.21
	Total	3 558.03	5 232.68
Import	Oversea	1 692.78	2 491.33
	Border	291.63	445.40
	Total	1 984.41	2 936.73
Total trade		5 542.44	8 169.41
Trade balance		1 573.62	2 295.95

Source: Ministry of Commerce

Table 2: Government and private share in trade (in percentages)

	2005/06		2006/07	
	Govt	Private	Govt	Private
Export	54.96	45.04	59.76	40.24
Import	31.05	68.95	38.44	61.56

Source: Ministry of Commerce

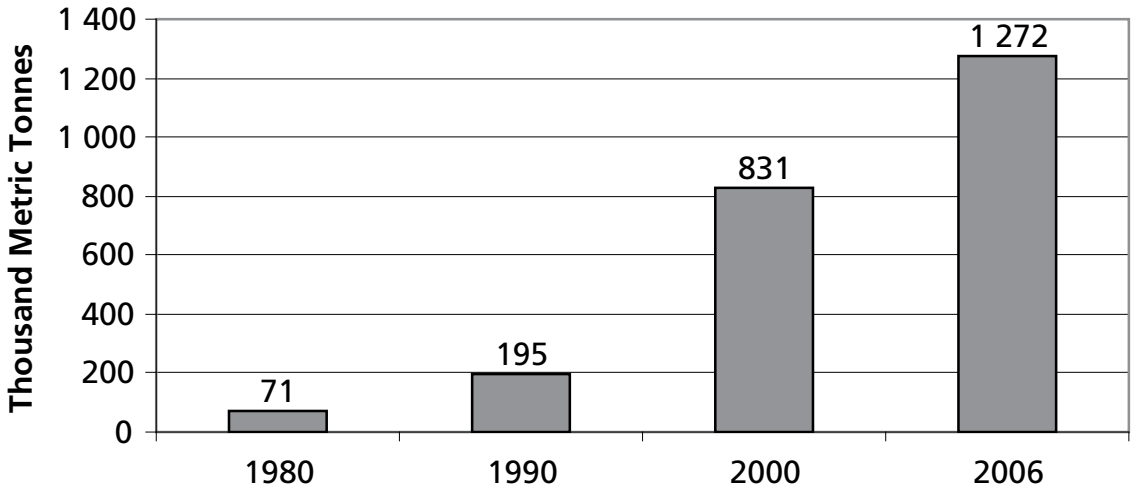
Myanmar's currency and its financial system are not considered stable by a significant majority of the country's citizens. People store their 'wealth' in kind (gold and precious stones) as a hedge against inflation and uncertainty. As a result, financial intermediation is underdeveloped and the allocation of capital is distorted. The Myanmar *Kyat* is not convertible on the international market and, therefore, all import transactions must be done in foreign currencies. This leads to a dash for foreign currencies, particularly US Dollars. Foreign currencies can be exchanged for Myanmar Kyats in country or informally at border towns with Thailand, the People's Republic of China, Bangladesh or India, where informal and formal border trade occurs.

4. Main oil crops policies

4.1 General environment

Until the early 1990s, the production of crops was heavily influenced by state controls and regulations. These controls dictated which crops could be grown and, in many cases, included compulsory procurement of output for sale at prices below market levels. This system started to change in the 1990s and one crop group, pulses, was effectively liberalized leading to a dramatic jump in yields, sown area and production, as well as in exports (see Figure 2).

Figure 2: Pulses exports in 1980/81, 1990/91, 2000/01 and 2006/07



Sources: CSO Yearbooks and Ministry of Commerce

However, not all market policies have been liberalized. Although no compulsory purchasing exists for oil crops, the oil crops and edible oil sub-sectors are among those for which state controls are still in place. These include outright bans or controls of export and import of oil crops, oil meals and edible oils.

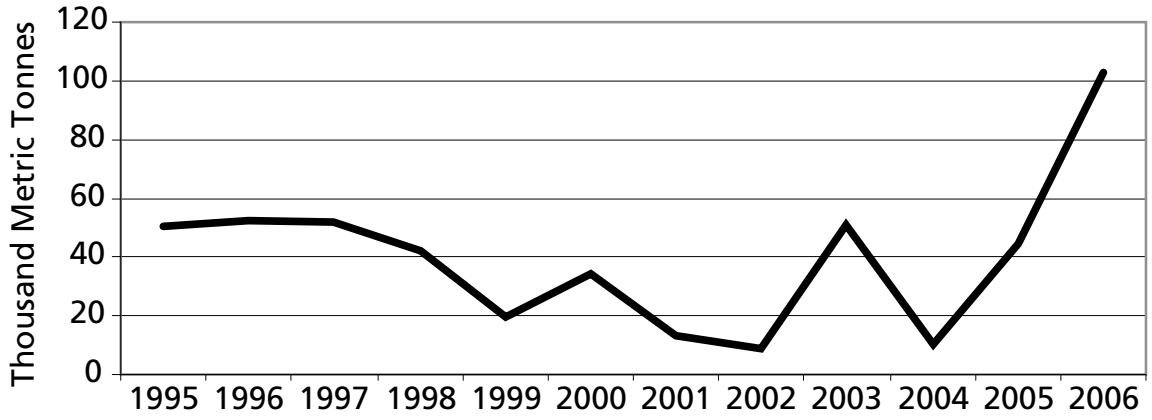
The most important restrictions in international trade include the following commodities:

- Palm oil import: more liberalized since 2003, but the volume of import and price are still controlled. Besides, the import of crude oils, such as crude palm oil (CPO), is prohibited.

- Oil crops seeds import (e.g. soybean) is prohibited.

- Export of groundnuts is prohibited.
- Export or import of oilcakes is prohibited.
- Export of sesame: In October 1998, an export ban for private traders was imposed until 2006, when export was authorized. The effects on export volumes were immediate, reflecting both the competitive advantage Myanmar holds on the international market and the dynamism of the private sector (see Graph 1). Discussions held in 2007 suggests that export of sesame may be further restricted.

Graph 1: Export sesame between 1995 and 2006



Source: CSO Statistical Yearbooks and Ministry of Commerce

The apparent logic of these bans is that Myanmar is currently a deficit producer of edible oil and oilcake, and significant quantities of palm oil are imported to partially meet domestic demand. Outright bans on imports or exports cannot be fully enforced. Informal imports allow the country to meet domestic demand of oil and oilcake, while informal exports of groundnuts for the snacks market allowed groundnut prices to be sustained on the domestic market.

4.2 Oil crops sub-sector policies

Overall, there are essentially two major government policy objectives for the oil crops sub-sector:

1. Achieve self-sufficiency in edible oil.
2. Maintain edible oil price control to avoid fluctuations.

As discussed below, these two policies are self-defeating. Through the implementation of these policies, Myanmar has adopted restrictive measures on imports and exports of oilseeds and oilseed products, but relatively open policies to the imports of large quantities of cheap palm oil, in an attempt to maintain edible oil prices at a low level on the domestic retail market. As a result, market prices of oil crops products in Myanmar are heavily distorted resulting in

stagnant production. A shift into the informal economy, whenever it has taken place, came with a cost (security). Myanmar is increasingly dependant on palm oil imports, while domestic production is stagnating.

4.3 SELF-SUFFICIENCY POLICY

Edible oil self-sufficiency

This policy is a remnant of the socialist period in Myanmar and has been in existence in the country since the 1980s[7]. Because of the central role edible oil plays in the Myanmar diet, the government attaches great importance to supplying the population's requirements directly from home production, as opposed to generating foreign exchange from home production through other means, and also securing required edible oil through imports. The MOCDP funded by OPEC aims at supporting the government to achieve its self-sufficiency objective.

The limitation or outright prohibition of exports of a number of agricultural commodities is justified on the basis that there is insufficient production of these crops to meet domestic needs. As a result, exports are only permitted when domestic demand has been filled. The result of such export controls has been to limit prices on the domestic market, as only informal export markets can be accessed. Although this may bring short-term benefits to urban consumers, it is damaging for both producers and consumers in the longer term. With depressed returns on domestic markets, producers reduce input usage and cropping intensity, resulting in stagnant/reducing yields and low uptake of new technologies. In addition, farmers will often shift to alternative crops, reducing supplies further. As a result, the longer term trend will be towards declining supplies and increased prices – even while exports are prohibited. Much of the strong growth in the relatively low value beans and pulses, for example, has occurred as a result of a shift in production from higher value oilseeds. As exports for oilseeds have been banned, the increased import volumes of cheap palm oil have pressured downwards domestic markets.

It is to be noted that Myanmar's policy to achieve self-sufficiency in edible oil is of doubtful practical effect, in the sense that no Asian country enjoys edible oil self-sufficiency besides the two main palm oil producing nations: Malaysia and Indonesia.

Oilseed and oilcake imports

Oilseed and oilcake imports are prohibited and the reasons for this ban are unclear. Probably the measure is an attempt to stimulate local production in a policy context of self-sufficiency.

Of particular interest is the import of soybean or soybean cake in Myanmar. The existing processing capacity in Yangon for soybean is 250 tonne/day, mainly from two privately owned plants: Yuzana and Batamya. Authorizing soybean import would supply much needed feed meal for the fast growing livestock and fish/shrimp industry, as well as supplement the oil

7 UNDP, ADB & MoC. 1984. *Oilseeds Production and Processing Project. Feasibility Report. Volume I: Main Report*, UGL Consultants Ltd.

deficit. Continuing the current ban will result in a substantial slow- down of the livestock industry and continued stagnant soybean production. Other countries in Asia, such as Thailand and Viet Nam, have successfully developed their chicken and fishery industry through imports of soybean.

4.4 EDIBLE OIL PRICE CONTROL

This policy is of strategic importance, as social stability is believed to depend on prices of rice and edible oil. Oil crops are indeed the second most important crop after rice in the household budget expenditure. Table 3 below indicates the estimated monthly household expenditure on essential foods. The country's edible oil production is insufficient for domestic requirements. To bridge the gap between the demand and supply, cheaper palm oil is imported, mainly from Malaysia.

Table 3: Average monthly household expenditure by group

	Total Kyats/Month	Percentage (%)
Cereal	4 635	15.8
Oil	2 433	8.3
Fruits and Vegetables	2 110	7.2
Spices and Condiments	1 119	3.8
Pulses	608	2.1
Other food	10 173	34.8
Total Food and Beverage	21 078	72
Total household expenditure	29 310	100

Source: CSO, Statistical Yearbook, 2001[8]

Palm oil import and price control: the end of the 65/35 Rule

Until March 2007, the government fixed a quota on palm oil imports at 30 000 tonnes/month; 20 000 tonnes by the private sector and 10 000 tonnes by the Union of Myanmar Economic Holding (UMEH). In April 2007, the quota was revised at 40 000 tonnes per month; 20 000 tonnes by the private sector and 20 000 tonnes by the UMEH. This raises the maximum import capacity from 360 000 to 480 000 tonnes/year. However, the maximum import capacity is not utilized, as imports reached their highest level in 2006/07 with 274 440 tonnes[9].

Until recently, the Myanmar Edible Oil Dealer Association (MEDA) retained 65 percent of any palm oil imported in the country and paid the importers at 'cost recovery' price. However, price adjustments are slow to respond to international market prices (see Section 5.8). Imported palm oil is stored in large capacity tanks in Kye Myin Daing at Thilawa Yangon port. Sixty-five percent of the total imported palm oil is sold to MEDA's members or municipalities at a fixed price (Kyats 1 700/viss in May 2007). If municipalities are receiving palm oil from MEDA, the

8 Exchange rate in 2001: Kyats 633 per US$

9 The monthly imports from January to May 2007 did not increase and averaged 26 700 tonnes/month. Table 31 in Annex VI presents the monthly palm olein arrival in Yangon port since January 2004.

oil is sold to members at Kyats 100 below open market price (e.g. Mandalay). The proceedings are reportedly used for social welfare activities organized by the municipality.

Sixty five percent of palm oil retained by MEDA is distributed to the association members (approximately 2 300 members) who are instructed to sell palm oil to consumers at fixed price (1 715 Kyats/viss in May 2007 in Yangon). However restaurants and factories buying in large quantities have to pay the open market price at Kyats 2 180/viss (May 2007). The importers can dispose of the remaining 35 percent of palm oil not retained by MEDA and sell it to wholesalers at open market prices.

As with most direct price control mechanisms, enforcement remains loose and as a result, the prices negotiated on the open market for the 35 percent share, set market price for all palm oils. As importers can only make profit on the 35 percent of the volume imported, they have to compensate for losses or absence of profit incurred on the 65 percent, through higher price negotiation on the open market. Therefore the 65/35 price control mechanism pushes the open market price up.

As a result the palm oil price market reacts opposite to the change of the controlled price by the government: an increase of the controlled price results in a decrease of the open market price and vice versa. On 24 May 2007, MEDA increased the wholesale fixed price by Kyats 200/viss from Kyats 1 715 to 1 915/viss, as a response to the increase of palm oil prices on the international market. As a result, on the same day the wholesale price in Mandalay dropped by Kyats 100/viss, from Kyats 2 160 to 2 060/viss and the retail price dropped from 2 200 to 2 050.

At the end of June 2007, perhaps related to the inefficient nature of the 65/35 price control mechanism, the government banned the private sector to import palm oil in Myanmar and all imports were to be handled solely by UMEH. If UMEH is able to import palm oil in a timely and sufficient amount, the price of palm oil decreases on the local market. Otherwise, oil shortages will result in an oil price increase.

A more efficient price regulation mechanism for palm oil would be to introduce an import duty that could be modulated, based on the international palm oil price, as practiced in India. The Indian Solvent Extractor's Association[10] plays an advisory role to the Indian Government on import duty rates. On the 13 April 2007, following increased palm oil prices on the international market, the Indian customs duty on Palm Group Oil was reduced by 10 percent across the board. The CPO duty was reduced to 50 percent from 60 percent, whereas refined-bleached-deodorized (RBD) palm olein duty was reduced to 57.5 percent from 67.5 percent[11].

Crude palm oil (CPO) import

CPO import is prohibited. The reasons for this ban is surprising, as authorizing import of CPO could add value and create jobs in Myanmar while the policy of supplying cheap palm oil to the

10 http://www. seaofindia. com/

11 http://www. seaofindia. com/revisionimportduty. html

market could still be achieved. The current refining capacity of CPO exceeds 120 000 tonnes per year considering the existing private and state operated refineries. Yuzana Ltd. has invested in a world class large capacity CPO refinery in Yangon, using physical refining processes.

4.5 Ability of the government to formulate and carry out policies

The GoUM has the required institutions in place to carry out policies in the oil crops sector. However, along border areas, the government faces serious constraints to enforce policies related to trade, and this allows a parallel informal economy to prosper.

Policy decision mechanisms on the oil crops sector seem scattered between a variety of bodies and interest groups. As a result, there is an absence of a forum in which to discuss and build consensus on individual policies related to the sub-sector. Hence, policies are often changing, depending on perceptions and interest group pressures, which create an unstable operating environment for the private sector. During the period of this study, there have been three policy changes affecting the import of palm oil: increase of import volume for UMEH in April, increase of minimum oil price in May and ban of private sector import of palm oil in June which marked the end of the 65/35 rule.

On the other hand, some policies appeared to be inflexible for decades. As an illustration, the self-sufficiency policy for oil crops dates back to the socialist government in the 1970s. It is to fulfil the self-sufficiency requirement, rather than a positive trade balance in the oil crops sector that the export of oil crops commodities was and continues to be restricted.

The mechanisms in which policies are decided in various aspects of the oil crops sub-sector in Myanmar remain unclear. However, policy changes such as opening/closing borders, imposing/lifting of export bans, introduction of export taxes and levies all have large repercussions on the farmers, millers and traders in Myanmar. It appears that generally private actors involved in the oil crops businesses have little say on policy issues, and insufficient considerations on the impacts of policy decisions on the various actors of the oil crops chain is made.

The creation of a coordinating body representing all of the various interests in the oil crops sector, to debate and formulate policies would substantially benefit the sector as a whole (see Part III). Well thought out policies built on consensus between different interest groups would result in a less volatile operating environment.

5. World edible oil, oil crops and oilcakes market and Myanmar

5.1 Edible oil: substitutable commodities in the global market

The world edible oil market consists of many closely substitutable commodities, such as soybean, oil-palm, rapeseed, sunflower, cottonseed and tropical oils (palm oil or its liquid fraction palm olein). Through technological means such as RBD, all oils have been rendered practically colourless, odourless and tasteless and, therefore, have become easily interchangeable in the kitchen. The situation in Myanmar is very different, as only a small fraction (8.6 percent) of the oil is RBD.

Exporting countries can either export the oilseeds or process them domestically and ship the resulting protein meal/cake and vegetable oils to foreign buyers. Foreign import demand depends on the deficit between countries' domestic oilseed output and consumption. Divergent requirements for protein meal and vegetable oil, as well as limits on domestic processing capacity, determine the ratio of oilseeds to oilseed products that countries will import. The volume and source of foreign imports depend on seasonal availability and relative prices, credit and delivery terms, local preferences, and quality. Country policies, such as tariffs and domestic subsidies, also can affect prices and the availability of competing products.

5.2 International trade policies

Compared with trade in other agricultural commodities, trade in whole oilseeds, particularly soybeans, is relatively unrestricted by tariffs and other border measures. But oilseed meals, and particularly vegetable oils, typically have higher tariffs. Applied tariffs on soybean oil, for example, average about 20 percent for the world's top importers of the commodity, compared with rates generally at or below 10 percent for soybeans. In addition to tariffs, both exporters and importers have used other trade-distorting policies, such as differential export taxes in Argentina and in Brazil (prior to 1996), production subsidies such as those in the European Union (EU), and phytosanitary barriers in India. These policies create incentives to boost domestic oilseed production or encourage exports of processed products.

India imposes prohibitive barriers on oilseed imports, so its domestic crushing is limited to the oilseeds that can be produced within the country. Domestically produced oilseeds are highly valued as vegetable oil, and India is now among the world's largest vegetable oil importers.

Myanmar restricts imports and exports of oilseeds and oilseeds products, but authorizes the imports of large quantities of palm oil and attempts to maintain palm oil prices at the lowest level on the domestic retail market. As a result, Myanmar is increasingly dependant on

palm oil import while domestic production is stagnating. Furthermore, as a result of an outright ban to import oilseeds or CPO, the domestic processing industry remains largely undeveloped, compared to neighbouring countries.

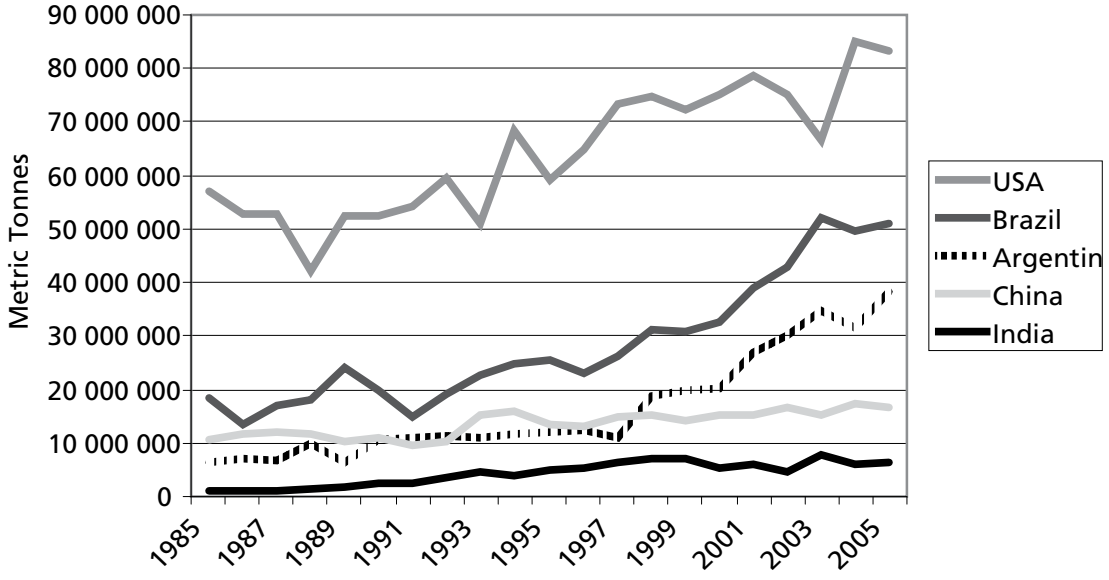
5.3 Soybean, soybean oil and soybean cake

Soybean (*Glycine max L.*) is a leguminous crop, which produces a number of important products. Soybean originally came from mainland China, where it became a major crop in the Yellow River valley. Today, soybean is used for a variety of commercial food products including soy sauce, cooking oil, miso, soy milk, soy curd and bean sprouts. It is also the basis of tempeh and tofu – protein products, which are particularly popular in Asia. All of these products are becoming increasingly popular in Western food markets, as soybean provides an important low-calorie protein source for vegetarians.

Soybean produces cake or soymeal; the most important oilcake in the world fuelling the animal feed industry. Soybean cake is primarily used as an ingredient in concentrated feed for livestock (primarily single stomached animals such as chickens and pigs) and fish.

Previously, soybean utilization was mainly for food; however, after 1970, the establishment of modern and high capacity oil-extracting factories created a greatly increased demand for oil-bearing crops, especially soybean. Production has been increasing steadily worldwide (Graph 2). High demand for soybean cake as feed ingredient with rapid expansion of livestock industries over the last decades forced countries to produce more soybeans. As a result, rapid improvement of soybean productivity has been achieved because of better research, transfer of technology and government support.

Graph 2: Global soybean production between 1985 and 2005



Source: FAO Database

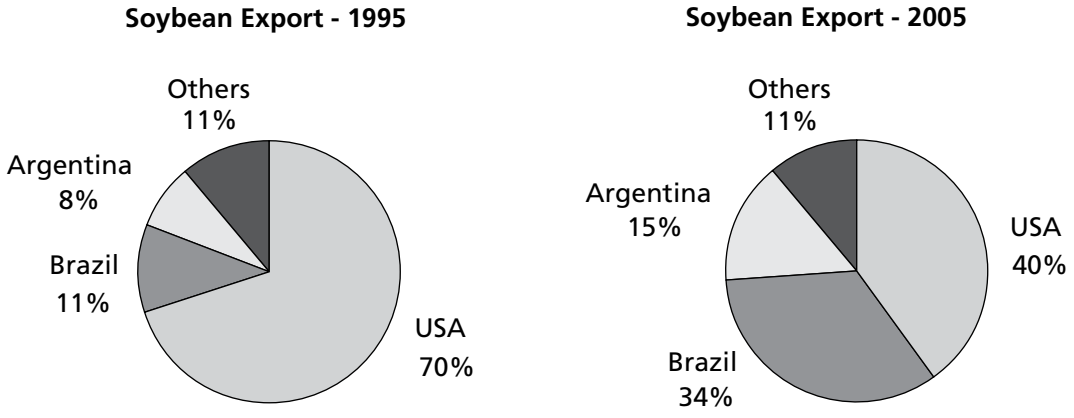
Production

Soybean is cultivated in many countries. However it is dominant in the United States of America, Brazil, Argentina, the People's Republic of China and India. Total soybean production is estimated at 233 million tonnes in 2006/07[12], or 58 percent of the total oilseed production. During the last ten years, soybean production increase has been exceptionally rapid in Argentina (20 percent annual increase), Brazil (12 percent) and the United States of America (2.9 percent). While the competitiveness of Argentina and Brazil soybean industry has increased, chicken exports have boomed in these two countries.

Exports

As illustrated in Figures 3 and 4, the United States of America's share of global exports over the past 25 years has steadily diminished. A key development has been the rapid growth of foreign soybean output and exports, particularly by Brazil and Argentina. Foreign soybean output now exceeds that of the United States of America, and Brazil and Argentina currently share approximately half of the soybean export market, up from less than 15 percent before 1980. With increased production, and faster expansion of trade in soybean products than whole beans, Brazil and Argentina have each surpassed the United States of America in soy meal and soybean oil exports. Another factor is the recent expansion of United States of America meat exports, which stimulates domestic meal use rather than contributing to exports of soybeans or soybean meal. Brazilian and Argentinean soybean and meal exports are projected to continue capturing market share from the United States of America in the next decade.

Figures 3 and 4: Global soybean exports in 1995 and 2005



Source: FAO Database

12 Source: FAO2007. *Food Outlook. Oilseeds, Oils and Oilmeals*, No.1

Oilseed Crops (in million tonnes)	2004/05	2005/06 estim.	2006/07 f'cast
Soybeans	216.6	221.4	232.9
Cottonseed	44.7	42.3	44.0
Rapeseed	45.9	48.9	47.0
Groundnuts (unshelled)	34.8	35.7	34.0
Sunflower	25.4	29.9	29.3
Palm kernels	8.9	9.5	9.6
Copra	5.2	5.1	4.8
Total	381.5	392.8	401.6

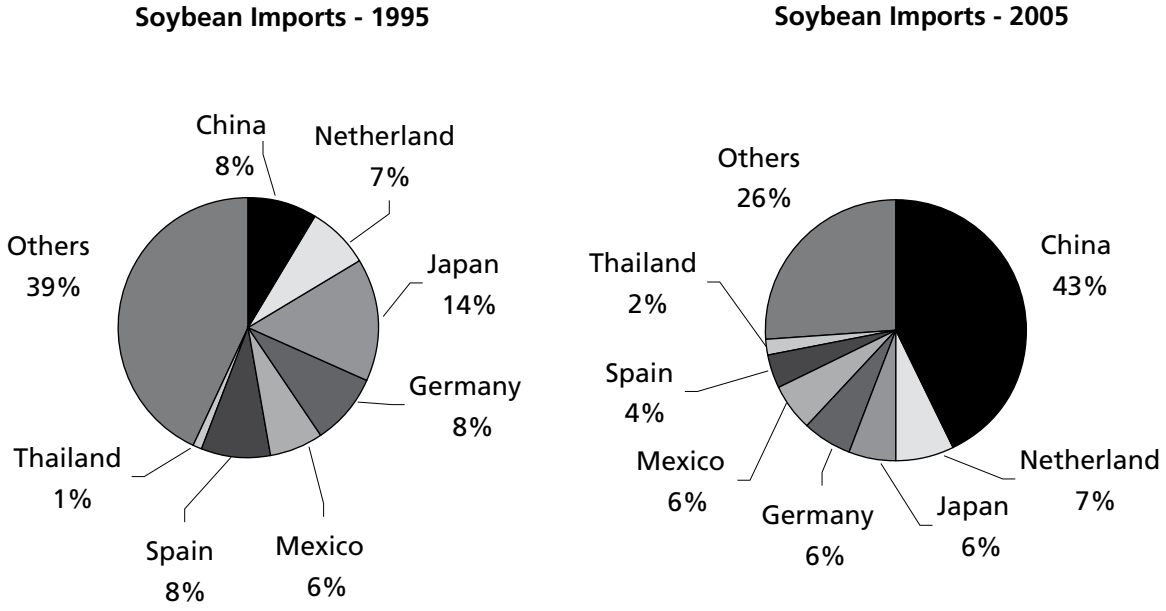
Yet, to date, the United States of America remains the world's largest producer and exporter of soybeans. Oilseed and oilseed product exports, particularly soybeans, represent a significant source of demand for the United States of America's producers and make a large net contribution to the United States of America agricultural trade balance. In the early 2000s, the value of United States of America oilseed and product exports averaged over US$9 billion, nearly half the farm-level value of production.[13]

Main export destinations for soybean, soybean oil and soybean cake, and vegetable oil include the EU, Mexico and Asia, namely the People's Republic of China, Japan, Taiwan, the Republic of Korea, Indonesia, Thailand and the Philippines.

Imports

Demand for soybean is mainly driven by demand for soybean cake from the animal feed industry. Over the past ten years, the People's Republic of China has emerged as the major soybean importer and is now reaping nearly half (43 percent) of the world imports while in 1995 the People's Republic of China imported less than 10 percent (Figures 5 and 6). Rapid growth of the People's Republic of China's economy has spurred food consumption, turning the country into the world's leading soybean importer. All Asian countries are importing soybean from the world market to fuel their growing livestock and fishery industries. Thailand is the seventh importer, with annual imports reaching 1.6 million tonnes of soybean over the past few years.

Figures 5 and 6: Global soybean imports in 1995 and 2005



Source: FAO Database

13 USDA. 2007. *Soybean Oil Crops Briefing Room*, ERS. www. ers. usda. gov/Briefing/SoybeansOilcrops/

Soybean cake (soymeal)

Soybean cake is the most important oilcake in the world, as it commands two-thirds of the global meal demand. The main consumers of soybean cake are the United States of America (24 percent), the EU (24 percent) and the People's Republic of China (6 percent)[14]. The main exporters of soybean cake are unsurprisingly Argentina, Brazil and the United States of America. The main importers of soybean cake are European countries.

In Asia, Thailand and Indonesia are the main importers and account for 1.85 million tonnes imported. To understand Thailand's soybean and soybean cake market, one must get to know its poultry market. Thailand ranked for over a decade among the world's top ten exporters of processed poultry, primarily to Japan and the EU[15]. Thailand's livestock and feed industries have expanded rapidly over the past decades, fuelled by booming domestic demand for poultry and pork and keen export demand for poultry. Another factor driving up feed demand in Thailand is aquaculture's growing need for oilcakes. With an outright ban on soybean and soybean cake import, Myanmar is missing out opportunities to develop its livestock and fishery industries.

Soybean oil

Soybean oil is only a by-product of soybean cake production, which is used by the food, detergents, cosmetics and chemical industries. Caused by the development of the livestock industries, soy oil now ranks as the most important edible oil in the world, with a global market share of 23 percent. However, soybean oil is slowly losing its market share to palm oil. Total soy oil production is expected to reach 39 million tonnes in 2007/08[16].

The main exporters of soybean oil are again unsurprisingly Argentina, Brazil and the United States of America, commanding nearly 76 percent of the world exports. Many countries are importing soybean oil. The top three soybean oil importers are the People's Republic of China (18 percent of total imports), India (17 percent) and the Islamic Republic of Iran (8 percent). The top three consumers of soybean oil are the United States of America, the People's Republic of China, and Brazil.

5.4 Oil-palm

Oil-palm (*Elaeis guineensis Jacq.*) is native to West Africa and is now planted in large-scale plantations throughout the tropics. CPO is the primary product derived from the red fruits of the oil-palm, while palm kernel oil (PKO), derived from the fruit's nut is considered to be a secondary product. Palm kernel meal (PKM) is primarily used for animal feed. CPO is currently the world's most produced oil with 34 million tonnes in 2005 and the largest traded

14 Oil World. 2002. *Oil World Annual* 2002.

15 In 2004, the bird flu hit the industry, which was producing more than a million tonnes of meat every year and generating four billion US$ in revenue. Exports dropped from over 340 000 tonnes of chicken meat to nearly 4 550 tonnes in 2004. The industry has by and large recovered by 2007.

16 Oil World. 2007. *Oil World Annual 2007*.

oil in the world. Palm oil exports reached 24 million tonnes in 2005, and the largest export shares come from Malaysia (50 percent) and Indonesia (30 percent). Palm oil is produced for both consumption and industrial uses.

Oil-palm has a unique feature in that it produces more oil per unit area and unit time than any oil crops. Furthermore, all over the world there is a great deal of competition for acreage between cereals such as wheat and rice, feed grains such as corn and sorghum and oilseeds such as soybean, rapeseed and sunflower seed. The only vegetable oil source that does not have to face this critical competition is palm oil, and therefore palm oil is a factor of stability in the world edible oil supply.

Production

During the past 30 years, expansion of oil-palm has been exceptional[17]. From a low 2 million tonnes in the early 1970s, palm oil world production has reached over 38 million tonnes in 2006. Indonesia produced 44 percent and Malaysia 41 percent of global palm oil production. Other countries represent 15 percent, including Thailand (2 percent). Africa, the original home of palm oil, is largely stagnating and thus may become a major import market. For all practical purposes, the palm oil industry means the industry in Malaysia and Indonesia (see Figures 7, 8 and 9). The industry employs millions of people and generates billions of US$ in turnover for private companies as well as vital government revenue in key producing countries such as Malaysia and Indonesia.

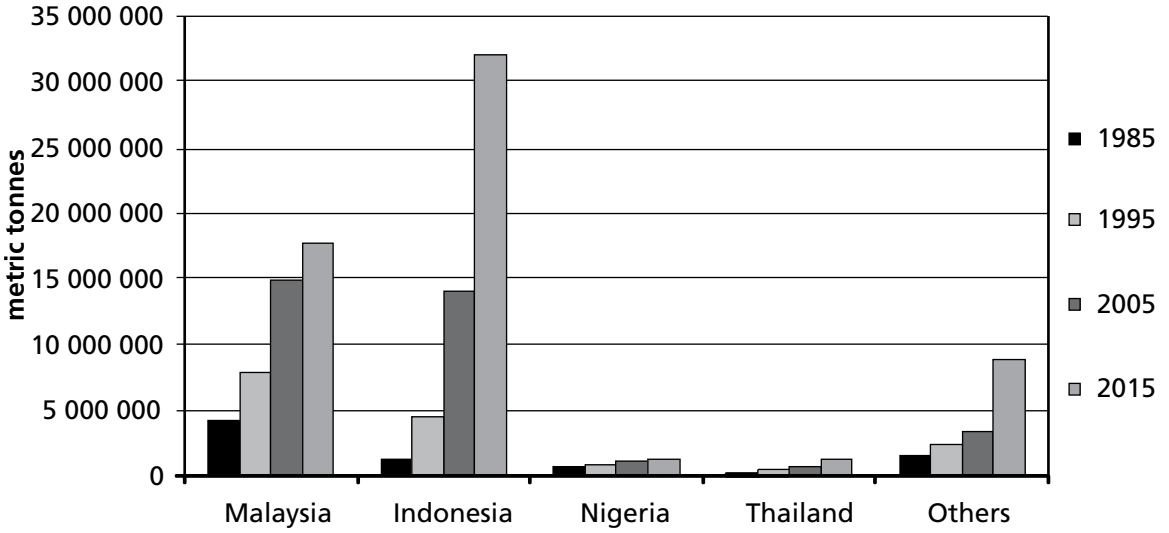
In Malaysia, the total mature oil-palm plantation area reached 3.79 million ha in 2007[18]. Assuming the past five years increase in area under cultivation, the total oil-palm plantations in Indonesia are set to increase to 4.3 million ha in 2015 and production to 15 million tonnes (18.7 percent increase). Malaysia's land and labour costs are considered increasingly prohibitive for further expansion of the oil-palm area: Indonesia out-competes Malaysia in terms of labour cost by five times and in cost of land by four times, thereby making it the cheapest producer of palm oil in the world[19].

17 The crop is of recent origin. The Southeast Asian palm oil industry, which accounts for nearly 90 percent of the total world production, started from the introduction of the four palm plants from Mauritius in 1948. By chance and good luck, this material proved to be high-yielding and resistant to pests and diseases. Three genetic types exist; Dura (ShSh) is thicker-shelled, Tenera, (Shsh) is thin-shelled and Pisifera (shsh) is more or less shell-less. Germplasm collection has been made by Malaysia in West Africa to provide material for breeding in Southeast Asia. FAO. 1991. *Report of the Regional Expert Consultation of the Asia Network of Oilseed Crops.17–20 December 1991*, Bangkok.

18 Oil World. 2007. *Oil World Annual 2007*, p.16

19 Friends of the Earth. 2005. *Greasy Palm. The Social and Ecological Impacts of Large-scale Oil-Palm Plantation Development in Southeast Asia*, p.14

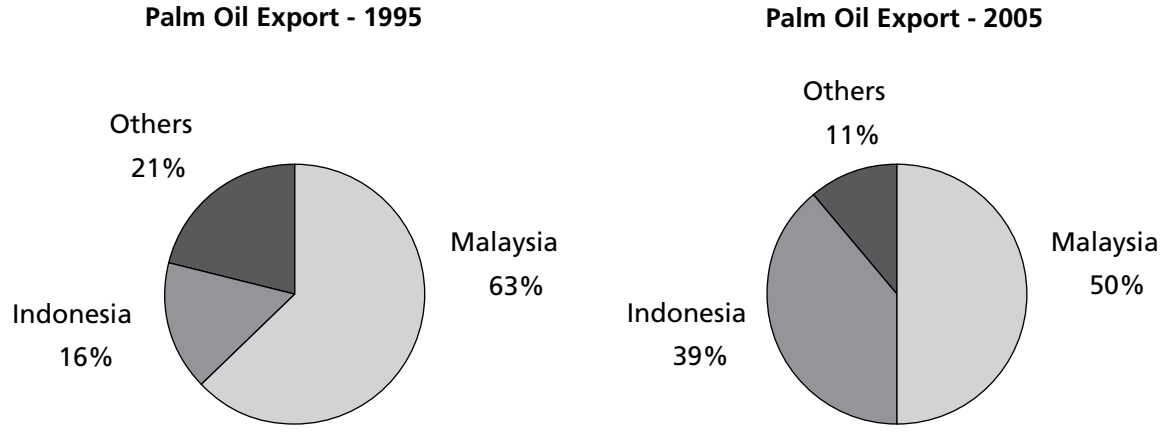
Figure 7: Global palm oil production in 1985, 1995, 2005 and a projection for 2015



Source: FAO Database

In Indonesia, the total mature oil-palm plantation area reached 4.58 million ha in 2007[20]. Assuming the past five years increase in area under cultivation, the total palm oil-palm plantations in Indonesia is set to increase to 8.2 million ha in 2015 and production to 32 million tonnes (120 percent increase). According to recent revisions of permanent forestlands, not officially published, the area of convertible forestland has increased from 8 million ha in 2000 to 14 million in 2002, which is believed to be mostly used for future palm oil plantations[21].

Figures 8 and 9: Main palm oil exporters in 1995 and 2005



Source: FAO Database

20 Oil World, *Ibid.*, 2007.

21 Friends of the Earth. 2005. *Greasy Palm. The Social and Ecological Impacts of Large-scale Oil-Palm Plantation Development in Southeast Asia*, p.13

Palm oil production is highly competitive. Economies of scale demand that an oil-palm plantation is at least 4 000 ha in size (~6 by 7 km) in order to be able to feasibly operate a CPO mill that processes the Fresh Fruit Bunches (FFBs) from the plantation estates. In Southeast Asia an average individual plantation company manages a plantation area of 10 000 to 25 000 ha. These companies are mostly part of larger agribusiness holdings, with plantation estates ranging from 100 000 to 600 000 ha in several provinces and countries. These holdings in turn usually belong to business conglomerates that are active in various other sectors, such as forestry, telecommunications, banking and construction. [22]

The Malaysian Palm Oil Board (MPOB)[23], a governmental promotion body, provides technical assistance and advice to a range of countries – from Viet Nam to the Philippines, Ecuador and Brazil – to develop oil-palm plantations. So far, Myanmar has not established a working contact with Malaysia to develop its palm oil industry.

Consumption and imports

Global demand for palm oil has been increasing by 250 percent over the past ten years. Palm oil is currently the world's second most consumed edible oil, and is about to overtake soybean oil as the world's most consumed oil. Palm oil is widely used across the globe. According to the FAO database, 187 countries have imported palm oil in 2005. Yet, most of this palm oil is being consumed in Asia; the People's Republic of China procures 19 percent of the total palm oil imports, India 10 percent and Pakistan 6 percent. Malaysia and Indonesia are also main consumers. Bangladesh is the sixth largest importer of palm oil with nearly 1 million tonnes in 2005. Imports in Bangladesh nearly doubled between 2000 and 2005.

All non-palm oil producers in Asia are net importers of edible oil. Myanmar is no exception, as it officially imported 274 000 tonnes in 2006/07, and palm oil consumption is estimated to constitute 53 percent of edible oil consumed in Myanmar (see Section 6.2).

5.5 GROUNDNUT

Production

Groundnut[24] (*Arachis hypogeas L.)* originated in South America. Raw groundnuts are basically used as seed, transformed into 'prepared' groundnuts (roasted, salted, flavoured, etc.), used in food industries to produce peanut butter/paste and groundnut intensive goods such as snacks and sweets, or crushed for oil and groundnut meal.

World production of groundnut is estimated at 34 million tonnes in 2006/07 (FAO). The People's Republic of China is the world's single largest groundnut producer, with 37 percent of the world's production, followed by India, which accounted for 18 percent of world groundnut

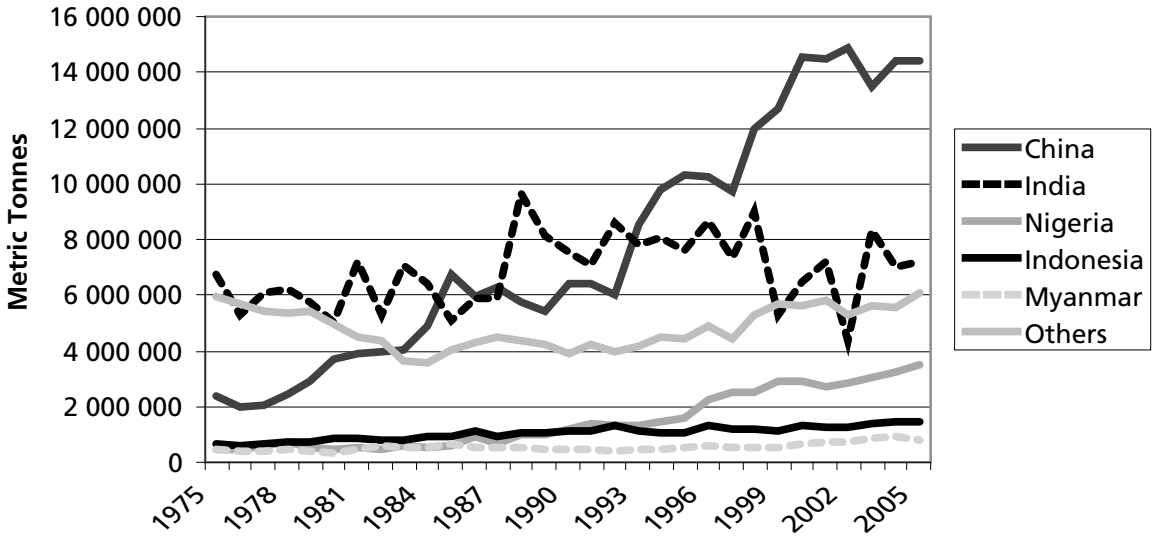
22 Friends of the Earth, *Ibid*., January 2005, p.11

23 www. mpob. gov. my/

24 Groundnuts are also known as peanuts, earthnuts, goobers, pinders, and Manila nuts. African nut, Chinese nut, Manila nut, kipper nut, hawks nut, jar nut, earth chestnut, monkey nut, goober pea, ground pea and ground bean.

production (Graph 3). A major shift in the global groundnut production is the rapid increase of the People's Republic of China over the past 15 years.

Graph 3: Global groundnut production over a 30 year period,1975-2005



Source: FAO Database

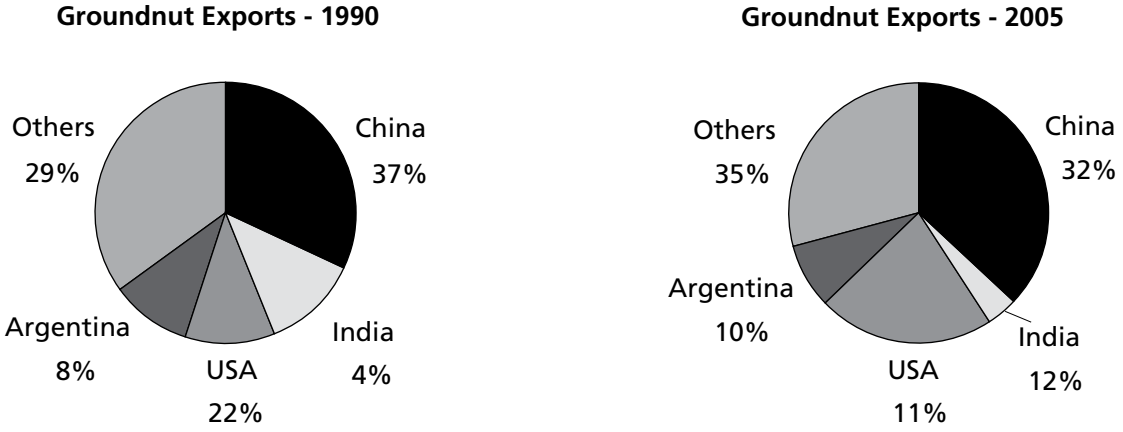
Myanmar is among the top ten world producers and ranked as the world's sixth largest producer, with two percent of global production in 2005.

A major decline in the share of groundnut production crushed for oil and meal over the past two decades reflects the increasing availability of cheaper, low-fat vegetable oils, such as soybean and palm oil. These oils have steadily substituted groundnut oil and meal. Globally groundnut meal must also compete with meal from other oilseeds and with cereal-based products such as maize gluten. A major increase in edible/snack groundnut occurred globally mainly in developed countries and fast growing economies in Asia. Producers in Myanmar still devote 60 percent of their production for crushing (oil and cake).

Exports

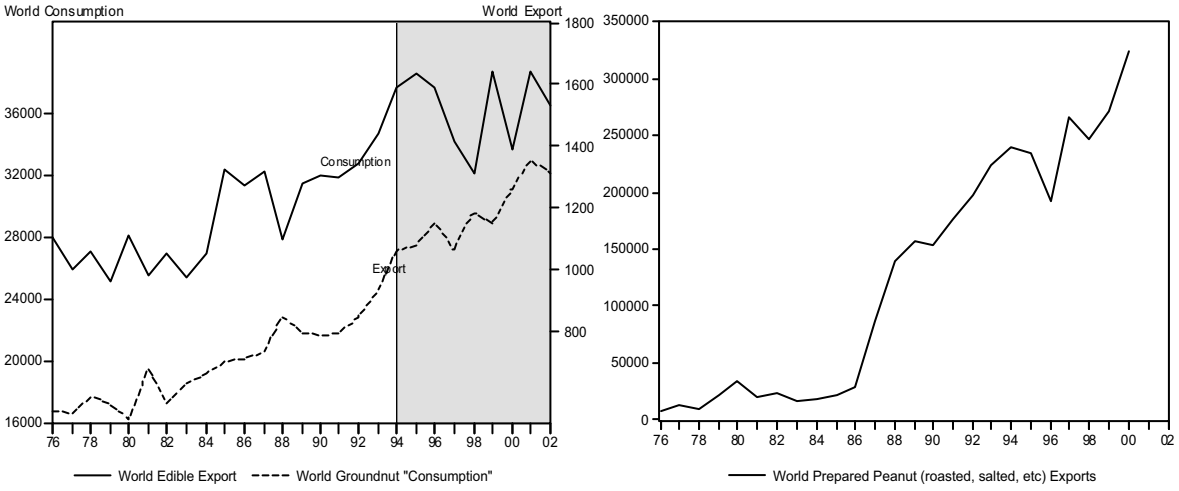
Groundnut export data is shown in Figures 10 and 11 and Graph 4. One salient feature of the world groundnut market is its thinness, with international trade of groundnuts representing only 3 percent of global production (1.1 million tonnes in 2005). Most of the world's groundnut production is thus consumed locally. In the 1960s and 1970s groundnut oil was the major item traded, as edible groundnut trade was negligible. Since that period, the reverse has occurred. Edible groundnuts dominate world groundnut trade while groundnut oil is of minor importance. In that process, groundnut cake in 2005 represented only a third of 1995 trade. Driven by rising demand in developed and fast-growing Asian countries, exports of edible groundnut increased by 10 percent over the past decade. Moreover, this growth followed a fast increase of over 40 percent between 1985 and 1995. Imports have boomed in Thailand with a five times increase of official imports over the past ten years. Rapid increase in groundnut consumption in Thailand has re-shaped the groundnut marketing chain in Myanmar.

Figures 10 and 11: Global groundnut exports in 1990 and 2005



Source: FAO Database

Graph 4: World export and consumption of edible groundnut ('000 tonnes)



Source: World Bank, 2003[25]

As stated by Diop *et al.* (2003), "China appears as one of the major beneficiaries of the expansion of the edible and prepared groundnut markets while the predominant role of the United States of America in these markets decreased significantly. From barely 1 percent in 1976, China's market share in the world edible groundnut market increased dramatically to reach 32 percent in 2001. During the same period, the United States market share dropped from 32 to 19 percent. The emergence of China as a leading groundnut exporter is even more

25 See Diop, Ndiame, Beghin, John & Sewadeh, Mirvat. 2003. *Groundnut Policies, Global Trade Dynamics and the Impact of Trade Liberalization*, World Bank, Draft, Washington D.C.

impressive in the prepared groundnut market. This country has overtaken the United States of America as the world's largest exporter in this market, after entering the latter in 1987". [26]

Myanmar remains a leading groundnut producer but was left out from these exciting international market opportunities, because of prohibition on export since the 1980s.

Sub-Saharan African countries, once major exporters, are the main losers in the international market, as they met difficulties in adjusting to international market shifts from groundnut for oil to edible groundnut, as well as from increasingly strict quality and product standards. The international market became more demanding on quality and product standards, from both a public health perspective (permissible level of aflatoxin), and from a technical standpoint (size, uniformity and quality of the product). Aflatoxin contamination of groundnut is a major human and animal health hazard and is one of the most important constraints to groundnut trade. Aflatoxin is a natural toxin known to cause cancer, suppressing immunity and interfering with nutrient uptake. Aflatoxin invades groundnuts during production or soon after harvest and is more prevalent in groundnuts exposed to end-of-season drought stress. While aflatoxin disappears with crushing, it tends to be present in groundnut cake and edible groundnuts. In the 1980s, Myanmar could not export large quantities of groundnut cake because of alfatoxin[27].

Imports

The structure of edible groundnut imports has not changed much over the last two decades. European countries remain the major edible groundnut importers. Competition among exporters in these markets has however increased. In 2005, European countries accounted for 72 percent of world groundnut imports.

Groundnut oil

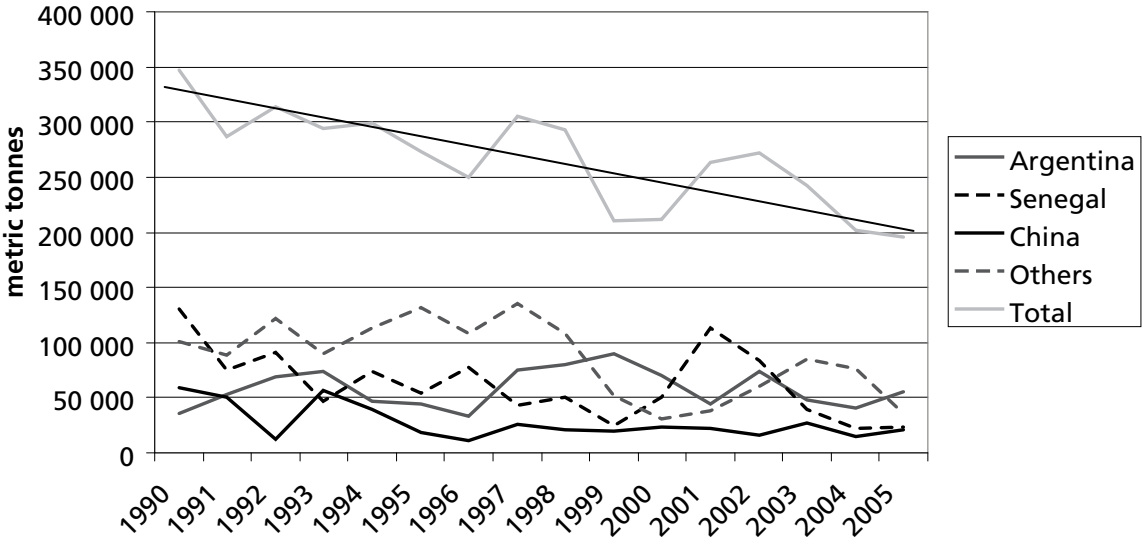
The top three groundnut oil exporters are Argentina, Senegal and the People's Republic of China and account for 50 percent of the total exports. The groundnut oil market segment has become all the more thinner, as other lighter and cheaper vegetable oils are increasingly used as substitutes of groundnut oil. Graph 5 shows that groundnut exports decreased from 0.36 million tonnes in 1990 to 0.2 million tonnes in 2005 (45 percent decrease). Significant fluctuations of exports reflect the extreme thinness of this market. Over the last 25 years, many countries have shifted out of groundnut oil (e.g. Brazil) or have opted to enter this market only when the quality of groundnut harvested cannot be sold in the edible market (e.g., United States of America). These downward trends in the groundnut market raise many important questions about the future of the sector and prospects for various players.

In Asia, the People's Republic of China is the main groundnut oil importer, which accounts for nearly 18 000 tonnes or 8.1 percent of world imports.

26 Diop, Ndiame, Beghin, John & Sewadeh, Mirvat, *Ibid.*

27 See UNDP, ADB & MOC. 1984. *Oilseeds Production and Processing Project. Feasibility Report. Volume I: Main Report*, UGL Consultants Ltd.

Graph 5: Trend of the groundnut oil exports between 1990 and 2004



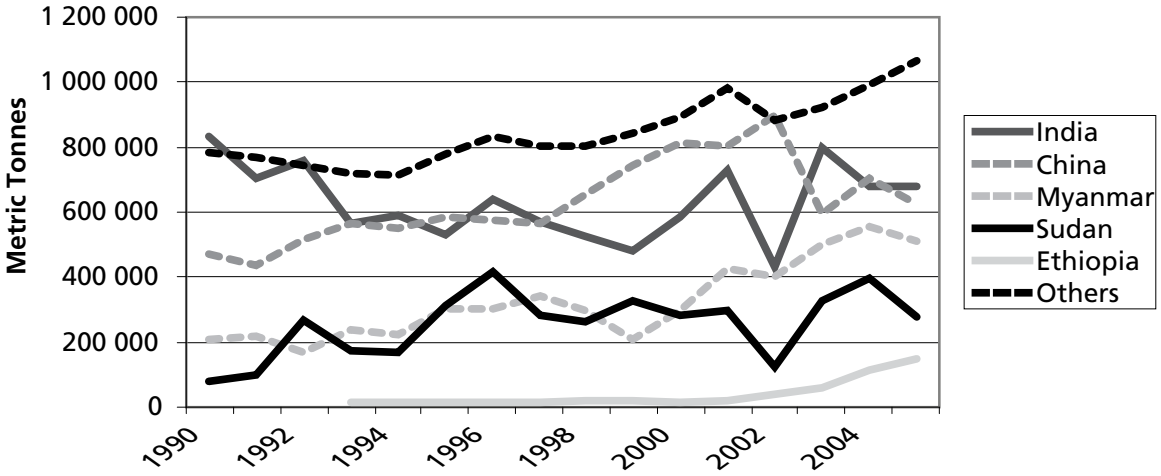
Source: FAO Database

5.6 SESAME

Production

Global production of sesame seed is estimated to have reached 3.3 million tonnes in 2005 having risen from 1.7 million tonnes in 1990 (Graph 6). Important variations on production in main producing countries are because of the heavy dependence of rainfall for sesame crops. In the People's Republic of China, after doubling production in the 1990s, production has declined since 2002. India has become the largest producer and accounts for 8.8 percent of the global production and is followed by the People's Republic of China. Myanmar is the third world sesame producer and accounts for 7 percent of global production.

Graph 6: Sesame production of the top five world producers between 1990 and 2005



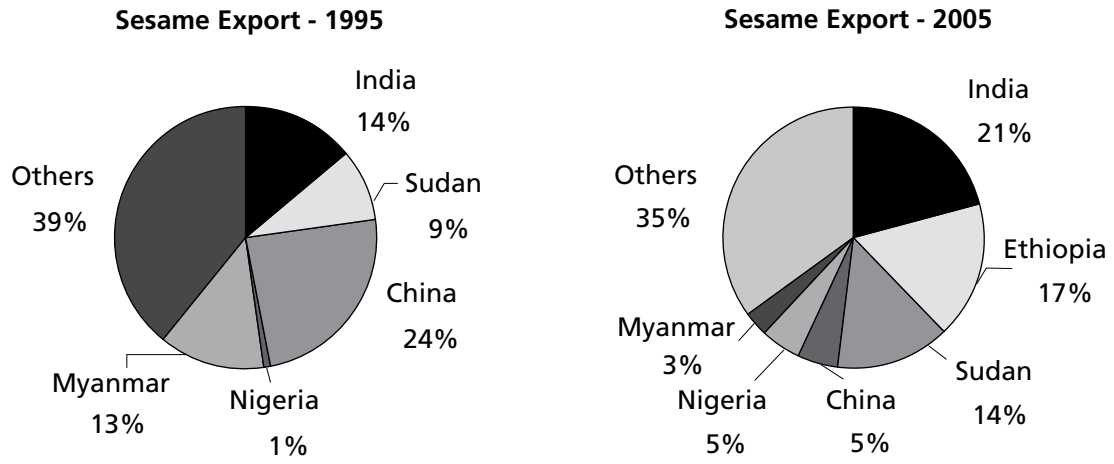
Source: FAO Database

Exports

Nearly 30 percent of the global sesame harvest enters international trade and reached 0.95 million tonnes in 2005. The sesame export market has been growing fast with an annual increase nearing 6 percent over the past ten years (Figures 12 and 13 and Graph 7). A major change in the exports market over the past decade is the reduction of the Chinese global share. This is because of stagnant production, but also increased indigenous consumer demands for high value commodities, as the Chinese economy is booming.

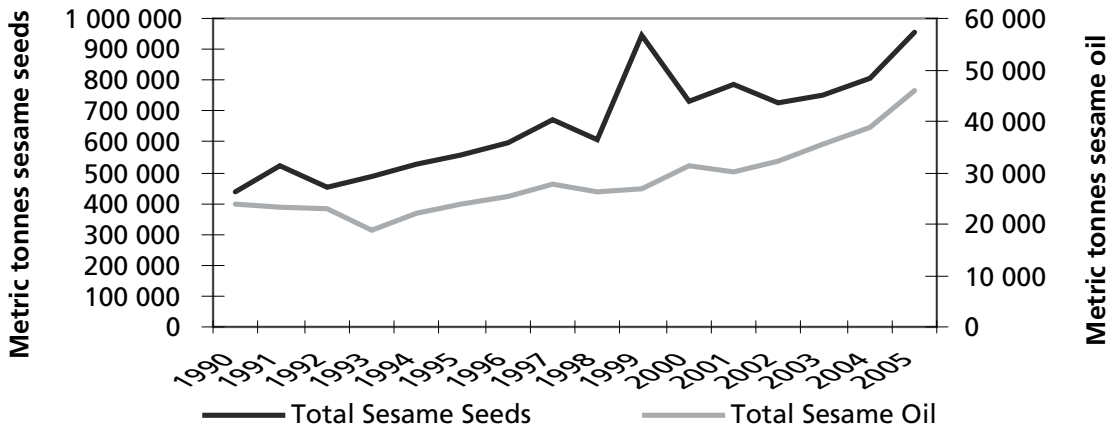
Ethiopia is a newcomer in the sesame trade, and in only a decade it has captured a significant share of the international market (17 percent), to become the second largest exporter. From a mere 2 500 tonnes in 1995, exports from Ethiopia have boomed to reach 161 000 tonnes in 2005. Sudan and Nigeria have also strengthened their position on the global sesame trade. New entrants on the international sesame trade are a potential threat to the sesame export industry in Myanmar.

Figures 12 and 13: Global sesame exports in 1995 and 2005.



Source: FAO Database

Graph 7: Global export of sesame seeds and sesame oil between 1990 and 2005



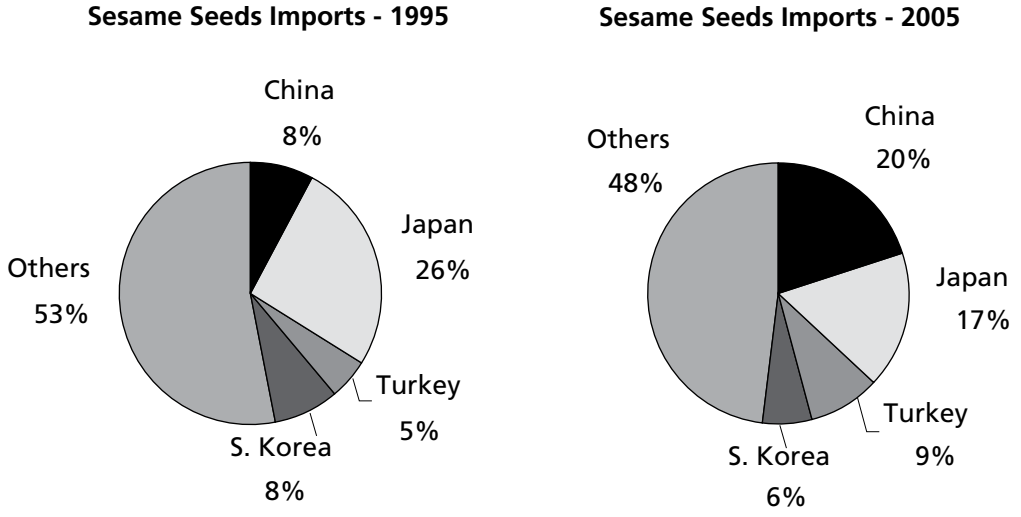
Sourc e: FAO Database

Imports

Imports of sesame seeds are concentrated in Asia, with the People's Republic of China, Japan and the Republic of Korea accounting for 43 percent of the global imports, followed by the Near East with Turkey, Saudi Arabia, Syria accounting for 15 percent (Figures 14 and 15). The major changes in the sesame seeds global trade is a sudden increase of imports from the People's Republic of China since 2003.

Japan is the second world importer of sesame, which is a popular food for Japanese people. Black sesame in particular is used as spice (*shichimi*) and roasted black sesame is used in confectionary drinks, salad dressing, noodle soup, bread and sweets (*ohagi*, Japanese sweet rice ball).

Figures 14 and 15: Global imports of sesame seeds in 1995 and 2005



Source: FAO Database

Sesame oil

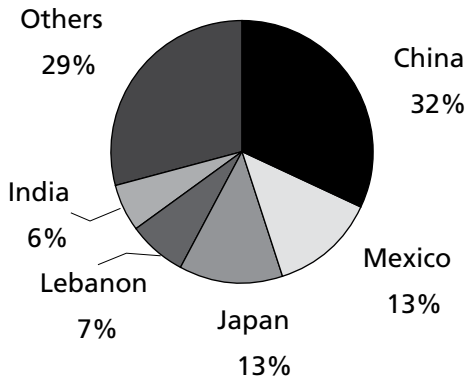
Global production of sesame oil is estimated at just over 900 000 tonnes a year. The top three sesame oil producers are the People's Republic of China (24 percent), Myanmar (22 percent) and India (17 percent). The oil has a distinctive nutty sweet flavour that has become established in the Far Eastern cuisine.

Global exports represent 5 percent of the total production or just over 45 000 tonnes per year. For the most part, the oil is pressed locally and used for cooking or the seeds themselves are eaten, particularly after being fried. The major exporters of sesame oil are the People's Republic of China and Japan. Among African sesame growers, only Sudan has developed a significant export trade in oil. The five top sesame oil exporters account for nearly 80 percent of the global exports. These are the People's Republic of China (27 percent) India (18 percent), Mexico, Japan and the United States of America (Figure 16). Relative to other vegetable oils, the trade in sesame oil is quite minor in quantity but high in value. In 2005, the global exports reached 45 800 tonnes that had a value of US$201 million

or an average of approximately US$2 250/tonne. Further, the global sesame oil market is rapidly expanding; from below 20 000 tonnes in 1990 the total export has more than doubled and reached 45 000 tonnes in 2005 (see Graph 7). Myanmar is left on the side of these fast growing market opportunities as milling equipment to produce high quality sesame oil and quality control systems are not in place.

Sesame oil, particularly from roasted seeds, is an important component of Japanese cooking and traditionally this is the principal use of the seeds. Retail price of black sesame oil in Japan is high and in the range of US$25–30/litre[28]. In the People's Republic of China, there is a trend in producing oil from imported sesame grain to supply the Japanese market. A rapid rise in sesame imports has been seen in the Republic of Korea, where the inability of local production to keep pace with demand, and the liberalization of imports, has allowed trade to increase dramatically. The Republic of Korea is principally an oil market. In the past, the bulk of sesame was imported from the People's Republic of China. Increasingly, other sources such as India, Sudan and more recently Pakistan are taking market share. The increased consumer concern for healthy eating, and the beneficial image of sesame in this sector, is held to be responsible for this development in the Asian market.

Figure 16: Sesame oil exports in 2005



Source: FAO Database

5.7 EDIBLE OILS COMPLEX – GLOBAL TRENDS[29]

In 2007 international prices for oilseeds, edible oil and oilcakes have increased significantly. At the beginning of the season, bleak crop production prospects gave rise to concerns of tightening supplies and falling stocks. However, global soybean output eventually exceeded the original expectations and 2006/07 supplies of oilseeds and derived products were then considered to be ample relative to demand, and the global level of stocks was high, both in absolute terms and in relation to consumption. Therefore, the continued rise in oilseed, oil and meal prices cannot be explained by the season's own market fundamentals. Instead, prices have

28 http://www. rakuten. co. jp/

29 This section is mainly prepared based on FAO. 2007. *Food Outlook. Oilseeds, Oils and Oilmeals*, No.1. http://www. fao. org/es/esc/en/index. html

come under the direct influence of developments in the related feed grain markets, notably the unprecedented surge in international maize prices caused by a decline in global coarse grain (and wheat) production, which coincided with a strong increase in demand, especially for maize used as biofuel feedstock. With soybeans and maize both in demand in the feed and the energy market, the two commodities are competing for land. Considering the shortage of maize, an expansion of global maize plantings at the expense of soybean appeared inevitable in 2007/08. The prospect of further tightening soybean supplies (which traditionally satisfy two-thirds of global meal demand) constituted the main factor behind the observed rise in prices for oilseeds and oilcakes in recent months and led to the expectation of continued price firmness during the remainder of the season.

Reasons behind the concomitant rise in international vegetable oil prices reside also outside the soybean complex: a poor performance and thus tightening supplies of the key high-oil yielding oil crops in 2006/07 coincided with a steady expansion in vegetable oil demand for human consumption and, in particular, as fuel and biodiesel feedstock. Such a situation explains the strong reaction of the market to reports on falling palm oil stocks and to downward revisions in the 2007 forecast of global palm oil production.

Additional factors contributing to the season's price strength include the rise in ocean freight costs, resulting from a shortage of vessels complying with the new international regulations that came into force in January 2007, and, more recently, the weakening of the United States Dollar.

A recent Organisation of Economic Co-operation and Development (OECD)/FAO[30] report observes that the high world oil crop market prices in international trade are, in large measure, because of factors of temporary nature, such as drought related supply shortfalls, and low stocks. But structural changes such as increased feedstock demand for biofuel production[31], and the reduction of surpluses because of past policy reforms, may keep prices above historic equilibrium levels during the next ten years.

5.8 Benchmarking Myanmar on international market prices

Graphs 8 to 14 and Figures 17 and 18 show that both international prices and Myanmar prices of oil crops and edible oils have increased over the year 2006. This reflects the general upward trends on the international markets because of both increased use of oil for biofuel and short-term reduction of global oil supply.

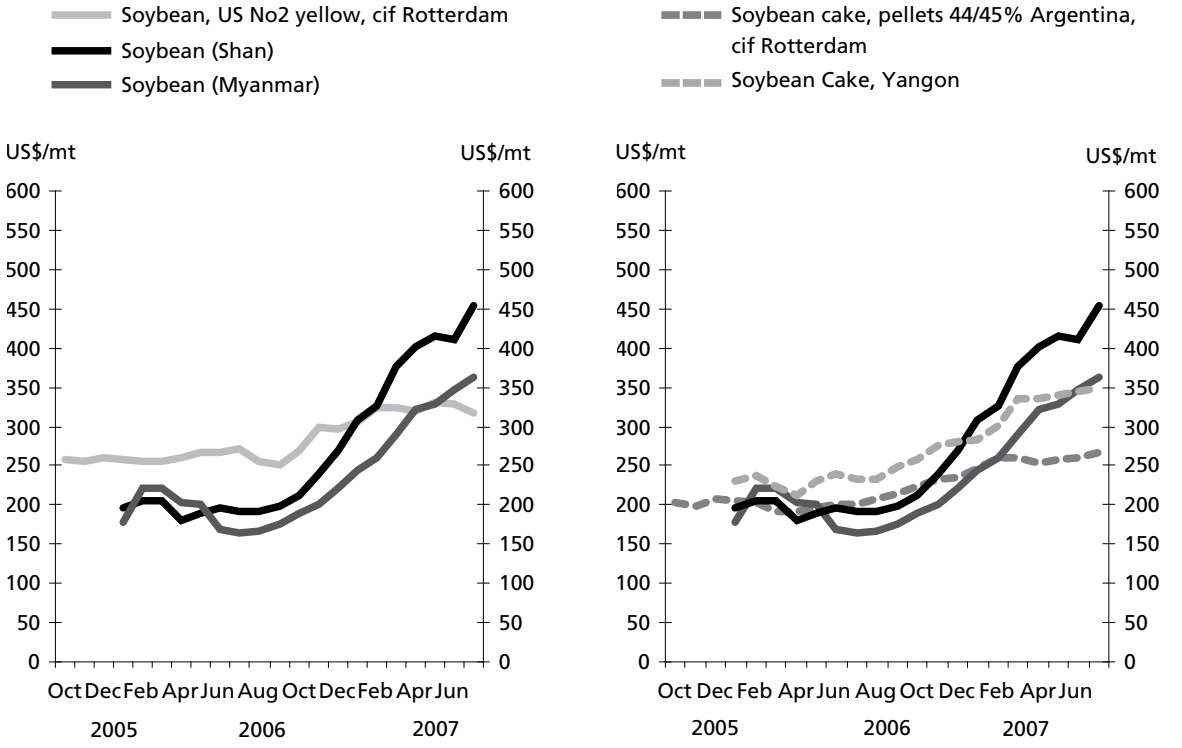
Graph 8 shows that the international price of soybean has increased substantially in 2007 to reach a 23 years high in July (The Public Ledger). The price of soybean in the Myanmar market has taken an even steeper upward trend with an increase of 232 percent between January 2006 and July 2007. In Myanmar Kyat, the increase is even larger with 241 percent increase, from Kyats 360/viss in January 2006 to Kyats 869 in May 2007 (see Graph

30 OECD & FAO. 2007. *Agriculture Outlook 2007–2016*. www. agr-outlook. org

31 On Malaysian initiatives, see Symbiosis, Interview with Tan Sri Datuk, Dr Yusuf Basiron, Chief Excecutive Officer of MPOC, October 2006, www. symbiosisonline. com

15). Prices reached a record high in 2007 and now exceed for the first time international market prices since January 2006 for Shan origin and June 2007 for lowland (Myanmar) origin. The price of soybean cake (see Graph 9) also significantly increased in 2007, with a climb of 152 percent between January 2006 and July 2007 in United States Dollar terms. Soybean cake price in Myanmar remained above international market prices, reflecting a situation of oilcake shortage. While the value of the cake had stabilized above the value of the soybeans on the domestic market, this scenario has changed in mid-2007 (see Graph 9). These changes are driven by higher demand for soybean cake and informal exports to inland areas in neighbouring countries (mainly the People's Republic of China) from Shan state as international prices soared.

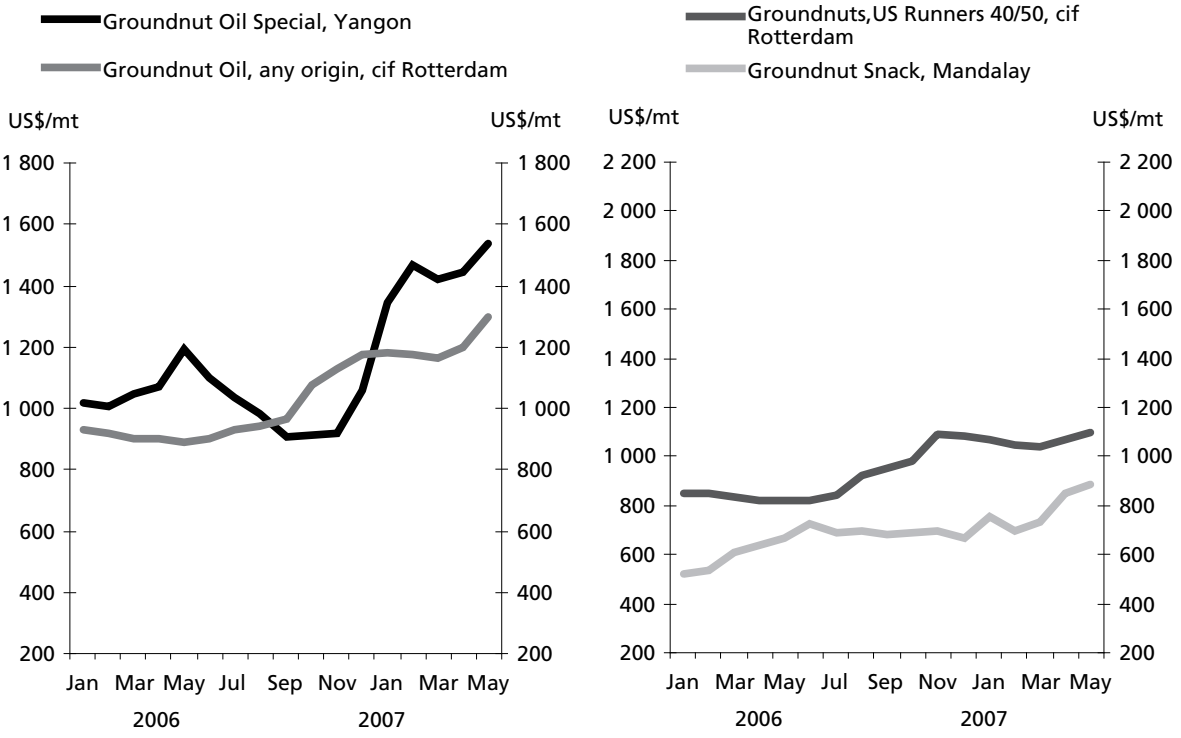
Graphs 8 and 9: Comparison between Myanmar and international market prices for soybean and soybean cake*



*In US$/tonne.
Sources: FAO, The Public Ledger, MIS, Animal Feed Crop Exchange Centre, Yangon

Graph 10 shows that while groundnut oil in the international market has increased from mid-2006 and 2007, the price in Myanmar in United States Dollar terms has decreased between May and November 2006. Prices in Myanmar dropped below international prices between September and November 2006, before a sharp increase during the 2006/07 cold season. Groundnut oil on the international market is produced from low quality groundnut that cannot be sold in higher value edible markets (small size, broken, etc..) and therefore prices are low. In Myanmar, edible/snack groundnut industry is informal and in its infancy. Graph 11 shows that edible groundnut in Myanmar remains below international market prices throughout the reporting period.

Graphs 10 and 11: Comparison between Myanmar and international market prices for groundnut oil and edible groundnut*

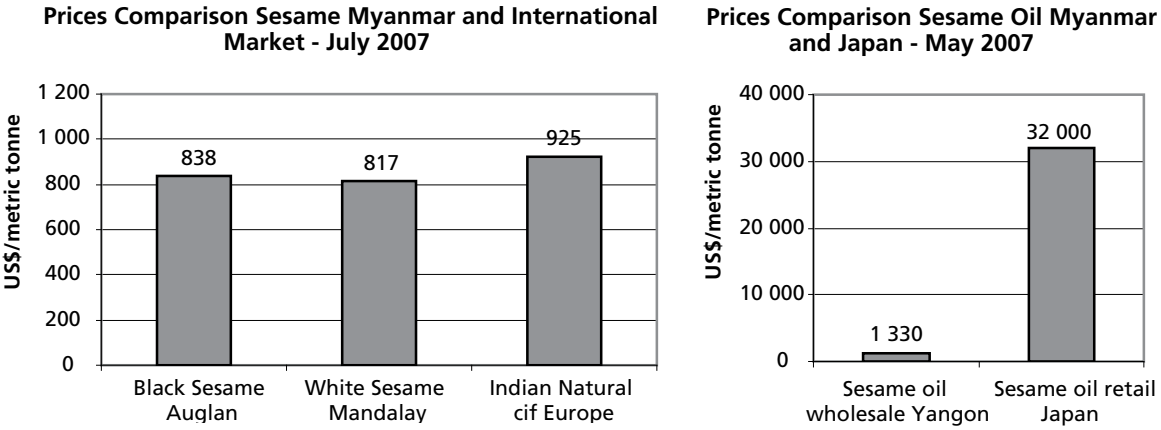


* In US$/tonne.
Sources: FAO database and MIS.

Globally, the sesame market is not centralized or regulated internationally and there are no mechanisms for price reporting. The Public Ledger publishes prices based on interviews, but these are not always consistent. Figure 17 shows that sesame prices in Myanmar are close to international market prices. But difference of price for sesame oil between Myanmar and Japan are huge (see Figure 18), offering a vast scope for adding value in Myanmar.

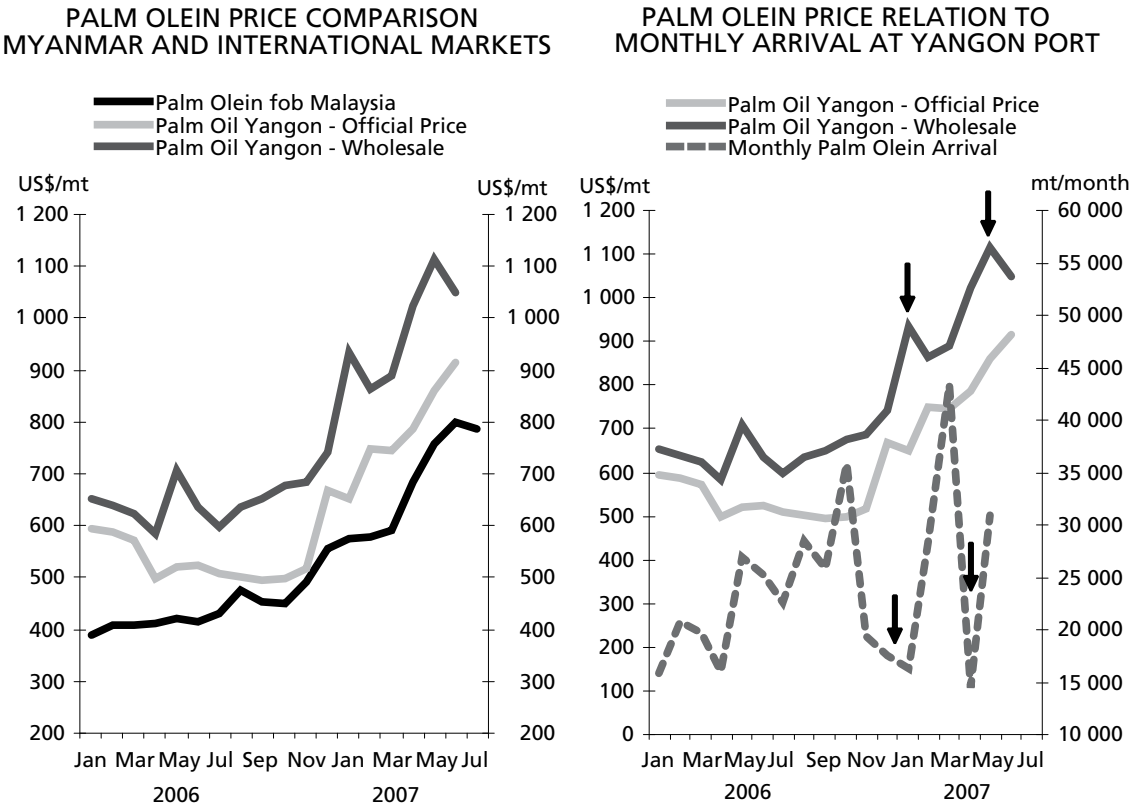
Graphs 12 and 13 show that international palm oil prices are lower than in Myanmar. Temporary surges in palm oil prices in Myanmar seem to be linked with the irregular monthly arrival of palm olein. Official prices also seem to react late to international market signals.

Figures 17 and 18: Comparison between sesame seeds and sesame oil prices in Myanmar and international markets in 2007



Source: E-Trade, MIS, The Public Ledger and Rakuten[32]

Graphs 12 and 13: Palm olein prices comparison in Myanmar and international markets (in US$/tonne) and relations between wholesale prices in Yangon and monthly palm olein arrival

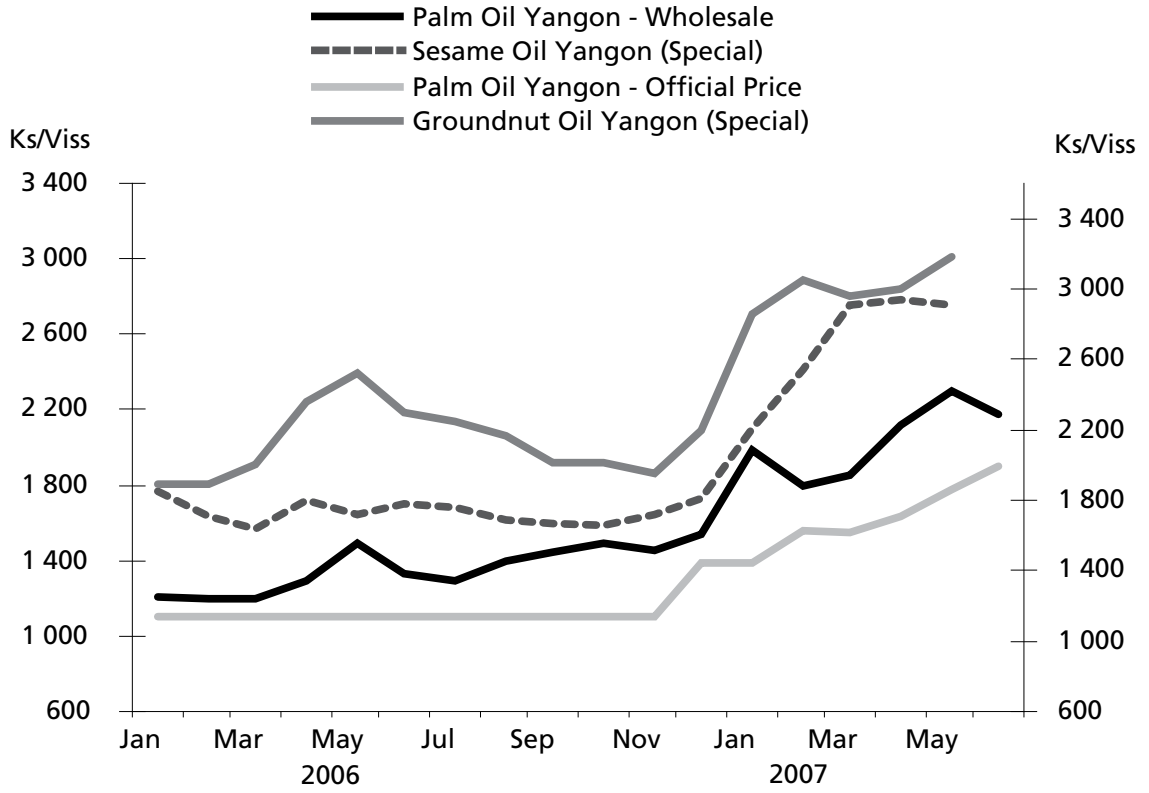


Source: Malaysian Palm Oil Board, MIS and Edible Oil Merchants Association

32 http://www. rakuten. co. jp/

Graph 14 shows that there are substantial differences between palm oil prices and domestically produced edible oils in Myanmar. Groundnut oil is the most expensive, followed by sesame oil and imported palm oil.

Graph 14: Edible oils prices comparison between January 2006 and June 2007*



* The term 'special' oil in Myanmar refers to prices of pure/unadulterated edible oil.
Source: MIS

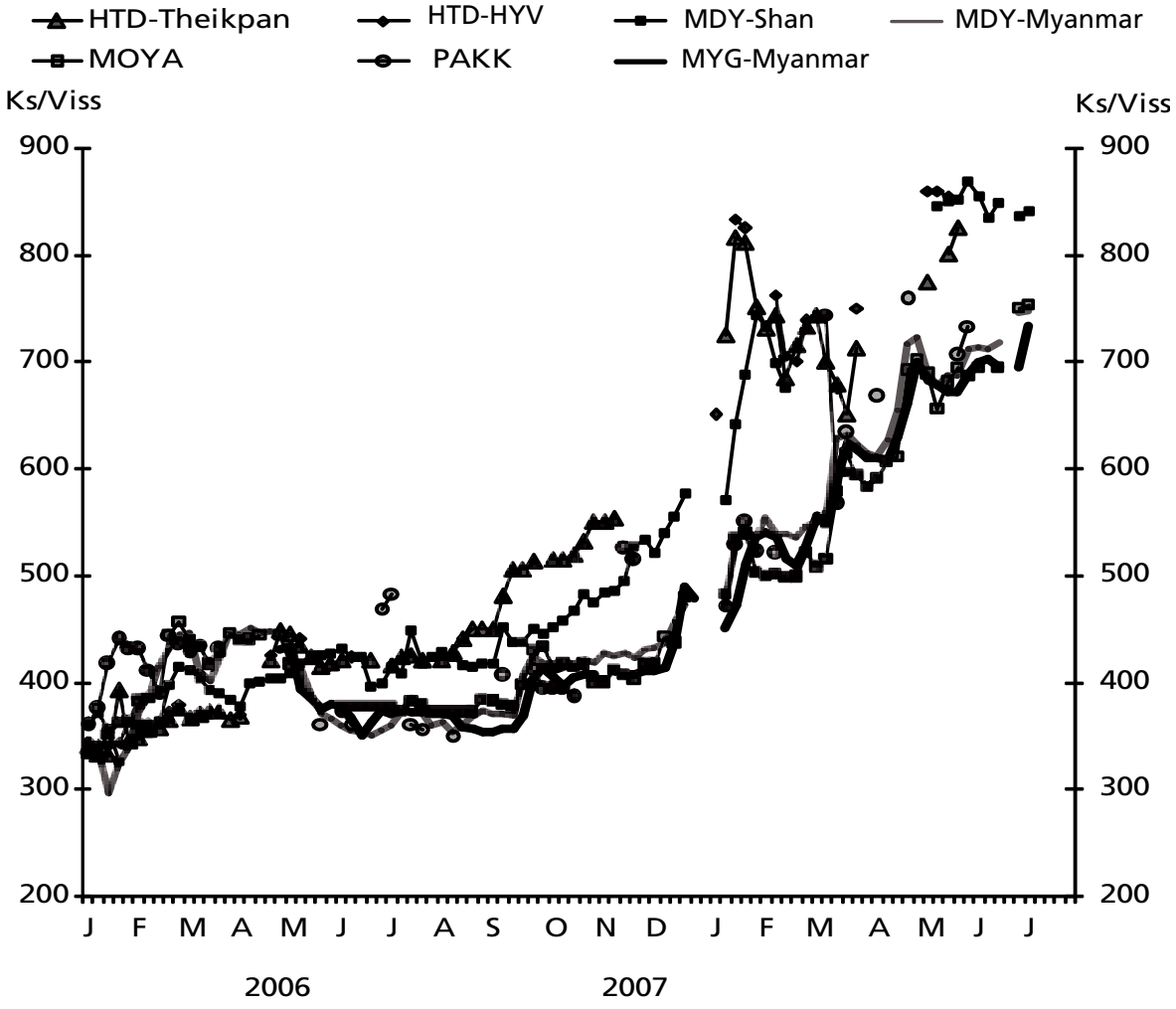
Table 4 on the next page compares the difference of prices between Myanmar and international market by commodity. The greatest price difference between Myanmar and the international market is with sesame oil (>30 000 US$/tonne). Groundnut price difference is noticeable with differential price values varying between 152 and 393 US$/tonne. Price differences are because of low production costs, absence of agroprocessing facilities to add value on oil crops and an outright ban on export. A less interesting commodity to export is sesame with a price difference of 98 US$/tonne, which appears sufficient to stimulate exports on the international market. Other commodities are more expensive in Myanmar than in the international market. Soybean prices were higher on the international market until recently; in July 2007, soybean price was 137 US$/tonne higher than in Myanmar. These vast price differentials between Myanmar and international markets reveal the deep distortion of market mechanisms and limited agroprocessing facilities.

Table 4: Price differences by commodity between Myanmar and international markets between January 2006 and June 2007*

	Sesame oil	Groundnut Edible/Snack	Sesame	Soybean shan	Soybean cake	Groundnut oil
Min value		-152		-62	21	-208
Max value		-393		137	85	297
Average	- 30 000	-262	-98	-15	46	106

*There are no mechanisms for international sesame and sesame oil price reporting and therefore time series price data are missing. Only a comparison in May 2007 between Myanmar and international markets could be made (see Figure 18).
Sources: FAO database, MIS, E-Trade, The Public Ledger, Animal Feed Crop Exchange Centre, Yangon and Rakuten33

Graph 15: Soybean price movement between January 2006 and July 2007*



*HTD – Hintada; MDY – Mandalay; MOYA – Monywa; MYG – Myngyian; PAKK – Pakkoku
Source: E-Trade

33 http://www. rakuten. co. jp/

6. Myanmar edible oil market

6.1 Myanmar Agricultural Service and Central Statistical Organisation edible oil supply and demand data 2005/06

The Myanmar Agricultural Service (MAS) has estimated the total domestic supply of edible oil in 2005/06 at 597 000 tonnes; 234 000 tonnes groundnut oil, 183 000 tonnes sesame oil, 144 000 sunflower oil, 21 000 tonnes niger oil and 14 017 tonnes mustard oil. These estimates are 65 000 tonnes over the 532 000 tonnes edible oil demand estimated by the CSO[34]. Therefore, official statistics suggests that Myanmar is self-sufficient in edible oil. In addition, during the same fiscal year, 185 000 tonnes of palm oil was imported into Myanmar, which should have resulted in a stock of 250 000 tonnes of edible oil. Table 33 in Annex VI presents MAS's assumption for the edible oil supply estimates, while Table 35 provides a breakdown of the official data by crop.

Official data do not reflect the reality of the oil crops sub-sector and therefore there is an urgent need to develop a sound database on supply and demand of edible oil in Myanmar, to allow adequate policy formulation and programme planning. This study undertook this task within the limited time frame and resources available, as this was a necessary prerequisite for its development. Without a realistic information base on edible oil supply and demand, sound analysis and recommendations cannot be made. The Excel files entitled *Edible Oils Supply Estimates* and *Edible Oil Consumption and Use Estimates*[35] provide details on the study estimates. Below is a detailed discussion on edible oil supply and demand estimates in Myanmar.

6.2 Edible oil supply/demand balance or the elusive quest for self-sufficiency

Demand trend analysis and projections

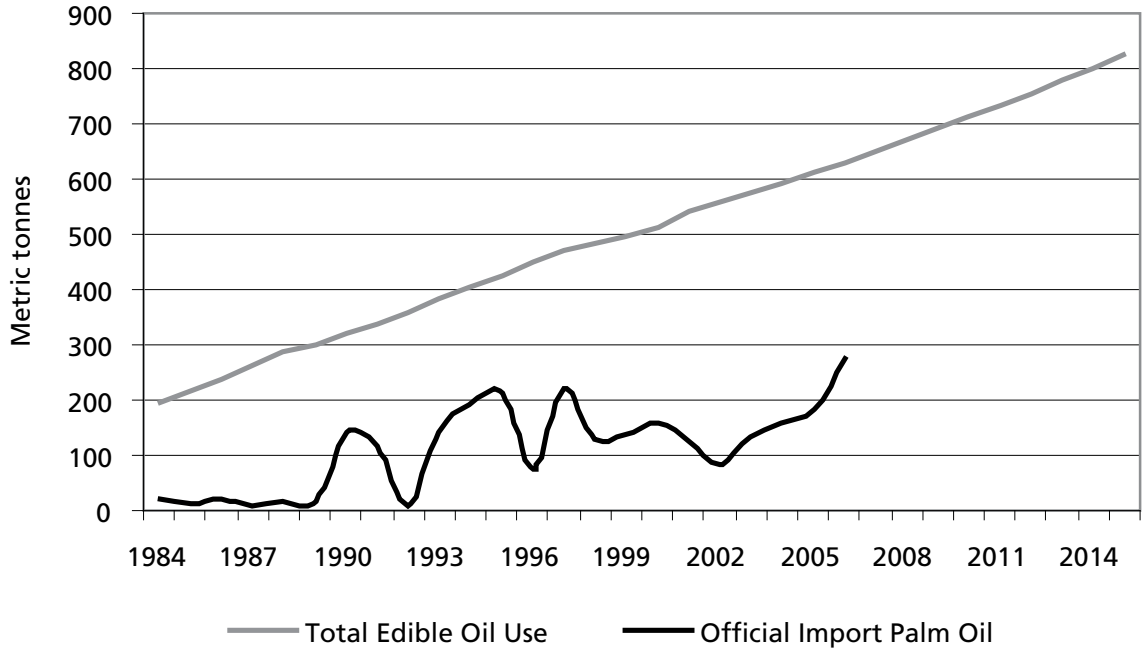
Edible oil is an important part of the Myanmar diet. It is used for frying and is often just mixed with other foods, such as rice, to improve palatability. Fried foods are popular and the quality of curries – the principal dish of the Burmese cuisine – is considered to depend very much on the quantity of oil included. A salad of tea leaves, fried pulses and sesame seeds mixed with oil is also commonly served at the end of a meal. In some rural areas, rice with salt and oil is the standard first meal of the day or taken to the fields for the midday meal.

34 CSO estimates do not take into consideration industrial and restaurant uses. The CSO estimates that the annual increase of per capita edible oil consumption was 0.3 kg/capita per year between 1984 and 1996 and 0.1 kg/capita per year between 1997 and 2001. An annual increase of 0.1 kg/capita between 2001 CSO data and 2005/06 was calculated.

35 The electronic version of these files are part of this study and available upon request.

According to the CSO Statistical Yearbook, annual per capita consumption of edible oil in 2001 was 9.2 kg (5.64 viss). CSO estimates are considered plausible by the study team as other independent estimates[36] on small samples have found similar or slightly higher levels of consumption. CSO figures are also consistent with estimates in neighbouring countries such as India[37]. The CSO estimates that the annual increase of per capita edible oil consumption was 0.3 kg/capita per year between 1984 and 1996 and 0.1 kg/capita per year between 1997 and 2001. Assuming that economic growth maintains at existing level, it is anticipated that the consumption will continue to increase by 0.1 kg/capita per year between 2002 and 2015. In addition, it is estimated that an additional 15 percent of edible oil is used for restaurant and agro-industry (chips, snacks and traditional processed food). Based on these assumptions, in 2007 the national edible oil consumption is estimated at about 630 000 tonnes. Considering a population growth rate of 2.02 percent[38], by 2015 the population of Myanmar will be 67.7 million and edible oil consumption will reach 825 000 tonnes (see Graph 16). The annual edible oil consumption growth rate is nearly 3 percent, which is well above annual production increase. Table 32 in Annex VI presents the actual and projected consumption data.

Graph 16: Edible oil use (consumption + agro-industry utilization) between 1984 and 2001 and projection for 2002–2015



Sources: CSO, Edible Oil Merchants Association and study estimates

In Graph 16, the gap between the estimated total edible oil use and the official import of palm oil is filled by national edible oil production and informal imports, mainly from Thailand.

36 MMRD. 2004. Myanmar Market Research and Development, see FAO, *Myanmar Oilcrops Development Project. FAO/TCP/MYA/2904. Volume II*, Annex 3.

37 Edible oil consumption in India is estimated at 11.48 kg/capita in 2006/07. See Solvent Extractors' Association website: www. seaofindia. com/feedingred. html

38 Source: CSO.

In 2006, the domestic edible supply is estimated at 288 000 tonnes (see Table 5 below) while the unofficial imports are estimated at 55 000 tonnes. The Graph also shows that official import volume of palm oil oscillates and does not reflect the actual demand. As a result, unofficial imports from Thailand fluctuate to bridge the gaps between supply and demand. As unofficial palm oil imported across the border from Thailand is packaged in ten viss metallic containers, it lands in central Myanmar at a higher price than palm oil imported in bulk from Malaysia. In June 2007, the price of Malaysian palm oil ranged between 2 200 and 2 250/viss, while palm oil informally imported from Thailand ranged between 2 700 and 2 800/viss.

Supply analysis 2006/07

Because most edible oil is produced in a multitude of privately run expeller plants throughout the oilseed producing areas, there are no statistics that directly record quantities of oil produced. Production from main oilseed crops must instead be estimated from total production of these oilseeds after allowing for seed, post-harvest losses, domestic consumption as grain, and formal and informal exports. These estimates were made based on interviews, conducted with farmers, millers, traders, retailers and MoAI officials as well as by consulting secondary information from literature. When official data on area cultivated by crop are used, however, yields were adjusted based on interviews when official figures were obviously too high. Interviews with traders on the market allowed to estimate use of oil crops for table/snack purpose, as well as informal trade. The MoC kindly computed official export data. Table 5 presents the oil and oilcake supply scenario in Myanmar in 2006/07 as estimated by the study team. Table 34 in Annex VI details the assumptions used to estimate domestic edible oil supply

Table 5: Domestic supply scenario on edible oil in 2006/07

	Estimated production (tonne)	Losses (t)	Seed require-ments (t)	Snack/ table food (t)	Seeds export (t)	Seeds used for crushing (t)	Oil supply 2006/07 (t)	Oil supply 2015/16 (t)*	Oil cake supply 2006/07 (t)
Domestic Production									
Groundnut	549 268	43 941	88 405	133 415	33 354	250 153	95 058	104 564	145 089
Sesame	503 604	30 216	10 122	35 252	113 000	202 014	90 906	99 997	103 027
Sunflower	160 211	14 419	6 175	15 117		124 500	36 105	39 715	82 170
Niger	63 046	3 783	974	0		58 289	19 236	21 159	36 722
Mustard	49 382	2 963	1 072	2 208	1 192	41 948	12 584	13 843	27 686
Soybean	188 831	18 883	12 590	53 769	8 000	89 615	9 348	10 283	76 682
Rice bran							1 122	1 122	
Cotton oil							20	20	
Palm oil production	172 191					172 191	23 751	100 000	137 753
Total domestic production	**1 686 532**	**114 205**	**119 338**	**239 761**	**155 546**	**938 710**	**288 130**	**390 703**	**609 129**

* Assuming a 10 percent increase in domestic oilseeds crops utilization for crushing and slightly over 200 000 acre of palm oil harvested.
Source: MAS data and study estimates

Edible oil supply/demand balance sheet

Table 6 and Figures 19 and 20 present a supply/demand balance sheet in 2006/07. The domestic supply represents 47 percent of the total edible oil demand and results in an uncovered deficit of some 340 000 tonnes of edible oil. Official and unofficial imports of palm oil bridge the deficit and account for 53 percent of the total demand[39].

Table 6: Edible oil supply/demand balance sheet in 2006/07

	Oil supply 2006/07	Percentage of total supply	Percentage of domestic production	Oil supply 2015/16	Percentage of domestic production
Groundnut	95 058	15.4	33.0	104 564	26.8
Sesame	90 906	14.7	31.6	99 997	25.6
Sunflower	36 105	5.8	12.5	39 715	10.2
Niger	19 236	3.1	6.7	21 159	5.4
Mustard	12 584	2.0	4.4	13 843	3.5
Soybean	9 348	1.5	3.2	10 283	2.6
Rice bran	1 122	0.2	0.4	1 122	0.3
Cotton oil	20	0.0	0.0	20	0.0
Palm oil production	23 751	3.8	8.2	100 000	25.6
Total domestic production	288 130	46.5	100.0	390 703	100.0
Total demand	630 000	102.0		825 000	
Uncovered domestic deficit	341 870	55.5		434 297	
Imports					
Palm oil formal imports	274 440	44.4		274 440	
Palm oil informal imports	54 888	8.9		54 888	
Total imports (estimated)	329 328	53.3		329 328	
Total supply	**617 458**	**108.8**		**720 031**	
Exports					
Palm oil informal exports	5 000	0.8		5 000	
Total exports	5 000	0.8		5 000	
Supply/demand balance	-12 542			-104 969	

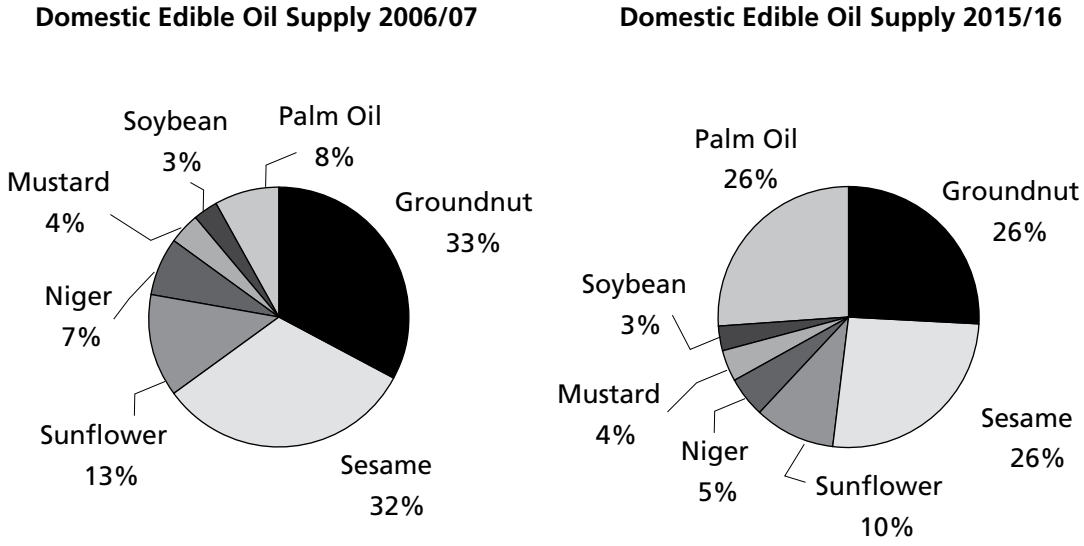
Sources: MAS, CSO, Ministry of Commerce, Edible Oil Merchants Association and study estimates

Assuming a positive scenario in which by 2015/16 edible oil crops output for oil crushing will have increased by 10 percent, and 200 000 ha of oil-palm plantation will be at full production[40], the edible oil uncovered deficit will continue to increase to reach nearly 434 000 tonnes (see Table 6). Imports of palm oil will have to increase by 110 000 tonnes to bridge the increased gap. These projections suggest that the quest for self-sufficiency in edible oil production is elusive.

39 Informal export of palm oil and mustard grains to India are estimated at 5 000 tonnes annually. Export of domestic oil is negligible in the overall demand/supply balance. A small amount of sesame oil export to Japan is being tested by exporters in Yangon while some groundnut millers are informally exporting a limited amount to the People's Republic of China.

40 Based on MPCE data and the Palm Oil producers Association objectives.

Figures 19 and 20: Domestic edible oil supply in 2006/07 and projected supply in 2015/16



Sources: MAS, CSO, Ministry of Commerce, Edible Oil Merchants Association and study estimates

Oil crops sub-sector trade balance sheet

According to official statistics, the oil crops sub-sector has a positive trade balance of US$8.33 million (see Table 7). These statistics do not account for informal imports and exports and the recorded import price of palm olein is substantially below international market prices. Taking into consideration informal trade, the study team estimated that the oil crops sub-sector has a trade deficit of US$34 million (see Table 8).

Table 7: Oil crops sub-sector trade balance based on official data, 2006/07

	Volume (tonne)	Unit price (US$/tonne)	Total value (US$)
Formal Imports			
Palm Oil Formal Imports	274 440	271.1	74 400 000
Total Formal Imports	**274 440**	**271**	**74 400 000**
Formal Exports			
Export Sesame	103 010	796.6	82 060 000
Export Niger	1 200	558.3	670 000
Total Formal Exports	**104 210**	**1 354.9**	**82 730 000**
Balance	**-170 230**		**8 330 000**

Source: Ministry of Commerce and Edible Oil Merchants Association

Table 8: Oil crops sub-sector trade balance based on sub-sector analysis estimates, 2006/07

	Volume (tonne)	Unit price (US$/tonne)	Total value ($)
Formal imports			
Palm oil formal imports	274 440	467.5*	128 300 717
Total formal imports	274 440	468	128 300 717
Informal imports			
Palm oil informal imports	54 888	584	32 075 179
Total informal imports	54 888	584	32 075 179
Total Palm oil imports	329 328	1 052	160 375 896
Formal exports			
Export sesame	103 010	796.6	82 060 000
Export niger	1 200	558.3	670 000
Total formal exports	104 210		82 730 000
Informal exports			
Export groundnut**	30 000	950	28,500,000
Export sesame	10 000	717	7 169 595
Export soybean**	8 000	255	2 040 000
Palm oil (olein and sterin)	5 000	1250	6 250 000
Total informal exports	53 000		43 959 595
Total oil crops exports	157 210		126 689 595
Balance	-172 118		-33 686 302

* Palm olein average FOB price in Malaysia[41] from the Malaysia Palm Oil Board, plus 25 US$/tonne to account for transportation cost

** Sub-sector analysis estimates

Sources: Source: Ministry of Commerce, Edible Oil Merchants Association and study estimates

6.3 EDIBLE OIL MARKET SEGMENTATION AND ADULTERATION PRACTICES

The only two locally produced edible oils directly marketed in large volumes are groundnut and sesame oils. Niger and mustard can be found on the market in small volumes. Soybean, sunflower and rice bran oils are not or rarely found as pure oils on the market. There are generally three qualities for locally produced oil sold in the market:

1. Premium branded quality: small volumes, sold in branded plastic bottles or jerricans (0.25 litre bottles to 10 viss jerricans) as pure groundnut or sesame oil.
2. Special quality: sold as pure groundnut or sesame oil.
3. Standard quality: large volumes, sold as mixed groundnut or sesame oil with palm oil.

It is common practice to adulterate sesame and groundnut oils by mixing palm, sunflower, soybean, niger or rice bran oils with little danger that consumers would notice the difference, even for premium quality. To maintain the 'nutty' flavour of mixed oils and increase the dilution rate, artificial flavours are at times added into the oil mix. Table 9 summarizes the observed adulteration patterns. These adulterations are widespread given the absence of standards and regulations on edible oils.

41 http://econ. mpob. gov. my/economy/EID_web. htm

Table 9: Oil crops and vegetable oil adulteration practices in Myanmar

Adulteration at the mills	Oil crops used as diluents	Mixed oil marketed as	Observations
Sesame seeds	Sunflower and niger seeds*	Special sesame oil	Oil crops seeds mixing take place in small and medium mills. Sesame is often mixed when crushed as sesame cake is dark and a small proportion of foreign seeds would not be recognized in the cake.
Groundnut seeds	None	Special groundnut oil	Groundnut is generally not mixed when crushed as both niger and sunflower produce a darker cake, which affect the price of groundnut cake.
Adulteration at the wholesale/retail levels	Oil used as dilutant		
Sesame & groundnut oils	Palm oil at wholesale or retail level	Special or ordinary oil	If retailers/wholesalers feels that the consumer won't notice the difference, it is sold as pure sesame oil.
Sesame & groundnut oils	Soybean and rice bran oils	Special or ordinary oil	Soybean or rice bran oils are used during the cold season instead of palm oil, which tends to turn whitish when temperature drops below cloud point.
Groundnut oil	Two shrimps brand palm oil (informal imports from Thailand)	Premium branded groundnut oil	Two shrimp bran palm oil does not turn whitish during the cold season when temperature drops below cloud point. Therefore, it is used for adulterating premium branded oil without risks of consumers noticing it and thus putting the brand at risk.
Niger oil	Palm oil	Mixed oil for deep frying	Niger oil is available on the market only in Shan state. Mixing niger and palm oil is said to reduce the evaporation losses for deep frying.
Diluted sesame and groundnut oils	Artificial flavour**	Premium branded or special	Artificial groundnut and sesame oil flavour can be procured in Yangon.

Source: Study team

* Because of the abrasive effect on expellers produced by hard cover oil crop seeds, such as niger and sunflower seed, these seeds are generally not crushed alone, but mixed with dark colour sesame.

** Groundnut flavour can be added to palm oil to produce groundnut like oil at the following ratio: ½ lt artificial flavour for 8 drums (920 viss or 1.5 tonnes). The cost of ½ litre bottle is Kyats 15 000.

Palm oil or palm olein is the main edible oil consumed in Myanmar and accounts for an estimated 53 percent of the total consumption. Palm oil is sold either pure or mixed with groundnut and sesame oil. There are three broad categories of palm oils sold in the market:

1. Officially imported palm oil sold in bulk. These account for an estimated 80 percent of the total palm oil sold in the country.

2. Unofficially imported palm oil from Thailand. These are imported in 10 viss cans from Thailand or the People's Republic of China and account for an estimated 20 percent of the total palm oil sold in the country. Along the Thai border the proportion of informally imported palm oil represents up to 80 percent of palm oil consumed while on the western

part of Myanmar, this proportion is as low as 10 percent. Imported brands include: One, Two & Three Shrimps brands and Fisherman brand.

3. Locally produced palm oil refined by Yuzana plant in Yangon. These are sold in 10 viss cans.

Consumers generally consider that the best quality palm oil is the imported oil from Thailand, followed by Yuzana oil while the lowest is considered to be the officially imported oil. Quality is judged by the amount of white deposit (sterin) the oil produces during the cold season when temperature drops below cloud point. Most consumers assume that these deposits are cholesterol or animal fat mixed with palm oil.

Picture 1: Palm oil in 10 viss cans informally imported from Thailand

6.4 Consumers' preferences

Domestic oils

Consumers in different regions of Myanmar have marked preferences for specific types of oil for each purpose. From locally produced oil, only groundnut, sesame, niger and mustard oils are found in the market. Groundnut oil is preferred almost everywhere for frying and particularly in lower Myanmar, it is preferred for all purposes. It thus commands a higher price. Sesame oil is preferred by both urban and rural consumers in the CDZ area for all purposes except frying.

The smell of groundnut oil is not liked in these areas, but it is still preferred for frying because it froths much less than other oils. Sesame oil tends to be bitter and darker in colour.

Niger oil is particularly appreciated in Shan state as frying oil. Niger oil is generally mixed with palm oil. Niger oil is appreciated by consumers not for its taste but because it reduces palm oil evaporation for deep frying. In other areas, Niger oil is not available but used to mix with sesame oil. Mustard oil is appreciated in eastern Myanmar, in areas bordering Bangladesh and India.

For both groundnut and sesame oils, rural people and some urban consumers prefer oil produced by the traditional *Hsi* zone (see Section 10.3) method that gives a cold pressed oil. *Hsi* zone oil commands the highest price from all oil sold in Myanmar, but the volume of production is limited.

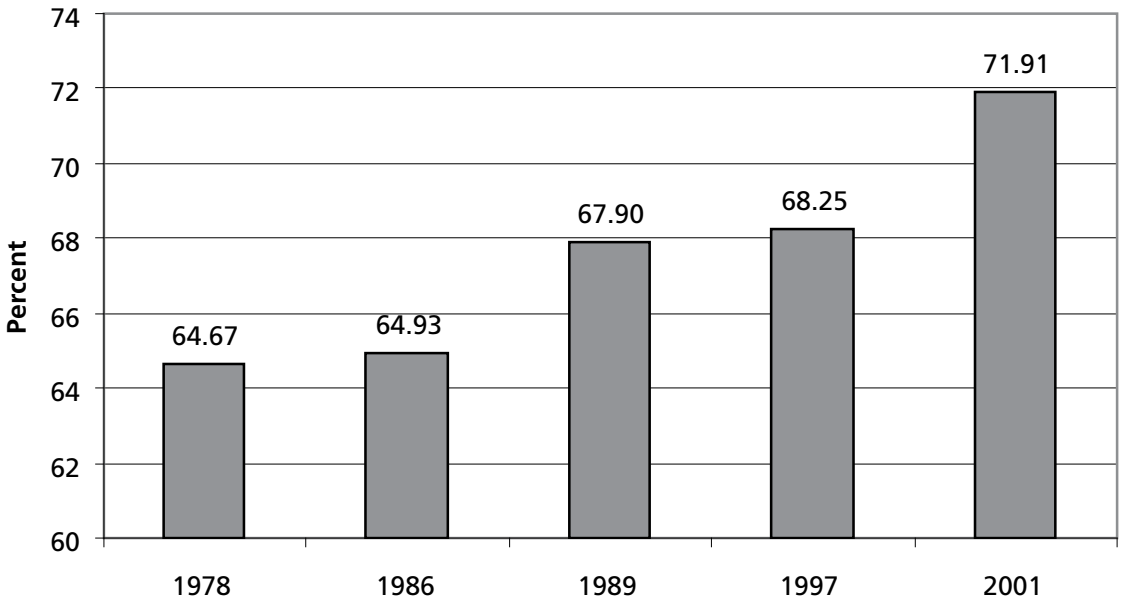
Sunflower, soybean, rice bran and cotton seeds oils are not or rarely found in the market as demand is very limited. Therefore, these oils are mainly mixed to increase volumes of sesame and groundnut oils. Sunflower seeds are generally mixed with sesame for crushing at the oil mill. Soybean oil is only found in small volumes in higher end markets in Yangon, produced by three companies Yuzana, Batamya and Mya. The 'bean' taste of soybean oil is not liked in Myanmar but a narrow market is developing in Yangon by consumers concerned about the quality of other oils marketed in the country. Rice bran oil and cotton seed are used to mix mainly with groundnut oils during the cool season as palm oil tends to coagulate and the cloudiness (whitish colour) in the oil is not appreciated.

Imported palm oil impact on consumers' preferences

Accessing edible oil at low prices is the main determinant for the vast majority of Myanmar consumers. According to the household expenditure surveys, the proportion of household expenditure on food has increased from 64.7 percent in 1978 to 71.9 percent in 2001 (Figure 21). By 2001, 80 percent of the household daily expenditure was below US$ 0.35/day (or Kyats 220/day). Given this low purchasing power and increased proportion of household expenditure on food items over the past three decades, price is the foremost factor for oil consumers. Only a small minority of consumers with higher income, mainly in Yangon, Mandalay and more recently Nay Pyi Taw, are spending on higher quality branded oils. There are 14 branded premium quality oils in Myanmar; 7 in Yangon, 3 in Pyay, 2 in Magway, 1 in Mandalay, 1 in Nay Pyi Taw[42].

42 These include the following brands, mainly for groundnut oil :
- Yangon: Shwe, Nobel, Padamya, Yangon, Ngwe Thazin Minm, Mya (soyoil), Royal (soyoil);
- Mandalay: Thamadi;
- Magway: Ameehtwar, Yam Pae (corn oil);
- Pyay: Laykyaun Man Naing, High-Tech, Ayeyarwaddi;
- Nay Pyi Taw: Zawtika.

Figure 21: Proportion of household expenditure for food and beverage from 1978 to 2001



Source: CSO Statistical Yearbooks

As a result of low palm oil prices and domestic oils adulteration, the proportion of formally and informally imported palm oil in edible oil consumption is substantial and represents as much as 53 percent of all edible oil consumed in Myanmar. Informally imported palm oil via Thailand or the People's Republic of China is considered as the best edible oil alternative by some consumers. Although the price is higher than palm oil imported in bulk, the price is lower than special or ordinary groundnut and sesame oils and the quality is generally considered to be higher. The study estimated that 20 percent of palm oil consumption comes from informal imports. Table 10 summarizes the main factors affecting consumers' choices.

Table 10: Factors affecting edible oil consumer preferences

Factors	Positive marketing Factors	Negative marketing factors
Price	Lowest possible	High
Transparency	Clear oil	'Cloudy' or 'whitish' oil
Colour	Intense yellow colour	Pale or clear colour oil Brown or greenish colour in Niger or rice bran oils
Taste/smell	'Nut taste' in groundnut and sesame oil	'Bean taste' in soybean oil; 'Neutral taste' in refined oils
Processing	Filtered but unrefined to keep the nut colour	Refined oil
Labelling	'100% Cholesterol free'; '100% Pure'	
Quality Control	Imported in cans. Thai or Malaysian origin	Locally produced or imported in bulk

Source: Study team

7. Part I: Conclusions and recommendations

International market opportunities

The global oil market is dominated by soybean and palm oils, which together account for 51 percent of the global supply (26 and 25 percent respectively). Soybean competitiveness comes from its dual purpose as cake and oil, whereas oil-palm competitiveness comes from its highest edible oil productivity per unit of area, compared to all other oil crops. With the emergence of these two crops over the past three decades on the international market, other oil crops that are cultivated in Myanmar, such as sesame and groundnuts, have lost their competitive edge. Global markets for these oil crops has evolved toward higher value products such as edible/ snack groundnut, processed white and black sesame, or high quality oil such as cold pressed sesame oil. These trends were accompanied by agroprocessing developments that add value to these commodities. The People's Republic of China seems to be the main beneficiary of these global oil crops trends.

Restrictive policies and market distortions have meant that the edible oil sub-sector in Myanmar has not followed the trends in the global market. Myanmar missed out exciting market opportunities in Southeast Asia, to the advantage of neighbouring countries. The agroprocessing industry on oil crops remains largely undeveloped, compared to regional standards. Capturing higher value from domestic oil crops production would not only require changes of policies, but also agroprocessing technology transfer in order to add value in-country and meet regional market requirements. The main 'actionable' opportunities identified by the study include the following:

- Exports of high quality cold pressed sesame oil.
- Export of edible/snack groundnut.
- Exports of processed sesame seeds.
- Import of soybean and particularly soybean cake for livestock and fishery industry.

These opportunities have vast development potential as Myanmar is the world's third producer of sesame and the world's sixth producer of groundnut.

Recommendations for the oil crops sub-sector in Myanmar based on international market review include the following:

- Conduct market research and feasibility studies for the development of the identified 'actionable' opportunities by the study, with focus on Southeast Asian markets.

- Conduct feasibility studies for the establishment of processing plants for prepared edible groundnut, processed sesame and cold pressed sesame oils with the private sector.

- Facilitate technology transfer through technical assistance, subsidized investment of agroprocessing plants by the private sector and joint ventures with foreign companies.

Main policy recommendations

The two main policy objectives in Myanmar, namely self-sufficiency and edible oil price control are self-defeating. Myanmar has adopted restrictive policies on import and export of oilseeds and oilseeds products, in a bid to achieve self-sufficiency objectives. Yet, the country followed relatively open policies concerning the import of large quantities of cheap palm oil in an attempt to maintain palm oil prices at a low level on the domestic retail market. As a result, Myanmar is increasingly dependent on palm oil import while domestic production is stagnating. In this context, the self-sufficiency policy objective will remain elusive and it is anticipated that the uncovered edible oil deficit will continue to increase by approximately 100 000 tonnes in 2015/16.

The price control mechanisms aiming at the lowest possible price of edible oil on the domestic market need to be questioned. A more efficient price control mechanism can be achieved through the application of an import duty, rather than direct price control. The government should engage in a constructive dialogue between all actors of the oil crops sub-sector, from producers to consumers, to determine a 'desirable' price level for edible oil on the domestic market. A consensus between various interests, namely the edible oil crops producers, processors, consumers, oilcake users and the State Peace and Development Council (SPDC), which fears social unrest from edible oil price changes, needs to be achieved. 'Desirable' price on the domestic market would probably be at a higher level than the current level. Based on the 'desirable' edible oil price level, an import duty can be calculated. To facilitate this process, a study on the impact of possible edible oil price policy could be undertaken.

The following policy changes on the oil crops sub-sector are required:

- Abandon self-sufficiency policy in the oil crops sub-sector.

- Instead, focus on promoting opportunities with better development potential.

- Conduct a consumption survey to better understand the domestic market and regional differences.

- Introduce an import duty tax to the palm oil group (including sterin) in order to stabilize prices at desired level and remove all other price control mechanisms on the domestic market.

- Define desirable edible oil prices on the domestic market and consequently import duty level by convening a national workshop with all stakeholders of the oil crops sub-sector.

- Remove restrictions on palm oil imports (quantities imported and private sector involvement) to ensure regular supply.

- Authorize the import of CPO to promote smooth development of the edible oil processing industry and create employment.

- Authorize the import of soybean and soybean cake (and other oil crops seeds and cakes) to ease the current shortage of cake in Myanmar and allow the animal industry to grow.

- Facilitate investments and technology transfer for oil-palm production in Tanintharyi as the sole potential source of low-cost edible oil production in Myanmar.

Main institutional development recommendations

The current statistics do not reflect the realities of the oil crops sub-sector and as a result the formulation of policies and the planning of support programmes is severely constrained. The major limitations in the statistics are related to crop output estimations and the inclusion of formal and informal trade data.

The most urgent capacity building needs have been identified in the following areas:

- Conduct a crop area and production statistical survey in collaboration with the Settlements and Land Record Department (SLRD) of the MoAI.

- Strengthen the capacity of the MoAI to produce accurate statistics for oil crops development planning. This includes DAP, MAS and SLRD.

AN ANALYSIS OF THE MYANMAR EDIBLE OIL CROPS SUB-SECTOR

PART II

ANALYSIS OF THE OIL CROPS CHAIN

8. Value chain map

8.1 Brief description of the oil crops chain

There are three distinct groups of oil crops, as regards the flow of the product along the chain:

1. Group I: Oil crops for which oils are sold pure and unrefined (crude oil) in the market. The group comprises groundnut, sesame, niger and mustard. These crops are either used for snack/confectionary or for crushing. Also, these crops are exported to foreign countries both formally (sesame and niger) and informally (groundnut and mustard).
2. Group II: Oil crops for which oils are sold on the market as refined RDB oils. This includes oil palm and crops for which oil is a minor by-product such as rice bran, cotton seeds and corn oils. Quantities of rice bran, cotton seeds and corn oils are very small.
3. Group III: Oil crops for which oils are not or rarely found in the market, but generally used to adulterate oils in the first group: sunflower and soybean. Soybean is a crop in transition, as small but increasing quantities are being produced and refined.

The flow for each oil crop group is summarized in figures 22, 23 and 24 below.

8.2 Description of the chain maps and channels

Marketing of oil crops

The general pattern of marketing oil crops shows a variety of situations where transactions occur at farm, village, township, urban centres and CEXCs level, involving multitudes of actors competing on low profit margins, such as primary collectors, commission agents, brokers, wholesalers, traders and oil millers.

Although marketing channels differ somewhat from place to place, there are six well identified channels in existence:

1. Producers to primary collectors, who in turn sell either directly or indirectly through wholesalers or commission agents.
2. Producers to commission agents/brokers to millers, either directly or through wholesalers or CEXCs.
3. Producers to millers directly.
4. Producers to commission agents/brokers to export traders, either directly or through wholesalers or CEXCs.
5. Producers to export traders under contract farming agreement.
6. Exporters: backward integrating sesame production for export to international markets.

Figure 22: Chain map oil crops group I: Sesame, groundnut, niger and mustard oil

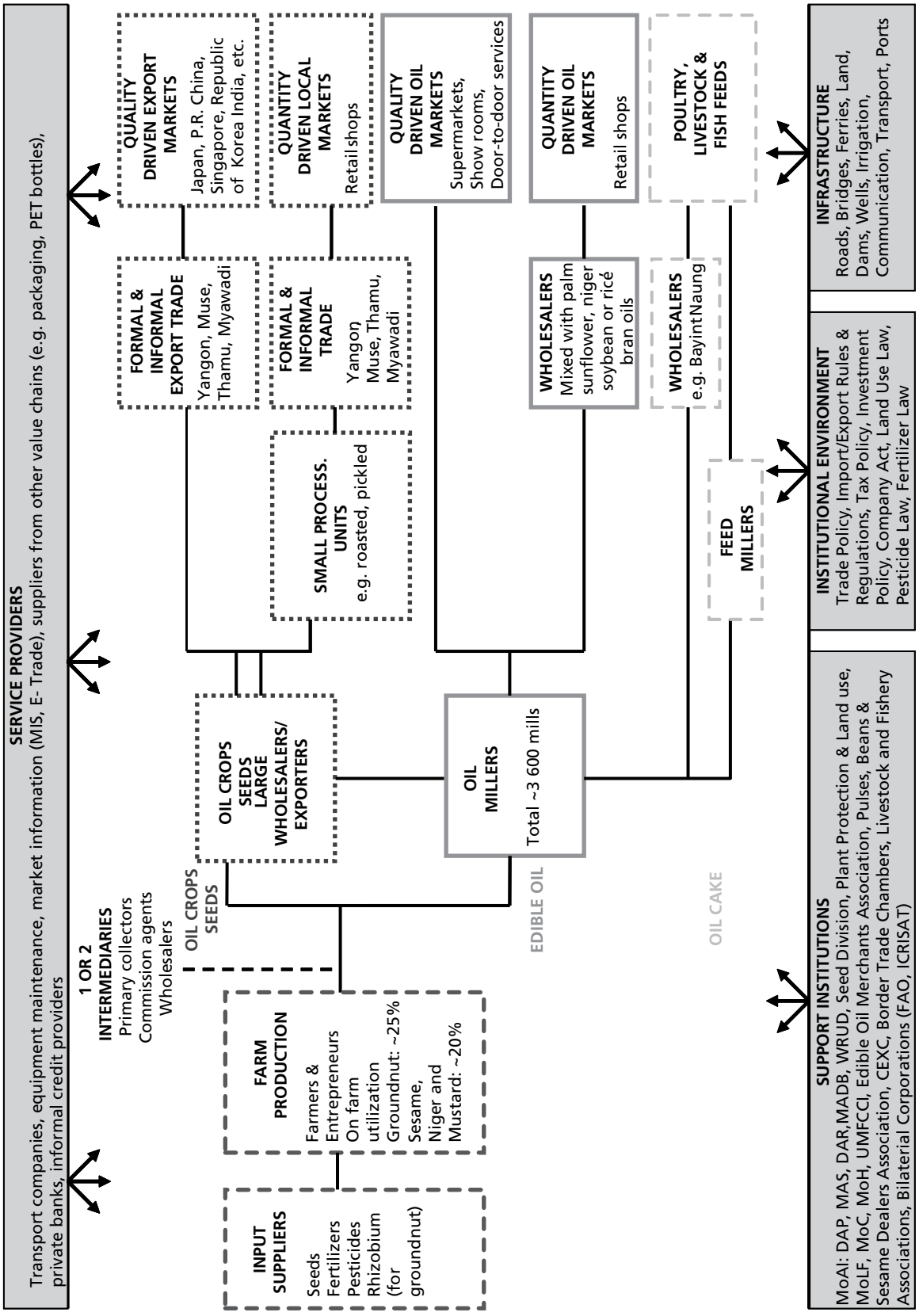


Figure 23: Chain map oil crops group II: Palm oil, rice bran, cotton seed and corn oil

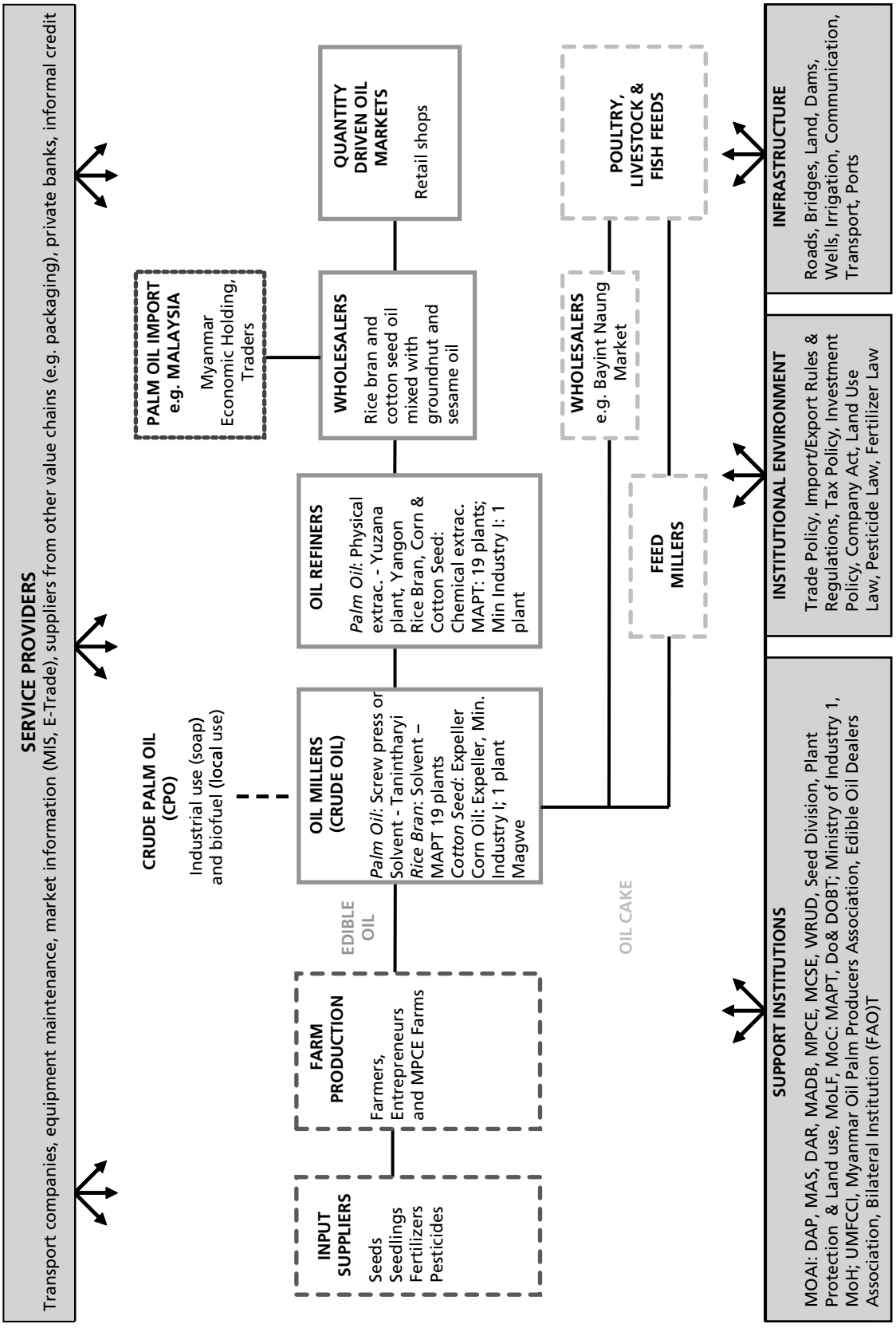
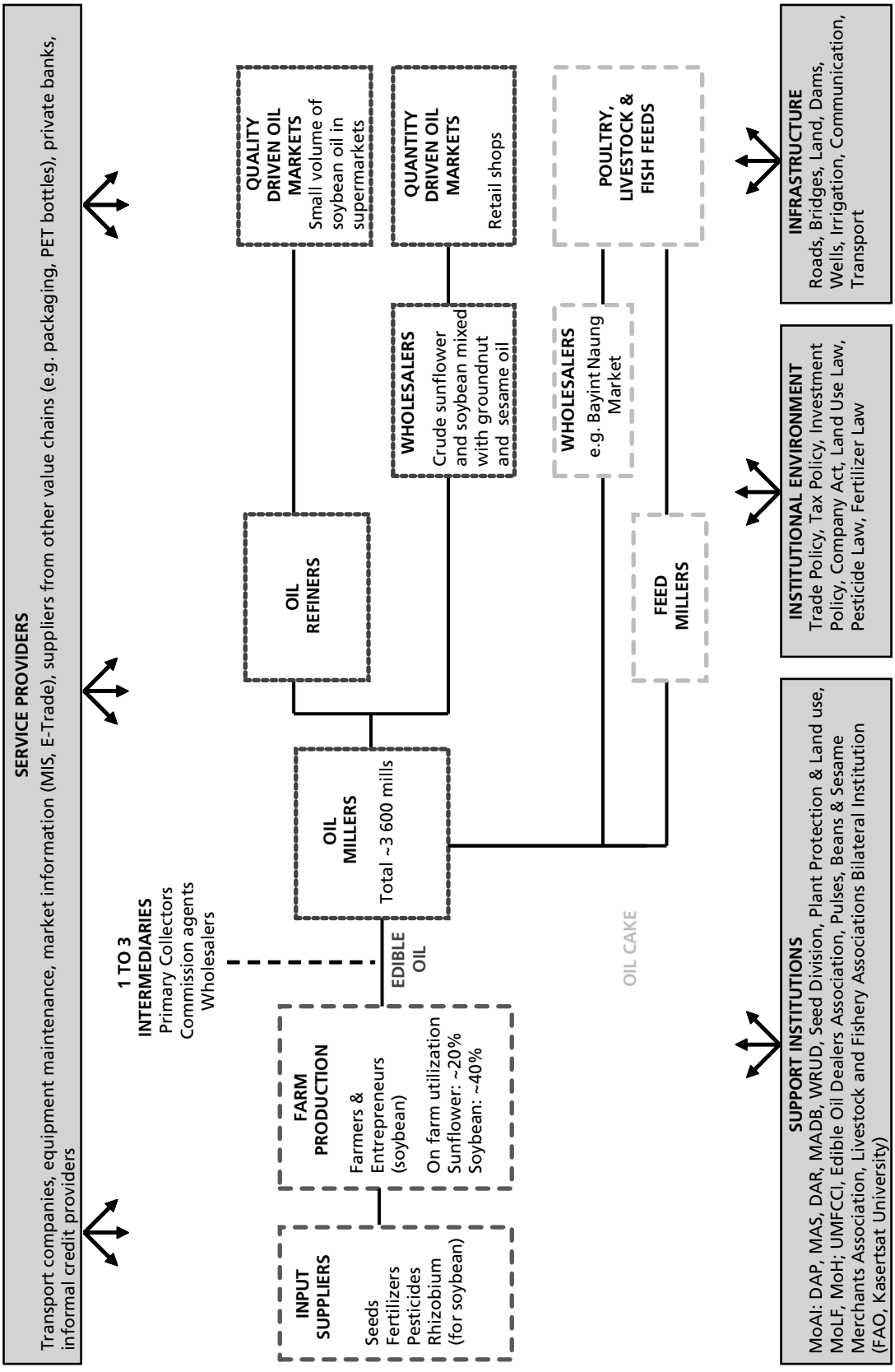


Figure 24: Chain map oil crops group III: Sunflower and soybean oil



Primary Collectors

The village primary collectors procure directly from farmers at the farm itself. All the marketing costs are borne by the primary collectors. Sometimes farmers get credit from these primary collectors. The normal procedure of payment to the farmer is after the produce is delivered and sold. Sometimes primary collectors sell directly to millers or through commission agents, who in turn sell to a wholesaler, or directly to millers. Typically, primary collectors add 5 to 7 percent of the cost of oilseeds for their services.

Wholesalers

Town wholesalers purchase seed from primary collectors and may handle oil and cake from millers, often through the local crop exchange. Wholesalers employ their own agents/brokers for crop collection. Some possess good storage facilities and practice speculative storage, waiting for prices to go up. Larger scale wholesalers rely on trucks to deliver the commodity from local market to urban wholesale market. They may buy the oilseed crops on behalf of an exporter. Some wholesalers may act as commission agents for larger traders or exporters.

Commission agents

The commission agents are traders who buy or sell, or offer to buy or sell on an agreed commission. They offer to facilitate the completion and carrying out of the transaction. The commission agent charges between one and two percent, depending on the volume of transaction. Charges for transport from the farm to the market are borne by the farmers. From market to the mills charges are borne by the millers.

The commission agents generally buy on an agreed commission, when they do not have sufficient cash to act as traders and negotiate prices. Commission agents normally work for a set number of larger traders or millers with whom a trust relation is established. They communicate several times a day to discuss current commodity prices. As all transactions are paid cash, the traders/millers transfer via bank wires advance money to commission agents, enabling them to procure the commodities.

Brokers

Millers, traders or wholesalers sometimes recruit people who work as their brokers in purchasing grains. This system is increasingly developing for some oil crop seeds in high demand such as soybean in Shan state and sesame for exports as actors along the chain are competing to procure sufficient quantities of products.

Millers

Most of the millers do not use agents and do not provide credit to farmers or collectors. Millers buy the oilseed crops from farmers, primary collectors or township wholesalers.

Direct sale from producers to millers

Near larger oil millers, farmers can bring their oil crops directly to the mill. Sometimes farmers and oil millers have an established partnership for many years. The price is agreed through negotiation several days before the delivery. Payment is made at delivery. Direct sales to the millers account for a small proportion of the sales. The bulk of the products move from farmer to millers through middle men. All major oil crops are milled using expeller units, and the majority of oil millers own a sieve that allows rough cleaning of seeds and a decorticating unit for groundnuts. Decortication of groundnut for the snack market is done by hand. There is no organized company for the regular supply of groundnut or for processing it for consumption. Most oil millers are integrating oil milling and oil crops and pulses trading.

Crop Exchange Centres (CEXCs)

The role of the CEXCs in Myanmar is discussed in section 11.1.

Contractual agreements

Contractual agreements between farmers, traders and processors are virtually non-existent, and will fail to develop unless participants see real benefits from establishing long-term relationships. When they exist, contractual agreements are used for sesame export to higher end markets such as Japan. From the trader side, the main drivers for such agreements are the need to ensure sufficient supply of high quality sesame seeds and allow traceability. From the farmer side, the main interest in entering in contract agreement is to access credit. Exporters are providing credit to farmers before planting, against the delivery of an agreed quantity of sesame at an agreed price a few points below the expected market price.

Backward integration of sesame exporters

A handful of sesame exporters in Yangon find it increasingly difficult to comply with traceability and quality requirements for higher end international markets such as Japan. To address these issues, a few exporters are attempting to backward integrate their operations and are developing new farms on wasteland in the CDZ. Some of these attempts have failed because of the wasteland's low fertility under cultivation or inadequate farming practices, while some others are showing signs of success.

Marketing of oil

In Myanmar, the bulk of oil goes to the consumer as crude filtered oil. Groundnut, sesame, niger and mustard oils are not refined. Only cotton oil and rice bran oil is RBD in government owned plants and palm oil at Yuzana plant.

There are five well identified marketing channels in existence:

- Farmers milling the oil themselves using the *hsi* zone traditional wooden mill, for their own consumption or village markets.
- Farmers renting a mill for their own consumption or to supply village markets.

Picture 2: Locally made truck rented by primary collectors to deliver agriculture produce to a commission agent in the southern Shan state *(Augban, 1 June 2007)*

Picture 3: Hand cleaning white sesame procured from the Mandalay crop exchange centre for export to the People's Republic of China *(Mandalay, 24 May 2007)*

- Small and medium size oil millers to local wholesale markets and/or retailing themselves.
- Larger oil millers to wholesalers in larger urban centres.
- Large oil millers marketing branded oil to supermarkets, showrooms or door to door services.

Small-scale millers

Small-scale millers are generally located near villages and crush oil crops on producers' demand. It is estimated that producers retain 20 percent of the oil crops for their own consumption (25 percent for groundnut). The milling fee varies depending on the availability of electricity in the local market. If a generator is used, the milling cost is generally doubled. The oil is used directly by farmers or marketed to oil deficit farming and non-farming families in the village. Sometimes millers retain the cake after crushing, instead of charging a milling fee.

Medium-size millers

Small and medium size mills are marketing their products to the local wholesale markets and often keep a retail outlet at the mill location. Some medium size mills own a retail shop in an urban centre, retailing their own oil, as well as other consumables.

Large-size millers

Larger mills are supplying oil to wholesalers in larger urban centres. They generally have an established relationship based on trust with the wholesalers and increasingly supply oil on credit. The wholesalers repay the oil millers after selling at the agreed price at delivery, generally two to four weeks earlier. At retail level, the oil is displayed to the consumer in open bowls, from which the oil may be sampled and from which it is measured out and poured into the consumers' container on sale (see Picture 4). It is not uncommon to see foreign particles in the oil on display. Pumps used for siphoning oil from the barrel, bowl or utensils used are often very grimy (see Picture 5).

A few large oil millers have developed their own brands, mainly for groundnut oil. The oil is typically packaged in 0.25 to 1 lt PET bottles or 2.5 or 10 viss jerricans. The oil is distributed to consumers (mainly Yangon) through company show rooms (see Picture 6), supermarkets or door to door services (min.5 viss for door to door service).

Marketing of cakes

With the fast growth of the livestock (mainly chicken) and fishery and shrimp industries, the demand for cake has increased significantly over the past three to five years. There are three well identified marketing channels in existence:

- Farmers crushing their own oil crops in small expeller mills or traditional *hsi* zone mills using the cake generally for their own livestock or selling it in the village to other farmers.

Picture 4: Retail edible oil containers in Monywa *(Monywa, 29 May 2007)*

Picture 5: Buying palm oil in plastic containers for restaurants *(Pyay, 12 May 2007)*

- Medium size mills are selling oil cakes generally to a local wholesale market or CEXCs in Mandalay or Yangon.

- Large mills are selling oil cakes to feed mills, wholesale markets or CEXCs. However, most of the oil cakes from large mills are sold directly to feed mills. The cakes are sold at the oil mill gate and payment is made in cash at the time of transaction or a few days later.

Picture 6: View of a branded oil show room in Yangon *(Yangon, 11 May 2007)*

9. Production

9.1 Main oil crops cultivated in Myanmar

Approximately 16 percent of the cultivated area or nearly 7.5 million acres of land are sown with oil crops, which is the third most important crop group in Myanmar agriculture after cereals (20.5 million acres) and pulses (9.4 million acres) (see Figure 25). Since the liberalization of the pulses trade in the early 1990s, the acreage cultivated in pulses has overtaken oilseed crops.

The most extensive and traditional oilseed crop is sesame (*Sesamum indicum*), which occupied 44 percent of all oil crops cultivated area in 2006/07, or 3.31 million acres. Sesame is reportedly native to Myanmar[1] and thus the country benefits from an astonishing diversity in varieties that are used by farmers. There is an upward trend in the cultivation of this crop, mainly driven by international market opportunities.

The next most extensive oilseed crop is groundnut (*Arachis hypogea*) with 1.8 million acres. As it has a much greater yield of oil per unit area, groundnut contributes with the largest share (33 percent) of Myanmar produced edible oil. Yet, interviews with farmers and field observations in the main groundnut producing areas suggest that the national average yield of 50.8 basket/acre of groundnut with shell (equivalent to 410 kg/ha without shell) reported by the MAS in 2006/07 is an over-estimation.

Sunflower (*Helianthus annus*) is the third oil crop cultivated in Myanmar with 1.7 million acres. However, field observations strongly suggest that sunflower areas have significantly decreased, as two-thirds of the sunflower cultivated area is intercropped with chickpeas, with sunflower rows planted at 5 to 10 metres apart (see Picture 16). As a result, sunflower output is slightly above other minor oil seed crops and its contribution to the indigenous oil production represents nearly 12 percent.

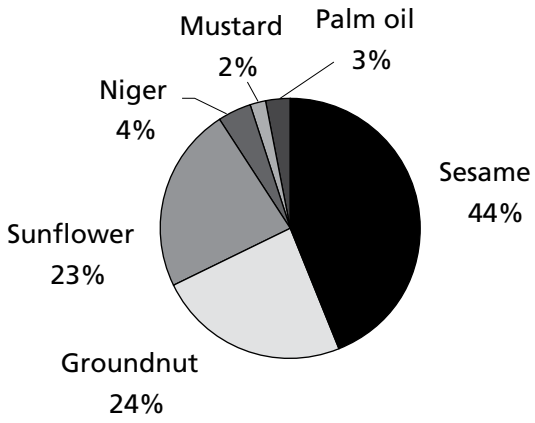
Minor oilseed crops are niger (*Guizotia abyssinica*) which accounts for 0.32 millions acres and mustard seed (*Brassica juncea*) with 0.16 million acres. These crops are locally important in Shan states and eastern Myanmar, but their contribution to the local oil production is small: 4 percent each. A very limited amount of edible oils is also produced from rice bran and cottonseed; 1 120 and 20 tonnes respectively.

Palm oil is mainly cultivated in Tanintharyi and Mon states on slightly above 200 000 acres out of which approximately 50 000 acres were harvested in 2006/07. Palm oil production represents 7.5 percent of the domestic edible oil consumption and this share is expected to increase to above 30 percent in 2015/16, once the 200 000 acres will be in full production.

1 UNDP, ADB & MoCoo. 1984. *Oilseeds Production and Processing Project. Feasibility Report. Volume I: Main Report,* UGL Consultants Ltd.

The maps 6 to 12 in Annex V present the geographical distribution of oilseed crops by district in 2006/07.

Figure 25: Proportion of oil seed crops area cultivated in 2006/07

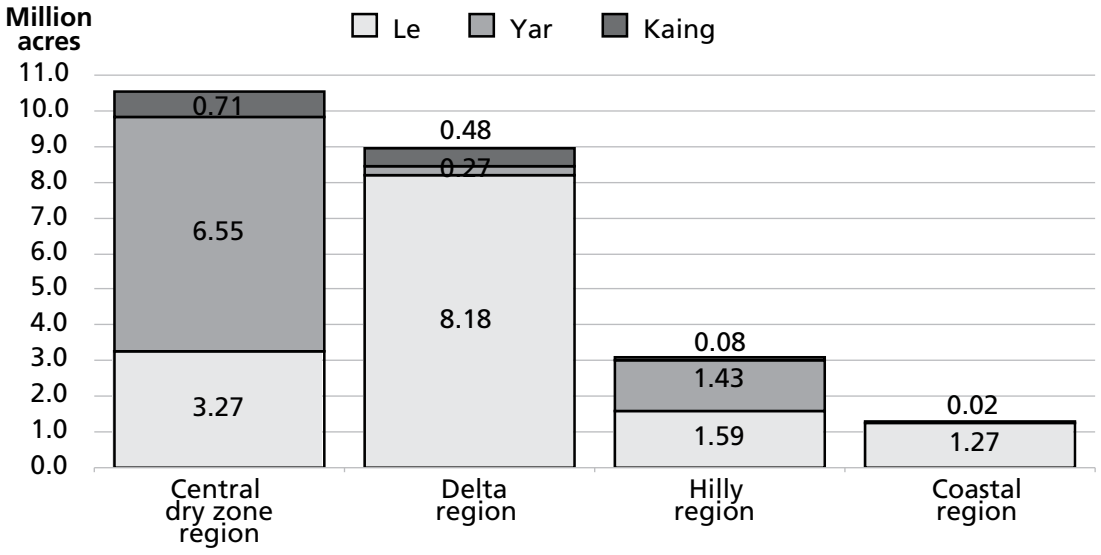


Sources: MAS and study estimates

9.2 Land types and cropping patterns

Eighty two percent of the national production of oilseed crops is from lowland Myanmar in the dry zone as well as the delta region where groundnuts and sesame are the main crops. Fifteen percent of the oil crops production originates from the hills where soybean, groundnut, niger and mustard seeds are grown. The coastal divisions account for only 3.5 percent of oil crops production. Climatic variation and land type have marked effects on cropping patterns. Figure 26 illustrates the acreage of land by type and by region. Table 36 in Annex VI presents data on land types by region.

Figure 26: Land type in different regions 2005-2006



Source: MoAI

Lowland rainfed Yar Mye

The main land type of lowland that accounts for the majority of the sown oilseed area is the *yar mye*. These are gently sloping uplands on which oil seed crops depends entirely on monsoon rainfall, or on late rainfall and residual moisture during the cool season. Both annual rainfall and its distribution are variable and, particularly in the CDZ of central Myanmar oilseed farmers are exposed to considerable risk of crop loss. *Yar mye* constitutes 62 percent of the total arable land in the CDZ.

Historical yield data shows that the least stable are yields of cool season sesame in the driest areas of central Myanmar. In general, groundnut yields on *yar mye* are more stable than those of sesame and sunflower. In the driest area, sunflower is not a viable crop on *yar mye* and the crop is mostly cultivated at the periphery of the dry zone. Groundnut yields are higher at the periphery of the dry zone (between the dry zone and the delta region) where rainfall is higher.

Picture 7: Monsoon groundnut on yar mye in Magway Division
(Magway, 3 June 2007)

Picture 8: Weeding monsoon sesame on yar mye in Nyang U
(Nyang U, 2 June 2007)

Sesame appears to be the riskiest crop in the CDZ and as such has gained the reputation of being a 'gambling crop'[2]. Yet, sesame can strive with a limited amount of rain in the driest regions as well as in the less fertile soils. Further, there are good market opportunities for export both to the People's Republic of China via the Muse border or to a higher end market such as Japan and the Republic of Korea via Yangon. At the periphery of the dry zone, rainfall increases and sesame has to compete with high-value export crops such as green gram during the monsoon season and black gram during the cool season.

From a practical perspective *yar mye* is divided in three categories of soil in the lowland, which has specific cropping patterns:

- Light texture white soil: mostly one crop per year; monsoon sesame. An estimated 30 percent can be cultivated with a second crop, generally green gram or black gram.

- Medium texture yellow/red soil: two crops a year; generally monsoon sesame followed by groundnut; or groundnut followed by black gram or sesame. Cool season sesame is cultivated only on 13 percent of the *yar mye* land.

- Heavier texture darker/black soil: similar cropping pattern as medium texture soil, but darker soils are more fertile and yield generally higher.

2 Several local proverbs express the dilemmas about sesame cultivation.

Picture 9: Shifting cultivation in northern Shan state
(Northern Shan State, 27 May 2007)

Given the climatic constraints and risks associated to dry land farming in the CDZ, oil crops grown on *yar mye* are low cost/low input. The low yields of oil crops in Myanmar are the result of a high dependence on rainfall and limited use of modern inputs including high yielding seed varieties. Furthermore, the scope to improve productivity remains limited on these types of land. The focus of the Oil Crops Development Project is on the CDZ.

Hills rainfed Yar Mye

In the Shan hills, rainfall is higher and more regular which offers extensive opportunities for expansion of groundnut and soybean crops. In many parts of the Shan hills, farmers are engaged in shifting cultivation which leaves much of the land fallow. In the western part of the Shan hills, increasing population pressure on the land leads to more permanent cultivation practices. Non-farmed *yar mye* is used as pastureland for livestock. Increased fertilizer use and transfer of fertility from pastureland to cultivated *yar mye* through farmyard manure (FYM) allows more permanent cultivation patterns and yield increases. Farming practices, particularly on land preparation for shifting cultivation and permanent cultivation need to adjust. Increased use of fertilizers and improved land preparation practices have led to significant improvements in soybean yield in the southern Shan state (see Figure 29 and tables 48 and 49 in Annex VI).

On *yar mye* in the hills, the main cropping patterns are the following:

- Shifting cultivation in western Shan: land is cultivated three years in a row and then left fallow for another three to five years. The general cropping patterns on these lands are the following: the first year, monsoon groundnut is followed by niger in the cool season; the second year, land is left fallow after a monsoon corn and the third year monsoon groundnut is followed by three to five years of fallow.

- Continuous cultivation in western Shan: the main cropping pattern is monsoon groundnut or soybean followed by cool season wheat or niger. In southern Shan state, wheat is an important cash crop and therefore, legumes such as soybean are considered as an excellent preceding crop in the monsoon season. If maize or potato is cultivated, the land is left fallow during the cool season.

Note that upland rice is also cultivated on rain-fed sloping land, but these types of land are categorized as 'upland' (and not *yar mye*) as only upland rice is planted in succession in a shifting farming practice.

There are substantial opportunities to increase both yield and area cultivated in the Shan hills. Increasing oil crops output in the Shan hills would require an increase of the use of farming inputs, including high yielding seed varieties, improving land preparation practices and increasing availability of FYM to allow permanent cultivation of *yar land*. Map 15 in Annex V illustrates the opportunities for increasing cultivation on wasteland which mainly exists in Shan and Kachin states.

Picture 10: Groundnut cultivation in a cleared forest in northern Shan state
(Kyaume, 27 May 2007)

Irrigated Le Mye

The majority of the levelled cultivated plain is the paddy land or *le mye*[3]. Cropping patterns for irrigated *le mye* are multiple as with controlled irrigation, the land can be cultivated all year round. Generally, irrigated *le mye* have high clay content (heavy soil texture) and thus are not the best suited for sesame and groundnut crops. However, in the CDZ, lighter *le mye* have been put under irrigation and these lands provide a major opportunity for extending oil crop cultivation. In particular, it was found that farmers captured the highest margin from all cropping options with the pre-monsoon irrigated sesame.

Current cropping planning procedures are based on plans derived from the national project, which are then implemented on existing irrigation systems irrespective of constraints that may render the cropping patterns impractical. On irrigation schemes, including the CDZ, priority is given to paddy, despite the fact that cultivation of paddy requires 4 times more water than irrigated sesame or 2.3 times more than irrigated cotton. Irrigation infrastructure in the CDZ has been developed mainly for commercial crops such as cotton or horticulture crops which require less water than rice. In the CDZ, the irrigation requirements are as follows (MoAI):

- Monsoon rice: 6 acre-feet
- Pre-monsoon Rice: 8 acre-feet
- Cotton: 3.5 acre-feet
- Pre-monsoon Sesame: 2 acre-feet

The difficulties of outgoing irrigation practices had already been pointed out by FAO (2004). "A typical example is the Kinda irrigation project. The system is designed for the irrigation of mainly dry season crops such as cotton, sesame and chilli. In the original design the assumed portion of summer paddy was only five percent, much lower than levels now required under the National Project. Irrigation requirements and the dimensions of the canal network were therefore based on a specific irrigation requirement of 1.5 l/s/ha (litres per second per hectare); far lower than is needed under the mandatory cropping pattern now observed. The opportunity costs of the current high-paddy cropping pattern were calculated as between Kyats 8 and Kyats 35/m^3 of water supplied for irrigation (in 2003). If cropping restrictions were removed, and the shift made to sesame, chilli and similar crops, the net benefit would be substantial"[4].

According to the Irrigation Department in Nyaung-U, the Kyetmauktaung dam has a command area of 29 786 acres which could be under irrigation for cotton production. As paddy is given priority, only 6 500 acre of pre-monsoon crops and 12 000 of monsoon crops are being cultivated, leaving 78 percent and 60 percent of the command area dry in both seasons respectively. Crop budget analysis has shown that a well managed irrigated early monsoon sesame crop[5] can produce a gross margin of Kyats 224 000/acre, whereas irrigated

3 In Myanmar, despite substantial irrigation potential, only ¼ of the agricultural land is irrigated (approximately 2.5 million ha). The government has made significant efforts in expanding irrigation and the area under irrigation has reportedly doubled over the past two decades.

4 FAO. 2004. *Myanmar: Agriculture Sector Review and Investment Strategy. Volume 2: Agricultural sector Investment Strategy*, p 174-175.

5 As seen in Kyause by contract farmers for sesame export.

paddy in the CDZ can produce a gross margin of 230 000/acre (see Figure 27). Based on crop budget analysis for irrigated sesame and other cash crops (e.g. pulses), the increase in farmers' gross margin that would derive from removing cropping restrictions in Kyemauktaung dam command area is in the range of US$1.4 and US$1.8 million per year[6].

Picture 11: Irrigated pre-monsoon sesame in Mandalay Division
(Kyause, 26 May 2007)

Picture 12 : Irrigated sesame requires specific skills and experiences*
(Myinkin, 4 June 2007)

* Here failed irrigated sesame is observed in Magway

6 Provided the private sector would be invited to invest in contract farming on sesame, horticulture crops and pulses.

As a result of the current policies prioritizing rice cultivation over less irrigated intensive crops, the actual area under irrigation has contracted around the head of the irrigation canals, leaving much of the irrigable land without water. Given the higher price of rice on the market in the CDZ, farmers cultivating paddy utilizing irrigation water at nearly free cost can achieve a fair income, while farmers whose land is no longer irrigated have to cope with significant losses.

Most of the contract farming for sesame exports to Japan and other Asian countries are taking place on irrigated *le mye*. The opportunity to expand contract farming for sesame export in *le mye* in the dry zone is substantial, provided restrictions on cropping patterns are removed, and instead the MoAI role readjusted to regulate for a fair distribution of available irrigation water to water users' associations (WUAs)[7].

Non-irrigated Le Mye

On non-irrigated *le mye*, paddy is the main crop, followed by cool season legumes for export. However, in the CDZ, farmers generally wait and see how good the monsoon rainfall is before deciding on the crop. Therefore land preparation in non-irrigated *le mye* generally starts after the rain-fed *yar mye*. If rainfall is sufficient, paddy is planted through direct seeding[8], whereas if rainfall is inadequate to establish paddy, farmers are switching to pulses (mainly green gram) or sometimes sesame intercropped with chick pea (on lighter non-irrigated *le mye*). Chick pea is well adapted to the non-irrigated *le mye* condition in the CDZ and ensures a minimum return to farmers. As planting takes place late on non-irrigated *le mye*, in general only one crop is cultivated on this land in the CDZ. Groundnuts are generally not cultivated on non-irrigated *le mye*, because of the heavier soil texture.

Delta Region Le Mye

Paddy is the main production in the vast delta region. Somewhat more than half of this vast area is unsuited to cool season cropping and remains fallow. Yet, part of the delta has lighter texture soils which offer opportunities for cool season cropping with beans/pulses and oil crops. Beans and pulses have rapidly expanded on delta *le mye* with the active involvement of the private sector to capture international market opportunities. This expansion of beans and pulses was at the expense of oil crops cultivation. Sunflower was reported as a suitable crop as its tap root makes an optimal use of residual soil moisture. Relay cropping with beans/pulses (including soybean) after paddy and cool season niger could be tested as opportunities for further expansion of oil crops in the delta region. Also, opportunities for expanding on less suitable areas for cool season cropping should be explored.

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7 "Under current legislation in Myanmar, WUAs can only be informal organizations without legal status or standing. They lack autonomy and governance, i. e. the ability to make independent decisions on matters of concern to the group. Instead, the role of water user groups is reduced to collaboration on terms set by the village councils and committees. In the absence of statutes and by-laws, the internal arrangements remain informal and rather vague. The role and the responsibilities of WUAs are not well defined and authorizing access to land and water use right remains a prerogative of the state. If effective and meaningful participation by WUAs is to be achieved, much more attention must be given to the formation, strengthening and empowerment of WAUs in order to effectively participate in system operation, maintenance and management". See FAO. 2004. *Myanmar: Agriculture Sector Review and Investment Strategy. Volume 2: Agricultural sector Investment Strategy*, p 175.

8 Nurseries and transplant of paddy rice is not practiced on this land as the decision on the selection of crops is done just before actual planting takes place.

Kaing Mye or flood recession farming

Most of the lowland plain flanking the Irrawaddy and Sittoung rivers is inundated during the monsoon period from June to October, making crop production impossible. Post-monsoon, the land drains and the recent and fertile alluvium, the *kaing mye* is exposed by the failing river level. High value crops are sown with the residual moisture on these fertile lands. Planting generally takes place in October/November and harvesting in January/February. Groundnut was cultivated on about 385 000 acre *kaing mye* in 2006/07 which is by far the most productive oilseed in Myanmar. However, groundnut planted area on *kaing mye* has lost ground for higher value beans and pulses which benefit from wide export market opportunities as well as vegetable and tobacco sold on the local market.

The main crops cultivated on *kaing mye* are the following:

- River bank: rice bean, groundnut, soybean, vegetables (chilly and onion) and tobacco.
- More fertile land closer to the river bed: suntani bean and butter bean.

On *kaing mye* the use of fertilizer is limited given the annual inundation patterns; any residual fertilizers on the soil is washed away and lost for the next cropping season. Therefore, foliar fertilizers are widely used on oil crops and pulses. With limited scope for land expansion, further production increase on *kaing mye* can only originate from improved seeds.

9.3 LAND PREPARATION

Landless households with less than one acre represent a substantial proportion of total households and vary from 20 to 30 percent, to as much as 50 percent. These households provide a valuable pool for both farm labour and their wage employment which provide opportunities for labour intensive farming practices, but are disincentive for the mechanization of agricultural activities.

Lowland

Land preparation is predominantly by draught animals and availability of livestock seemed adequate to ensure land preparation in all main oil crops producing areas. Myanmar farmers prove to be particularly skilful in their land preparation/cultivation practices making optimal use of a few small and adapted implements mainly produced at village level. Generally, land preparation is done as follows:

- 1 or 2 ploughings: this takes approximately 1 or 2 days with a breaking plough pulled by a pair of oxen.
- 1 or 3 harrowing and furrowing: approximately 1 or 2 days with a 5 tooth harrow pulled by a pair of oxen. Sometimes, farmers are using a hand pulled light harrow to create small

furrows. The harrow is pulled in two passages at a 90 degree angle and at each intersection of furrows, one seed is placed and ensure a near perfect alignment and distribution of seeds on the land (see Picture 13). This practice is mainly used for legumes (including groundnut and soybean).

- 1 levelling and furrow: 1 day with a 5 tooth harrow pulled by a pair of oxen.

Land preparation for sesame requires more passages to obtain a smooth and fine structure that is adequate for small seeds to germinate, whereas larger pulse seeds can strive on coarser soils and therefore land preparation requires fewer passages. In particular, pre-monsoon sesame on irrigated *le mye* land requires two additional passages from the previously mentioned patterns because of the heavier soil texture of these lands.

Yet, as land preparation practices varies from one area to the other, there are ample opportunities to research on best practices and use farmer-to-farmer methods to disseminate them. A typical case is the pre-monsoon irrigated sesame on *le mye* which requires particular soil preparation techniques. Farmers in Kyause proved to be particularly skilful and represent an important human resource for disseminating best practices on irrigated sesame.

However, as only oxen and traditional equipment are available to farmers, land preparation is time consuming and there are delays in land preparation. Farmers are not able to plant at optimal time particularly after sufficient rainfall at the onset of the monsoon season on *yar mye* in the CDZ. However, given the small land ownership and low farmers' income, the use of oxen remains the most realistic option for dry-land oil crops farming. Yet, as farm production potential could increase with adequate machineries there may be some scope for leasing companies to operate in Myanmar.

However, when machineries exists they are of poor design and result in poor land preparation. The study team observed in the CDZ that yields of oil crops, on land prepared with draught animals were consistently higher than those prepared by tractors. Acquiring adequate machinery and sound knowledge on dry land preparation would substantially benefit sesame exporters' backward integration in their attempt to ensure control over export quality.

Shan hills

In many villages in the Shan hills, seed bed and seeding is done traditionally as for slash and burn/shifting cultivation. After ploughing the land, seeds are sown in individual holes dug out manually. These practices are time consuming and often result in irregular planting density and planting depth (see Picture 15). The lowland 'five tooth harrow' or 'hand pulled light harrow' are rarely used. Improving land preparation technology on permanently cultivated *yar mye* in the Shan hills cannot only reduce labour cost but increase yield. Crop budget analysis shows that improved farming technologies can increase the gross income from Kyats 14 000/acre to Kyats 95 000/acre (see Figure 29 and tables 48 and 49 in Annex VI).

Picture 13: Inter-cultivation on a monsoon sesame field in Magway *(Magway, 3 June 2007)*

Picture 14: Near perfect alignment and planting distance on green grams in Magway, without the use of any machinery *(Magway, 2 June 2007)*

Picture 15: Time consuming traditional oil crops planting techniques in the Shan hills *(Northern Shan State, 27 May 2007)*

Irrigated land

For irrigated sesame and groundnut, in most cases the land is not prepared properly for irrigation channels and furrows. For sesame, the land is generally not sufficiently cultivated to obtain a pulverized soil structure. For both crops, as irrigation furrows are not established, the usual method of irrigation is to flood the entire field. The uneven distribution of water in the field reduces the efficiency of irrigation and result in logging damages on oil crops.

The timing of irrigation was found to be inappropriate. Irrigation is generally applied too late, when the crop starts to show visible signs of moisture stress. By this time a large majority of the early flowers have already been aborted. On groundnut, irrigation induces a new flush of flowers. But the pods from this flush are usually unproductive, because they do not mature in time for the harvest.

9.4 Crop budget analysis

Crop budget analysis was prepared for all four main oil crops, namely sesame, groundnut, sunflower and soybean for all growing seasons and soil types for the CDZ and Shan states.

The rationales of the analysis are summarized as follows:

- Modelling was made based on extensive farmer interviews conducted by the study team in six divisions, Mandalay, Magway, Sagain, northern Shan state, southern Shan state and

Bago. Validation of data collected by farmers was made against MAS data and further phone interviews with MAS staff at district level.

- The crop budget analysis reflects scenarios farmers are anticipating for various cropping options. Yields reflect farmers' expectations on which they base cropping decisions.

- Farm-gate price reflect current or minimum anticipated market prices for the coming harvest.

- Rural labour cost is on average Kyats 600/day in the CDZ, Kyats 1 000/day in the southern Shan sate, Kyats 1 500/day in the northern Shan state and Kyats 1 000/day in the CDZ for work in wet paddy fields. Higher labour cost in Shan state results in higher production costs.

- All costs are monetized, including farmers' labour.

Tables 37 to 50 in Annex VI present detailed data on oil crops budget analysis. A review of the Figures 27 to 32 show that:

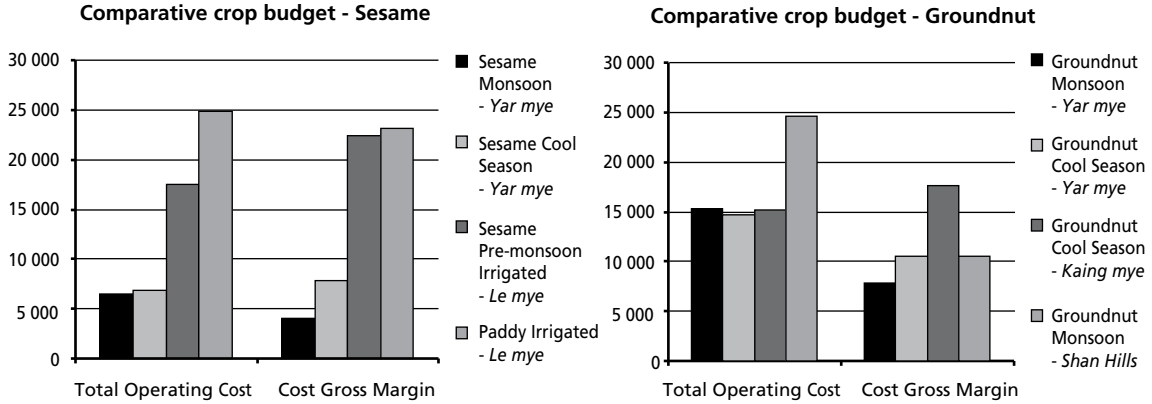
- *Sesame*: The highest gross margin from all oilseed crops is obtained from pre-monsoon irrigated sesame (Kyats 224 000/acre or US$443/ha). However, achieving high yields required fine land preparation and irrigation practices that are only mastered by some farmers in Kyause district. The lowest gross margin is obtained from monsoon sesame on *yar* land and this represents the majority (80 percent) of sesame cultivated in Myanmar. Although cool season sesame provides a higher return, it represents only 13 percent of the area cultivated.

- *Groundnut*: Costs of production for groundnut are significantly higher than any other oil crops, with the exception of irrigated soybean in Shan states. Limited access to credit is a constraint for the expansion of groundnut cultivation. The highest gross margin is obtained from cool season groundnut in *kaing mye*.

- *Soybean*: Gross margin of cool season soybean on *kaing mye* is significantly lower than groundnut and other pulses and therefore is little cultivated. Recent upward trends of soybean prices may reverse this scenario. Soybean is rarely cultivated on *yar mye* or *le mye* in lowland. In Shan state, on *yar mye*, the soybean gross margin is very low caused by inefficient land preparation practices and a negative comparison with groundnut. However, in villages where improved cultivation practices have been adopted, gross margin is comparable to groundnut. The recent price increase may prove a good incentive for an increase in area under soybean cultivation, however, the number of villages adopting improved cultivation practices remains limited.

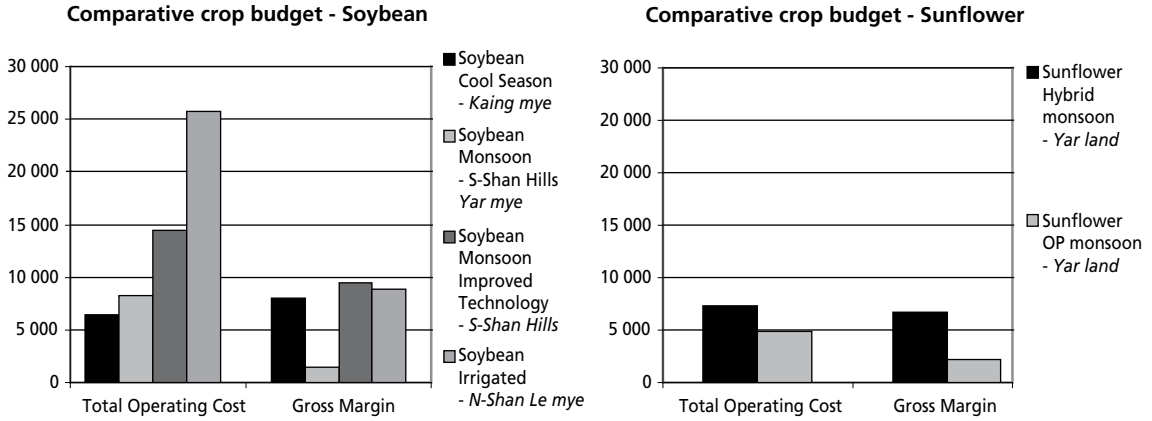
- *Sunflower*: Gross margin of open pollinated (OP) sunflower in the CDZ is the lowest of all oilseed crops (Kyats 21 500/acre or US$43/ha). As a result, the crop is declining. Production cost is also the lowest and, therefore, the crop is undertaken by poor farmers having limited capital to invest in higher return crops. However, gross income of hybrid sunflower monsoon season on *yar mye* is higher than sesame and lower

Figures 27 and 28: Comparison of crop budget for the two major oilseed crops; sesame and groundnut



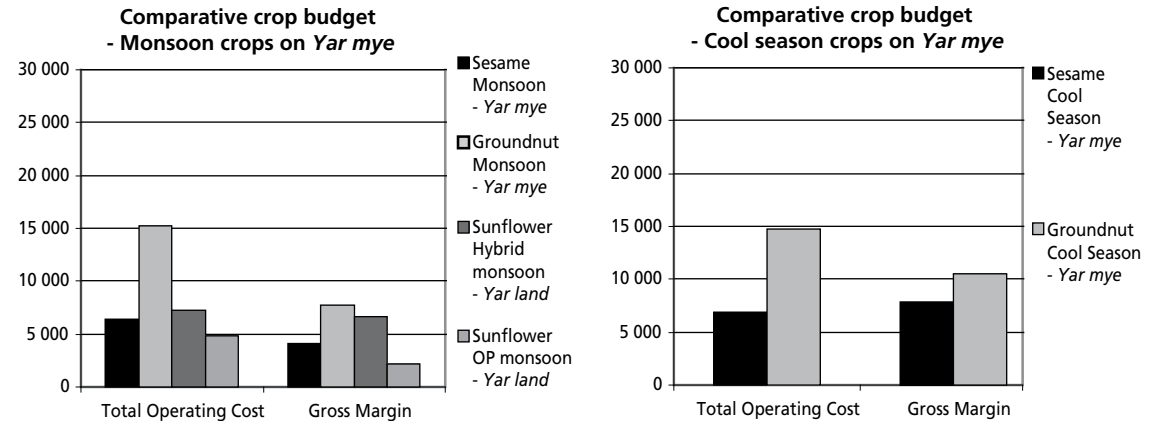
Source: Study team

Figures 29 to 30: Comparison of crop budget for the two oilseed crops; soybean and sunflower



Source: Study team

Figures 31 to 32: Comparison of crop budget monsoon and cool season crops on *yar mye* in the Central Dry Zone



Source: Study team

than groundnut. Yet, the operating costs are much lower than groundnut and slightly higher than sesame. This makes hybrid sunflower a popular option for farmers in the CDZ and hybrid seeds are in high demand. Wide spacing intercropping of sunflower rather than open field cultivation is the main practice. Crop budget for cool season sunflower in the delta region could not be established within the timeframe of this study.

Picture 16: A groundnut field with wide spacing sunflower (white harrows) in southern Shan state *(Southern Shan State 30 May 2007)*

Table 11 presents a comparison of crop rotation patterns between sesame and groundnut on *yar mye* in the CDZ and shows that the cropping pattern groundnut – sesame has a slight advantage (Kyats ~10 000/acre) over sesame – groundnut pattern. However, Table 12 shows that the cultivation of groundnut as a first crop requires an additional operating cost of Kyats ~88 000/acre. As this occurs during the lean season, most farmers do not have cash at hand and would have to access rural credit at high interest rates to cover the additional operating costs. Even at the lowest available rural credit interest rate (three percent), the additional cost incurred is nearly equivalent to the benefit from substituting sesame for groundnut as the monsoon crop. At a higher interest rate, the cost of credit becomes prohibitive to farmers. Therefore, most farmers chose to cultivate sesame as a first crop which allows them to invest in a higher cost groundnut cultivation as a second crop (cool season).

Table 11: Total operating cost and gross margin of two cropping patterns on *yar mye* in the Central Dry Zone

	Cropping Pattern I: Monsoon Sesame followed by Groundnut			Cropping Pattern II: Monsoon Groundnut followed by sesame			Difference
	Sesame Monsoon	Groundnut Cool	Total	Groundnut Monsoon	Sesame Cool	Total	
Total Operating Cost	64 455	147 205	211 660	153 005	68 855	221 860	10 200
Gross Margin	40 545	105 295	145 840	77 995	78 145	156 140	10 300

Source: Study team

Table 12: Additional operating cost on the cultivation of groundnut versus sesame as the monsoon crop*

	Total Operating Cost	3 percent interest rate	5 percent interest rate	7 percent interest rate	10 percent interest rate
Groundnut Monsoon	153 005				
Sesame Monsoon	64 455				
Additional Operating Cost	88 550	9 297.75	15 496.25	21 694.25	30 992. 20

* Credit costs for additional operating expenses is calculated on a basis of 3.5 months, which is the duration of the crop cycle
Source: Study team

9.5 Discussion on the cropping patterns developed for the Oil Crops Project

DP–1 Substitute pre-monsoon sesame with groundnut

Since the early 1980s, the government attempted to replace monsoon sesame by groundnut on *yar mye*[9] with little success to date as the area of monsoon sesame has been on an increasing trend ever since. Sesame benefits from growing international market opportunities. Furthermore, in the driest areas and on low fertility *yar mye* land, sesame is the best adapted crop. On more fertile areas, substitution with groundnut is possible, however there are financial constraints for farmers to undertake groundnut as a monsoon crop (see section 9.4).

DP–2 Substitute pre-monsoon sesame with sunflower

Sunflower has limited market potential in Myanmar as it is used to adulterate sesame oil at the oil mills (see section 6.3 above). Given the good market opportunities for sesame, sunflower may not be the best opportunity for farmers. Furthermore, heavy rainfall during the monsoon can affect the sunflower and reduce the yield. With its tap root system, sunflower can fetch water from deep layers in the soil and therefore is more adapted for cool season cultivation in lower Myanmar as the crop optimizes residual soil moisture. As a result, sunflower yield is lower during the monsoon season compared to the cool season and only 12 percent of the sunflower area is cultivated during the monsoon season.

9 See MoCoo. 1984. *Oilseeds Production and Processing Project*, UNDP, ADB and the Socialist Republic of the Union of Burma, Feasibility Report.

DP–3 Increase pre-monsoon sunflower areas

For this option similar consideration can be made as for option DP-2 above. Other crops grown during the monsoon season are groundnut which has a higher oil production level than sunflower or pulses which have higher market value.

DP–4 Inter-row post-monsoon pulses with sunflower

This option is generally practiced by farmers in the dry zone area. It is estimated that 70 percent of the sunflower cultivated in Myanmar is intercropped with pulses (see picture 16). Intercropping distances varies between 5 to 10 meters.

DP–5 Increase sunflower area under irrigation

Given the opportunity cost for irrigation water use, the best option would be to dedicate irrigated water to high-value crops such as sesame or pulses. Hybrid sunflower seeds are successfully used by farmers during the cool season benefiting from residual soil moisture and post monsoon/late rainfall.

DP–6 Substitute pre-monsoon maize with soybean

Demand for maize is increasing rapidly to feed the booming chicken industry in central Myanmar and Shan state. Maize production areas are increasing at a rapid rate. However, opportunities for inter-cropping maize with soybean need to be explored with imported varieties. In the hills in particular, maize is increasingly cultivated and as fertilizers are used little, the land is left fallow for the cool season. Intercropping with soybean would allow soil fertility to maintain a higher level and possibly allow an expansion of cool season niger cultivation with minimum nitrogen fertilizer input.

DP–7 Substitute post-monsoon pulses with soybean

Pulses have a higher value compared to soybean, as they are exported on the international market. Soybean is in great demand in Myanmar to produce cake mainly for chicken and fish feeds. Yet, most varieties cultivated are traditional and the oil and protein contents of soybean in Myanmar are significantly lower than internationally traded varieties. As a result, soybean farming in Myanmar remains a low cost, low return crop and farmers preferred options are exportable pulses. Yet, there is a need to increase the supply of soybean and this can only be achieved with the use of improved varieties. Testing the adaptability of high yielding varieties needs to take place on a larger scale. The private sector linked to the fishery and chicken industry are randomly introducing and testing new varieties from Thailand. Informal trade with the People's Republic of China and Thailand supply small volumes of seeds to farmers willing to take the risks of using new soybean varieties.

DP–8 Increase soybean area following monsoon rice

In the lowland, farmers are almost solely cultivating soybean on *kaing mye* and not on *yar mye* or *le mye* in the lowland. Demonstrating that cultivation of soybean on *le mye* after paddy is essential if the area is fit for soybean. Yet, similar consideration as on option DP – 7 can be made regarding the genetic potential of soybean varieties used.

DP–9 Increase soybean under irrigation

As long as the variety assortment of soybean varieties used in Myanmar is not increased, farmers may prefer to cultivate paddy in the delta region or higher value crops in the CDZ.

DP–10 Improve post-monsoon sesame yield

This demonstration is essential and trials with different local varieties may be needed. The main advantage of post-monsoon sesame is that the crop can be harvested during the dry season and therefore quality of seeds for export may be higher. Also, if planted after groundnuts or other legumes, sesame would benefit from nitrogen fixation in the soil.

It is essential for the demonstration component of the OPEC Fund for International Development (OFID) project to implement these through the farmer field school (FFS) approach and adapt the demonstration options based on farmers' constraints and opportunities. The FFS approach calls for a bottom-up planning process to extension service. The option DP – 1 is being tried and demonstrated without much success since the early 1980s. Flexibility is essential to allow trials and demonstrations which respond to farmers' needs. Here are some trials and demonstration patterns which could be a starting point to further develop field trial and demonstration:

1. Land preparation practices for irrigated sesame in the lowland.
2. Land preparation practices for soybean in *yar mye* in the hills.
3. Continuous cultivation of groundnut, soybean and niger in the Shan hills based on adequate application of FYM and fertilizers.
4. Soybean varieties trials in different agro-ecological zones and types of land.
5. Soybean intercropped with corn in different agro-ecological zones and types of land.
6. Soybean in non-irrigated *le mye* in the CDZ.
7. Relay cropping of soybean after rice on *le mye*.
8. Sunflower after paddy on *le mye* in the lowland and delta regions.
9. Sesame varieties trials on cool season.
10. Niger on *le mye* in lowland and delta regions as a pilot trial.
11. Variety tests for all oil crops in different agro-ecological zones and types of land.
12. Irrigation test and land preparation practices on irrigated land for sesame and groundnut.
13. Response of fertilizer use on all oil crops in different agro-ecological zones and types of land.
14. Rhizobium use on groundnut and soybean.

Further options could be identified through a detailed study on farming practices. Trials and demonstration options should identify best potential areas for yield improvements, which may be outside of the CDZ.

9.6 FARMING INPUT

Seeds

In Myanmar, the generation system of seed production is as follows: breeder, foundation, registered and certified seeds. Breeder seed is produced by the Division of Agriculture Research (DAR). Foundation seed in the progeny of breeder seed is produced by DAR, as well as the Seed Division. Registered seed is produced from foundation seed by the Seed Division, which is given to the Extension Division for production of certified seed on farmers' fields. According to the

Seed Division, the current division institutional set up does not allow adequate quality control on certified seeds at farm level, as these seeds are not cleaned, sorted and labelled.

The current seed supply scenario in Myanmar with regard to oil crop seeds is of serious concern. Despite decades of breeding, selection and multiplication of oil crops, the existing official system supplies between 2.26 percent seeds requirement for sunflower and 0.01 percent for groundnut (see Table 13). Informal imports of seeds from Thailand and the People's Republic of China exist but remain limited. In this context, farmers' seeds replacement rate is unsurprisingly very low and a market for certified/formal seeds for oil crops virtually does not exist. Under these circumstances, the yields of oil crops in Myanmar remain very low.

Table 13: Seed supply from foundation seed to certified seed in 2006/07

Oilseed Crops	Sown Acre	Seed Requirements (tonne)	Foundation Seed Supply DAR (t)	Registered Seed Supply MAS (t)	Certified Seed Supply MAS (t)	Multiplication Rate	Percentage of Total Requirements (percent)
Sesame	3 306 493	10 122	0.4	9.4	191.1	20-25	1.89
Groundnut	1 804 928	88 405	0.2	1.4	9.1	6-7	0.01
Sunflower	1 701 893	6 175	0.0	1.7	139.3	60-80	2.26
Soybean	385 572	6 295	0.3	2.3	18.3	8-9	0.29
Niger	318 082	974	0.5	7.1		14-15	0.72
Mustard	164 082	1 072	0.1	1.0	16.7	15-16	1.56
Total	7 681 050	113 042			3 74.5		

Source: MoAI, Seed Division

The Seed Division reported that it cannot undertake the task of supplying oil crop seeds and other channels should be explored. The MoAI has recently proposed that the private sector could play an important role on seed multiplication in Myanmar. While private sector involvement in seed supply is essential, the existing seed market in Myanmar is small. The existing seed market with respect to varieties, quantities and prices is unknown. Farmers may prefer to buy only small quantities of seeds, grow them on small plots and multiply them on their own in the following years. Under the current seed scenario in Myanmar, the private sector may well prove to be unsuccessful/ uninterested to supply seeds through the formal channel. The Nepal successful experience in increasing the supply of high yielding varieties and broadening the market base for improved seed through an informal approach to seed supply could be useful for Myanmar (see Box 1).

Informal oil crops seed supply does exist in Myanmar and these are mostly dealt by small-scale traders operating close to production areas. A good illustration of the ability of local small-scale traders in supplying seed is black sesame. This is indigenous to Auglan and has made this region famous for its supply of the highest quality black sesame grains to the Japanese market. Local traders played a significant role in improving the quality of black sesame by supplying farmers with clean black sesame seeds. Local traders have direct contact with progressive farmers who are selecting on their fields the best sesame plants based on the production and the homogeneity of the seed colour. These seeds are sold to traders at a premium price of Kyats 200/basket higher than the grain price. Traders are cleaning the seeds manually to increase purity and reselling these seeds to other farmers, which would ensure them a market to sell their production. These small-scale traders in turn supply sesame

Box 1: Nepal District Seeds Self-Sufficiency Program (DISSPRO)

Starting in 1997/98 and in response to low seed supply (<2percent) from formal supplies, the Nepali Department of Agriculture launched the DISSPRO. Fifteen districts were selected to produce registered seeds on farmers' fields from the foundation seed stock procured from the Nepal Agriculture Research Centres (NARCs). Seeds produced are spread through the farmer-to-farmer informal exchange practice, under the coordination of the District Agriculture Office.

The Crop Development Directorate under the Department of Agriculture is collecting the foundation seeds demand for DISSPRO (as well as for private seed companies) and providing the demand to NARC to plan foundation seeds production in formal meetings of the National Seed Board Planning and Monitoring Subcommittee. Demand is based on farmers' request (bottom up) and is finalized in a national seed planning work-shop conducted annually.

This programme has been instrumental in spreading good quality seeds through the farmer-to-farmer informal exchange practice. A decade later in 2007, most of the districts are part of the DISSPRO and these informal mechanisms of seed supply account for over 95 percent of the farmers seed use while farmers' seed replacement rates increased from a fraction of a percentage to 10 to 30 percent depending on the crops. DISSPRO intends to motivate farmers or farmers groups to be involved in the commercial production of cereal seeds. A decade later, the programme has created a market for improved seeds (higher replacement rate) and the issues at stake are the upgrading of farmers' seeds producers into 'village seed enterprise' and streamlining this successfully informal seed supply into a formal supply chain. Processing, storage, labeling and efficient distribution of seeds from community based seeds producers has become a problem. This may be achieved through technical assistance, mini-processing plants and linkages with local traders to support 'village seed enterprises'. Simplified certification mechanisms such as Quality Declared Seeds (QDS) will need to be implemented.

* In Nepal, the equivalent of registered seeds is referred to Certified First Generation (C1).

exporters in Yangon with exportable quality of black sesame. As a result, quality of sesame seeds in Auglan has improved substantially over the past decade. These improvements where driven by export markets and took place outside of a formal seed certification system. The 'scientific black' sesame seeds released by DAR were reported to be in short supply by both farmers and traders and thus were little used.

Table 14 summarizes the potential interest of private sector involvement in seed supply in Myanmar. In general terms, the private sector has interest in:

- Hybrid varieties which farmers have to replace every year. Hybrid corn is a case example, as most hybrid seeds are being produced under contract farming and distributed by the CP group (A Thai company that operates in the sector).

- Cross-pollinated varieties which farmers need to replace regularly. Self-pollinated and varieties with good genetic stability are not of interest to the private sector as farmers tend infrequently to replace these seeds.

- High multiplication ratio. This is necessary to allow supply of seeds at an affordable price to farmers.

- Good seed viability. Apart from sesame, seed viability is an issue for oil crops (because of the high oil content).

- High market demand, as the private sector needs to start from an existing market base. The evaluation of the current market demand is based on the study team observation on the ground and this may be complemented by further studies.

From this analysis, the private sector in Myanmar may demonstrate a moderate interest in sesame and hybrid sunflower seed production and low or no interest in groundnut and OP sunflower seeds production. Sesame interest is driven by the export market opportunities. Some interest in soybean seeds supply by the private sector may come from the shortage of cake for the fishery and chicken industry and the absence of good varieties in Myanmar. This interest was expressed by a few actors able to integrate soybean production and processing and fishery production and export.

Given each crop specifics, addressing seed supply should consider the constraints and opportunities for each specific oil crop.

Table 14: Potential interest of the private sector in engaging in oil crops seed supply

Oil Crops	Pollination Type	Genetic Stability	Genetic Diversity	Seed rates per acre	Multi-plication Rate	Viability	Current Market Demand	Private Sector Interest
Sesame	Self-pollinated (5-15 percent cross-pollination)	Moderate	Excellent	3 kg Low	20-25	Very Good	Low	Moderate
Groundnut	Self-pollinated (<1 percent cross-pollination)	Excellent	Good	70 kg High	6-7	Low	Moderate	Low
Sunflower	Cross-pollinated	Low	Poor	3.6 kg Low	60-80	Moderate	Low	Low
Sunflower Hybrid	Hybrid	None	Poor	3 kg Low	NA	Moderate	High	Moderate
Soybean	Self-pollinated (<1 percent cross-pollination)	Excellent	Poor	33 kg High	8-9	Low	Fair	Low-Moderate

Source: Study team

Sesame

Sesame has been recorded as being cultivated at the time of the Bagan Dynasty commencing in 1044 AD. The genetic diversity of sesame is exceptional in its diversity of colour, oil content, taste and agronomic characteristics. In fact, it represents a major comparative advantage for Myanmar in the oil crop sector for the export market. This diversity offers opportunities to identify varieties adapted to farming practices (short or long cycle varieties) and market demand, both nationally and internationally. Yet, most farmers are using their own seeds and the potential of the local varieties remains largely unexplored. Research on sesame has mostly involved breeding and has perhaps not sufficiently explored opportunities for using existing materials. Identification and multiplication, from the vast sesame genetic pool, of best local varieties with potential for various uses including export markets, oil production and confectionary by involving small and large scale traders, needs to be implemented.

Currently, the private sector is actively involved in informal sesame seeds multiplication for the export market. These trends may be supported by the public sector through training/ capacity building in seed production. However, the private sector focuses only on a few varieties which offer the best opportunities. The public sector could map the existing varieties on both their agronomical and technical characteristics.

Groundnut

The use of improved groundnut varieties is widespread and the genetic base is considered sufficiently broad for the need of the sector. Spanish and Valencia varieties are grown in Myanmar. Sp 121/070, Magway-10, Magway-11 and Sinpadetha-6, Sinpadetha-7 are Spanish varieties cultivated in main growing areas. They mature in about 100 days in monsoon and about 120 days in the post monsoon season. Varieties of the Valencia type, locally known as 'big Japan' and 'small Japan', also take about 100 to 120 days. They were introduced from India, most probably as table types. They have attractively large and long pods, but relatively low shelling percentage, because of their thick shell. No Valencia varieties were officially released in recent years in Myanmar. Kyaung Gon and Myanmar Pinpyant represent the Virginia type in Myanmar. They are both spread types, taking about 150 days to ripen, having a crop duration of 170 days, and are only grown during the monsoon. Owing to their ability to adjust their growth rate to available soil moisture and also owing to their characteristic seed dormancy, these varieties are suited both for areas with good rainfall distribution, and in the CDZ. Thanks to the excellent genetic stability of the groundnut, the varieties used by farmers even for several years do not degenerate.

The quick loss of viability of groundnut seeds has prevented farmers in regions were only one crop per year is possible to keep their seeds for the next season. Therefore, farmers had to procure seeds every season and a seed trade between the CDZ and the Delta region has developed. In the Delta region, groundnut is only cultivated as a winter crop. However, discussion in the field with traders and farmers seem to indicate that this trade is now very limited for the following reasons:

- Area of groundnut cultivation in the Delta region has markedly reduced in favor of green-gram.

- Cultivation of groundnut as a monsoon groundnut on *yar mye* in lowland areas bordering the Delta region has increased. Therefore, to reduce transport cost, seeds are now transported from nearer production areas.

- Increase of the Virginia spread type which seeds have dormancy and reportedly can be stored from one season to the other.

Supply of groundnut seeds are extremely low and will remain a challenge as it is unlikely that the private sector will find sufficient commercial incentives. Furthermore, the public sector is equally constrained by crop characteristics such as low multiplication ratio, quick loss of viability, bulky nature of the produce and high transport cost.

Sunflower

The genetic base for sunflower is very narrow in Myanmar as only a handful of varieties were provided from the Russian Federation, Great Britain and Australia. Mahuyar (Smena) variety was the first sunflower variety experimented in Myanmar in 1970 at Tatkone central farm. The majority of oil seed sunflower currently grown in Myanmar are OP and limited to the following four varieties; Mahuyar (Semena), Doatkhit (Peredovik), Sunfola, and Sinshwekya 2. Furthermore, sunflower is cross-pollinated and it is relatively more cumbersome to produce pure seeds with these crops. As a result, existing OP varieties used by farmers have degenerated and lost their production potential. Degenerated varieties are commonly seen in the field; uneven plant heights, less uniform flowering periods, development of various head sizes and serious yield reductions. Acreage of sunflower and production has plummeted, although not reflected in official statistics[10]. It is unlikely that the private sector would take a leading role on OP sunflower seed production.

During 1979-1980, the hybrid sunflower variety, Hysun 33 was introduced in Myanmar. Although it is possible to produce hybrids by using elite introduced parental lines from abroad, these parental lines need to be procured with hard currencies (see section11.6) and their adaptability and yielding potential need to be tested. For these reasons, DAR started developing in 1993 its own local inbred lines to produce a new hybrid variety. The hybrid sunflower Yezin 1 was successfully developed and released by DAR to farmers a decade later in 2001-2002. Yezin hybrid 1 is widely accepted by farmers for its high yield (up to three times higher than OP varieties), earliness, high oil content, and moderate tolerance to *Alternaria* leaf blight.

Farmers demand is high but given the complexity of producing hybrid sunflower, supply is very low and it is unlikely that the private sector in Myanmar can undertake this task in the short term. Production of hybrid seeds is a complex process. Maintenance of female maintainer and restorer lines and production of F1 seeds every year is rather an exacting and more demanding task and needs highly skilled and trained manpower.

10 This was recently acknowledged by a public official in Yangon at a meeting in June 2007.

Soybean

There are over 20 soybean varieties cultivated in Myanmar. DAR has released 8 soybean varieties in the country. Different local names are given to these varieties according to their locality. DAR estimates that approximately 70 percent of total soybean areas are covered with local varieties and 30 percent with improved varieties. Soybean yield is very low compared to improved varieties. There are two culinary soybean local varieties widely grown; Shansein lonegyi and Shansein lonethay. They have indeterminate growth habit, high response to photoperiod, pods shattering types and low grain yield. These varieties have a high protein and less oil content, greenish yellow seed coat colour and uniform seed size (see table 51 in Annex VI).

Out of DAR released soybean varieties, Yezin-5, Yezin-6, Yezin-8, Yezin-9 which have good export quality, high yield potential, non shattering and wider adaptation. Among them, Yezin-6 is adaptable to both monsoon and post monsoon growing season. According to the results of demonstration trials, these improved varieties will be promoted in major soybean production areas in Myanmar in the near future. Expanding these varieties will require an active involvement of the public sector as it is unlikely the private sector will invest in soybean seed multiplication.

Recommended approach

Seed is the cheapest and most essential instrument for increasing agricultural production. Therefore, the public sector needs to undertake a strategic role in insuring that seed supply is secured. The extremely low supply of seeds for oil crops denotes the low priority given to oil crops in the seed sector. The Seed Division has indicated that it cannot take responsibilities on its farm to supply oil crop seeds. Yet, would any progress be achieved in the oil crop sector at production level, the supply of seeds needs to be addressed as the top priority.

The proposed strategy on the seed sector aims at both increasing supply of high yielding seed varieties and broadening the market base for seed which can facilitate future private sector involvement.

Building on existing initiatives from the private sector (mainly small-scale traders) and successful experience in other countries (e.g. Nepal), an informal[11] approach is proposed:

- DAR increases the supply of foundation seeds on its own farm or on land allocated by the Seed Division.
- DAR provides foundation seeds to district MAS for redistribution to selected farmers for multiplication.
- If supply of foundation seeds is insufficient, the seeds could be multiplied by the private sector (groundnut is likely to be insufficient) and procured by MAS for redistribution to farmers.

11 Formal seed multiplication system is possible but it is costly and time consuming.

- MAS coordinates the redistribution of first generation seed to other farmers within the district.
- Farmer-to-farmer exchange ensure the distribution of the multiplied seeds.
- MAS informs local traders on the list of farmers who have received first generation seeds in order to facilitate distribution of these seeds.
- MAS at district level collect farmers' needs in terms of varieties and quantities of seeds and submit to the Seed Division DAR to plan for foundation seed production and adjust variety assortment.
- The Seed Division organizes an annual work-shop including the private sector to plan seed production and prepare a seed balance sheet.

The Seed Division would under take the responsibility to train farmers involved in seed multiplication. However, in the first years, training could be basic as the system may not try to achieve a 'formal' certification system beyond the foundation seeds. The first priority is to have high yielding seed varieties available to farmers whereas in a few years stricter quality control can be put in place. The government needs to subsidize the multiplication of foundation seeds, necessary capacity building activities of both farmers and private sector and the coordination activities of the whole seed supply chain.

Table 15 presents the acres required on a DAR farm for foundation seed. It looks at the quantity of seeds that need to be multiplied to increase seed supply to 10 percent of the total requirement for groundnut and soybean and 30 percent for sesame and OP sunflower[12]. To achieve these objectives, DAR would only require 409 acres of land dedicated to oil crops foundation seed production.

Table 15: Acres required for foundation seeds*

Oilseed Crops	Percentage of Total Seeds Requirements (percent)	Foundation Seed Supply DAR (tonne)	Acres Required	First Generation - on Farm or Private Sector (tonne)	Second Generation - On Farm (tonne)	Multi-plication Rate
Groundnut	10.00	210	371	1 263	8 840	7
Sesame	30.00	4.9	13	121	3 037	25
Sunflower OP	30.00	0.7	5	37	1 852	50
Soybean	10.00	7.8	20	70	630	9
Total		223.40	409	1 491	14 359	

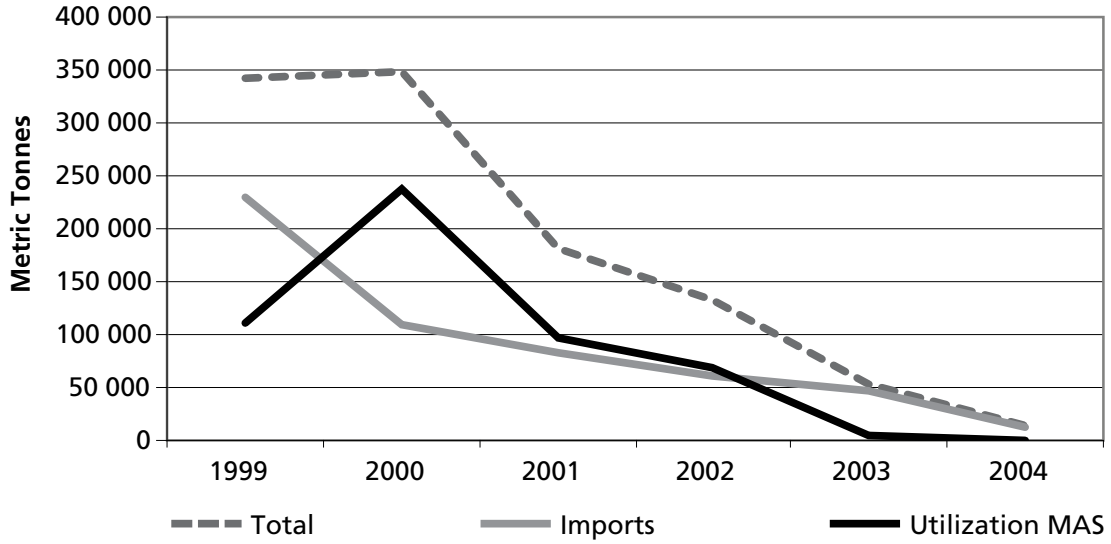
*This table looks at the quantity of seeds that need to be multiplied to achieve a 10 percent of total seed requirement for groundnut and soybean and for a 30 percent requirement of sesame and OP sunflower
Sources: Seed Division and study estimates

12 The Seed Division, along with stakeholders along the oil crops chain, may determine their own seed supply objectives.

Fertilizers

Based on official statistics, the recent trends in fertilizer supply are of serious concern; the total fertilizer supply has dropped by 24 times between 1999 and 2004 (Graph 17). Official imports have declined by nearly 20 times within the same period. Furthermore, the current official import procedures are constraining and resulting in delays in fertilizer supply.

Graph 17: Total fertilizer used on all crops, 1999 to 2004



Source: CSO, Myanmar Agricultural Statistics

Myanmar is equipped with a fertilizer law, but the rules and regulations are still under discussion and as a result, the law cannot be implemented. Taking advantage of a legal vacuum and the severe shortage in fertilizer supply, private companies are marketing crushed bones from slaughtering houses mixed with other residues using misleading labelling. Chemical content of fertilizers is not controlled.

Based on the current scenario of seed and fertilizer supply, production in Myanmar should have collapsed but field observations suggest otherwise; the informal economy has saved the industry. Informal imports of fertilizers into Myanmar is massive and based on fertilizers use reported by farmers interviewed in the field, the minimum informal fertilizer import is above 1 million tonnes per year. Informal imports take place across border from neighbouring countries; Bangladesh, India, Thailand and the People's Republic of China. Fertilizer is the single most important cash expenditure for farmers. It is access to fertilizer mainly for the monsoon oil crops that farmers need credit in the CDZ (see section 9.7).

According to the Ministry of Livestock and Fishery (MoLF), there are approximately two million cattle in each of the three divisions in the CDZ. Considering that each cattle/livestock equivalent is producing an estimated equivalent of 3 kg of usable composted FYM per day mixed with litter, the amount of FYM available per acre of land is 0.5 tonne/acre in Sagaing, 0.6 tonne/acre in Mandalay and 0.8 tonne/acre in Magway.

The rates of application of FYM and inorganic fertilizer are well short of the net requirements by crops, and serious nutrient mining has implications for the future sustainability of all the cropping systems.

Pictures 17 and 18: Fertilizers with inadequate marking sold on the local market

Picture 19: Fertilizers on sale in a farm input dealer in Magway
(Magway, 4 June 2007)

Rhizobium

Treating pulses seed with rhyzobial cultures is advocated by MAS but is not widely practiced, owing to the restricted availability of commercial packet inoculants[13]. Only 150 000 packets of inoculants were produced in 2006/07, sufficient only to treat 1.6 percent of Myanmar's legumes (one packet is sufficient to treat legume seeds for one acre). In 2006/07, the distribution of rhizobial inoculants packets for groundnut and soybean was respectively 5 100 and 2, representing a coverage of 0.28 percent for groundnut and 0 percent for soybean. Table 52 in Annex VI presents the distribution of rhizobial inoculants by legume crop.

Pesticides

The *Plant Protection Department (PPD)* has responsibilities in pesticide registration and limits on pesticide residue for agricultural export commodities. PPD stopped producing pesticides in Myanmar since the year 2000 and therefore now all pesticides used in Myanmar are imported by the private sector. The PPD has established a list of nine banned pesticides (see Annex III). The PPD pesticide registration board benchmarks its list of authorized and banned pesticides with neighbouring countries, namely India, Thailand and Malaysia. For authorized pesticides, the PPD labels each package in Myanmar language. The labels include cautions on pesticide uses and toxicity class. However, loose implementation of the Pesticide Law[14] results in the uncontrolled availability of agro-chemicals on the market through informal imports. Banned pesticides are cheaper than legally imported ones, as import taxes and controls are not applied.

9.7 Rural Finance: A scenario of cash starvation

Rural finance market

Rural finance was consistently reported by farmers as their most severe constraint in oil crops farming. The availability of formal rural finance services is low – while 70 percent of the population is engaged in agriculture, which produces 52 percent of GDP, only 1 to 3 percent of formal bank credit is provided to the sector[15].

Thus far, provision of rural finance has focused on credit only and has been supply-driven, based on Myanmar Agriculture Development Bank's (MADB) lending plan. However, as MADB funding base is restricted, lending has been shrinking in real terms for several years. MADB's lending has been limited to agriculture and predominantly rice and to the exclusion of rural enterprises. When available, the current maximum level of lending by crop

13 Commercial production of rhizobial inoculants was initiated in 1978-1979 at Plant Pathology Section under Biotechnology, Plant Genetic Resources and PPD, DAR. All of Myanmar's rhizobial inoculants are produced by DAR.

14 GoUM. 1990. *Pesticide Law*, Yangon, Myanmar ; GoUM. 1992. *Formation of the Pesticide Registration Board*; Government of Myanmar. 1991. *Procedures relating to the Pesticide Law*, Yangon.

15 FAO. 2004. *Myanmar Agriculture Sector Review and Investment Strategy. Volume 2: Agriculture Sector Investment Strategy. Working Paper 9: Rural Finance.*

is only Kyats 7 000/acre of paddy and Kyats 4 000/acre of groundnut. As a comparison, the total production cost for oil crops varies between Kyats 50 000 to Kyats 230 000/acre.

Under the Ministry of Finance and Revenue, a credit facility exists through official 'pawn shops'. The pawn shops accept collaterals in gold and precious stones and provide loans of up to 40 percent of the market value of the collateral. The government 'pawn shops' are borrowing from the Myanmar Economic Bank at 40 percent interest rate per year (1.16 percent per month) and lending at 3 percent per month. Government 'pawn shops' exist in most townships in the CDZ (e.g. Mandalay 27 out of 29 townships). There are official and unofficial 'pawn shops' which lend at a monthly interest rate varying between 3 to 5 percent, with collateral, and 7 to 10 percent without. Private 'pawn shops' can lend up to 80 percent of the collateral value.

Other formal institutions have been discouraged from providing rural financial services. Formal banks, other than MADB have been inexplicably prohibited from lending for agriculture production. Interest rate ceilings (currently at 17 percent per year), coupled with recent inflation rate (independent estimates: 21 percent in 2007[16]), is resulting in negative real interest rates making it inherently unprofitable. Price controls on interest rates are inconsistent with the government policy of market base provision of goods and services. Banks are further discouraged from lending to rural households, by their inability to accept agricultural land-use rights as collateral given the prevailing Land Law[17].

Table 16: Identified rural credit available in the Central Dry Zone

Lender	Interest Rate per Month	Corresponding Annual Interest Rate	Ceiling	Collateral	Reported repayment Rate
MADB	1.42 percent	17 percent	Kyats 4 000/acre groundnut	No	100 percent
Government pawn shops	3 percent	36 percent	Max 40 percent of collateral value	Yes	100 percent, if not auction sale of collateral
Private pawn shops or local money lenders	3 to 5 percent	36 to 60 percent	Up to 80 percent of collateral value	Yes	Near 100 percent
Private pawn shops or local money lenders	7 to 10 percent	84 to 120 percent	Depending on trust and social background of lenders	No	Depending on trust, but reportedly near 100 percent
Fertilizer dealers	2 to 4 percent	24 to 48 percent	Varying	No	98-100 percent
Contract farming	2 to 5 percent*	24 to 60 percent	Varying	No	98-100 percent

* Under contract farming arrangements, the repayment is generally made in kind at harvesting time. The price is fixed at the time of the contract farming agreement when the actual market price at harvesting time is yet unknown.
Source: Study team

16 Economist Intelligence Unit. 2006. *Country Report. Myanmar*, EIU, London.
17 GoUM. 1992. *Duties and Rights of the Central Committee for the Management of Culturable Land, Fallow Land and waste Land and Procedures conferring the Right to cultivate Land/Right to Utilize Land.*

Given the inability of the formal institutions to provide rural credit, the majority of farmers are getting credit from friends, relatives or, less agreeably, the local moneylender – for time immemorial a ubiquitous presence in the country. Interest rates applied by informal credit providers are usuary and varies between 36 and 120 percent annually. As repayment rate is generally close to 100 percent, these usury rates practiced on rural credit by the private sector reflect the acute paucity of cash in rural areas. Table 16 summarizes the terms and conditions of available rural credit identified in the CDZ.

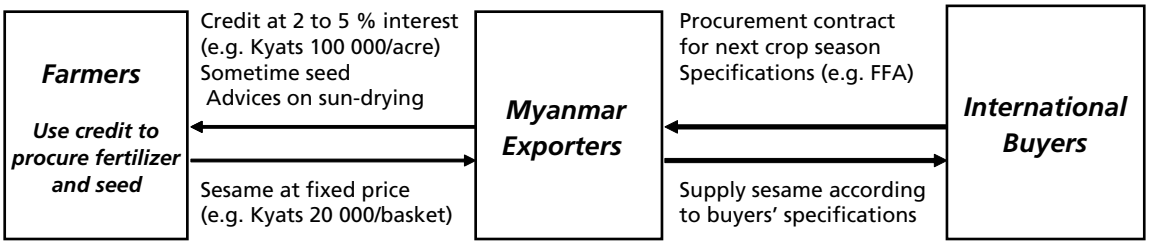
Considering the financial market situation, there are vast opportunities for the private sector to provide rural credit at interest rates that are lower than the existing system. Yet, private banks are not allowed to enter this market. Fertilizer dealers or exporters engaging in contract farming are new actors in the rural credit scene. They generally provide credit at lower interest rate than the other private actors. Annex IV presents an original draft contract document on official letterhead and its translation between a fertilizer dealer and a farmer for the procurement of fertilizers on credit in Magway.

Fertilizer dealers could greatly expand their business if they would provide fertilizers on a credit basis. Fertilizer is the main cash expenditure for oil-crops farmers in Myanmar. However, although the reported repayment rate is close to 100 percent in most cases, the majority of fertilizers dealers are unwilling to take risks which they are unable to assess. It was reported in various instances that some fertilizer companies are marketing their products on a credit basis through local authorities which reduces their risks near to zero, but increases interest rates for farmers.

Contract farming as a source of rural credit

Contract farming practices in Myanmar are essentially a model of rural credit provision to farmers and in the oil crops sub-sector the system is being developed to service sesame export trade. Farmers find advantages to access credit through contract farming arrangements as they do not need collateral, they can repay in kind and interest rates applied are lower than the informal market. In Kyause, farmers are provided with Kyats 100 000/acre of irrigated sesame and will repay with 5 baskets of sesame in kind at harvesting time. The expected price at harvesting time is Kyats 23 000/basket and therefore the anticipated interest rate is 3.75 percent/month over a 4 month period. The expected yield is between 16 and 20 baskets/acre and the balance can be either sold to exporters or on the local market at prevailing market price. Besides sun-drying advices, technical assistance is not provided to farmers under the current contract farming arrangements.

Figure 33: Current contract farming model on sesame for export



Source: Study team

Tripartite partnership in credit supply and contract farming

There are opportunities to develop 'tripartite partnerships' between farmers, the private sector and the MoAI in providing rural credit and facilitating contract farming. Under the current situation, all actors along the chain are interested in providing or receiving credit. However, insufficient credit is provided, essentially because of the lack of trust and communication between actors along the chain:

- Exporters would like to increase their exports and have better control over quality and traceability through contract farming and provision of credit to producers. However, they find challenging to contact farmers as they are not organized in genuine interest groups.

- Fertilizer dealers could expand significantly their market share/sale by providing fertilizers on credit. However, they do not have sufficient experience in credit provision, have no farmers' group interlocutors to deal with and generally tend to overestimate the risks associated with credit lending in the Myanmar context.

- Farmers desperately need credit at lower rates than the current usury practices. Yet, they are not organized in interest groups and thus have difficulties to contact fertilizer dealers or exporters to negotiate agreements.

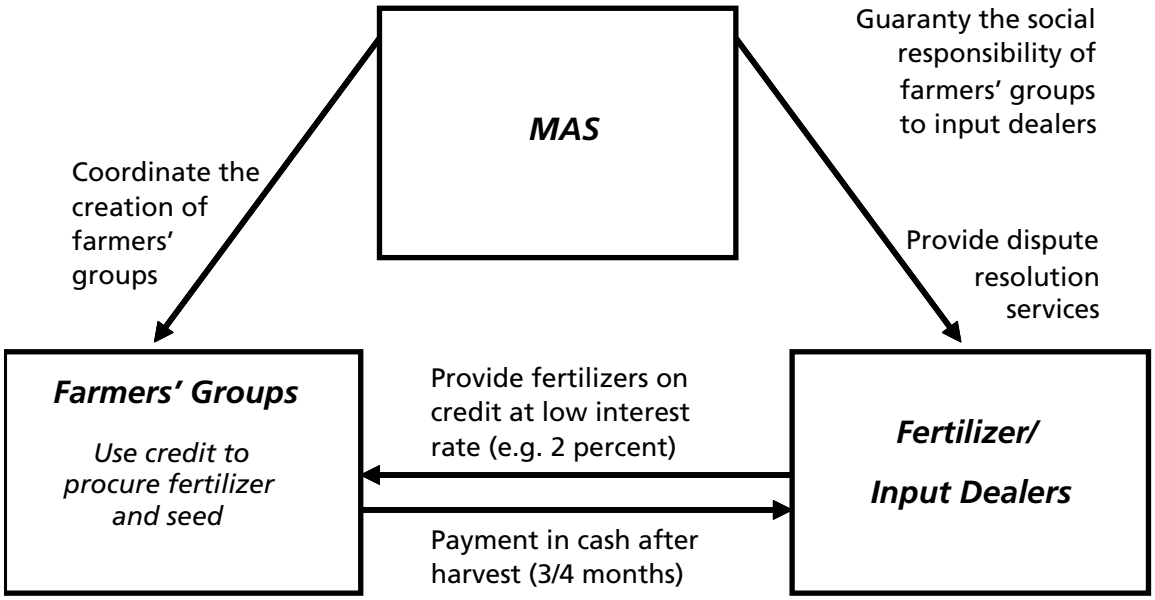
Given the low use of farm input, rural credit, even at high interest rate finds farmers interests as the incremental yield is substantial. The most productive oil-crops producers visited were those involved in contract farming and thus having access to sufficient farm input through credit.

Even without provision of cash, a better organization of the input supply chain would improve the availability of rural credit. The creation of genuine farmers' interest groups is a prerequisite. Note that farmers' marketing groups/cooperatives have reportedly failed in Myanmar essentially because farmers have options to market their products amongst numerous competing traders (see section 8.2 on marking channels). As a result, farmers capture a reasonable proportion of the market price. The essence of farmers' interest groups here is different in the sense that it can respond to an existing need for rural credit and farming input.

A pilot project should be implemented aiming at building trust between actors along the chain. MAS would facilitate the creation of farmers' interest groups in pilot areas through a bottom up approach and provide the contacts of these groups to fertilizers dealers and export traders. A simple agreement of shared responsibilities toward credit received by farmers' groups can be signed and deposited within MAS offices. In case of conflicts between farmers and fertilizers dealers/export traders, MAS would facilitate conflict mediation. Blacklisting of farmers' groups to access further credit or engage in contract farming should be a sufficient incentive to avoid risks of non-payment.

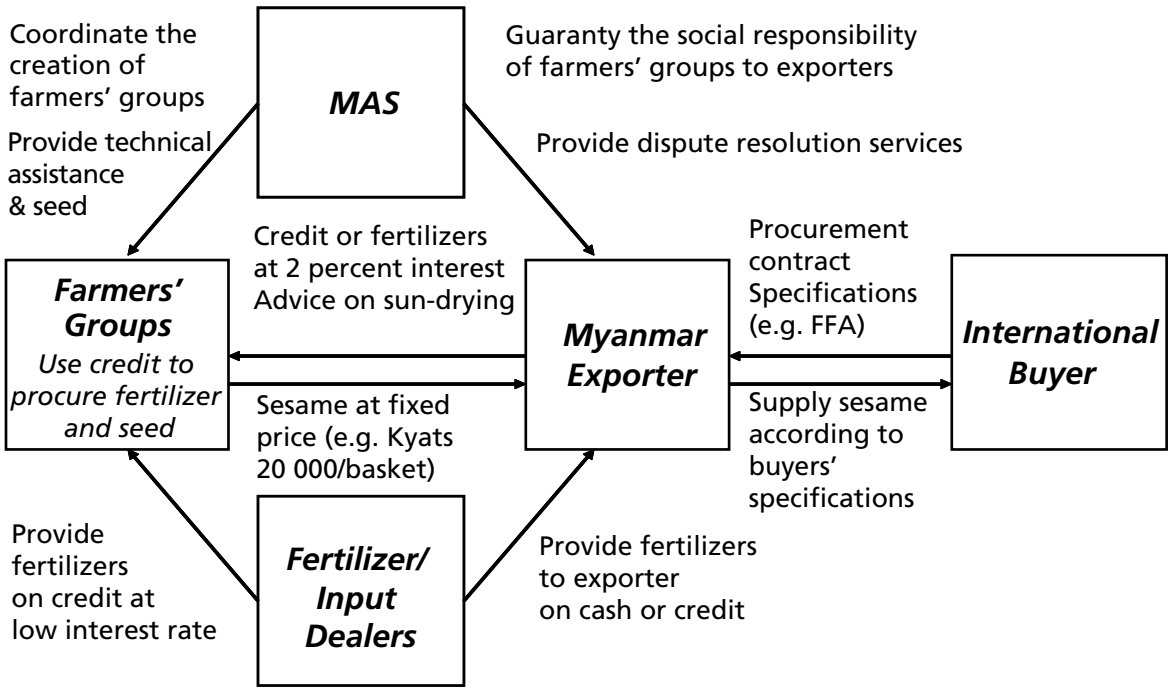
Figures 34 and 35 illustrate possible tripartite and quadripartite partnership models to facilitate farming input supply on credit and contract farming. Farmers' interest groups can become active users and participants of MAS extension service facilities or clients of private credit providers.

Figure 34: Tripartite partnership model, to facilitate farming input supply on credit*



*Partners are MAS, fertilizer/input dealers and farmers' interest groups. This model could be extended to credit providers, if the financial sector would allow the private sector to enter rural finance.
Source: Study team

Figure 35: Quadripartite partnership model to facilitate contract farming*



* Such partnership would primarily take place mainly in irrigated *le mye*. Partners are MAS, exporters, fertilizer/input dealers and farmers' interest groups
Source: Study team

Picture 20: Proper drying of sesame is essential to maintain low Free Fatty Acid levels for export markets *(Kyause, 26 May 2007)*

10. Processing: Oil mills

10.1 Geographical distribution of oil mills and milling capacity

Expeller[18] milling capacity

Expeller milling technology is widespread throughout the country. There are over 3 600 expeller mills in operation in Myanmar (FAO, 2004)[19]. Most mills are owned by the private sector while the Myanmar Cotton and Sericulture Enterprise (MCSE)[20] owns cotton mills and the Myanmar Industrial Crop Development Department (MICDD)[21] is currently installing new expeller mills in various districts for the extraction of Jatropha oils. The mills are categorized on the basis of connected power, as per Table 17.

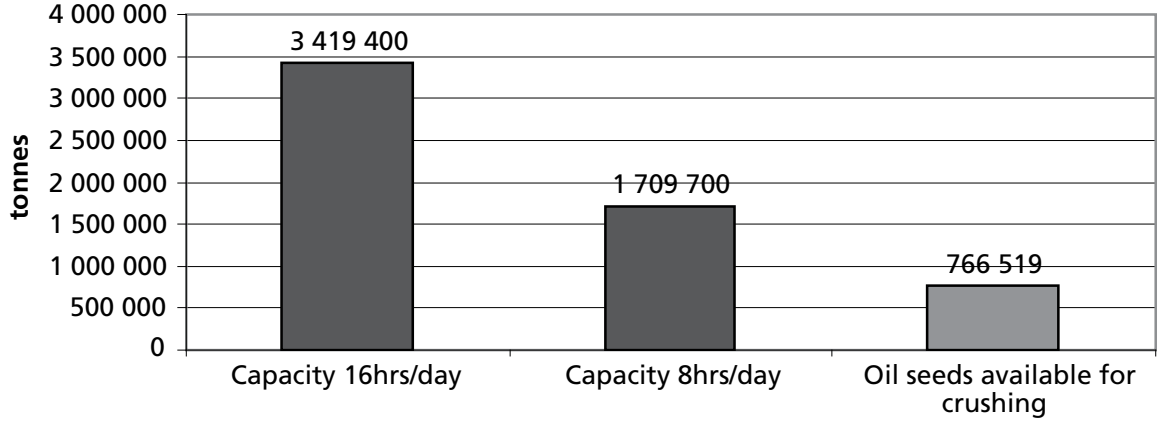
Table 17: Mills category in Myanmar

Connected load	Category	Crushing capacity range (tonne /8 hours)	Average crushing capacity (tonne /8 hours)
Less than 25 hp*	Small mills	Up to 1	0.5
25-50 hp	Medium mills	1.5 to 3	2.25
50 hp onwards	Large mills	4 to 20	12

*hp= horse power

Source: FAO. 2004. Myanmar Oilcrops Development Project (FAO/TCP/MYA/2904), Preparation Report, Volume I – Main Report, Investment Centre Division, Rome.

Figure 36: Expeller milling capacity and oil seeds available for crushing



Sources: FAO. 2004. Myanmar Oilcrops Development Project (FAO/TCP/MYA/2904). Preparation Report. Volume I – Main Report", Investment Centre Division, Rome, & CSO, MoAI, MCSE and study estimates.

18 An expeller consists of steel worms on a shaft revolving inside a steel cage. The worms are so arranged to produce gradually increasing pressure on seeds. Oil is expelled through perforation of the steel cage and the cake comes out from the opposite end.

19 Data for 12 districts are missing or expeller technology is not used.

20 MCSE is under the MoAI. Several cotton oil expeller mills have been handed over to the army.

21 MICDD is under the MoAI.

Considering the average crushing capacity per 8 hours and an average of 25 days per month, the total expeller milling capacity for edible oil seed crops is 1.7 million tonnes or 2.2 times over the domestic oilseed crops used for crushing (766 500 tonnes). Table 53 in Annex VI presents the number of mills and estimated milling capacity by district. Since the installed capacity exceeds the seed availability, many mills are not operating and the ones in function operate only 5 to 6 months per year and only when grid electricity is available.

Apart from the private sector, the public sector operates expeller mills. Table 18 below presents the expeller mills operated by the public sector. The expellers 1 to 6 are well designed expeller machineries from United Kingdom or Germany which can serve as a model to be shown not only to oil millers, but also to equipment manufacturers. Under the Ministry of Co-operatives (MoCoo), six cooperative mills are producing limited quantities of groundnut and sesame oils. In 2005/06, the total edible oil produced by the cooperative was 749 tonnes. The type of expeller mills operated by cooperatives could not be assessed. Table 54 in Annex VI presents the oil production produced under the MoCoo.

Table 18: Public sector owned edible oil expeller mills*

Location	Crushing Capacity 24 hrs	Origin	Year of Installation	Owned and Operated by
1. Monywa	8	UK, Rose Downs	2001	MCSE
2. Myinmu	12	UK, Rose Downs	1994	Ministry of Industry I
3. Myinttha	30	UK, Rose Downs	1986	Ministry of Defence
4. Myingyan	7	Germany, HEB	1953	Ministry of Industry I
5. Mahlaing	30	UK, Rose Downs & Germany HEB	1975	Ministry of Industry I
6. Auglan	24	UK, Rose Downs & Germany HEB	1995	MCSE

* The mills No 2 to 5 were owned and managed by MCSE until 2005
Source: MCSE

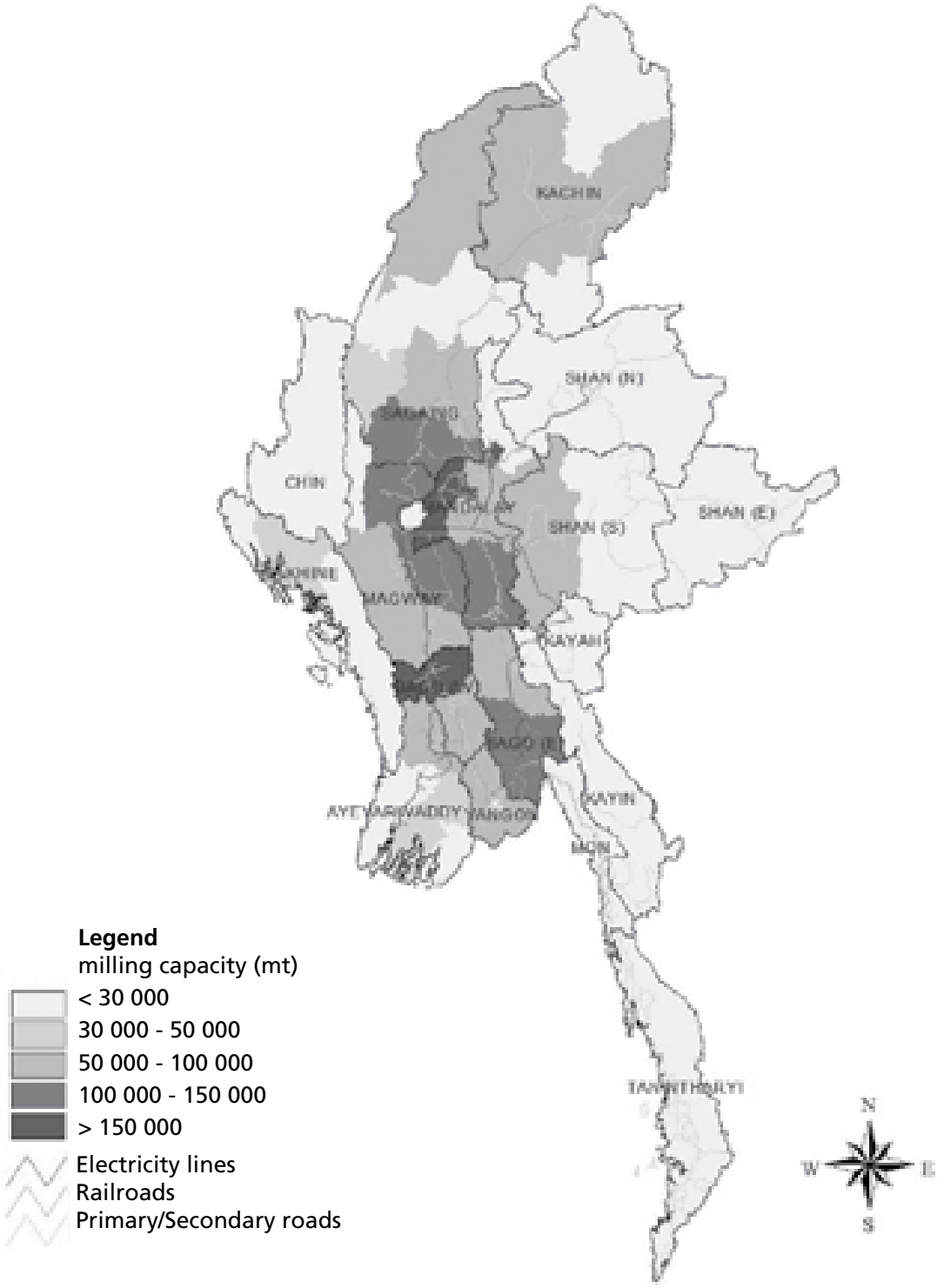
The Myanmar Industrial Crops Development Enterprise (MICDE) started manufacturing and distributing small-scale expellers for Jatropha to villagers in 2007. Table 19 presents the number of expeller mills installed in Myanmar.

Table 19: Expeller mills installed for Jatropha

State and Division	Number of mills	Operated by	Maximum capacity tonne/day	Origin	Year of installation
1. Mandalay	5	Engine	0.35	Myanmar	2006/07
2. Magway	5	Engine	0.35	Myanmar	2006/07
3. Shan (south)	4	Engine	0.35	Myanmar	2006/07
4. Tanintharyi	3	Engine	0.35	Myanmar	2006/07
5. Ayeyarwaddy	3	Engine	0.35	Myanmar	2006/07
6. Yangon	3	Engine	0.35	Myanmar	2006/07
7. Kachin	3	Engine	0.35	Myanmar	2006/07
Total	26				

Source: MICDE

Map 2: Expeller oil milling capacity in Myanmar



Source: FAO 2005[22]

22 FAO. 2005. *Agricultural Atlas of the Union of Myanmar. Agricultural Year 2001-2002.*

The Ministry of Industry-1 also owns and operates oil mills. However, data on oil plants owned and operated by the Ministry of Industry-1 could not be accessed. However, the expeller mill used for corn germs in Taung Twin Gyi (Magway Division) could be visited. The plant was installed in 2004, but caused by a shortage of raw material, production has not gone beyond testing the equipment.

Map 2 illustrates the expeller milling capacity by district. The larger milling capacity exists near large urban centres in the dry zone.

Pyay is also a major oil milling centre although it is not a main production area. The history here is different. Under the socialist government, the oilseed and edible oil sector had been chosen as the spearhead through which cooperatives could increase their participation in the national economy. This policy effectively drove out the private traders and millers from the oilseed and edible oil trade in production areas[23]. Magway, Mandalay and Sagaing Divisions were selected as an implementation area for this policy. The socialist government had imposed limitations on the operations of both private millers and merchants by forbidding mill operation or movement of oilseeds from townships as long as cooperative purchasing targets had not been met. As the private sector was driven out from the oil crops trade and milling in these Divisions, investment took place in other Divisions at the margin of the main producing areas and close to main consumption areas. Pyay was well suited for this development. As a result, still to date, Pyay owns an oversized milling industry dating back from 30 to 40 years.

Solvent extraction capacity

Solvent extraction technology is now well established in Myanmar with a total of 22 solvent plants owned and operated by both the public and private sectors. The Myanmar Agricultural Produce Trading (MAPT), under the MoC has been operating solvent plants for rice bran since 1962. MAPT owns 19 plants out of which two are modern continuous solvent plants. MAPT has a number of well trained engineers on solvent extraction technology. MAPT has successfully tested solvent extraction on soybean and oil cakes in two recently installed continuous plants. To be fully operational for soybean and cakes, preconditioning equipment needs to be installed on these plants (flakers for soybean and pelleters for cake). These new plants are of Indian origin and have been installed between 2002 and 2004.

Table 20 provides details on MAPT solvent plants. MAPT data also shows that Myanmar has reversed engineered their own solvent plants, possibly from imported equipment or with foreign technical assistance. Out of 19 government installed solvent plants, 9 have been produced in Myanmar.

23 The goal was "to distribute the legitimate benefit of the cooperative to the producers of goods and the consumers for their relief and welfare by doing away with the middleman and his exploitation". MoCoo. 1984. *Oilseeds Production and Processing Project*, UNDP, ADB and the Socialist Republic of the Union of Burma, Feasibility Report.

Table 20: List of solvent extraction plant in Myanmar

Rice bean Oil	Type of Mills	Solvent Technology	Extraction Capacity (tonne/24hrs)	Refinery Capacity (tonne of crude oil/24hrs)	Type of Mill	Origin	First Year in Operation
MAPT Yangon Division							
1. Hlaing	Batch	Filtration Extraction	20	10	Domestic	Myanmar	1962
2. Insein	Batch	Immersion	25	10	Diachemie	Germany (East)	1964
MAPT Bago Division							
3. Bago	Batch	Immersion	25	10	Diachemie	Germany (East)	1966
4. Nyaunglaybin	Batch	Immersion	25	10	Diachemie	Germany (East)	1963
5. Phyuu	Batch	Filtration Extraction	12	-	Domestic	Myanmar	1976
6. Hletpantan	Batch	Filtration Extraction	25	-	Taiyo	Japan	1965
7. Zhegone	Batch	Filtration Extraction	15	-	Domestic	Myanmar	1972
8. Paungte	Batch	Filtration Extraction	25	10	Boso	Japan	1964
MAPT Ayerwaddy Division							
9. Hinthata	Batch	Filtration Extraction	25	10	Boso	Japan	1963
10. Phyarpone	Batch	Filtration Extraction	15	-	Domestic	Myanmar	1968
11. Kyeiklatt	Batch	Filtration Extraction	15	-	Domestic	Myanmar	1967
12. Bokalay	Batch	Filtration Extraction	15	-	Domestic	Myanmar	1968
13. Myaungmya	Batch	Filtration Extraction	15	-	Domestic	Myanmar	1967
14. Mawlamyaingkyune	Batch	Filtration Extraction	15	-	Domestic	Myanmar	1968
15. Pathein	Continuous	Percolation	40	10	Lurgi	Germany (West)	1963
MAPT Rakhine State							
16. Sittway	Batch	Filtration Extraction	25	6	Boso	Japan	1964
MAPT Mon State							
17. Mawlamyaing	Batch	Filtration Extraction	25	-	Dosmetic	Myanmar	1968
MAPT Mandalay Division							
18. Kyaukse	Continuous	Percolation	50	10	Veendeep	India	2002
MAPT Sagaing Division							
19. Shwebo	Continuous	Percolation	25	-	Veendeep	India	2004
Total MAPT			437	86			
Private Solvent Plants							
20. Yuzana, Yangon	Continuous	Percolation	150	No info		China	2004
21. Padamya, Yangon	Continuous	Percolation	100	70		China	2004
22. Honechai, Mandalay	Continuous	Percolation	100	No info		China	1995
Total Private Plants			350	70			
Total Union			787	156			

Source: MAPT and interviews with private sector

Since 2003, MAPT is no longer procuring rice from farmers and therefore, the solvent plants are underutilized. As from 2005, all MAPT solvent plants are operating only on a rental basis to the private sector. Given the delays in rice bran delivery, the oil extracted is mostly used for soap production. Unprocessed rice bran is widely used by the fishery industry. MAPT is privatizing all its rice mills and solvent plants. So far, two plants have been privatized; Phyarpone and Bokalay in Ayeyarwadi Division.

Beside MAPT, the private sector has established 3 solvent mills; 2 in Yangon and 1 in Mandalay.

Picture 21: Myanmar Agricultural Produce Trading continuous solvent plant in Kyause *(Kyause, 25 May 2007)*

Most solvent plants in Myanmar have either closed down or are operating at a fraction of their capacity. MAPT edible rice bran oil production in 2006/07 was only 1 120 tonnes. Honechai plant in Mandalay and Yuzana plant in Yangon have closed down, while Badamya operates only for a few months a year. The main challenges faced in operating solvent plants are the following:

1. Less competitive than expeller technology in Myanmar context (see section 10.3)

2. Unavailability of raw material which is particularly severe for soybean.

3. Electric load shedding which requires operating solvent plants on diesel generators. The cost of generator energy is high and reduces the profitability of the operation (see section 10.3).

4. Low market value for soybean and rice bran oils which are used to adulterate groundnut or sesame oils.

5. Hexane is not available in Myanmar. Instead, the Ministry of Energy (MoE) is supplying SBP 62-82 or Special Boiling Point 62-82°C. Operation with SBP 62-82 is far less efficient than Hexane because of the high and broad range boiling point (Hexane boiling point is lower and narrower; 55-65°C). As a result, solvent extraction plants are designed to use Hexane extraction and therefore there are considerable solvent losses and risks of residual solvent left in the oil and cake in particular.

6. Cost of SBP 62-82 is high for the private sector: US$3.5/gallon to be paid in foreign currency to the MoE. Hexane import to the private sector is not authorized by the MoC.

7. Utilization of oil cakes is possible with the existing plants, however this has not taken place as oil cakes from expellers have a lower percentage of oil than previously reported[24]. Premium price for solvent extracted cake is only Kyats 50/viss higher than wholesale price and Kyats 20/viss than large expeller mills. The presence of sand in oil cakes (particularly sesame cake) was also reported as a risk to the solvent plants equipment.

8. High maintenance costs as local maintenance services are not available to the private sector in Myanmar and thus needs to be done by foreign companies.

9. Technical problems on some solvent plants imported from the People's Republic of China.

Palm oil mills capacity

There are 14 palm oil mills in Myanmar, 3 owned and operated by the government and 11 by the private sector. All palm oil mills use press technology. The total extraction capacity, based on 8 hours operation per day and 24 days per month is 260 000 tonnes. However, given the inefficiencies of the plants, the current capacity does not exceed 150 000 tonnes per year[25].

Given that in 2011/12, just over 200 000 acres of palm oil will be in production, the total expected FFB production is over 700 000 tonnes (see Table 22)[26]. The existing palm oil

24 See processing report in: FAO. 2004. *Myanmar Oilcrops development Project (FAO/TCP/MYA/2904). Preparation Report. Volume II – Annexes*, Investment Center Division, Rome.

25 On technical issues affecting the palm oil milling plants, the following reports, although they are dated discuss some of the key issues;FAO. 1991. *Mission Report of Consultant Engineer*, by J. Verheek, UNDP/MYA/86/018; FAO. 1994. *Mission Report of Consultant Engineer*, by J. Verheek, RLA 008/AGP; FAO. 1994. Mission Report of Consultant Engineer, by J. Verheek, UNDP/MYA/018.

26 Note that the productivity level of palm oil plantation in Myanmar is very low at an average of 3.5 tonne/acre or 8.65 tonne/ha. A yield below 18 tonne/ha FFB is considered as uncompetitive in the future of palm oil business. According to the MPOB, average yield in Malaysia in 2006 was 19.6 tonne/ha (http://econ. mpob. gov. my/economy/EID_web. htm).

milling capacity is well below the anticipated production in 5 years from now (see Figure 37). Investment in well designed oil palm processing is required to cope with the upcoming FFB production.

Table 21: Current palm oil milling capacity

Location/Name of Mills	Type of Mills	Maximum FFB Capacity tonne/day	Maximum FFB Capacity tonne/year	Origin	Year Established
MPCE Mills Tanintharyi					
1. Longlone	Press	24	6 912	Malaysia	1992
2. Pugawzon	Press	60	17 280	Malaysia	1992
MPCE Mills Mon					
3. Ingabo	Press	24	6 912	Myanmar	2001
Total MPCE		108	31 104		
Private Mills Tanintharyi					
4. Daw Yi Yi Win Co	Press	12	3 456	Myanmar	1993
5. CKB Co	Press	12	3 456	Myanmar	1993
6. Kan Bawza	Press	12	3 456	Myanmar	2006
7. Kaung Htet	Press	24	6 912	Myanmar	2005
8. Shwe Siohn	Press	24	6 912	Myanmar	1993
9. S. I.	Press	40	11 520	Malaysia	2005
10. CKB Co	Press	40	11 520	Myanmar	2006
11. Shwe Siohn	Press	40	11,520	Myanmar	2002
12. Aung Zin Mar	Press	52	14 976	Myanmar	2004
13. South Dagon	Press	60	17 280	Malaysia	2004
14. Yuzana	Press	480	138 240	Malaysia	2005
Total Private Sector		**796**	**229 248**		
Total Union		**904**	**260 352**		

Source: MPCE

Table 22: Current palm oil production and anticipated production in five years in 2011/12*

	Planted Area (acre)	Harvested Area (acre)	Yield tonne/ acre	Prod FFB tonnes	Extraction Rate percent***	Crude Palm Oil tonnes	Refining Rate percent	Total refined tonnes
2006/07	202 050	50 246	3.46	172 191	20	34 438	70.1	23 751
2011/12	**	202 050	3.53	713 267	20	142 653	70.1	100 000

* (Only once 200 000 acres of palm oil plantation are in full production.)

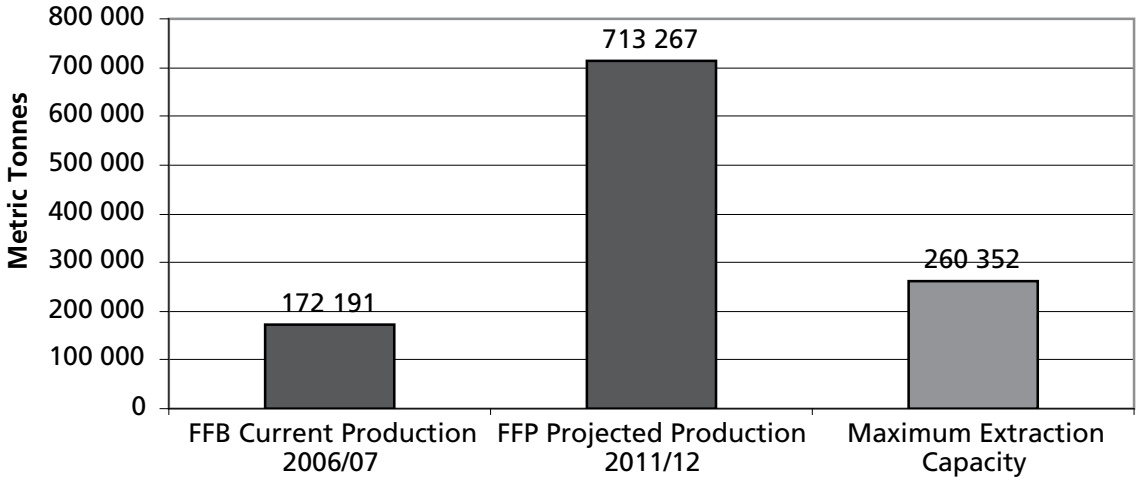
** Projection of area planted not estimated

***Note that these official extraction rates are certainly overestimated. There are reports that extraction rates may not exceed 15 percent in Myanmar. According to the MPOB, average extraction rate in Malaysia in 2006 was 19.85 percent (http://econ.mpob.gov.my/economy/EID_web.htm).

Source: MPCE

There is only one physical refinery plant for palm oil with total capacity of over 120 000 tonnes of refined palm olein per year. The plant is owned by Yuzana and is located in Yangon. Other refineries are chemical refineries and often unsafe because of poor maintenance and aging equipment.

Figure 37: Fresh fruit bunch production and maximum extraction capacity



Source: MPCE and study estimates

10.2 Edible oil storage capacity

At present, all distribution of edible oil is in steel drums (see section 12.3), which are reused many times and which each contain 116 viss of oil (190 kg). Oil millers sell their products in second-hand barrels holding 110-115 viss. The reason being that barrels are reused and thus often dented and the capacity is reduced. When reused, the drums are banged and thus capacity is reduced to 110 viss (180 kg). Some larger mills have limited tank storage capacity, but in other cases, nearly all oil storage is in drums.

Table 23: Palm oil storage capacity in Yangon in 2007

Location	Tank Capacity (tonne)	No of Tanks	Total Capacity	Owned by
Alon	1 000	4	4 000	UMEHL
Hti Tan	2 000	2	4 000	Diamond Dragon Ltd
Hti Tan	1 000	1	1 000	Diamond Dragon Ltd
Hti Tan	500	2	1 000	Min. Industry I
Hti Tan	1 000	5	5 000	Min. Industry I
Total			15 000	

Source: MPCE

Palm oil is imported in bulk and stored in tanks supervised by the MEDA in Kyee Myin Daing, Yangon port. Table 23 shows that the total palm olein storage capacity is 15 000 tonnes or 37.5 percent of the total authorized monthly imports (40 000 tonne/month). Turnover of palm oil in Myanmar is fast, suggesting a higher demand than actual imports.

10.3 Competition

Given the excessive expeller milling capacity, competition between oil millers is high. Except for small quantities of branded edible oil, there is fierce competition on prices between oil millers. To survive, the following strategies are followed by different categories of millers:

Hsi Zone millers

The principle of the *hsi* zone wooden mills is a pestle rotating in a mortar. Oil is extracted in the mortar as a result of friction caused by the revolving pestle. *hsi* zone are driven by bullocks. It takes 2 to 3 hours to crush a charge and three to five charges can be handled in a day. An estimated 5 percent of oil crops are crushed using *hsi* zone technology.

The traditional *hsi* zone millers are slowly disappearing although it is still in use in remote villages. In other areas, they produce an oil quality considered to be higher and is used mainly in villagers by wealthier groups.

Picture 22: A traditional* hsi *zone mill in Nyang U *(Nyang U, 2 June 2007)*

Small-size Millers (< 1 tonne/day)

Small-size mills represent 2 percent of the expeller milling capacity. All small mills visited are operating on a rental basis for farmers (toll crushing) and were powered by small diesel engines imported from the People's Republic of China. When electricity is at all available, it lasts only a few hours a day in smaller towns. Small-size mills are often adjoining domestic premises. Average price for crushing sesame is Kyats 135/viss and groundnut Kyats 215/viss when grid electricity is available. The rental price of the milling operation doubles when diesel engines are used.

Small-size mills are generally located close to farmers and their main comparative advantage is that given their small capacity, farmers can process small amounts of oil crops sufficient for their family or for small groceries in the village. The total investment for a small mill is low.

Medium-size millers (1.5-3 tonne/day)

Medium mills represent 34 percent of the expeller milling capacity. About half of the medium size mills owned a backup diesel engine for their operation. Engines are rarely used, unless there are short windows of good marketing opportunities which are mainly driven by the price of oilcakes (in shortage) rather than an increase in the price of oil. Medium size mills are generally found in medium and large urban centres. Medium size millers appear to be the main looser in this fierce competition, as their equipment lacks the efficiency of larger mills and are too large or distant from farmers to operate on a rental basis. Yet, these mills still process a substantial proportion of the oil crushed in Myanmar. Although adulteration is practiced by all categories of millers, it is mainly the medium size millers category that use such strategies (see Table 9).

Large-size millers (> 4 tonne/day)

Large mills represent 44 percent of the expeller milling capacity. Most large mills do not use diesel engines, as these are generally located in industrial zones where electricity supply is generally available for 5 to 9 hours/day. Large millers were found to be the most successful mills in Myanmar. However, there are only a few large oil millers which succeed in striving in this competitive market. In general larger mills have separate crushing lines by crop (generally groundnut line and sesame line). Soybean is generally crushed in the groundnut line. This allows better adjustment of the expeller to each crop, resulting in a higher extraction rate, reduce the number of multipressing and result in higher oil cake quality. A premium of Kyats 30-50/viss is paid for cake produced by larger millers. Successful entrepreneurs have developed their own marketing brands, based on a high quality advertisement strategy. Packaging and labelling is an important part of the marketing strategy. The main advertisement messages to consumers are the following:

- Pure oil: product not adulterated by other oils of unknown sources.
- Cholesterol free: the general consumer belief in Myanmar is that palm oil has a high content of cholesterol.[27]
- Healthy product.
- Ideal for frying and cooking.

Advertisements are made on local TV and newspapers.

27 Which is incorrect as cholesterol is not found in any vegetable oil, but in animal fat.

Maintenance of equipment is kept to the minimum necessary to allow operation. Any major breakdown in equipment is often not repaired. Hardly any new investments in expeller mills were observed, except in Nay Pyi Taw, where new market opportunities exist with the construction of the new capital and in Taunggi/Mandalay to service the needs for soybean cake. By any standard, all expeller mills visited were not well maintained or cleaned and are unhygienic (see pictures 23 and 24). Larger oil millers owning a brand tend to be better maintained.

Competition amongst oil millers is distorted by oil adulteration malpractices and absence of systematic quality standard control. All categories of millers are diversifying their activities and engage in grain/pulses trade and milling has often become a secondary activity. Some millers/traders use a bank loan for monthly purchase of raw material (pulses or oil crops). Their oil mills provide them with the opportunity to crush oil seeds when prices of oil and cake can result in profitable operations. Most crushing takes place during the cool season as mixing with imported palm oil is more problematic as temperature drops below palm oil cloud point.

Solvent technology

Solvent technology proved to be less competitive than the existing expeller technology mainly because of government distortions of the market. Overall, because of the lack of competitiveness of solvent extraction to supply the local market, all private sector investments on these plants have not been successful. Private investors in solvent plants consistently discouraged further investment in solvent technology under the current situation of Myanmar. Table 24 below compares key competitiveness characteristics between expeller and solvent extraction technologies.

Availability and cost of solvent and cost of energy are major issues for solvent plants in Myanmar. Although solvent extraction consumes less energy than expeller technology, the price structure of energy in Myanmar distorts competition. Solvent extraction needs to operate continuously 24 hours per day and therefore given the frequent electric load shedding, plants have to operate with generators. Caterpillar, official generator dealer in Yangon, has kindly calculated for this study the cost of energy using a 275 KVA generator[28] which is able to operate a 50 tonnes solvent plant[29]:

- At the current open market price of diesel (Kyats 4 100/gallon), the price of KWH (kilowatt-hour) is Kyats 550 (US$44 cents/KWH), including maintenance and amortization cost, or over Kyats 2.18 millions per 24 hrs operation. Diesel alone costs Kyats 280/KWH.

- At the government subsidized price of diesel (Kyats 1 500/gallon), the price of KWH (kilowatt-hour) is Kyats 370 (US$30 cents/KWH), including maintenance and amortization cost, or over Kyats 1.47 millions per 24 hrs operation. Subsidized diesel alone costs Kyats 100/KWH.

28 Calculation based on 75 percent load on the generator or 165 KWH.

29 These prices are calculated for one generator per plant. As a standby generator is required for solvent plants, the price of electricity would be 20 to 30 percent higher.

Table 24: Competitiveness factors of expeller and solvent extraction technologies in the Myanmar context

	Expeller Technology	Solvent Technology
Investment	Low (< US$ 50 000)	High (> US$ 1 million)
Amortization cost	None or very low (old equipment)	High
Energy use	High	Low
Cost of energy	Low	High, use of generator required for continuous plants
Local market opportunities	High	Low, solvent extracted oils have limited market base
Seed procurements volumes	Low and flexible as per local demand	High volume required, less flexibility to adjust to market trends
Cost other inputs	Low	High, SBP 62-82 is expensive for the private sector
Maintenance cost	Low, maintenance services is available in all processing areas. Most large scale oil millers operate their own workshops	High, as maintenance services are not available in Myanmar and have to be procured from foreign companies
Health hazard risks	Medium in the absence of quality control	High, SBP solvent residues can be present in oils and cakes
Appropriateness for oilseeds grown in Myanmar	Appropriate, most oil seeds grown in Myanmar have high oil content (sesame, groundnut, sunflower)	Inappropriate if operated alone. Expeller technology is required to reduce oil content of sesame, groundnut and sunflower
Appropriateness for soybean	Low, yet given the lack of quality control on oil, most soybeans are crushed at low cost with expellers without refinery	High, yet domestic soybean supply is very low, import of soybean is banned and the livestock/fishery industry is extensive and does not pay a premium for higher quality soy meal
Extraction efficiency	Low efficiency, 5 to 6 percent oil left in the cake	High efficiency, 1 to 2 percent oil left in the cake
Appropriateness for extraction from oil cake	Not appropriate	High, yet given the low premium price paid for cake and low oil content in expeller cake, solvent extraction on cake has not taken place

Source: Study team

As a comparison, highly subsidized grid electricity costs Kyats 50/KWH (US$4 cents/KWH) and nearly no maintenance cost is required by the users. To operate the same plant with grid electricity, it would cost Kyats 200 000 per day or 11 times less than with a generator.

In Pyay, a gas generator could be used, provided the government would supply gas to the plant. The fertilizer factory in Aunglan, 7 miles away from the planned site for a MAS solvent plant, uses gas. However, the investment cost for a gas generator is twice as much as a diesel generator (over US$100 000 for a 275 KVA) and the current government policy restricts the use of gas by the private sector.

10.4 Main constraints on expeller technology

The main technical inefficiencies identified on expeller mills are the following:

- Expellers made in Myanmar are of very old design. This creates the need for multiple pressings, up to seven times resulting in yields of low (off) quality oil.

- Ineffective seed cleaning and as a result, dust and foreign particles enter the expellers. This is particularly the case for sesame.

- Incorrect pretreatment and conditioning of the oil seeds, particularly drying, resulting in low quality raw material being processed. The absence of seed dryers was identified as a constraint during the rainy season as drying can only take place during sunny days, thus hampering milling capacity.

- Absence of cake breaking after the first press resulting in less effective extractions.

- Misalignment of pressing worm and cage components caused by inadequate material, equipment and maintenance skills.

- Poor iron quality used for maintenance which result in short life of expeller parts[30].

- Inexistent or when it exists, inadequate/non-functional steam treatment of seeds, which affects the yield and product quality. Steam-raising equipment consist of a variety of boilers designed to burn crop residues (rice husks or groundnut shells) and sometimes coal from the southern Shan state which are the major fuels available. The boilers are undersized producing inadequate steam supply for the process. The provision of instrumentation and safety equipment is largely non-existent.

Mention should be made of the continuing practice of copying other manufacturers' machinery and spares. This can only be of advantage so long as the replacement items are strictly and faithfully reproduced. If copies are produced from other copies, then many of the original design tolerances and specifications are lost.

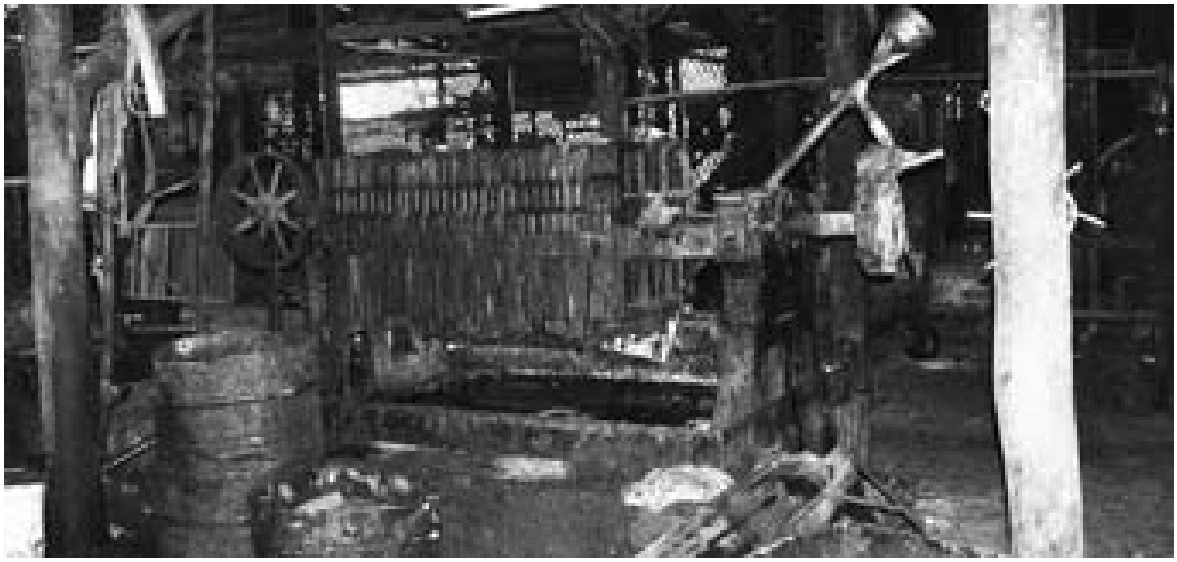
There are modern expeller mills in Myanmar. The Myinttha expeller plant near Mandalay in particular (see Table 18) was reported by a FAO milling expert in 2004 as a model to be shown to oil millers and equipment manufacturers. The plant has been handed over to the Ministry of Defence and is now inaccessible to the public[31]. However, MCSE owns two modern expeller plants in Monywa and Aunglan which could serve the same purpose.

30 Because of this problem, only a handful of millers can crush pure niger seeds, using expellers imported from the People's Republic of China. The high abrasive nature of hard niger seeds reduce further the already short-life of expeller parts.

31 A visit to the plant was planned as part of the study but this could not take place.

Picture 23: Most expeller mills in use are old and hygiene is not a priority

Picture 24: A filtration unit for edible oil*



*Hygiene is poorly maintained.

10.5 Oil mills management

With the exception of one solvent plant in Yangon, all oil mills are family owned and operated. Procurement of raw material, supervision of production chain, marketing and accounting is directly supervised by family members. Sometimes trusted individuals may be trained to take management responsibilities in the oil mills. Training of operating personnel in all size mills are based on in-mill experience. Milling techniques are handed down to family members who learn from their forebears. For some plant installed by foreign firms on a turn-key contract, on-the-job training is being done by the contracted firm. Most of the largest mills have two to three generations of millers who at some point in time started with a small operation in a village.

Government mills have engineer operating state owned mills. In all mills visited, mill supervisors were consistently family members or sons/daughters of the owner. None seem to have been employed or benefited in one way or another from government trained engineers.

Given the advances which have been made in processing techniques, the training and instruction available on in-mill experience is often inappropriate and thus fails to have any impact on mills efficacy.

10.6 Cake nutritional analysis and quality issues

The MoLF conducts laboratory tests on oilcake based on demands from the private sector. Table 25 shows that average oil content in oilcakes has significantly decreased compared to the 1970s. This is because of technological improvement and improved milling practices that took place over the past 30 years. While a few decades ago groundnut was reportedly crushed with the shell, the practice today is rare and only occurs in small ill equipped oil mills in villages which are processing for farmers.

In recent years, the rapid growth of the feed mill industry has created demand for higher quality cakes and better quality control. CP, a major user of oilcake for its growing chicken industry is providing training to oil millers to improve conditioning of oilseeds before crushing. Finally, the low cost of electricity allows oil millers to crush cakes up to 7 times to increase the extraction rate. As a result, oil content in cakes varies between 5 and 7 percent (see Table 25).

Palm oil cake is crushed with shell which results in low protein content and high fibre value. This depreciates the value of palm oil cake on the market. Higher oil content in palm oil cake suggests inefficiencies in the existing mills.

The quality of the available oilcakes in the market was discussed with feed millers and livestock producers. All oilcake users in Myanmar reported to be satisfied with the quality of oil cakes. The oil content in cakes is generally appreciated for the chicken industry, as oil is rich in energy and needed for chicken feed. If de-oiled cakes through solvent extraction are used, feed-millers would have to add oil in the cakes to increase the energy value of the chicken feeds. Crude edible oil is more expensive than cake and therefore feed millers would not pay a premium for de-oiled cakes.

Table 25: Nutritional value of oil cakes in Myanmar

	Moisture %	Crude Protein %	Oil Content %	Crude Fibre %
Groundnut cake	8.58	42.78 44.22 (1970s)	5.25 8.82 (1970s)	3.82
Sesame cake	7.16	39.07 44.35 (1970s)	6.62 13.77 (1970s)	4.91
Soybean cake	15. 20	47.50	6.40	5.10
Palm oil cake	6.24	14.35	8.72	25.12
Sunflower cake		25.03		
Niger cake	8.82	37.10	6.38	4.87

Source: Ministry of Livestock and Fisheries

Picture 25: An oil miller adequately drying oil crops before crushing, improving both the quality of the oil and the cake *(Magway, 3 June 2007)*

Main quality concerns for the chicken industry are the Aflatoxine and Ureic Acid (UA) levels. Aflatoxine level can be contained by quality inspection of raw material from the farm and proper sun drying and seed conditioning before crushing. The CP company has conducted training of oil millers which are supplying oil cakes. UA level is maintained low by cooking soybean before crushing. Not all oil mills have cooking facilities and therefore, feed mills are routinely testing UA content. Cake rancidity during the rainy season was reported as a minor issue by both oil and feed millers.

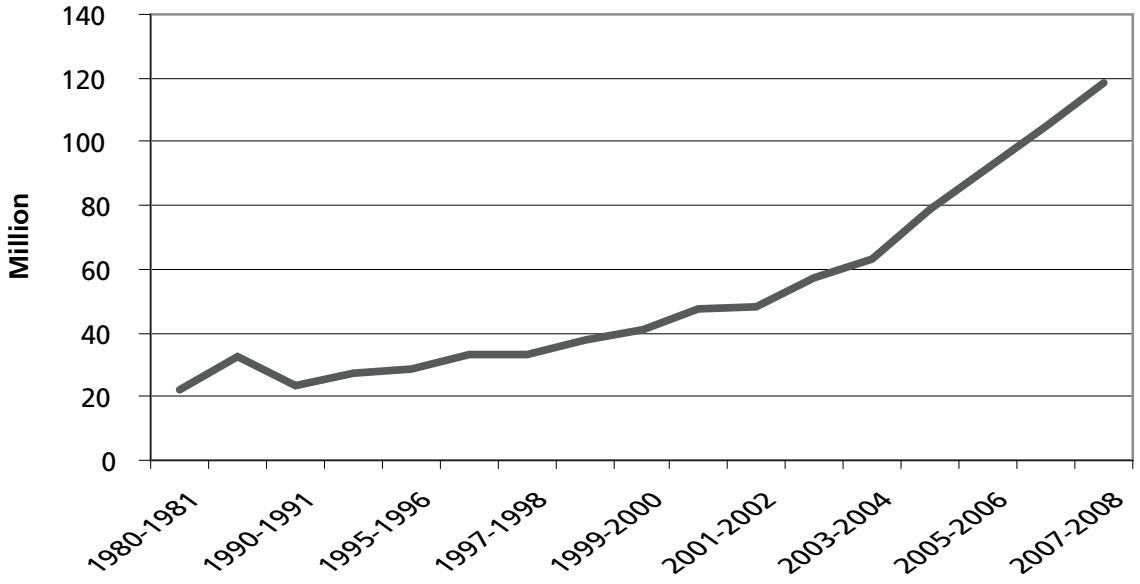
For the fishery industry, the nutritional value of the cake is satisfactory as well. Yet, protein content is the main nutritional factor and therefore a small premium of Kyats 20-30/ viss over what the wholesale market is paid for de-oiled soybean cakes produced from solvent

plants in Yangon. The fishery sector is mostly of extensive nature and do not pay a premium for higher quality cake[32]. The premium cake market is reportedly limited to a small number of intensive fish producers.

10.7 OILCAKE SHORTAGE

With the fast growth of the livestock (mainly chicken), fishery and shrimp industries, the demand for cake has increased significantly over the past three to five years. According to the MoLF, the chicken population has nearly doubled over the past five years (Figure 38)[33]. Table 26 compares the estimated feed demand for the livestock and fisheries industry with the oilcakes availability (including. palm oil cake). There is a shortfall of 660 000 tonnes of oilcake in the country.

Figure 38: Fowl numbers between 1980 and 2004



Source: Ministry of Livestock and Fisheries

The CP, a Thai company, is the main buyer of oil cake for the poultry industry in central Myanmar and the Shan state (north and south). The CP company and privately owned feed mills are competing to procure oil cake and private companies have established purchasing offices in main oil crop producing areas, to ensure regular cake supply.

To reduce practices of mixing oil crop seeds in oil mills, feed millers are establishing direct contact with larger oil millers who can ensure higher purity of cake. However, given

32 The main quality concern for the fishery industry is the adulteration of rice bran with rice husk to increase volume of bran.

33 Although official statistics presents a fast growth of the chicken industry, which reflects field observations, the number of chicken per head in Myanmar remains very limited. With a population estimated at 57.7 million in 2007, the average number of chicken per capita is only 2.05. As a result, in July 2007 retail price of chicken (Kyats 6 000/viss) is oddly higher than prawn (Kyats 4 000/viss) on the domestic market.

the unsatisfied demand, cake is also procured on the wholesale market. Larger millers are speculating on oil cake price by storing them when milling reduces. Availability of oilcakes varies along the year, with best availability during the cool season when rice bran from the monsoon crop is available and adulteration of edible oil with imported palm oil is reduced as temperature goes below palm olein cloud point. Oilcakes availability is lower during the monsoon season.

Table 26: Estimated animal feed requirements (in '000 tonne)

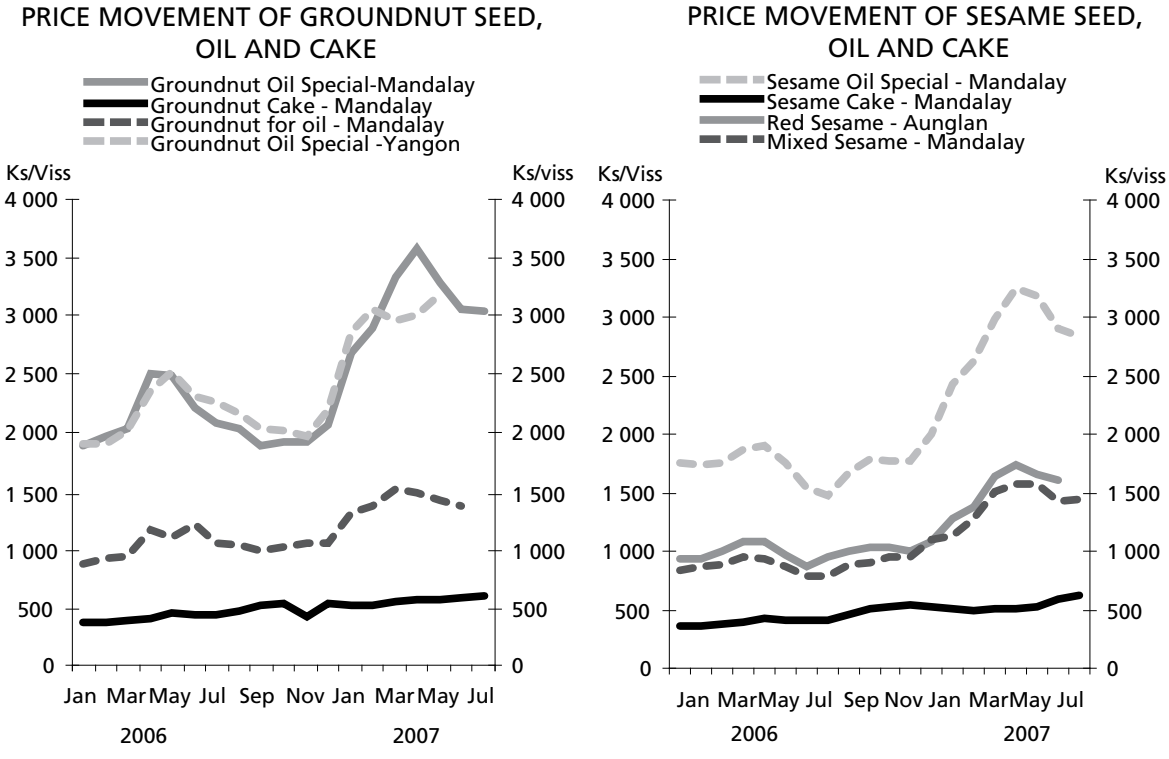
Livestock	Broken Rice	Corn	Beans/ Peas	Bran	Dried Fish	Oil Cakes*
Dairy cattle	53	53	214	160	0	267
Swine	613	429	0	307	164	307
Chicken	109	156	0	52	43	94
Duck	6	0	0	2	0	0
Fish Pound	0	0	0	1 401	0	601
Total	781	639	214	1 922	207	1 269
Availability	No Info	No Info	No Info	No Info	No Info	609
Oil Cake Shortage						-660

* Including all palm oil cakes. See table 6 in section 6.2

Source: Ministry of Livestock and Fisheries

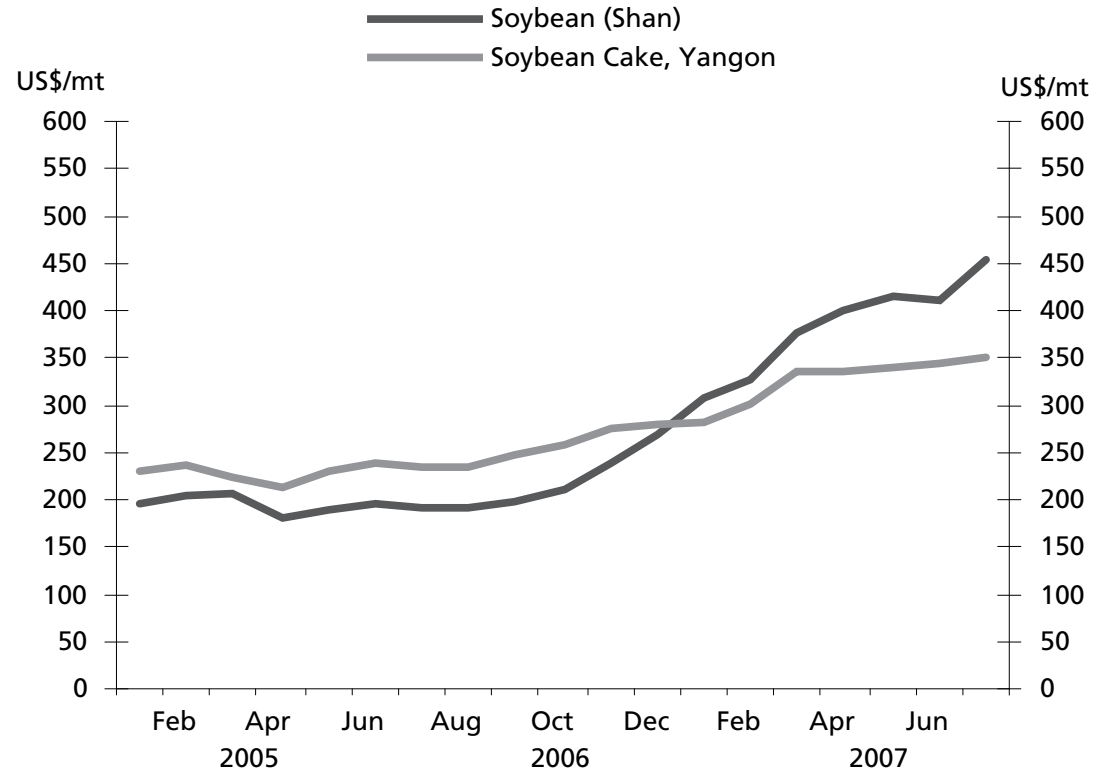
The price of oil crops cake (Graphs 18, 19 and 20) significantly increased in 2007 with an increase of 170 percent sesame, 160 percent groundnut and 152 percent soybean cakes between January 2006 and July 2007 in US Dollar terms.

Graphs 18 and 19: Price movement of groundnut and sesame oils and groundnut and sesame cakes in 2007



Source: E-Trade, MIS

Graph 20: Price movement of Shan soybean and soybean cake in Yangon market



Source: E-Trade MIS

11. Marketing and distribution

11.1 Distribution of oil crops, edible oils and oil cakes

The domestic agricultural marketing system of oil crops covered in this study is generally efficient. Farmers have choices of traders for selling their produce as many traders are competing on the market[34]. CEXCs and private information services are effectively facilitating oil crops trade. Distribution channels are presented in section 8.2.

Nevertheless, inefficiencies exist with respect to marketing policies and access to timely market information by farmers. These include access to international markets, lack of quality standards, trade standards and measures (see section 12), poor infrastructures and utilities, energy price structure, as well as macroeconomic policies related to finance and trade policies which are severely distorting the market.

Most of the oil crops, edible oil and oil cakes trading centres are located near production areas in the CDZ. There are 7 main trading centres in the oil crops sub-sector (see Map 3):

1. Yangon
2. Mandalay
3. Myingyan
4. Monywa
5. Pakkoku
6. Magway
7. Pyay

Crop Exchange Centres (CEXCs)

The first CEXC established in Myanmar is the 'Brokers, Merchants and Millers Maha Kahtaintaw Association' and was founded in Mandalay during the colonial period in 1935. The association has operated as a CEXC as well as a voluntary organization supporting Buddhist institutions for the past 72 years. Membership is open to any Myanmar citizen who is 18 years old and who lives in the municipal area of Mandalay City. The association does not allow non-members to do business in the association compound. However they can visit and observe the marketing activities in the association compound and have to pay an entrance fee.

34 Studies of other commodities including rubber, oil palm, cashew, coffee and sugar cane, have tended to confirm that internal marketing systems operate efficiently where the private sector is unrestricted. These include two draft studies prepared for the FAO project Technical Support for the Integration of Myanmar's Agriculture into the ASEAN (TCP/MYA/2902): *Study on the Competitiveness of Selected Perennial/ Plantation Crops* U Hla Myint, Yangon, November 2003, and *Assessment of the Commodity Competitiveness of Agro-industrial Commodities: Sugar and Cotton* San Thein, Yangon, November 2003. The international competitiveness of oilseeds was also assessed as part of the FAO project Myanmar Oilcrops Development Project Formulation (TCP/MYA/2904) under the Project Preparation Report FAO, March, 2004.

The primary role of the CEXC is to facilitate business transaction for its members. Members bring grain samples for display in the CEXC and buyers negotiate prices. Time for negotiation is restricted within the working hours of the CEXC. Once in agreement, both parties are checking the grains in warehouse. The CEXC association staffs record the agreed transaction prices on a black board (see Picture 33 in Annex VI) or print some 400 copies of transaction prices daily. These copies are sold Kyats 20/per copy within the premises of the CEXC as the crop exchange closes. Market information are dispatched to other marketing centres in Myanmar amongst traders using mobile phone or through private marketing information services (E-Trade). Mandalay market is the main grain exchange market in Myanmar, including oil crops. Mandalay CEXC is the first market to operate daily and therefore it is a price setter for oil crops in Myanmar.

Apart from the Mandalay association, other CEXCs exist in Yangon, Monywa, Pakokku, Magway, Myingyan and Taunggyi and refer to the price and demand situation of the Mandalay market. Map 3 shows the location of CEXCs in Myanmar. The main commodities traded in all CEXC are pulses, followed by oil crops. In Yangon, oil crops are rarely traded.

The CEXC offers dispute resolution mechanisms for its members for transactions that occurred within the CEXC premises. A working group of dispute resolution calls both buyer and seller to the association to investigate. Then, this working group can make a judgment, which is submitted to the executive committee. The executive committee has to confirm or can make amendment on the judgment of the working group. Buyer and seller have to comply with the final judgment of the executive committee. If a member is dishonest, he or she shall be removed from this association.

Picture 26: Samples displayed in Mandalay Crops Exchange Centre
(Mandalay, 24 May 2007)

Picture 27: Negotiations between traders taking place at Monywa Crops Exchange Centre *(Monywa, 29 May 2007)*

11.2 Market Information

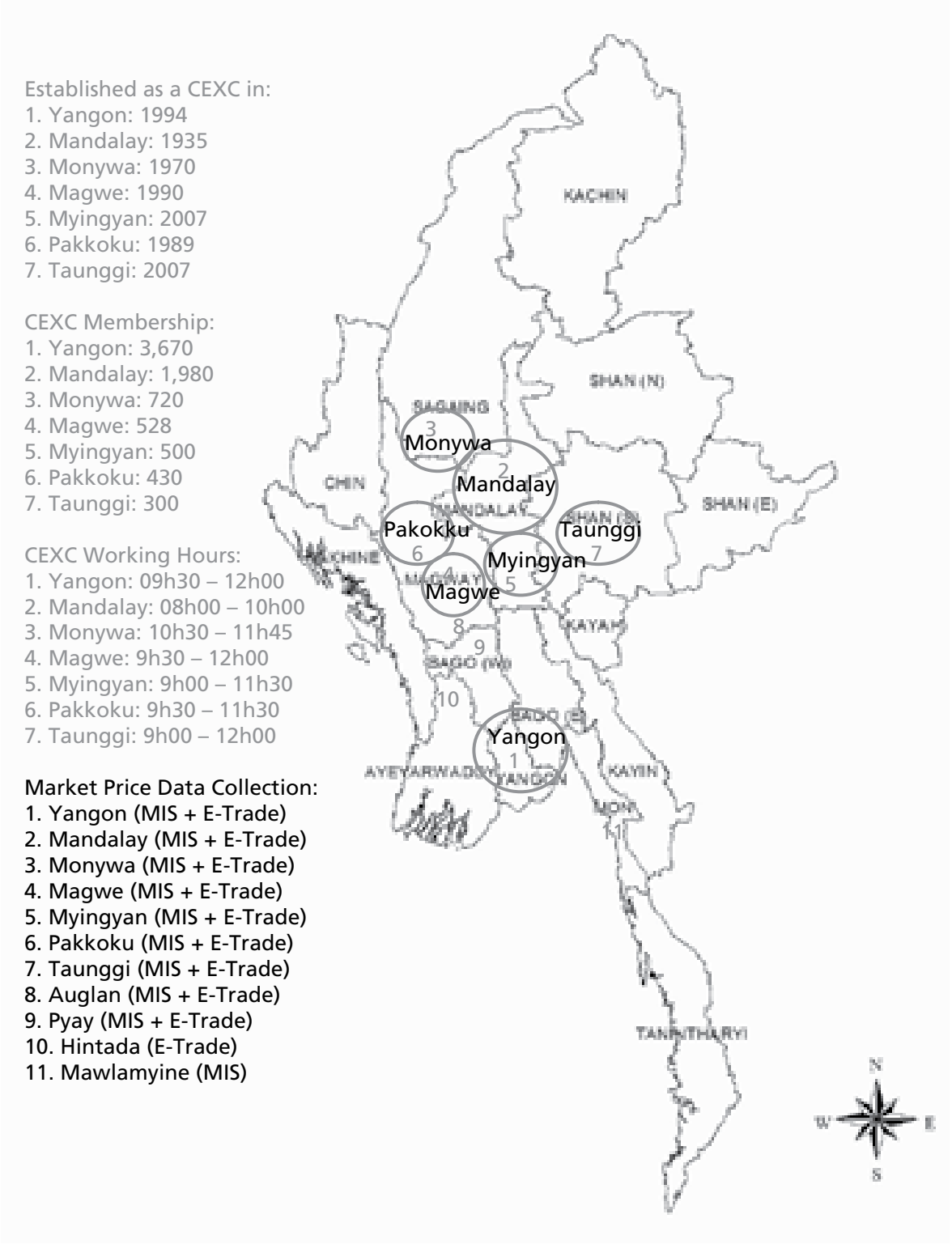
Timely market intelligence is essential for both domestic and international markets. Market information is required by farmers, traders, millers and exporters along the supply chain. All participants make decisions based on market information such as up-to-date information and historical trends analysis. The main information required by stakeholders in the oil crops sector is on the following:

- Traders and millers interviewed require daily price information in main regional market centres in Myanmar to assist daily decisions on procurements. These actors are aware of transport costs from procurement location to main markets and can therefore effectively utilize regional market price information. Weekly trends analyses are also appreciated, as it provides pertinent information assisting business strategies.

- In addition to daily price information, exporters require market intelligence on international market trends to decide on exports. For actual transaction, daily price information is essential and weekly average price and monthly price trends can assist exporters.

- Farmers need daily price information from neighbouring markets to assist decisions on selling their agricultural produce. Timely trends analysis in main market centres could also assist farmers in their decisions.

Map 3: Location of the Crop Exchange Centres and market price data collection by the Myanmar Agricultural Service and E-Trade



Source: FAO. 2005. Agricultural Atlas of the Union of Myanmar. Agricultural Year 2001-200", Rome. Data presented on the map were gathered by the study team.

There are two main sources of market information on agriculture produces in Myanmar; MIS and E-Trade.

Government Market Information Service (MIS)

The MIS was established in the year 2000 with technical and financial support from FAO. It is currently implemented by the DAP in the MOAI. Market prices are collected by MAS staffs on rice, paddy, oilseeds crop, edible oil, pulses, vegetables and fruits. Daily market prices are collected only in Yangon and Mandalay and weekly prices in other cities (Pyay, Myigyan, Monywa, Pakkoku, Taunggi, Augban and Mawlamyine). MIS print and distribute 15 000 copies of weekly market prices to over 300 MAS township offices. The weekly market prices can be procured by the private sector at MoAI library in Yangon. Delays in distribution of daily and weekly market prices reduce the value of the information system for farmers and traders.

To increase its role in facilitating trade, MIS services need to expand from just providing market information on prices to a limited audience, to include information specifically required by farmers, commercial agriculture and agro-industry on a much wider scale. Radio broadcasting of marketing information, databases of price, trade and production data that can be accessed via internet and enhanced capacity to collect and interpret data are also desirable.

The MIS has not been authorized to broadcast marketing information on radio as disseminating prices of rice and edible oils are perceived as a potential risk to social stability.

E-Trade

In Myanmar, the private sector has come in to fill some gaps in MISs for agricultural commodities. E-Trade was established in April 2003 with the objective of providing trade and business intelligence to Myanmar traders and exporters. E-Trade service has adapted to the specific demands from traders and exporters. Daily prices in CEXC (Yangon, Pyay, Myigyan, Mandalay, Monywa, Pakkoku, Magway, Taunggi, Auglan and Hintada) are collected and E-Trade customers are updated on price news several times a day through Short Message Service (SMS) on mobile phone and internet facilities www. etrade. Myanmar. com. Commodities covered by E-Trade include oil crops, edible oils, palm oil from Malaysia and oilcakes, but the main focus is on pulses market intelligence in Myanmar and on the Mumbai market in India35. Weekly price trends analysis are made available to E-Trade customers. Printed versions of the weekly price analysis are distributed in trading centres where electronic communication is not available.

The company has more than 2 000 customers registered and using their services, mainly located in Yangon, Mandalay, Monywa and Magway. Monthly SMS service charge ranges between Kyats 5 000 to 25 000 depending on different market information selected by users.

35 Non-agriculture commodities includes construction material prices in main cities, gold price in Yangon and London, Exchange rate for Thai bath, Chinese RMB, Japanese Yen, Singapore Dollar, Malaysian Ringgit, Bangladesh Taka, and Euro. Also, news related with business, economic issues, export and import, trade affairs based on domestic market, international market and market condition of ASEAN countries are translated into Myanmar language and made available to E-Trade members.

Limitations of market information systems

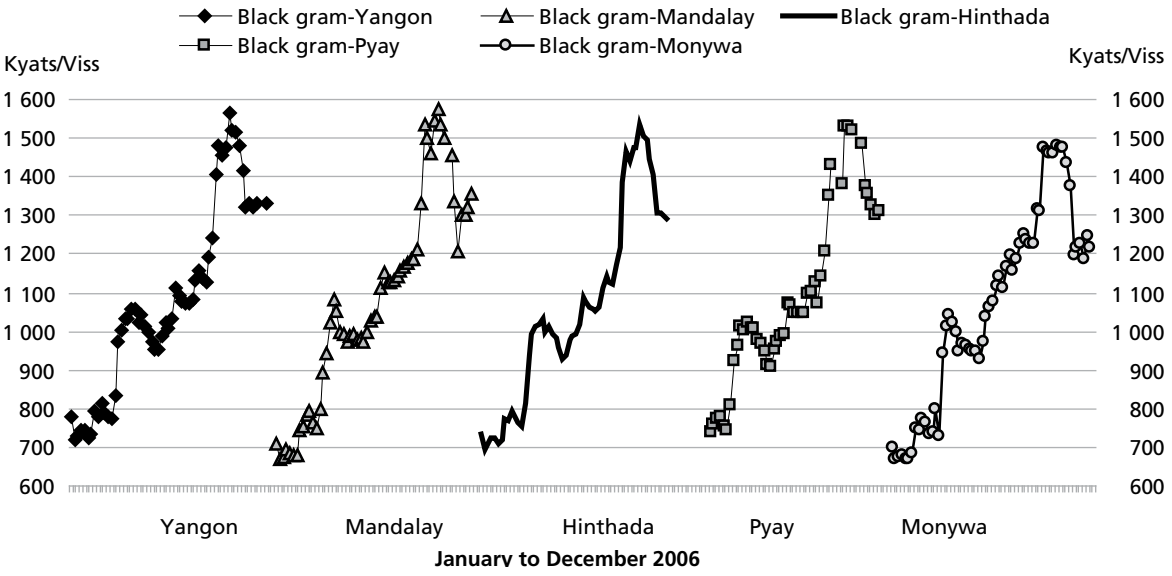
None of the existing market information is made available to farmers in rural areas. The MIS is not in a position to broadcast market data through radio and E-Trade uses communication means (SMS and internet) which are expensive in urban areas (mobile phone) and simply not available in rural areas. During the field visit, it appears that many villages in the CDZ are connected with phones. If not directly connected to a phone line, cordless phones mounted with an antenna that can receive signals up to 5 or 10 miles (depending on the phone model) are available in many villages. As a result, villagers in the CDZ can make phone calls to any part of Myanmar. Market information could be disseminated through automated phone services. Discussions with farmers were encouraging and showed that a market for such services does exist.

Other limitations of the current market information system is that international market intelligence remains limited to a few commodities for which export is well established. Prospecting market intelligence on other promising commodities such as processed sesame seed, sesame oil, edible/snack groundnut would provide useful information to traders and support business development.

11.3 Market integration and trade flow

Market integration analysis could not be conducted within the framework of this study. However, a look at Graph 21 suggests that grain markets are well integrated in Myanmar. The functioning of CEXCs in the main producing areas and timely market information updates provided to traders by E-Trade results in immediate market reactions to signals from any CEXC in the country. The main price setters are Mandalay CEXC for oil crops, Yangon for palm oil and Taunggi for soybean. Price differences exist between markets but these mostly reflect transport costs to end markets.

Graph 21: Price movement of black gram (raw quality) in different markets



Source: E-Trade, 2007

Oil crops, edible oils and oilcakes flow from production and processing to consumption areas. Maps 5 to 13 in Annex V illustrate the general trade flow patterns for oil crops, edible oils and oil cakes in Myanmar.

Domestic Edible Oils (Map 5)

Domestic edible oil flows from main production areas in the CDZ to Yangon and other states and divisions which have a deficit in edible oil production. There are small volumes of groundnut oil informally exported to the People's Republic of China.

Sesame (Map 6)

Sesame flows from main production areas in the CDZ to Yangon and the Chinese border in Muse for export. In 2006/07, the total sesame exports has reached a new record and exceeded 100 000 tonnes. There are informal exports reported on Myawadi border to Thailand. Sesame for oil consumption remains mainly located in central and upper Myanmar where consumers prefer the aromatic and slightly bitter taste of sesame oil.

Groundnut (Map 7)

Groundnut flows from main production areas in the CDZ and Shan states to processing areas mainly in Mandalay, Magway, Pyay and Yangon. Main consumption areas for groundnut oil is in lower Myanmar. It is estimated that overall 40 percent of marketed groundnut are used for snack/table purpose out of which an estimated 20 percent is informally traded to Thailand mainly via Myawadi border. The rate of groundnut use for snack/table purpose has significantly increased over the past three to five years.

Sunflower (Map 8)

Sunflower trade flow is very limited as most of the production is consumed locally by farmers or villagers mixed with sesame oil. Trade of roasted sunflower from Shan states is not presented on the map.

Soybean (Map 9)

Soybean for crushing purpose flows from main production areas in the Shan states (northern and southern), Mandalay and Ayeyarwaddy Division to Mandalay and Yangon. In the southern Shan state, crushing capacity for soybean is increasing in order to supply the local demand for cakes. There are informal trade flows reported to the People's Republic of China and Thailand.

Niger (Map 10)

Niger flows from main production areas in the southern Shan state and northern Sagaing to Mandalay and other parts of the CDZ. It is used for adulterating sesame and groundnut oils. Most of the niger appears to be used locally in production areas. Small quantities of niger are exported as bird feeds from Yangon.

Mustard (Map 11)

Mustard flows from main production areas in Kachin and Northern Sagaing to Monywa for crushing. Mustard oil is then shipped to Chin state. Informal mustard grains trade exists with India and Bangladesh in border areas.

Oil Palm (Map 12)

Domestic production of CPO from Tanintharyi division is shipped by boat to Yangon and refined at Yuzana refinery. Unprocessed CPO is used by the soap industry or locally as biofuel. Imported palm oil, mainly from Malaysia is shipped in bulk to Yangon. Palm oil is dispatched to all parts of Myanmar from Yangon through the Myanmar Edible Oil Dealers Association and municipalities administrations. Palm oil is shipped in drums by boat to Rakhine state from Yangon. Informal palm oil imports from Thailand enter the country mainly via Myawadi and Kaya state border points and is estimated to account for 20 percent of all palm oil imports in the country. This proportion varies depending on government palm oil price and import policies. Informally imported palm oil is redistributed to all parts of the country through traders and wholesalers. Informal exports of palm olein and sterin to India takes place in Tamu border, stimulated from price differences between India and Myanmar[36].

Oilcakes (Map 13)

Sesame and groundnut cakes flow from main processing areas in the CDZ and Yangon to main livestock and fishery production areas in Ayeyarwaddy, Yangon and Shan states. Feed millers are processing and enriching oilcakes in Mandalay, Yangon and Shan states (northern and southern). Soybean cake flows from Yangon and Mandalay to fishery and chicken production areas in Ayeyardaddy and Shan states. Caused by the shortage of oilcakes which became apparent in the past two to three years, palm oilcakes, although of poor quality, are increasingly used as animal feed.

11.4 Economic viability of marketing chains

Supply driven chains

In supply driven chains, market demand is high and the amount marketed depends on the volume supplied. Prices tend to increase because of the imbalance of supply and demand. In the oil crops sector, most chains are supply driven, which in other words means that production could substantially increase to supply the market without suffering price depreciation. Table 27 presents sustainable commodity chain or chains that would substantially benefit from a lift of restrictive government policies.

36 Price of edible oil is higher in India than Myanmar because of import tariffs in India.

Table 27: Supply driven chain in the oil crops sector

Chain	Market	Added Value	Policies Issues
Sesame pure black, white	Export to fast growing high-end markets (e.g. Japan)	Medium	Private sector allowed to export, US sanctions limits exports to Western countries
Sesame black, white	Export to Chinese market	Medium	Private sector allowed to export
Processed sesame	Export to fast growing high-end markets (e.g. Japan)	High	Absence of support to high-value commodities export developments
Groundnut snack	Informal Export to international market through Thailand, fast growing market	Medium	Ban on export
Soybean	High demand for soybean cake on the domestic market	Medium, prices are increasing	Ban on import of soybean and soybean cake
Niger	Domestic and small export market (bird feed)	Low	Private sector allowed to export, US sanctions limits exports to Western countries
Mustard	Domestic and informal export to Bangladesh/India	Low	
Branded groundnut and sesame oil	Domestic market	Medium	Absence of quality standards and food safety control system
Sesame oil	Export to fast growing high-end markets (e.g. Japan)	High	Absence of support to high-value commodities export developments
Processed edible groundnut	Export to fast growing markets in Asia	High	Ban on export
Palm Oil	Domestic market	Medium	Support local production, import of cheap palm oil competing on the market

Source: Study team

Demand driven chains

In demand driven chains, production exceeds market demands and therefore the amount marketed depends largely on demand. In the oil crops sector, the main demand driven chain are those in which the policies have contributed to low competitiveness:

Table 28: Demand driven chain in the oil crops sector

Chain	Market	Added Value	Policies Issues
Sesame red and mix for crushing	Domestic market for oil	Low	Import of cheap palm oil competing on the market
Groundnut for crushing	Domestic market for oil	Low	Import of cheap palm oil competing on the market
Sunflower	Adulteration of edible oils for domestic market	Low	Absence of systematic quality standards and food safety control system

Source: Study team

11.5 INFRASTRUCTURE

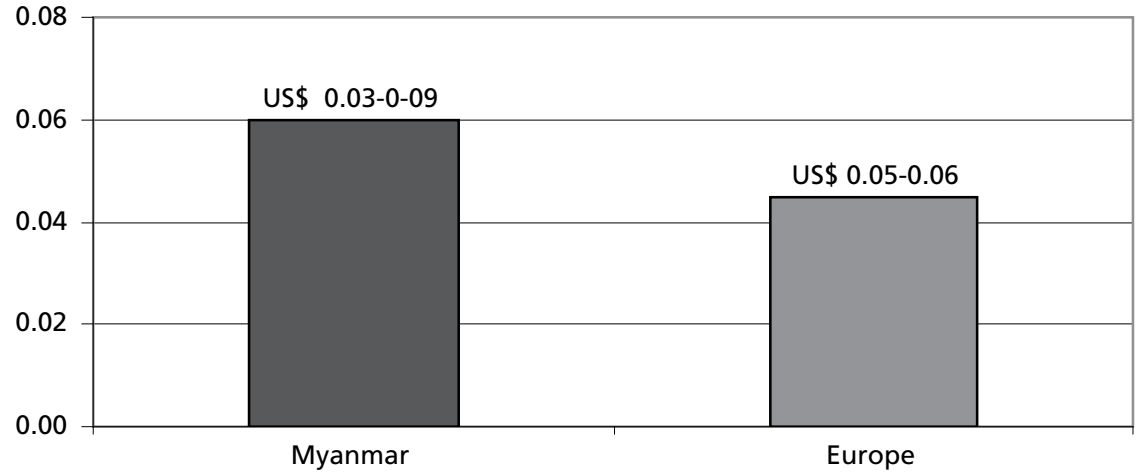
Road transport costs

Most oil crops and oil crops products are transported through the road network. The road network in Myanmar is poorly developed compared to neighbouring countries and paved roads remains limited to main roads only. Paved roads are narrow with uneven surface which result in low average driving speed. In the Shan hills, the road network is even less developed. Rural roads are unpaved and generally in poor conditions. These roads are often impassable during the rainy season.

There are two major highways connecting Yangon to the CDZ; Yangon-Nay Pyi Taw-Mandalay and Yangon-Pyay-Mandalay highway. Southern Shan state is connected to the Yangon-Nay Pyi Taw-Mandalay at Thazi while northern Shan state is on a main trading road to the People's Republic of China from Mandalay. Another important highway is Yangon-Myawadi to Thailand where much of the informal groundnut trade takes place. Mandalay is connected to India through Tamu road. Road connectivity to oil palm plantation area south of Dawei in Tanintharyi division is poor.

The general poor situation of the road network, combined with restrictive policies on fuel distribution and vehicle and spare parts imports, is resulting in high transportation cost within the country. Private transport companies are not entitled to access limited quantities of subsidized fuel for their operation and have to procure diesel from the open market at Kyats 4 100-4 300/gallon (June/July 2007). Table 56 in Annex VI presents transport costs for some destinations between main cities and the oil crops production areas. Transport cost varies between US$0.03 to 0.09/tonne per kilometre. Despite much lower labour costs, transport costs in Myanmar are on average higher than in Europe (US$0.04-0.05/tonne per km)[37].

Figure 39: Average national transport cost comparison between Myanmar and Europe for 1 metric tonne and 1 km



Sources: Ministère de l'Ecologie, de l'Energie et du Développement durable et de l'Aménagement du territoire, République Française http://www. statistiques. equipement. gouv. fr and study estimates

37 http://www. statistiques. equipement. gouv. fr

These prices do not include short distance transport from main roads to wholesale markets in cities. Large trucks are not allowed to enter cities and therefore, goods have to be transferred to small trucks. Since the first week of June 2007, small transporters in town do no longer benefit from subsidized diesel supplied by the government.

***Picture 28: The highway between Nay Pyi Taw and Mandalay** (23 May 2007)*

Seaport

The absence of deep sea port facilities in Myanmar result in higher shipment costs and poor accessibility during the monsoon season. The maximum berthing capacity in Yangon is 8 000 to 10 000 tonnes. This compares to a maximum berthing capacity of up to 115 000 tonnes at Klang deep seaport in Malaysia and 40 000 tonnes at Leamchabang deep seaport in Thailand. Shipment prices CIF (cost, insurance and freight) Yangon is estimated at 10 to 15 percent higher than other international seaports.

11.6 Export/import policies and procedures

Import/Export Policies

All exports and imports require a permit from the MoC. Exports/imports are authorized by the Trade Council (TC) which meets every two weeks to review applications. The TC is headed by the Vice-Chairman of the SPDC[38]. Annexe I summarizes export and import procedures in Myanmar.

38 FAO & MoAI. 2000. *Agricultural Marketing in Myanmar.*

On all exports, a commercial tax of eight percent and income tax of two percent is levied on all merchandise, including agricultural commodities. The tax is payable in US Dollar to the Internal Revenue Department, prior to receiving export authorization. The MoC sets minimum export prices for each authorized commodity on which taxes are calculated. For agriculture produce, the MIS within the MoAI provides regular market updates supporting the establishment of minimum export prices. National statistics on exports volumes and values are calculated based on approved exports/imports by the MoC.

Imports can only be realized through export earnings and as Myanmar Kyats are not exchangeable on the international market, imports can only be paid in hard currencies. Exporters/importers are authorized to open bank accounts in foreign currencies which can only be used in foreign transactions or account transfer. Withdrawal of foreign currencies from export earnings is not authorized for Myanmar citizens. Given the 10 percent tax on exports, traders are allowed to import to a maximum of 90 percent of the value of export they have realized. The MoC and Ministry of Border Trade is keeping a close watch on traders' operations to make sure this rule is respected[39].

Businesses requiring to import for an investment or to procure input for their businesses (e.g. chemical for edible oil refinery, nutritional supplements for animal feeds, etc.) need to procure foreign currency (US Dollars) within Myanmar from other companies having realized export earnings. This is possible through bank account transfers and a specific negotiated exchange rate exists for such transfers. Depending on the amount of foreign currency required, the account transfer exchange rate is 10 to 25 percent higher than the open market rate. This state of affairs not only reduces the competitiveness of businesses in Myanmar but it is a direct disincentive to technology transfer by the private sector as:

a) Technology is costly and needs to be procured in hard currencies.

b) Many exporters have short term interests in agricultural commodities (see below).

Combined with severe restrictions in Foreign Direct Investments (FDIs) and international technical assistance, Myanmar remains on the sideline of technology progress in agriculture and agribusinesses. In this scenario, the state remains the main actor in technology transfer.

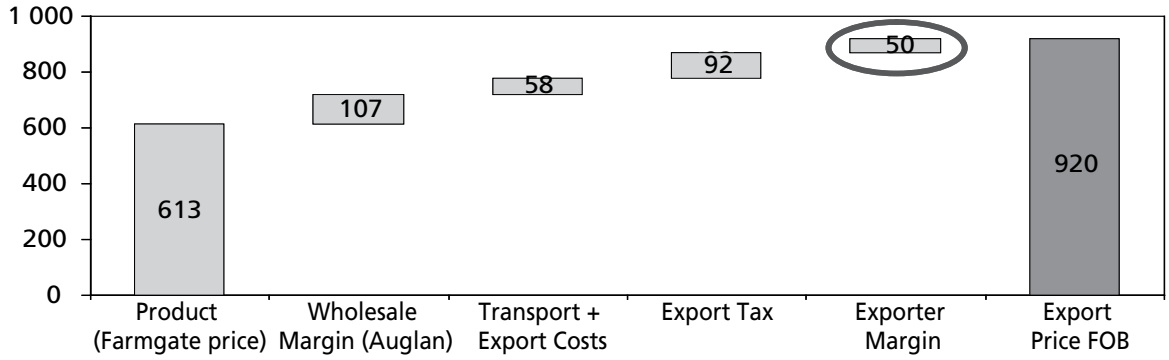
Furthermore, the need to earn foreign currencies to finance imports has directly led a number of businesses who have no expertise in agriculture to enter the agricultural export sector solely in order to earn foreign currencies. This is stimulated by the significant differences between open market exchange rate and account transfer exchange rate, plus the high profitability on imports of some commodities for which volume is restricted. Under these conditions, profitability on export of agricultural commodities becomes a secondary consideration. This state of affairs has serious impact on the added value of export in real terms for the national economy.

39 FAO & MoAI, *Ibid.*

Black sesame formal export – case study

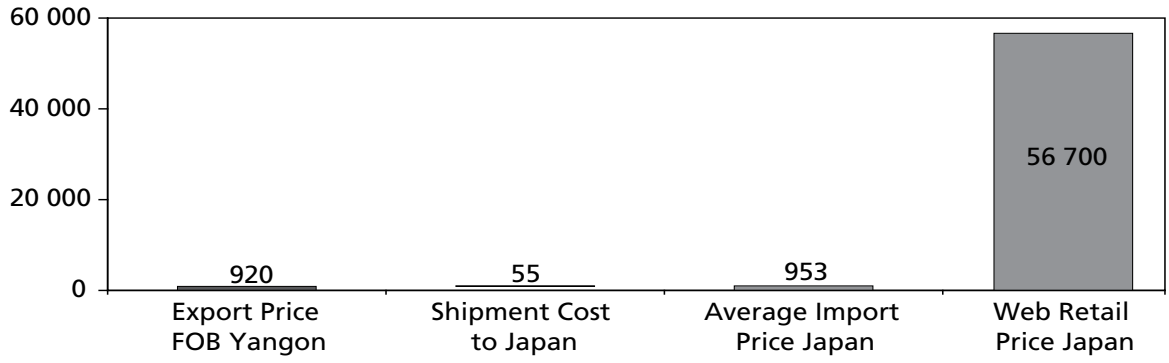
An illustration of the above is the value chain of the highest-value oil crops exported from Myanmar; Auglan pure black sesame for the Japanese market. Figure 40 presents the value chain of Auglan black sesame export to the Japanese market. The striking aspect of this value chain is that the exporter margin is unexpectedly low (5.4 percent of export price) and farmers margin is unexpectedly high (2/3 of export price). There is evidence that a similar situation exists with other agricultural commodities exported from Myanmar and it was reported that exporters shipping commodities abroad at losses to obtain foreign currencies[40]. Figure 41 compares the export price of sesame FOB (free on board) Yangon to retail price of roasted black sesame in Japan. FOB Yangon export price represents as little as 1.6 percent of the retail value in Japan.

Figure 40: Auglan black sesame export value chain* (in USD/tonne)



* Table 56 in Annex VI presents details on transportation and other export costs.
Source: E-Trade[41] and sub-sector analysis data.

Figure 41: Web retail prices of roasted black sesame in Japan*



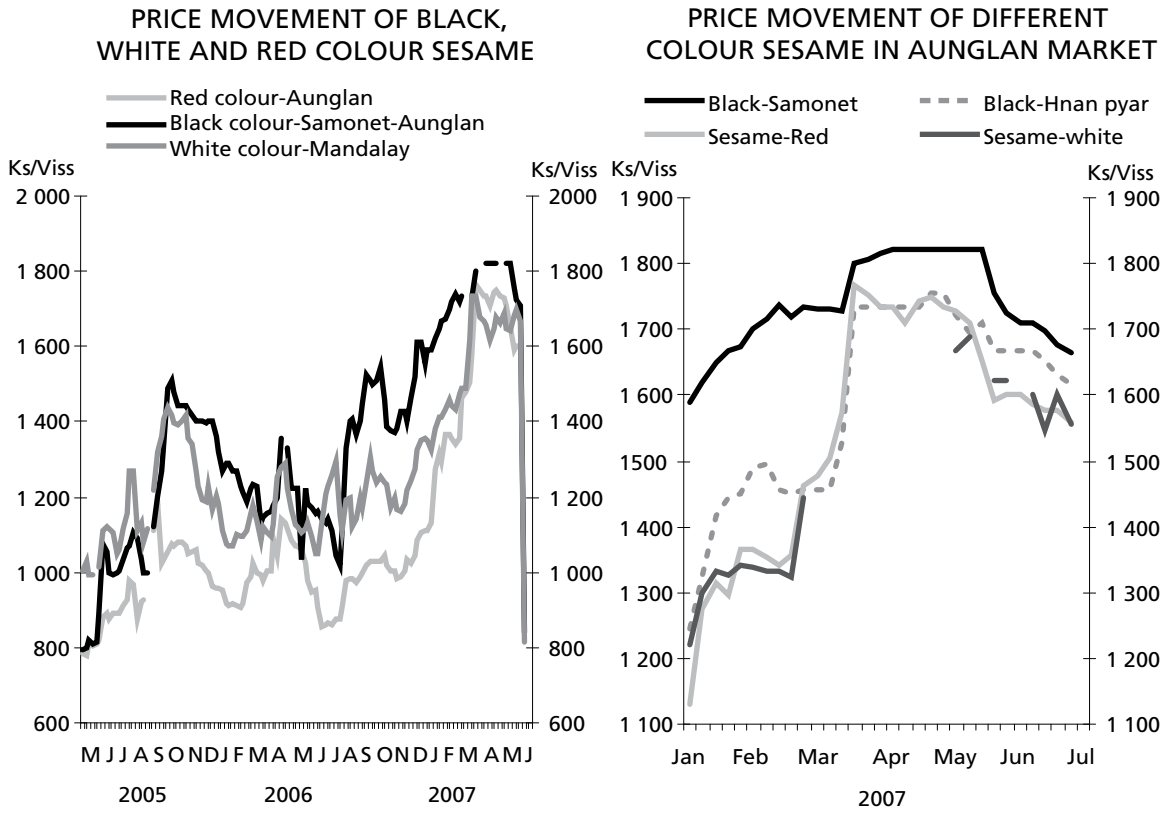
* Note that average import price in Japan includes all qualities
Source: Rakuten internet shopping[42] and official Japanese trade statistics[43]

40 FAO. 2004. *Myanmar Agricultural Sector Review and vestment Strategy. Working Paper 8: Marketing.*
41 E-Trade. 2007. *Study of Myanmar Pulses and Oilseed Crops Production and Marketing*, Yangon.
42 http://www. rakuten. co. jp/. This website is in Japanese and was browsed by Kanasawa Daisuke for this study.
43 http://www. jetro. go. jp/en/stats/statistics/

Figure 41 suggests that there are substantial opportunities to add value to sesame export by processing the products in Myanmar. However, given the disincentive of trade policy to technology transfer, added value on Myanmar sesame is taking place in the People's Republic of China or Japan rather than in the country itself. Under these circumstances, Myanmar exporters would, in theory, find it more attractive to invest in sesame processing in the People's Republic of China rather than in Myanmar. Partnership with foreign companies is also limited caused by the restrictions on the private sector to mobilize FDI[44].

However, despite the strong competitiveness bias on exports created by government macroeconomic and sectoral policies, exports have proved beneficial for local traders and farmers. In Auglan, the quality of black sesame has substantially improved over the past years, setting Myanmar in a stronger position on the international market. Also, the value captured by both farmers and local traders is higher for exportable quality. Graphs 22 and 23 compare prices of different quality of sesame in Auglan and Mandalay over the past 3 years. Pure black sesame (Samonet) consistently captures higher market value than other qualities on the domestic market at various levels of the chain.

Graphs 22 and 23: Wholesale prices of sesame in Auglan and Mandalay markets* (Kyats/Viss).



* Black-Samonet sesame is the export quality.
Source: E-Trade

44 As an illustration, within the time frame of this study, it was not possible to obtain the Company Act, a fundamental document for investors, despite numerous official letters, phone calls and e-mails to relevant departments.

11.7 Policy options to address oil crops cake supply[45]

Essentially, the GoUM has two main policy options to address the oil cake shortage which is to further restrict import and export of oil corps and oil cakes or to remove trade restrictions.

Further restrict trade in oil crops

There are forces interested in further restricting the export of oil crops (e.g. sesame of different colours) to force processing of these crops in Myanmar in order to increase the supply of oilcakes. This policy is the preferred choice of the MoLF, feed millers and chicken & fish producers. Maintaining the outright ban on soybean and soybean cake imports and further restricting exports of oil crops would force the export businesses into the informal sector and contribute to further destabilization of border areas. The policy would initially push prices down on the local market with the reduction of marketing opportunities and as oil millers cannot make profit on edible oils, as prices are depressed by cheap palm oil imports. As a result, oil crops traders' margin would reduce, farmers' gross margin would drop and a shift to more profitable crops would take place, further reducing oil crops supply. Palm oil import would have to increase to a higher level than anticipated in section 6.2 to bridge fast growing gaps between demand and supply and given the increase of palm oil prices on the international market, this would create further strain on the official trade balance. Yet, the policy would bring very short term benefits to the livestock industry. In the medium term, it would harm both the oil crops sub-sector and livestock industry. Myanmar consumers would continue to pay high prices for meat on the local market, while consumption of cheap imported oil would further increase.

Remove trade restrictions on oil crops

Oil crops currently restricted by government policies are mainly groundnut export and soybean and soybean cake imports. Removing trade restrictions on these commodities would be beneficial to all actors along the oil crops chain. This policy would be beneficial in the short term to oil crops farmers, traders and in the mid-term it would also substantially benefit stakeholders in the livestock industry. The liberalization of all oil crops exports (e. g groundnuts) would improve the official trade balance in the oil crops sector and ease tension along borders. It would also increase prices paid to producers and improve traders' margin. As a result, production of oil crops would increase and lower grade oil crops that cannot be used for snack or export could be used for crushing at competitive market prices. The import of palm oil would continue to bridge the gap between edible oil supply and demand and consumer prices remain at low prices. Increased supply of chicken and fish would reduce prices for consumers in the local market. The import of soybean and soybean cake could address the current shortage of oil cake in the country, promote an oil processing industry by crushing soybean or allow high value livestock industry to develop further through imports of animal feed.

The current trade policy brings another layer of constraints even if imports are authorized. In a non-distorted market policy and integrated financial system, imports can

45 This section was prepared following specific request from the MoAI to the study team.

take place benefiting from a small price differential. However, in Myanmar, because of severe trade distortions, the price difference between domestic and international markets have to be substantially different to be economically feasible, in view of the official import procedures:

- Import can only be done through 'export earnings', on which 10 percent export tax is applied.
- Account transfers are 10 to 25 percent higher than the informal exchange market.
- Undeveloped port facilities in Yangon result in high import prices by 10 to 15 percent, compared to international standards ports.
- Lengthy import procedures which have to take place in Nay Pyi Taw bring additional costs.

In June 2007, prices of soybean and soybean cake are respectively 25 percent and 30 percent higher than the international market and this may not be enough for formal imports by the private sector. Therefore, removing trade restrictions may not be sufficient and it is recommended that 'special treatment' is made for the import of soybean and soybean cake through formal channels and 'outside' export earnings. Informal imports of fish feed is already taking place. Both the oil crops and livestock industries will substantially lose from not removing these market distortions.

Another option would be for the government to 'informally authorize' imports of animal feed using the same practices as informal imports of fertilizers. After all, fertilizer is the food for plants which comes under the MoAI and oil cake the food for livestock and fisheries, which comes under the MoLF.

12. Trade standards, quality control and food safety issues

12.1 Trade standards and measures

Myanmar possesses a bewildering array of weights and measures, which often vary both geographically and as the commodity moves through the marketing chain (see tables 58 and 59 Annex VI). While the absence of grades and quality standards has not been a major drawback to the operation of the domestic agricultural marketing system, it is critical for the ability of Myanmar to maintain and further develop quality export markets.

Picture 29: Local oil crops volumetric units: Basket and Pyi*

*(16 Pyi is equivalent to 1 Basket)

On the local market, CEXCs such as Mandalay CEXC have set some level of standardization of marketed agricultural commodities. Before 1994 these agricultural products were being marketed based on agreements between buyers and sellers. Farmers tend to mix foreign matters in the products and to improve the quality of agriculture products trading, the CEXC have a fixed minimum level of foreign matter that its members are authorized to trade (0.1 to

0.2 viss/50 kg bag or 0.3 to 0.7 percent). Other standards are related to visual characteristic (size and colour), varieties and origin. Table 55 in Annex VI present the classification of various commodities sold on Mandalay CEXC as recorded on the black board. Standards in CEXC exclude such potentially important factors such as moisture content, protein content or chemical contamination. Qualities sold in CEXC are 'raw' and for export markets, exporters are sorting and cleaning their commodities (e.g. sesame) in Yangon.

The absence of standardized weights and measures also restricts the usefulness and accuracy of MISs (see Table 59), as these must deal with measures unfamiliar to market participants in other parts of the country and which may, in any case, vary within a single market. The absence of standards increases the learning period of new market information users and increases the risk of cheating of producers and other small participants as transfers are made from one measure into the other along the chain. Inaccurate volumetric measures (Basket and Pyi) are used at farm levels and converted into weight measures further down the chain.

Through consultation and discussion, efforts should be made to establish a standardized measure that would be used throughout the marketing chain, and which are compatible to international systems. There are substantial costs associated to the standardization of measures (e.g. replacement of all measuring implements), but the longer Myanmar waits to adjust to international standards, the higher the cost.

12.2 Quality standards and food safety control

Quality standards are typically imposed for reasons of public health and food safety, and are of particular importance to safeguard from biological and chemical contamination. They often require government certification of exported goods, as well as inspection capacity at agroprocessing and transport chain level. The FAO/WHO Codex Alimentarius is the major international source of such food safety standards.

Oil crops

Quality standards and food safety control are not systematically implemented in Myanmar. Even where such standards exist, however (CEXCs and the MAPT define certain standards for rice, oilseeds and pulses) they are generally based on characteristics clearly visible to the human eye – such as percentage of broken grains, or colour. Oil crops exporters are cleaning and conditioning oil crops in Yangon to fit exporters quality specifications. Private certification companies such as SGS[46] are providing certificates on the basis of specifications established in contracts between Myanmar exporters and foreign buyers. MAPT can conduct pesticide residues analysis and certificates for exports. Table 61 in Annex VI presents the laboratory analysis MAPT can conduct on oil crops and other food stuffs.

Most oil millers are not striving to provide higher oil quality to the market and have little consideration for quality of raw materials received for crushing. Price is the main

46 Société Général de Surveillance is the world's leading inspection, verification, testing and certification company.

determinant for oil crushing and poor quality seeds for processing include infected, mildewed and contaminated material. However, the professionalization of the livestock feed industry is creating a drive for higher quality oilcake and therefore oil millers are advised by feed millers to better control the quality of the raw material used for crushing. The MAPT solvent extraction plants are equipped with apparatus for oil content and FFA, and these tests are regularly done on the limited volume processed.

Edible oils

The Food and Drug Administration (FDA) under the MoH has the responsibility of controlling the quality and safety of locally produced as well as imported edible food. FDA has adopted FAO/WHO codex standards, guidelines and recommendations as a working reference. Every palm oil shipment imported to Myanmar is tested by the FDA laboratory. The FDA conducts every three to six months market surveys of edible oils in Yangon based on sampling in wholesale markets. Edible oils in other cities are not tested. Samples are collected by the Myanmar Inspection and Testing Service (MITS), under the MoC. The FDA conducts identification, quality and safety analysis on edible oils:

- Identification: iodine value, fatty acid composition and saponisation value
- Quality: FFA and Peroxyde value
- Safety: Moisture, soap content, mineral oils, volatile components (gas chromatography)

Table 62 in Annex VI presents the laboratory analysis the FDA can conduct on edible oils.

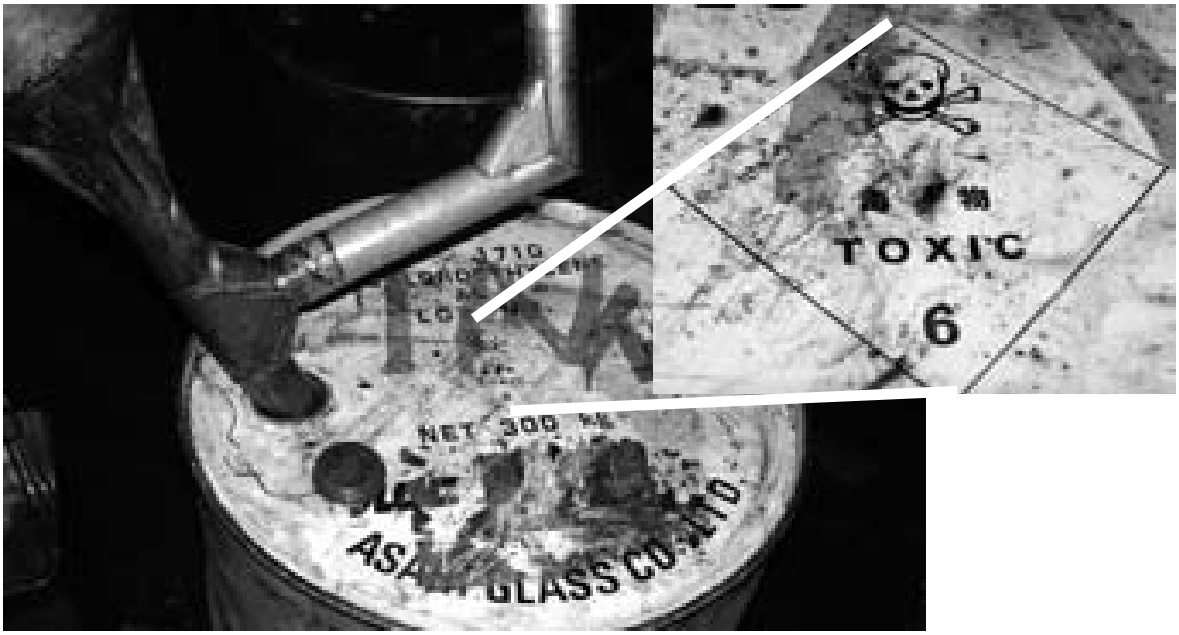
Adulteration of edible oil is widespread, resulting in a situation where none of the edible oils sold are of known quality. The absence of systematic quality control mechanisms distort competitiveness as profit margin is obtained from adulteration of oil, mostly taking advantage of cheap palm oil imports. Yet, for the first time on the 12th July 2007, the FDA decided to publish the results of its laboratory survey on edible oils, caused by the excessive adulteration of oil taking place in the country. The name and address of companies and shops were published in two local newspapers. The translation is provided in Annex II.

None of the oil mills visited had any laboratory in which quality control is regularly done. All the quality parameters are estimated based on personal judgments of the millers. However, prices reflect a premium for branded oil, special or ordinary and paler or clearer oils.

Edible oil is stored and transported in metallic drums. These drums are not manufactured in Myanmar. In the past, palm oil used to be imported in drums and stock piles of palm oil metallic drums were recycled for edible oil. Over the past few years, palm oil is imported in bulk and therefore, there is a shortage of drums for edible oil. Drums currently used are recycled metallic drums having transported industrial chemicals, motor oil or fuel. These drums are washed with water, sand and caustic soda by oil millers and then re-used for edible oil (see pictures 30, 31 and 32). Given the difficulties to clean metallic drums (the cap is only few centermetres wide) and the type of chemical recorded, these are serious health hazards. Table 29 presents a list of chemicals randomly recorded in a small sample of drums inspected.

Picture 30: Edible oil sold in a recycled metallic drum which previously transported engine oil

Picture 31: A metallic drum having transported industrial chemicals and used to store edible oils



Picture 32: Cleaning recycled drums to store and transport edible oil
(Yangon, 28 June 2007)

Table 29: List of chemicals randomly recorded on metallic barrels used for edible oil

Chemical Name	Origin	Industrial use	Toxicity for human
Trichlorethylene	Japan	Solvent for industry (dry cleaning, grease cleaning on machineries	Carcinogen
Monoisopropylamine	-	Regulating agent for plastics, intermediate in organic synthesis of coating materials, plastics, pesticides, rubber chemicals, pharmaceuticals and others, additive in petroleum industry and as corrosion inhibitor	Carcinogen probable
Polyurethane and Polyether Polyol	Japan	Used in flexible and rigid foams, adhesives and sealants, varnish, fibres, gaskets, condoms, carpet underlay, and hard plastic parts	
Styrene Monomer	-	Manufacture of plastics and rubber products and unsaturated polyester resins	irritant, and potential carcinogen
Engine Oil and Fuel	Diverse		

Source: Study team

Oil cakes

The MoLF conduct laboratory tests on oil cake based on demand from the private sector. Moisture, oil, protein and fibre contents are routine test on oil cake and are conducted to facilitate price negotiation between oil millers and livestock/fishery feed millers. Feed millers visited are equipped with laboratory equipment and are advertising the nutritional content on feed packaging. Yet, laboratory analysis is not done regularly because of the high cost of lab chemicals which needs to be imported. The CP group is conducting baseline lab tests from Bangkok and mixing ratio of feeds are communicated from Thailand.

In small and medium oil mills, residual oil contents are generally higher which may lead to rancidity of the product during the monsoon season and create digestive disorders in cattle. This problem is particularly acute for farmers crushing in small mills and storing the cake for the extended period of time. In other instances, this problem was reported as a minor constraint, given the high demand and turn over of oil cake. Sesame is sometimes high in sand content caused by poor cleaning of the seed.

12.3 International certification and industrial zones

International certification

None of the edible oil processors or traders and exporters in the oil crops sub-sector have their company certified to international standard. Most actors in the oil crops sub-sector have unclear ideas of international standard certification requirements. According to SGS[47], only two agribusiness companies in Myanmar have applied for international certification on food safety (ISO 22000); a vine producer and a beer exporter. Training on international standards and certification would increase awareness to the private actors engaged in quality oil crops and edible oils supply. SGS can provide training on ISO 9100 certification.

Industrial zones

The government has established the Myanmar Industrial Development Committee (MIDC) established to facilitate the creation of necessary infrastructures for the development of industries/agro-industries. A major concern on the outlay of industrial zones in that agro-industry and other industries are not adequately demarcated. As a result, the oil milling industry can have as their direct neighbours steel, fertilizers or chemical industries. While this may not be a concern under the current situation where quality control and food safety measures are not implemented, but this may prove to be a serious handicap in years from now when international certification (e.g. International Organization of Standardization [ISO], Hazard Analysis and Critical Control Points [HACCP]) for Myanmar products will be required for international exports.

47 SGS Myanmar is 100 percent owned by SGS Geneva/Switzerland.

13. Part II: Conclusions and recommendations

Main findings and recommendations at production level

Farmers in Myanmar have proved exceptionally skilful and entrepreneurial in optimizing the uses and maximizing the impact of limited resources available to them. Together with local traders, farmers have managed to maintain yields despite a extremely low supply of quality seeds and a collapse of the formal fertilizer supply system. These achievements are enough to consider farmers as a major strength to the agriculture sector. The MoAI may encourage this entrepreneurship by easing farmers' constraints instead of focusing on 'educating' farmers[48].

Farmers' constraints in Myanmar are astounding as they are trapped in a low yield vicious circle maintained by scarcity within the 'farming inputs – credit complex' (see Figure 42):

- Usury interest rates on credit are maintained by high demand for rural finance and limited supply. The ban for private banks to lend to the agriculture sector and the land policy which deprives Myanmar farmers from mortgaging, selling or using it as collateral effectively maintain a 'cash starvation' scenario on rural Myanmar.

- Substantial incremental yield achieved from limited amount of fertilizers' use allows farmers to access credit at high cost.[49]

- The collapse of the official fertilizer supply, the incomplete legal framework and the absence of quality control allow the supply of very poor quality fertilizers at low prices (e.g. crushed bones).

- The scarcity scenario of the 'farming input – credit complex' forces yield to stabilize at low level. Farmers proved to be extraordinary resourceful to maintain yields by making optimal use of limited resources available to them and creative technologies reproduced at village level.

- This scenario is conducive for local authorities to engage in profitable fertilizer and credit supply to farmers.

Breaking this vicious circle requires an integrated approach to the 'farming inputs – credit complex'. Such an approach should address simultaneously seeds and fertilizers supply as well

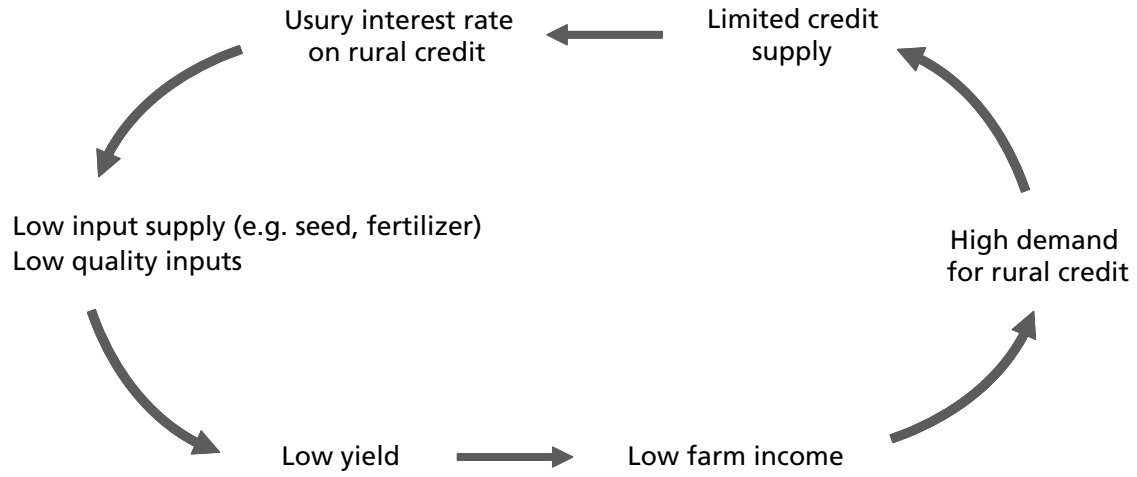
48 MAS approach to extension is what is usually considered as 'top-down'.

49 Incremental yield is higher with low amounts of fertilizer. As fertilizer use augment, yield continues to increase, but yield increment by unit of fertilizer applied reduces.

as rural credit. Partnership between farmers, private sectors and the government is necessary. Possible partnership models were presented in Section 9.7.

The creation of genuine farmers' interest groups is a prerequisite to addressing farmers' constraints. This is a top priority to the oil crops sub-sector. Note that farmers' marketing groups/cooperatives have reportedly failed in Myanmar essentially because farmers have options to market their products amongst numerous competing traders (see section 8.2 on marking channels). As a result, farmers capture a reasonable proportion of the market price. The essence of farmers' interest groups here is different in the sense that it responds to an existing need for rural credit and farming input.

Figure 42: Low yield vicious circle maintained by policies on the 'farm inputs – credit complex' in Myanmar



Main policy reforms aiming at easing farmers' constraints include:

- Reform the financial sector to end the current acute shortage of rural finance. Necessary reforms in the financial sector are beyond the scope of MoAI but includes the following:
  - Elimination of prohibition of private banks to lend to the agriculture sector.
  - Elimination of interest rate subsidies.
  - Allow expansion of best practices in microfinance.
  - Elimination of differential exchange rates.

- Finalize the legal framework on fertilizer and systematically implement quality control on fertilizers and pesticides.

- Facilitate the import of fertilizers by allowing for a 'special treatment' of formal fertilizers import by the private sector outside export earnings.

- Remove restrictions on cropping patterns in irrigated '*le mye*' and regulate for a fair distribution of available irrigation water to WUAs.

Specific interventions to ease farmers' constraints include:

- Provide services to facilitate the establishment of farmers' interest groups. Technical Assistance by FAO may be required to support the MoAI in this task.

- Through a pilot project, facilitate the development of tripartite partnerships between the government, input dealers or exporters and farmers' groups for the provision of farming inputs on credit as well as contract farming and technical assistance (e.g. dryer for export sesame).

- Through a pilot project in selected townships, start multiplying high yielding varieties oil crops seed varieties on farmers' fields in selected townships.

- Sesame seed multiplication should take advantage of the vast genetic diversity of sesame cultivated in Myanmar, which offers opportunities for identifying and multiplying best material for various uses; export markets, oil production, confectionary. This diversity constitutes a comparative advantage in the oil crops sub-sector.

- Test more aggressively the adaptability of high yielding oil crops varieties on a larger scale on DAR farm and farmers' fields.

- Facilitate the cultivation of pre-monsoon irrigated sesame which captures the highest crop margin through farmer-to-farmer extension. Experienced sesame farmers in Kyause are important human resources.

- Facilitate the establishment of leasing companies to operate in Myanmar, as farm production potential could increase with adequate machineries.

- In the post-harvest sector, support farmers to improve oil crops drying process, particularly for exports markets through technology transfer of efficient drying methods.

The demonstration component of the OPEC project needs to implement a FFS approach as planned in the UTF/MYA/006/MYA project document. The FFS approach calls for a bottom up planning process to extension service. Flexibility is essential to allow trials and demonstrations which respond to farmers' needs. Here are some trials and demonstration patterns which could be a starting point for further development:

- Land preparation practices for irrigated sesame in the lowland.

- Land preparation practices for soybean on *yar mye* in the hills. The lowland 'five tooth harrow' or 'hand pulled light harrow' are rarely used. Improving land preparation technology on permanently cultivated yar mye in the Shan hills can not only reduce labour cost but increase yield.

- Continuous cultivation of groundnut, soybean and niger in the Shan hills based on adequate application of farm-yard manure and fertilizers.

- Soybean varieties trials in different agro-ecological zones and types of land.
- Soybean intercropped with corn in different agro-ecological zones and types of land.
- Soybean in non-irrigated *le mye* in the CDZ.
- Relay cropping of soybean after rice on *le mye*.
- Sunflower after paddy on *le mye* in the lowland and delta regions.
- Sesame varieties trials on cool season.
- Niger on *le mye* in lowland and delta regions as a pilot trial.
- Variety tests for all oil crops in different agro-ecological zones and types of land.
- Irrigation test and land preparation practices on irrigated land for sesame and groundnut.
- Response of fertilizer use on all oil crops in different agro-ecological zones and types of land.
- Rhizobium use on groundnut and soybean.

Further options could be identified through a detail study on farming practices. Trials and demonstration options should identify best potential areas for yield improvements, which may be outside of the CDZ.

Main findings and recommendations at processing level

The edible oil processing industry in Myanmar is characterized by an oversized oilseed processing capacity on both expeller and solvent technologies. Because of this oversized capacity and import of cheap palm oil from abroad, competition between oil millers is strife. To survive, many actors are resorting to unethical edible oil adulteration practices. Solvent extraction technology is not competitive in Myanmar mainly because of a market distortion on energy, unavailability of Hexane, trade policies, insufficient supply of raw material, high investment costs and limited domestic market for RDB oils.

The current processing capacity of oil seeds is sufficient for the current production as well as foreseen production in 2015/16. Additional investments by both the private and the public sectors are not required. Yet, expeller technology is sub-optimal and crushing efficiency and quality of edible oil produced can improve. Technical assistance to the private sector is required to address constraints on expeller technology:

- Priorities should be given to oil millers striving for quality and having developed their own brands.

- Provide technical assistance to equipment manufacturers.

- Access MCSE owned or formerly owned modern expeller plants as a model for both millers and equipment manufacturers.

- Provide technical assistance in pre-treatment and conditioning of oil seeds for crushing (e.g. dryers).

In contrast, the processing capacity for palm oil is undersized, particularly in view of the anticipated FFB production in 5 to 7 years from now. Investment in palm oil processing facilities is required and should be led by the private sector. The public sector can facilitate such investment by:

- Extending the current sub-sector analysis to oil palm caused by time constraints, the production and processing facilities could not be visited.

- Identifying technical assistance packages to support production and processing in the oil palm sector, capitalizing on past technical assistance provided by FAO.

- Providing technical assistance to the private sector and leverage private sector financial resources. Technical assistance should be provided in priority to private actors willing to invest in new plants or upgrade existing ones.

On solvent plant technology, private and public sectors are discouraged to invest, unless:

- Soybean production has dramatically increased, which is anticipated to take a decade given the seed supply situation.

- Import of soybean from international markets is authorized and facilitated (see section 11.7).

- Energy price structure reflects actual market price.

- Hexane is made available to private sector at the international market price.

Yet, the public sector may provide technical assistance to improve efficiency of existing solvent plants. Required technical expertise for maintenance and upgrade of installed solvent plants does not exist in Myanmar. These plants are beneficial to the oil crops and livestock sectors, as once imports of soybean will be authorized in Myanmar, only these plants can ensure a start-up on soybean oil and soybean cake production.

Most oil refineries are using chemical refinery processes that are old and unsafe both for factory workers and the environment. The private sector has invested in a new world class refinery plant, but because of prevailing trade policies, this plant runs at a fraction of its capacity. Priorities for the public sector in the edible oil refinery sector include the followings:

- Authorize the import of CPO in order to promote the development of modern refinery capacity and create employment.

- Close unsafe chemical edible oil refineries. When possible upgrade these factories leveraging private sector financial resources.

Main findings and recommendations at marketing level

Oil crops marketing and distribution within Myanmar is characterised by an astonishing effectiveness which derives from the outstanding entrepreneurship displayed by the Myanmar private sector. The functioning of CEXC and private market information system are illustrations of this dynamism. Wherever the private sector was left to operate freely, marketing of oil crops proved highly effective, given the general operating environment. Another illustration of this dynamism is the rapid adaptation of trade flows over the past 4 to 5 years which have affected mainly groundnut (edible/snack trade to Thailand), sesame (increased exports through Muse and Yangon) and oil cakes.

None of the existing market information is made available to farmers in rural areas. The MIS is not in a position to broadcast market data through radio and E-Trade uses communication means (SMS and internet) which are expensive in urban areas (mobile phone) and simply not available in rural areas. Many villages in the CDZ are connected with phones. If not directly connected to a phone line, cordless phones mounted with an antenna that can receive signals up to five or ten miles (depending on the phone model) are available in many villages. As a result, villagers in the CDZ can make phone calls to any part of Myanmar. Market information could be disseminated through automated phone services. Discussions with farmers were encouraging and showed that a market for such services does exist. Other limitations of the current market information system is that international market intelligence remains limited to few commodities for which export is well established. Market research on other promising commodities such as processed sesame seed, sesame oil, edible/snack groundnut would provide useful information to traders and support business development.

Major weaknesses in oil crops marketing clearly come from ill suited policies which are affecting the competitiveness of the oil crops sub-sector. Policy reforms are required to take place as a prerequisite to enhance competitiveness of the oil crops sub-sector:

- Reform external trade policies by reducing or eliminating export tax and the export earnings rule which severely reduces competitiveness and are strong disincentives to technology transfer.

- Liberalize the communication sector, particularly the mobile phone which is an efficient communication tool to assist trade activities.

- Increase investments to further develop rural road network and sea port infrastructures.

- Remove restrictions on soybean and soybean cake imports and allow for a 'special treatment' of formal soybean and soybean cake imports outside export earnings in order

to ensure that import transaction by the private sector can take place and oil cake shortage is adequately addressed.

Priority interventions in the oil crops sub-sector:

- Provide technical support to the private sector to pilot dissemination of market data through automated phone services.

- Improve export earnings and global market penetration through:
  - Support traders with market research and development of oil crops in Asia: research should be transaction oriented and should therefore be conducted along with Myanmar traders. The focus is on identification of opportunities through direct contacts between Myanmar and foreign traders.
  - Support Myanmar traders in penetrating new markets through interventions that improve access to international markets and potential clients. Myanmar exporters should regularly attend international trade fairs, particularly in Southeast Asia to enhance market learning. Trade fairs are an important part of benchmarking competition and making new buyer contacts.
  - Enable the most dynamic Myanmar traders to effectively utilize internet based trade and marketing platforms by developing targeted business support services in this area.
  - With all stakeholders of the oil crops sub-sector trade, develop brands for Myanmar oil crops products (sesame products in particular).

Main findings and recommendations on trade standards, quality control and food safety

Through the CEXCs, Myanmar has set some level of standardization of marketed agricultural commodities which are sufficient for the domestic markets. Similarly, the prevailing maze of weight and measures units used in marketing oil crops has not been a major drawback to the operation of the domestic agricultural marketing system as most actors along the chain have become familiar to this diversity of units. Yet, maintaining the ability of Myanmar to maintain and further develop quality export markets, it is critical to harmonize trade standards and measures. There are substantial costs associated to the standardization of measures (e.g. replacement of all measuring implements), but the longer Myanmar waits to adjust to international standards, the higher the cost.

Myanmar is equipped with few laboratories on food stuffs (MAPT[50] and FDA[51]) that can conduct analysis on oil crops and edible oils. The MoLF is equipped to conduct nutritional analysis on oil cakes. Yet, despite the existence of laboratories, systematic food safety controls are not implemented, leaving room for unethical practices of edible oil adulteration.

50 Myanmar Agriculture Produce Trading, under the MoC.
51 Food and Drug Administration, under the Ministry of Health.

Perhaps the major food safety concern is the use of recycled metallic drums which have transported chemicals, fuels and engine oils to store edible oils.

Priority interventions include the following:

- Harmonize trade standards and measures to the international system.
- Evaluate existing laboratories and need for upgrade to satisfy food safety control requirements in the edible oil crops sub-sector.
- Implement systematic food safety controls on oil crops, edible oils and oil cakes in all markets of Myanmar.
- Ban of recycled metallic drums to store and transport edible oils.
- Replace recycled metallic drums with clearly identifiable containers such as plastic drums.
- Provide training to the private sector and international certification standards.

AN ANALYSIS OF THE MYANMAR EDIBLE OIL CROPS SUB-SECTOR

PART III

INSTITUTIONAL ENVIRONMENT

14. Mapping of institutions

This chapter presents a non-exhaustive list of institutions supporting, regulating or directly involved in business at different levels of the oil crops sector.

14.1 Support institutions - production

The main institution supporting production activities in the oil crops sub-sector is naturally the MoAI. There are eight departments or services, one PMU for the implementation of the OFID funded Oil Crops Development Project and one university supporting the oil crops sub-sector. All components of the OPEC funded Oil Crops Development Project are embedded within the MoAI, MAS Department.

The MoAI is mainly responsible for agricultural research and extension. In addition, other supporting activities such as irrigation, agricultural mechanization and crop forecasting, land record and land utilization are provided to develop important major crops production such as cereal crops, oil crops, pulses, fruits and vegetables and perennial crops. In 2006, the MoAI staff number was reduced from over 70 000 to 61 000 with the privatization of State Owned Enterprises (SOEs).

Department of Agricultural Planning (DAP)

The DAP has responsibilities in policy and plan formulation, compilation of agricultural statistics, coordination between the various MoAI departments as well as other ministries and relations with international organizations.

While DAP reportedly has a policy role in the agriculture sector, the department appears not to have maintained records on the oil crops sub-sector policies, suggesting that policies in the sub-sector are formulated outside DAP.

Myanmar Agricultural Service (MAS)

The main function of MAS is agricultural extension and therefore MAS staff work with agricultural researchers to diffuse proven technology such as varieties, agronomic techniques, plant protection and soil improvement. MAS is well staffed with 7 606 personnel, out of which 68 percent are technical and 32 percent support staffs. Table 30 provides a breakdown of MAS staff by division. The MAS is structured into eight divisions; Agriculture Extension, Seed Department, Land use, Plant Protection, Procurement and Distribution, Project Planning Management and Evaluation, and Account and Administration divisions.

Table 30: Myanmar Agricultural Service personnel by division

#	Division	Technical Staff	Support Staff	Total
1	Extension division	4 521	1 282	5 803
2	Seed division	252	150	402
3	Land use division	97	37	134
4	Plant protection division	176	17	193
5	Project planning, management and evaluation division	58	63	121
6	Procurement and distribution division	60	161	121
7	Administrative division	22	207	227
8	Account division	4	499	503
	Total	5 190	2 416	7 606

Source : MAS

The following divisions have a stake in the oil crops sub-sector:

- The oil crops *PMU* aims at oil crops productivity and output through the Component I of the OPEC funded oil crops project. The PMU has mainly focused on the demonstration plots (see section 9.5) and with FAO support, students have been sent for training abroad. Yet, during field visits in 10 states and divisions, the OPEC funded project is rarely known either by MAS staff in the field or oil crop farmers. Critical issues such as seed supply and rural credit have not been addressed. Lack of momentum within MoAI for the project implementation means that activities under the project Component I are yet to be implemented. Furthermore, given the findings of this study on the status of oil crop production in Myanmar, significant revisions of Component I are required (see sections 9 and 13).

- The *Seed Division* is responsible for the certified seed production (see section 9.6). The seed Division owns 32 farms with a total sown area of 5 000 acres (see map 14 in Annex IV). Supply of breeder seeds is the responsibility of DAR. Certified seeds are multiplied on farmers' fields with assistance from the extension department staff.

- The *Land Use Division* has responsibilities in soil and agro-ecological zone mapping, soil laboratory analysis, fertilizer recommendation, soil erosion prevention, fertilizer and FYM experiment. The division has drafted a Fertilizer Law that was endorsed and published in October 2002[1]. However, since then rules, regulations and procedures for the implementation of the Law are still under progress and as a result, the Law is not implemented. Quality control on fertilizers marketed in Myanmar is not implemented and fertilizer companies are using and abusing this legal vacuum (see sections 9.6 and 13). Until recently, the government supplied virtually all the fertilizers available to crops, whether by imports or from its own three fertilizer plants through the Procurement and Distribution Division of the MAS. At present, MAS is no longer involved in handling fertilizers in Myanmar as this has been taken over by the SPDC authorities.

1 GoUM. 2002. *Fertilizer Law*, Yangon.

The *PPD* has responsibilities in pesticide registration and limits on pesticide residue for agricultural export commodities. PPD stopped producing pesticides in Myanmar, since the year 2000 and therefore now all pesticides used in Myanmar are imported by the private sector (see section 9.6).

- The *Agriculture Extension Division (AED)* has responsibilities on oil crop extension. Front line extension staffs are designated Deputy Assistant Supervisors (DAS) who are assigned responsibilities at village or village tract level on an average basis of extension of 5 000 acres of cropping area per staff.

- *Farmers' group:* Because of the lack of extension staff in terms of numbers, farmer groups are formed (10 farmers per group) to diffuse agronomic techniques among members of farmers through their leader. Farmers' group leaders are contact points for extension officers and extension messages are disseminated through the group leaders. They then have responsibilities to transmit the extension/technical messages to other group members. In main producing areas, extension camps are established to organize farmers to meet extension workers for agricultural extension purpose.

Department of Agriculture Research (DAR)

The DAR based in Yezin near to the SPDC Nay Pyi Taw headquarter is responsible for research into crops of economic importance. Until 2004, DAR was under the MAS department. Its major objectives are to develop high yielding varieties through breeding and to produce basic and foundation seed of released crop varieties for the Seed Division of MAS.

In addition to its central institutes in Yezin, DAR has 19 regional research farms located in all agro-ecological zones and major cropping regions of the country. DAR is well staffed with over 328 personnel, out of which 4 hold a Ph. D., 34 M. Sc. degrees and 170 a Diploma in Agriculture. In total, 1 711 acres of land are available for research activities. The oil seed crops section was created in 1983. Other researches work for individual state enterprises responsible for crops, such as palm oil (see Figure 44). Besides FAO, DAR collaborates with international institutes on oil crops development:

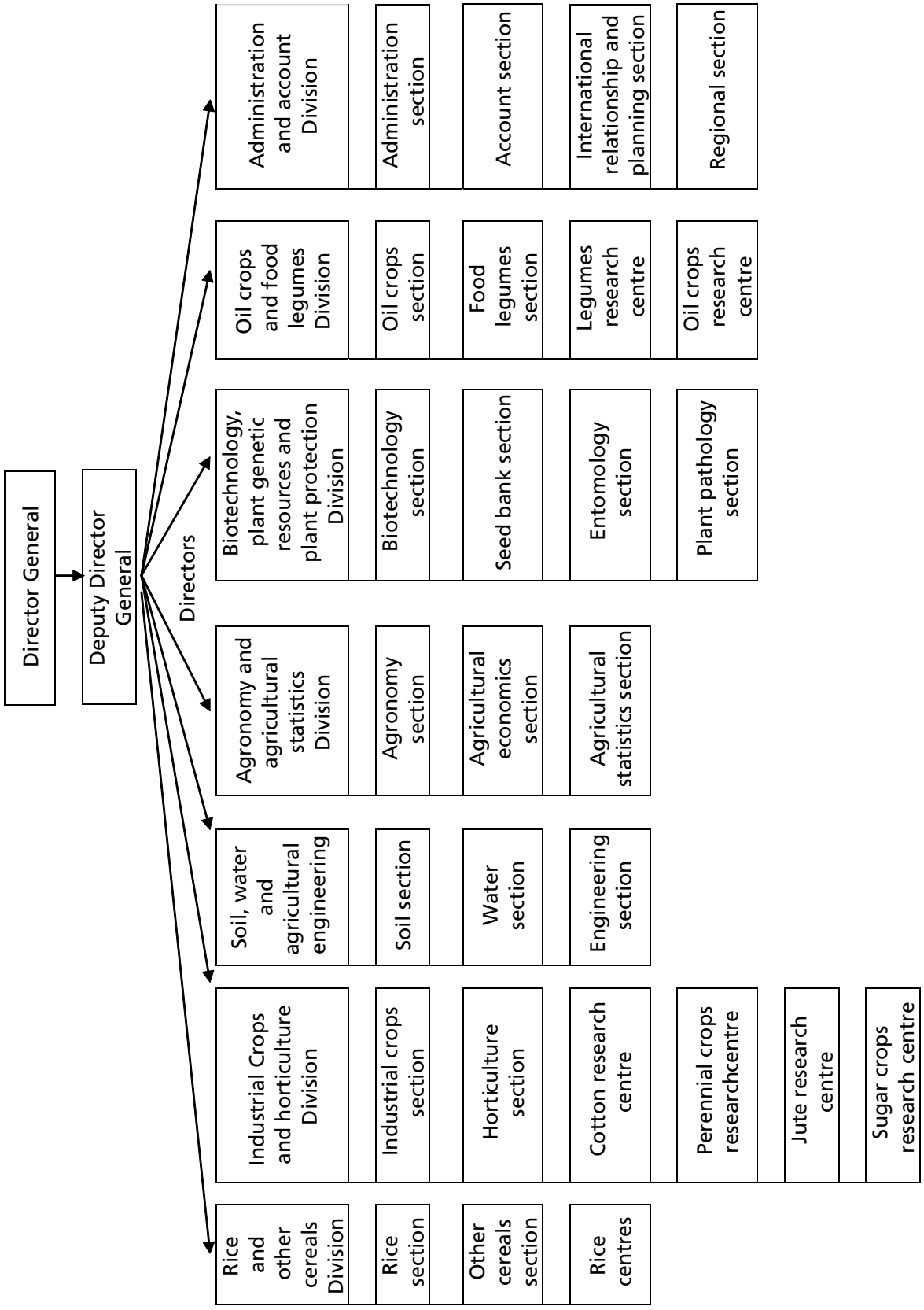
1. International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in India on groundnut.

2. The World Vegetable Centre (AVRDC) in Taiwan on soybean.

Despite well staffed office and fair facilities, Myanmar has little or no increase in agricultural productivity for main oil crops over the last decade. Yields are consistently lower than those of neighbouring countries or the regional average across almost all crops. Interestingly, beans and pulses are similar to and higher than the regional average, despite the near absence of research and extension in these crops. The role of the private sector has been significant in increasing productivity of beans and pulses.

According to the Agricultural Sector Review, "research and extension programmes normally do not take into account farmers' needs and constraints, and similar activities are

Figure 43: Department of Agriculture organizational chart



repeated year after year without a clear objective. In part, this occurs because they are usually centrally planned at headquarters. Those who plan do not have the in-depth experience and knowledge of the local agro-ecological and socio-economic conditions, and those who implement in many instances do not understand the technical design of the programmes. The consequence of this approach is a low adoption rate for technical recommendations, even when they are available".[2]

Myanmar Industrial Crop Development Enterprise (MICDE)

The MICDE was created in 2006 by re-grouping five departments into one; Myanmar Perennial Crops Enterprise (MPCE), MCSE, Myanmar Sugar Cane Enterprise (MSCE), Myanmar Jute Industries (MJI) and Myanmar Farms Enterprise (MFE). These departments continue to exist as divisions.

- The *MPCE* has the responsibility for the development of oil palm, rubber and cashew and is staffed with 1 226 personnel. Most MPCE palm oil farms are now leased to private companies. Research and breeding of oil palm is conducted mainly at the Applied Research Centre on Perennial Crops (ARCPC) at Ingabo State, Kyaikto Township as well as in Mon State Pa-Auk Research station.

Myanmar Agriculture Development Bank (MADB)

The MADB is mandated to provide short-term agricultural credit to rural households who are acknowledged as cultivating land. No other banks are permitted to lend in rural areas. The MADB lend at 17 percent interest per annum basis while independent estimates of inflation in 2006 is put at 21.4 percent[3]. However, the overall volume of lending is small with annual ceilings imposed by the Central Economic Bank. In 2006/07, individual lending ceilings of Kyats 7 000 per acre of rice and Kyats 4 000 per acre of sesame, groundnut and soybean. The level of recovery on disbursed loans has been very good: close to 100 percent.

Settlements and Land Record Department (SLRD)

The SLRD has responsibilities in production estimates, agricultural statistics and land taxes. The Land Law which deprived Myanmar farmers from mortgaging, selling or use as collateral for rural credit was enacted in 1992[4]. The land policy has remained the same with some minor adjustments in land and irrigation taxes.

2 FAO. 2004. *Myanmar Agriculture Sector Review and Investment Strategy. Volume 2: Agriculture Sector Investment Strategy. Section 1: Investment Strategy*, p.60; FAO. 2004. *Myanmar Agriculture Sector Review and Investment Strategy. Volume 2: Agriculture Sector Investment Strategy, Working Paper 7: Review of Agricultural Research and Extension in Myanmar.*

3 EIU2006. *Country Report. Myanmar,* The Economist Intelligence Unit, London.

4 GoUM. 1992. *Duties and Right of the Central Committee for the Management of Culturable Land, Fallow Land and Waste Land and Procedures Conferring the Right to Cultivate Land/Right to Utilize Land.*

Water Resource and Utilization Department (WRUD)

The WRUD has responsibilities in design, construction, operation and maintenance of reservoirs, pumping schemes and ground-water development. WRUD is handling the construction of major pump irrigation projects, with command areas of up to 40 000 acres using high discharge pumps. Cropping patterns on irrigated land are implemented jointly between WRUD and MAS.

The use of Myanmar's water is not free of charge[5]. As from the next cropping season, an increase in irrigation tax is planned: Kyats 1 950/acre for paddy and Kyats 600/acre for other crops. Previous taxes included Kyats 10/acre irrigation from government diversion weirs and reservoirs and Kyats 5/acre for projects under the protection of government embankment and drainage canals. Since the water tax remains considerably below actual costs and as it is charged on a per-acre basis, there is no incentive that could encourage farmers to optimize the use of irrigation water.

Agricultural Mechanization Department (AMD)

The AMD encourages the private sector to produce small-scale machineries for farmers. AMD operates seven plants which produce machineries used in various agriculture sub-sectors, including oil crops:

1. Farm Machinery Production Plant, (9 Miles, Yangon)
2. Farm Machinery Production Plant, (Inkone, Kyaukse, Mandalay Division)
3. Farm Machinery Production Plant, (Kyaikkaloe, Yangon)
4. Farm Machinery Production Plant (Kyaikkaloe, Yangon)
5. Farm Machinery Production Plant (Ywarthatgyi, Yangon)
6. Part Production Plant, (Mingladon, Yangon)
7. Farm Machinery Production Plant (Kyaukse, Mandalay Division)

Ministry of Commerce(MoC)[6] - Myanma Agriculture Produce Trading (MAPT)

The MAPT under the MoC has responsibilities in exploring new cultivable land and organized extensive cultivation and assists the enhancement of better quality crop production and strives for export promotion. Activities undertaken by the MAPT in production could not be assessed.

Ministry of Co-operatives (MoCoo)[7]

The MoCoo is a remnant of the socialist period in Myanmar. According to the MoCoo, during the "fiscal year 2005-2006, 14 470 agricultural cooperative societies have been producing various kinds of crops such as paddy, groundnut, sesame, pulses and beans. The total sown acreage is 15 acres in lakh and total output value is 116 611 kyats in million". Within the timeframe of the sub-sector analysis we could not find evidence on the existence of these cooperatives.

5 For more details, see FAO. 2004. *Myanmar Agriculture Sector Review and Investment Strategy. Volume 2: Agriculture Sector Investment Strategy, Working Paper 4: Irrigation and Water Resources Management.*

6 www. commerce. gov. mm

7 www. myancoop. gov. mm/ministryofcop. htm

Yet, in 1984, the MoCoo, with UNDP and ADB support designed an *Oilseed Production and Processing Project*[8] which bears similarities to the FAO *Myanmar Oilcrops Development Project* in 2004.

Independent Oil Producers Associations

There are no independently formed producers associations in Myanmar defending the interest of oil seeds farmers. The absence of independent farmers' associations is a major obstacle to sound institutional development in the oil seeds sub-sector (see also section 9.7 on rural finance). Producers are absent from all forums in which policies are decided on their behalf. There is however, a producer association for palm oil.

- The *Myanmar Oil Palm Producers Association (MOPA)* regroups large private companies investing in oil palm estates in Southern Myanmar (mainly Taninthayi Division). This association assists its members in accessing land for plantation, establishing crude oil processing plant and marketing the products.

14.2 Support institutions - processing

Ministry of Commerce (MoC) - Myanmar Agriculture Produce Trading (MAPT)

The institution with most expertise in edible oil processing in Myanmar is surprisingly the MoC through its MAPT. MAPT has vast experience in solvent extraction since 1962 and operated 19 mills out of which 2 have been privatized. MAPT is in the process of privatizing the 17 other mills (see section 10.1). MAPT plants are equipped with laboratories for edible oil analysis.

Ministry of Agriculture and Irrigation (MoAI)

Under the MoAI there are four divisions involved in oil crop processing:

- The *MICDE* started manufacturing and distributing a small-scale expeller for Jatrohpha to villagers this year.

- The *MPCE* now operates three oil palm extraction plants (see section 10.1) in Tanintharyi Division and Mon State. The private sector has engineered palm oil extraction plants based on plants imported from Malaysia by MPCE.

- The *MCSE* has responsibilities in research and processing of cotton. MCSE does not procure cotton since 2004 and therefore, the expeller plants owned and operated by the MCSE used for cotton seed oil extraction are operating at a very low level and on rental basis to the private sector. In 2006/07, MCSE has produced 20 tonnes of refined cotton seed oil. Out of 6 expeller mills owned by MCSE, 4 have been handed over to the Ministry of Defence (1) and Ministry of Industry (3) (see section10.1).

8 UNDP, ADB & MoCoo. 1994. *Oilseed Production and Processing Project. Feasibility Report. Volume I – Main Report*, ULG Consultants Ltd.

- The *MAS* through the OPEC funded oil crops development project[9] has planned to install two solvent plants (Pyay and Mandalay) and upgrade expeller extraction technology.

- The oil crops *PMU* under the MAS aims at increasing efficiency and quality of edible oil extraction through the Component II of the OPEC funded oil crops project. To ate the PMU has focused on sending students for training abroad. Given the findings of this study on the status of the oil processing industry in Myanmar, significant revisions of Component II are required (see sections 10 and 13).

Ministry of Industry-1

- The *Myanmar Foodstuff Industries (MFI)*[10] is one of the six state-owned Myanmar industries under the Ministry of Industry (1) and is engaged in the production of various food products and beverages, including edible oil production. Data on oil processing plants owned and operated by the Ministry of Industry-1 was not shared with the study team.

- The *MIDC* is responsible for the development of industrial zones. It appears that international certification standards requirements (e.g. ISO, HACCP) in agro-industry have not been sufficiently considered in the industrial zone designs. This may prove to be a handicap for future competitiveness of Myanmar oil crops sub-sector.

Ministry of Co-operatives (MoCoo)

Under the MoCoo, 6 cooperative mills are producing limited quantities of groundnut and sesame oils (see section 10.1). None of these cooperatives could be visited within the limited time of the study.

Ministry of Health (MoH)

The FDA under the MoH[11] has overall control responsibilities on food, drugs and household products, including oil crops and edible oils (see section 12.2). The Minister for Health is the chair person of the Myanmar Food and Drug Board of Authority (MFDBA) and members are from other relevant ministries and agencies, concerned with food and drugs. The National Drug Law has been promulgated in 1992 and National Food Law in 1997. The FDA was formed under the Department of Health in 1995. It has two divisions, food and drug and each division has enforcement and laboratory sections.

The FDA is Codex Contact Point for Myanmar and has adopted FAO/WHO codex standards, guidelines and recommendations as a working reference for food and pharmacopoeias are used as references for drugs.

9 FAO. 2004. *Myanmar Oilcrops development Project (FAO/TCP/MYA/2904), Preparation Report, Volume I – Main Report"*, Investment Centre Division, Rome; FAO. 2004. *Myanmar Oilcrops development Project* (FAO/TCP/MYA/2904), Preparation Report. Volume II - Annexes Investment Centre Division, Rome.

10 www. myanmar. com/Ministry/MOI-1/

11 www. moh. gov. mm/

Ministry of Livestock and Fisheries (MoLF)[12]

The MoLF role in the oil crops sector is limited to the promotion of oilcake use for livestock and fishery industry. The MoLF has also taken an active advocacy role to the MoAI and other institutions on the consequences of the current oilcake shortage in Myanmar. There are two departments with responsibilities on oil cakes:

- The *Livestock, Feedstuff and Milk Products Enterprise (LFME)* is a state owned organization which, amongst other responsibilities, produces animal feeds with oil cakes as a base.

- The *Livestock Breeding and Veterinary Department (LBVD)* operates a laboratory and conduct nutritional analysis for both the private and public sectors on oil cakes used as raw material to produce animal feeds.

Ministry of Energy (MoE)

Under the MoE[13], the Myanmar Petrochemical Enterprise (MPE) has responsibilities in refining and processing crude oil and natural gas. The MPE produces SPB 62-82 which is used as solvent for edible oil extraction. The Myanmar Petroleum Products Enterprise (MPPE) is responsible for marketing and distribution of petroleum products, including SPB 62-82. Both the private and government solvent plants rely on SPB 62-82 supply from the MoE.

Independent Oil Millers Associations

There are no independent oil millers associations in Myanmar promoting the interest of the industry. The MEDA has some role in representing oil millers but this role is not undertaken as MEDA has until recently been on the front line of price control on imported palm oil. This is seen as a major impediment to the promotion of good quality edible oil to the national market.

14.3 Institutions supporting oil crops, edible oils and oil cakes marketing

Commodity Price Supervision Committee(CPSC)

The CPSC undertakes regular consultations with actors in the agriculture sector in order to implement price control operations. Oil crops and edible oil are part of the commodity list of the price supervision committee. The exact roles and responsibilities and reporting line of the CPSC are not known as the study team was not authorized to meet with the committee members.

12 www. myanmar. gov. mm/ministry/live&fish/default. htm
13 www. energy. gov. mm/

Ministry of Commerce(MoC)

The MOC[14] plays a key role in formulating and implementing export and import policies. The MoC plays a vital role in the implementation of the economic reforms towards the market-oriented economy especially in the trade sector. There are three directorates and departments influencing the oil crops marketing in Myanmar.

- *The Directorate of Trade* (DT) is responsible for the formulation of trade policies (see section 11.6) and plans with the aim to regulate the smooth flow of internal and external trade. Export/import rules and regulations for the private sector were published by the MoC in December 1998[15]. It occasionally releases trade notifications, directives and issues export/import licenses and also certificates of GSP FORM A and Country of Origin. It undertakes registration of exporter/importer and business representatives and all export promotional activities. It is also the regulatory body on imports and exports for the private sector in external trade. The DT is also the national focal point for the World Trade Organization (WTO) since January 1997. The DT works in collaboration with or oversees the Union of Myanmar Federation of Chambers of Commerce and Industry (UMFCCI) Chamber of Commerce and affiliated traders' associations.

- The *Department of Border Trade (DoBT)* was established in 1996 with the objective to put border trade in line with normal official trade. Border Trade Transaction Methods which are using local currencies had been suspended since 1997 and the Normal Trade Transaction Method which is Export First/Import Later system was introduced on 21st July 1997. In the Normal Trade System, all payments have to be made in US Dollars. Import was permitted based on the value of export proceeds. Later, according to the Notification No.5/2000 dated 13.11. 2000, issued by the MoC, all payments have to be made in US Dollar (or) Kyat (or) Renminbi (Yuan) in Myanmar-the People's Republic of China border area and US Dollar (or) Kyat (or) Rupee in Myanmar-India border area. Then, according to the Notification No.6/2000 dated 28.12. 2000, issued by the MoC, all payments have to be made in US Dollar (or) Kyat (or) Bath in the Myanmar-Thailand border area. But payments have to be made only in US Dollar in the Myanmar-Bangladesh border area as prescribed in previous notification.

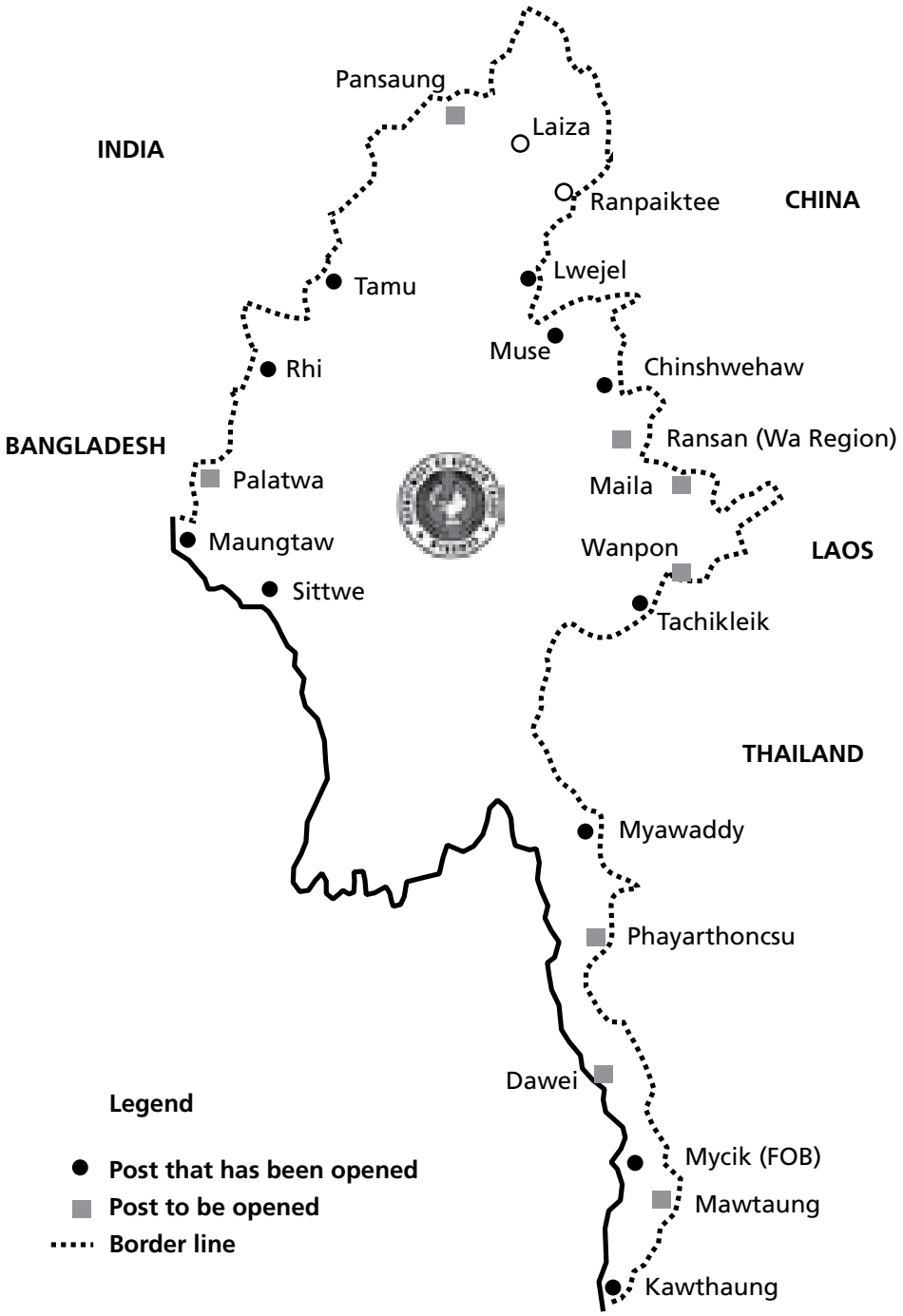
Map 4 shows the border points between Myanmar and neighbouring countries. The DoBT has opened (13) Border Trade Posts at various border points:

1. Myanmar-the People's Republic of China Border Area: Muse (105 mile), Lwejel, Lizer, Chinshwehaw, Kanpaiktee.
2. Myanmar-Thailand Border Area: Tachileik, Myawaddy, Kawthaung, Myeik FOB
3. Myanmar-India Border Trade Area: Tamu, Rhi
4. Myanmar-Bangladesh Border Area: Sittwe, Maungdaw

14 www. commerce. gov. mm

15 Ministry of Commerce. 1998. *Myanmar Export/Import Rules and Regulations for Private Business Enterprises*, Directorate of Trade.

Map 4: Location of Ministry of Commerce border posts



Source: www. commerce. gov. mm

The DoBT undertakes registration of exporters and importers doing border export and import trade. It is authorized to issue export/import licenses and permits through the border area. It is also the regulatory body for imports and exports of the private sectors in overland trade with neighbouring countries. Bilateral border trade agreements have already been singed between Myanmar and neighbouring countries with the exception of the Lao People's Democratic Republic.

- *MAPT* is a government organization under the MoC with the primary objective of generating foreign exchange income for the development of the national economy. Until 2002, MAPT purchased paddy at a fixed price from farmers based on quota system. In 2003, the government discontinued purchasing paddy from farmers and rice export marketing was liberalized. Thus, MAPT reduced its staff and is in the process of privatizing rice mills and edible oils solvent and refinery plants (see section 10.1). MAPT undertakes laboratory analysis and testing of soil and water, quality of food grains and extends technical assistance on post-harvest technology. MAPT can conduct laboratory analysis on pest residues, aflatoxin and FFA and provides export certificates. However, export certificates are generally done by SGS or other certification companies in Yangon. However, none of the certification companies can conduct pesticide residue tests and MAPT laboratory plays an important role for high end market exports.

Ministry of Co-operatives (MoCoo)

The Co-operative Export Import Enterprise (CEIE), under the MoCoo, was established on the 1st September 1994, as a government business organization to promote cooperative exports. The enterprise is engaged in direct export and import trade and is also responsible for enhancing and developing of export trade by cooperative societies. It is also responsible for export promotional activities such as collecting, analyzing and disseminating market information, identifying export potential products and documentation, supervision, control of export activities and support services for the cooperative societies to form joint ventures with foreign partners. The enterprise, together with cooperative societies, exports annually 40 000 to 50 000 tonnes of agricultural products such as beans and pulses. With export earnings, various types of goods and commodities are imported for the cooperative societies, private companies and for state organizations. The role of cooperative enterprise in oil crops trade could not be assessed within the timeframe of this study.

Ministry of Agriculture and Irrigation(MoAI) - Department of Agricultural Planning (DAP)

The government-run MIS is implemented under the monitoring of DAP (see section 11.2).

Union of Myanmar Federation of Chambers of Commerce and Industry (UMFCCI)

The UMFCCI[16] was founded in 1919 as the Burmese Chamber of Commerce and upgraded as a federation in 1999. UMFCCI has over 16 000. Twenty eight traders' associations, 9 Border Trade Chambers and 16 state and division chambers are affiliated with UMFCCI. The UMFCCI and its affiliated associations represent the business community and safeguard their interest. The main role of the UMFCCI is to act as a bridge between the state and the private sector.

The associations and federations with a stake in the oil crops sub-sector are the following:

16 www. umfcci. com. mm/

- The *Myanmar Pulses, Beans and Sesame Seed Merchants Association (MPBSSMA)* was formed in December 1991, soon after trade liberalization measures on pulses, beans and sesame trade. The association aims at creating a congenial atmosphere between the Myanmar sellers and the buyers abroad whom the association considers as business partner of Myanmar. The association takes as its responsibility to intervene to ensure amicable settlement of any dispute between local and international traders. The association has established specification for beans, pulses, oilseeds and cakes, based on the MoC guidelines.

- The *MEDA* mainly regroups local edible oil dealers who act as distributors of the fixed price of palm olein imported into Myanmar. MEDA has the responsibility to implement price control policies on imported palm olein. In March 2003, the CPSC tasked MEDA to organize the distribution of palm oil.

- The *Myanmar Livestock & Myanmar Fisheries Federation and Fish Feed Exchange Centre* represents businesses using oil cakes such as livestock and fish feed millers. A Fish and Shrimp Feed Exchange Centre has been established in Yangon to facilitate trade transaction and price setting of fish feeds. The Fish and Shrimp Feed Exchange Centre operates daily in Yangon from 9:30 to 12:30. Rice bran, groundnut cake, sesame cake, soybean cake, broken rice, maize and formulated feed are exchanged. Daily prices are recorded.

- Nine *Border Trade Chambers* were formed to promote border trade with neighbouring countries of the People's Republic of China, Thailand, India and Bangladesh. Meeting with Border Trade Chambers representatives was not possible for the study team.

14.4 Other support institutions

Education

YAU is located near the central DAR Institute in Yezin and has qualified and experienced teaching staff, plus a research farm. YAU offers education to Bachelor and Master degree levels. In addition, there is a network of seven State Agricultural Institutes (SAI) teaching to Diploma level.

1. Patheingyi Township (Mandalay Division)
2. Thaton Township (Mon State)
3. Pintphyu Township (Magway Division)
4. Pyinmana Township (Mandalay Division)
5. Thayarwady Township (Western part of Bago Division)
6. Myaungmya Township (Ayeyarwady Division)
7. Shwebo Township (Sagaing Division)

Since the early 1990s, the opportunities for Myanmar students to access higher level education in internationally reputed universities have remained limited. Professionals having benefited from international exposures within the MoAI are aging. Within 2 years, 11 heads of MoAI departments and divisions are going to retire and replacement with qualified human resources is becoming problematic. The focus of the OPEC funded oil crops development project on capacity building abroad up to PhD level is highly relevant in this context.

International technical assistance

Official development assistance declined sharply after 1989 and remained very limited to date. Only a few multilateral agencies still maintain active programmes in the country, of which UNDP is the largest. FAO is the only agency providing technical assistance in the oil crops sub-sector.

15. Management

All government institutions are managed through a strict hierarchical structure which leaves limited room for open debates, brainstorming, and participatory process in policy formulation and planning/implementing programmes and activities. As a result, decisions are based on incomplete or even at times erroneous information or data sets. As authority is centralized, all decisions, even minor administrative issues have to be approved by staff at a high level in the hierarchy which slows down the delivery of public services. These management practices are in place from export and import approvals down to the approval of minor office expenditures. The costs of sub-optimal practices in the public administration are enormous to the nation. To a large extent, the low quality of services impacting on the competitiveness of the oil crops sub-sector is directly related to management style.

16. Part III: Conclusions and recommendations

A major strength in the Myanmar government institutions is the dedication Myanmar civil servants are displaying in achieving results, while ironically a major constraint is the management system in place, which limits committed civil servants to fully express their qualities.

The institutional environment in Myanmar is a complex set of institutions with often overlapping responsibilities and little coordination between agencies. Overlapping of responsibilities occurs in particular at processing levels of the oil crops chain, with a variety of institutions involved (MAPT, MoIndustry I, MCSE, MPCE, MICD, MAS and other authorities). Restructuring of these responsibilities into one institution responsible for all aspects of oil processing, including policy, is advisable. At present, various institutions follow opposite policies (e.g. MAPT privatizes while MAS plans to build new solvent extraction plants). Lack of coordination occurs at all levels of the oil crops chain, particularly between ministries, departments and divisions within ministries and the private sector. Coordination mechanisms should be put in place at policy, programme design and implementation levels.

Farmers in particular are not represented in any form of independent institutions. The creation of farmers' interest groups through a bottom-up approach should be seen as a priority. The MoAI initiative to appoint farmers' leaders as recipient of extension activities is a good policy starting point.

The OFID funded oil crops development project has not yet built the desired momentum for its implementation. Yet, the OPEC project has sufficient resources to make a difference in Myanmar. However, implementing the oil crops project is a challenging task which may require the PMU to partner with other institutions such as MoC (MAPT), MoLF, various associations and the private sector. The effective delivery of the OPEC project is not something the PMU alone can achieve; the PMU may rather take a coordination role to ensure project implementation. Therefore a review of the implementation set up and the roles and responsibilities of various line ministries and agencies is advised.

The effective provision of support to the oil crops sub-sector is not something that can be achieved by the public sector alone with responsibilities fragmented in different institutions. In many countries there is a fruitful collaboration between public entities, the private sector and farmers in such tasks. Private and public sector partnership can be achieved through the creation of a MOCPC or Myanmar Oil Crops Coordination Committee (MOCCC)[17] is particularly needed in the following key areas:

17 The MOCDP document recommends the creation of a 'National Edible Oil Board', however without specifying the board ToR, the

- Facilitate policy formulation through dialogue amongst all stakeholders, considering all diverging interests along the chain.
- Enhance coordination in designing, planning and implementing programmes and activities.
- Advocate for equal participation of all stakeholders of the oil crops chain, including farmers.
- Facilitate the harmonization of trade standards and measures and the systematic oil crops and edible oils quality and food safety control.
- Coordinate the implementation of market research and development activities on the international market.
- Develop Myanmar brands on oil crops and oil crops products.
- Coordinate the allocation of technical assistance to the private sector and regulate the level of subsidies provided to the private sector by the OPEC funded oil crops development project (mainly on Component II).
- Support the PMU in implementing the OPEC funded oil crops development project.

Financial support to the establishment of MOCPC/MOCCC is required for the first three years through allocation of responsibilities on the OPEC project implementation in areas which require public-private partnerships (PPPs). Also, the proposed market research and development activities on the international market could be typically implemented by the committee. The committee may charge its members an annual fee to ensure institutional sustainability. The MOCPC could be anchored to the UMFCCI, but for a higher operational independence and provided the private sector demonstrates interest in such an institution, the MOCPC may be created as an independent institution[18].

modalities for its implementation or the required support for its establishment. On the 27th July 2007, the sub-sector analysis work-shop participants (stakeholder workshop) advised that the terms 'National' and 'Board' was not adequate in Myanmar as this would mean that the institution would be chaired by MoAI Minister. A lower profile institution is required and therefore the term 'committee' was retained. The authors would favor the term 'Myanmar Oil Crops Council (MOCC)' for this institution.

18 Perhaps in a similar fashion as the CEXC.

AN ANALYSIS OF THE MYANMAR EDIBLE OIL CROPS SUB-SECTOR

PART IV

LEVERAGE POINTS AND RECOMMENDATIONS

17. Leverage points, policy, strategy and intervention recommendations

17.1 Leverage points

Leverage is the ability to affect large numbers of sub-sector participants with a single, preferably low-cost action. These are known as points of leverage. Leverage points can be identified through system nodes, geographic concentration, and policy constraints. *System nodes* are points where large amounts of the product pass through the hands of a small number of sub-sector participants. Geographic concentration offers the opportunity for targeted interventions that reach many participants in the same region. Finally, policy constraints offer a very powerful point of leverage.[19] If opportunities for leveraged intervention do exist they constitute the skeleton of the project design or revision.

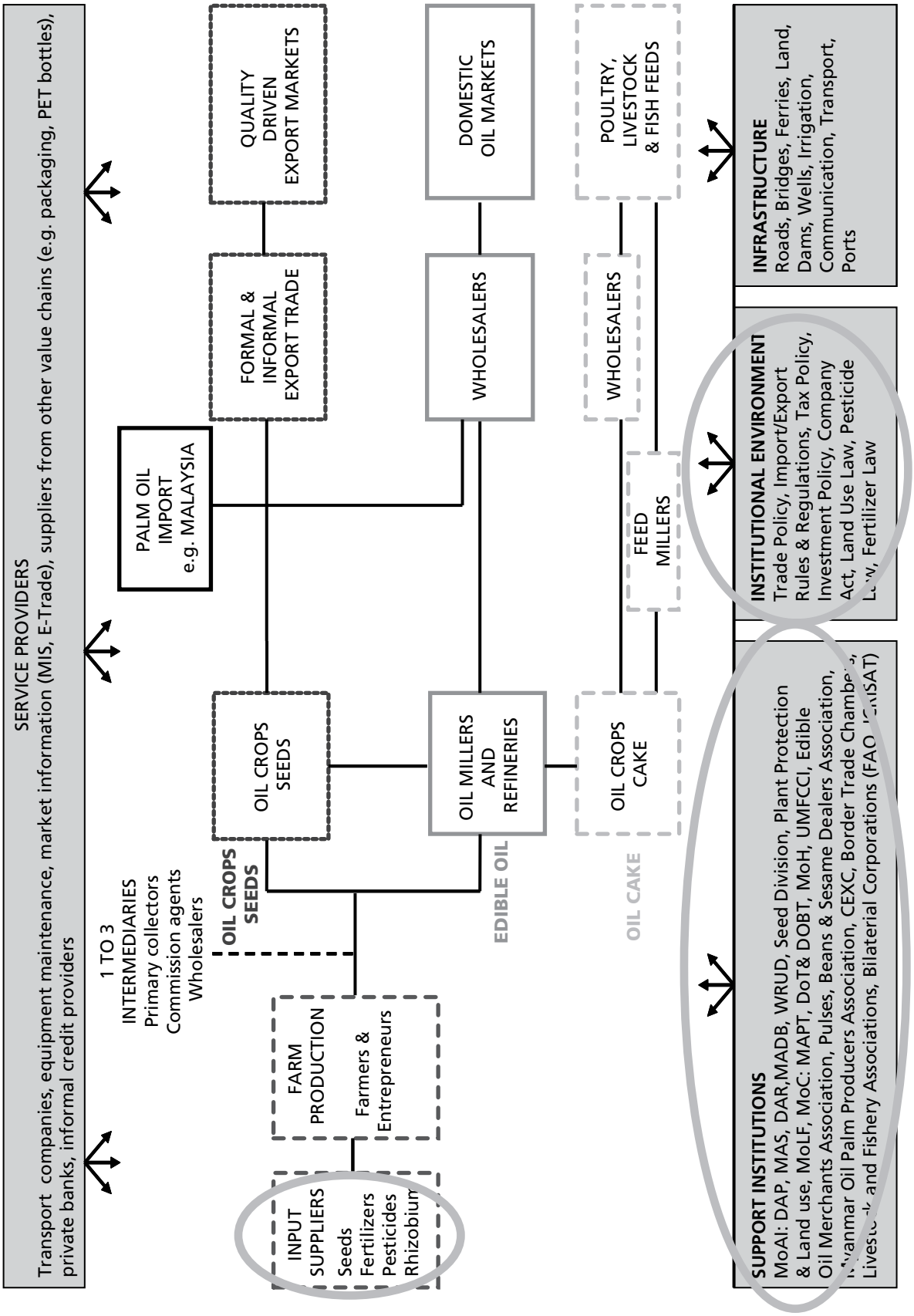
The study did not identify system nods and geographical concentration points of leverage in the oil crops sub-sector. The CDZ potential for increasing oil crops productivity and output appears limited whereas in other agro-ecological zones, higher potential may exists (e.g. Shan hills and Delta region).

The oil crops sub-sector in Myanmar is characterised by an astonishing efficiency in areas where the oil crops sub-sector participants are allowed to operate freely. This efficiency originates from the outstanding entrepreneurship displayed by the Myanmar private sector. Yet, policy constraints at all levels of the chain, poor infrastructures and support services are thwarting the sub-sector by impeding efficient use of agricultural and human resources and excessively increasing transactions costs along the chain. These constraints constitute the main points of leverage on the oil crops sub-sector in Myanmar which need to be addressed. Figure 44 highlights the points of leverage on a generic oil crop chain map.

Policy reforms in the oil crops sub-sector should aim at 'increasing national welfare' by increasing the profitability of private sector operations along the chain as opposed to 'self-sufficiency' and 'price control' policies. Policy reforms would have a large impact and are the most cost effective from all interventions recommended. The analysis of the oil crops sub-sector essentially demonstrated that cost of production at various level of the chain is low and competitive, but the sub-sector is crippled by very high transaction costs and poor technology resulting from ill suited policies.

19 Miles, T. 2000. *Agribusiness sub-sector assessment*, World Bank, Washington D.C.

Figure 44: Main leverage points on the oil crops chain



17.2 Policy recommendations

The two main policy objectives in Myanmar, namely self-sufficiency and edible oil price control are self-defeating. Myanmar has adopted restrictive policies on import and export of oilseeds and oilseeds products in a bid to achieve self-sufficiency objectives, but relatively open policies to the import of large quantities of cheap palm oil in an attempt to maintain palm oil prices at low level on the domestic retail market. As a result, Myanmar is increasingly dependant on palm oil import while domestic production is stagnating. In this context, the self-sufficiency policy objective will remain elusive and it is anticipated that the uncovered edible oil deficit will continue to increase by approximately 100 000 tonnes in 2015/16.

The price control mechanisms aiming at the lowest possible price of edible oil on the domestic market need to be questioned. A more efficient price control mechanism can be achieved through the application of an import duty rather than direct price control. The government should engage in a constructive dialogue between all actors of the oil crops sub-sector, from producers to consumers to determine a 'desirable' price level for edible oil on the domestic market. A consensus between various interests, namely the edible oil crops producers, processors, consumers, oil cake users and the SPDC needs to be achieved. 'Desirable' price on the domestic market would probably be at a higher level than the current level. Based on the 'desirable' edible oil price level, an import duty can be calculated. To facilitate this process, a study on the impact of possible edible oil price policy could be undertaken.

The following policy changes on the oil crops sub-sector are required:

- Abandon self-sufficiency policy in the oil crops sub-sector.
- Instead, focus on promoting opportunities with better development potential.
- Introduce an import duty tax to the palm oil group (including sterin) in order to stabilize prices at a desired level and remove all other price control mechanisms on the domestic market.
- Define desirable edible oil prices on the domestic market and consequently define adequate import duty level by convening a national workshop with all stakeholders of the oil crops sub-sector.
- Remove restrictions on palm oil imports (quantities imported and private sector involvement) to ensure regular supply.
- Authorize the import of CPO to promote smooth development of the edible oil processing industry and create employment.
- Authorize the import of soybean and soybean cake (and other oil crops seeds and cakes) and allow for a 'special treatment' of formal soybean and soybean cake imports by the private sector outside export earnings in order to ensure that import transaction by the private sector can take place and oil cake shortage is adequately addressed.

- Remove restrictive, centrally directed, crop production strategies on irrigated *le mye* which prevents farmers from responding to market opportunities and exporters to develop contract farming on productive lands.

- Regulate irrigation scheme for a fair distribution of available irrigation water to WAUs.

- Facilitate investments and technology transfer on oil palm production in Tanintharyi as the sole potential source of low cost edible oil production in Myanmar.

- Facilitate technology transfer through technical assistance, subsidised investment of agro-processing plants for the private sector and facilitate joint ventures with foreign companies.

The general operating environment required policy reforms as a prerequisite to enhance competitiveness of the oil crops sub-sector:

- Allow tradable land ownership rights which would allow farmers to capture the value of land improvement and provide security for borrowing. Agriculture land to be used as collateral for rural credit shall be authorised.

- Reform the financial sector to end the current acute shortage of rural finance. Necessary reforms in the financial sector are beyond the scope of MoAI but includes the following:
  - Elimination of prohibition of private banks to lend to the agriculture sector.
  - Elimination of interest rate subsidies.
  - Allow expansion of best practices in microfinance.
  - Elimination of differential exchange rates.

- Reform external trade policies by reducing or eliminating export tax and the export earnings rule which severely reduces competitiveness and are strong disincentives to technology transfer.

- Finalize the legal framework on fertilizer and systematically implement quality control on fertilizers and pesticides.

- Facilitate the import of fertilizers by allowing for a 'special treatment' of formal fertilizers import' by the private sector outside export earnings.

- Liberalize the communication sector, particularly mobile phones, which is an efficient communication tool to assist trade activities.

- Increase investments to further develop rural road network and seaport infrastructures.

17.3 Strategy recommendations

The global oil market is dominated by soybean and palm oils which both account for 51 percent of the global supply (26 and 25 percent respectively). Soybean competitiveness comes

from its dual purpose as cake and oil whereas, oil palm competitiveness comes from its highest edible oil productivity per unit of area compared to all other oil crops. With the emergence of these two crops over the past three decades on the international market, other oil crops which are cultivated in Myanmar such as sesame and groundnuts have lost their competitive edge. Global market for these oil crops have evolved toward higher value products such as edible/ snack groundnut, processed white and black sesame or high quality oil such as cold pressed sesame oil. These trends were accompanied by agroprocessing developments that add value to these commodities. The People's Republic of China seems to be the main beneficiary of these global oil crops trends. The Myanmar oil crops sub-sector benefits from fast growing market opportunities, particularly for the following commodities:

- Exports of high quality cold pressed sesame oil.
- Export of edible/snack groundnut.
- Exports of processed sesame seeds.
- Import of soybean and particularly soybean cake for livestock and fishery industries.

These opportunities have vast development potential, as Myanmar is the third producer in the world for sesame and sixth producer in the world for groundnut. Myanmar benefits from abundant land and water resources, exceptional genetic diversity in indigenous sesame varieties and good assortment of groundnut varieties.

Perhaps the foremost comparative advantage of Myanmar is its absolutely outstanding social capital in the form of highly entrepreneurial farmers, processors and traders and a disciplined, skilful and hardworking labour force. However, human capital for higher level graduates has been deteriorating over the past years, resulting in a situation where replacement of senior level managers in public offices is becoming problematic.

Moreover, on the international market Myanmar is competing with other countries on palm oil while the threat of new entrants is substantial, particularly in the sesame sector. Ever changing trade policies are accentuating this threat as it is difficult to recapture market shares lost on the international market as a result of restrictive trade policies.

Recommended development strategies to the oil crops sub-sector include the following:

- Recognize that the foremost comparative advantage of Myanmar is its social capital in the form of skilful and entrepreneurial farmers, processors and traders. Focus should be placed on easing constraints which are limiting Myanmar farmers and entrepreneurs to embrace higher productivity.
- Implement the FFS approach to extension as planned in the OPEC funded oil crops development project. 'Ease farmers' constraints' rather than 'educate farmers'.
- Fully recognize farmers' entrepreneurial qualities in the oil crops sector by facilitating the creation of genuine farmers' interest groups at village level through a bottom up process.

- Exploit Myanmar vast land and water resources to produce high value oil crops and built on the prominent position Myanmar holds in sesame and groundnut production to penetrate international market with high quality/high value processed products.

- Adjust development strategies considering international market opportunities and realities. For instance do not attempt to achieve self-sufficiency in edible oils (groundnut and sesame oils) with oil crops which have lost their competitive edge on the international market.

- Identify several commodities with the best development potential (e.g. processed sesame and groundnut) and concentrate efforts on these promising options.

- Facilitate technology transfer by the private sector.

- Reduce threat to the oil crops sub-sector, in particular the threat of new entrants on the international market and ever changing policies, by building consensus through a consultative process of policy formulation.

- Capitalize on research and experiences from regions with similar agro-ecological conditions, particularly in the People's Republic of China and Thailand.

An angular stone to achieve this strategic approach is the creation of an Oil Crops Promotion Committee[20] representing all the participants of the sub-sector, as discussed in Section 15.

17.4 PROPOSED INTERVENTIONS

While adequate policy reforms would have immense impact on the efficiency of the oil crop sub-sector, the sector also requires practical interventions. Recommended intervention can take advantage of significant resources allocated to the sector through the OPEC funded oil crops development project and by the MoAI, as oil crops have recently been given the highest priority. Yet, given that the findings of the oil crops sub-sector analysis substantially differ from the original oil crop development project design, a revision of the project output is advised.

The main bottleneck along the oil crops chain is at production level and specifically the supply of farm input. Interventions at production level needs to be given the highest priority. Interventions at the edible oil processing level are considered as the lowest priority, whereas interventions at marketing, trade standards, quality control and food safety need to be given high priorities.

20 Or 'Oil Crops Council'.

Recommendations at production level

As stated in Chapter 13, the creation of genuine farmers' interest groups is a prerequisite to addressing farmers' constraints. This is a top priority to the oil crops sub-sector. Note that farmers' marketing groups/cooperatives have reportedly failed in Myanmar, essentially because farmers have options to market their products amongst numerous competing traders (see section 8.2 on marking channels). As a result, farmers capture a reasonable proportion of the market price. The essence of farmers' interest groups here is different in the sense that it responds to an existing need for rural credit and farming input. (See the list in Chapter 13 which gives specific interventions to ease farmers' constraints.)

As discussed and listed in Section 9.5, the demonstration component of the OPEC project needs to implement a FFS approach as planned in the project document. The FFS school approach calls for a bottom-up planning process to extension service. Flexibility is essential to allow trials and demonstrations that respond to farmers' needs. There are some trial and demonstration patterns that could be a starting point for further development as listed in Section 9.5.

Trials and demonstration options should identify best potential areas for yield improvement, which may be outside of the CDZ.

Recommendations at processing level

The following proposed interventions at production, processing, marketing, trade standards and quality control, and food safety are reviewed in Chapter 13.

The edible oil processing industry in Myanmar is characterized by an oversized oilseed processing capacity on both expeller and solvent technologies. Because of this oversized capacity and import of cheap palm oil from abroad, competition between oil millers is strife. To survive, many actors are resorting to unethical edible oil adulteration practices. Solvent extraction technology is not competitive in Myanmar mainly because of market distortion on energy, unavailability of Hexane, trade policies, insufficient supply of raw material, high investment costs and a limited domestic market for RDB oils.

The current edible oil processing capacity of oil seeds is sufficient for the current production as well as foreseen production in 2015/16. Additional investments by both the private and the public sectors are not required. Yet, expeller technology is sub-optimal and crushing efficiency and quality of edible oil produced can improve. Technical assistance to the private sector is required to address constraints on expeller technology:

- Priorities should be given to oil millers striving for quality and having developed their own brands.

- Provide technical assistance to equipment manufacturers.

- Access MCSE owned or formerly owned modern expeller plants as a model for both millers and equipment manufacturers.

- Provide technical assistance in pre-treatment and conditioning of oil seeds for crushing (e.g. dryers).

In contrast, the processing capacity for palm oil is undersized, particularly in view of the anticipated FFB production in five to seven years from now. Investment in palm oil processing facilities is required and should be led by the private sector. The public sector can facilitate such investment by:

- Extending the current sub-sector analysis to oil palm as per time constraints, the production and processing facilities could not be visited.

- Identifying a technical assistance package to support production and processing in the oil palm sector, capitalizing on past technical assistance provided by FAO.

- Providing technical assistance to the private sector and leverage private sector financial resources. Technical assistance should be provided in priority to private actors willing to invest in new plants or upgrade existing ones.

On solvent plant technology, private and public sectors are discouraged to invest, unless:

- Soybean production has dramatically increased, which is anticipated to take a decade given the seed supply situation.

- Import of soybean from international markets is authorized and facilitated (see section 11.7).

- Energy price structure reflects actual market price.

- Hexane is made available to the private sector at international market price.

Yet, the public sector may provide technical assistance to improve efficiency of existing solvent plants. Required technical expertise for maintenance and upgrade of installed solvent plants does not exist in Myanmar. These plants are beneficial to the oil crops and livestock sectors as once imports of soybean will be authorized in Myanmar, only these plants can ensure a start-up on soybean oil and soybean cake production.

Most oil refineries are using chemical refinery processes that are old and unsafe both for factory workers and for the environment. The private sector has invested in a new world class refinery plant, but because of prevailing trade policies, this plant runs at a fraction of its capacity. Priorities for the public sector in the edible oil refinery sector include the following:

- Authorize the import of CPO in order to promote the development of modern refinery capacity and create employment.

- Close unsafe chemical edible oil refineries. When possible upgrade these factories leveraging private sector financial resources.

Recommendations at marketing level

Oil crops marketing and distribution within Myanmar is characterised by an astonishing effectiveness which derives from the outstanding entrepreneurship displayed by the Myanmar private sector. The functioning of CEXCs and a private market information system are illustrations of this dynamism. Wherever the private sector was left to operate freely, marketing of oil crops proves highly effective, given the general operating environment. Another illustration of this dynamism is the rapid adaptation of trade flows over the past four to five years which have affected mainly groundnut (edible/snack trade to Thailand), sesame (increased exports through Muse and Yangon) and oil cakes.

As discussed in section 11.2, none of the existing market information is made available to farmers in rural areas. MIS is not in a position to broadcast market data through radio and E-Trade uses communication means (SMS and internet) which are expensive in urban areas (mobile phone) and simply not available in rural areas.

Other limitations of the current market information system is that international market intelligence remains limited to a few commodities for which export is well established. Market research on other promising commodities such as processed sesame seed, sesame oil, edible/snack groundnut would provide useful information to traders and support business development.

Priority interventions on the oil crops sub-sector at marketing level include the following:

- Provide technical support to the private sector to pilot dissemination of market data through automated phone services.

- Improve export earnings and global market penetration through:
  - Support traders with market research and development on oil crops in Asia: research should be transaction oriented and should therefore be conducted along with Myanmar traders. The focus is on identification of opportunities through direct contacts between Myanmar and foreign traders
  - Support Myanmar traders in penetrating new markets through interventions that improve access to international markets and potential clients. Myanmar exporters should regularly attend international trade fairs, particularly in Southeast Asia, to enhance market learning. Trade fairs are an important part of benchmarking competition and making new buyer contacts.
  - Enable the most dynamic Myanmar traders to effectively utilize internet based trade and marketing platforms by developing targeted business support services in this area.
  - With all stakeholders of the oil crops sub-sector trade, develop brands for Myanmar oil crops products (sesame products in particular).

Recommendations on trade standards, quality control and food safety

Through CEXCs, Myanmar has set some level of standardization of marketed agricultural commodities which are sufficient for the domestic market. Similarly, the prevailing variety of weight

and measures units used in marketing oil crops has not been a major drawback to the operation of the domestic agricultural marketing system as most actors along the chain have become familiar to diversity of units. Yet, maintaining the ability of Myanmar to retain and further develop quality export markets, it is critical to harmonize trade standards and measures. There are substantial costs associated to the standardization of measures (e.g. replacement of all measuring implements), but the longer Myanmar waits to adjust to international standards, the higher the cost.

Myanmar is equipped with few laboratories on food stuffs (MAPT and FDA) that can conduct analysis on oil crops and edible oils. The MoLF is equipped to conduct nutritional analysis on oil cakes. Yet, despite the existence of laboratories, systematic food safety controls are not implemented, leaving room for unethical practices of edible oil adulteration.

Perhaps, the major food safety concern is the use of recycled metallic drums which have transported chemical, engine oils or fuel to store edible oils.

Priority interventions include the following:

- Harmonize trade standards and measures to the international system.
- Evaluate existing laboratories and need for upgrade to satisfy food safety control requirements in the edible oil crops sub-sector.
- Implement systematic food safety controls on oil crops, edible oils and oil cakes in all markets of Myanmar.
- Ban of recycled metallic drums to store and transport edible oils.
- Replace recycled metallic drums with clearly identifiable containers such as plastic drums.
- Provide training to the private sector and international certification standards.

Recommendations on institutional development

The current statistics are not reflecting realities in the oil-crops sub-sector and as a result the formulation of policies and the planning of support programmes is severely constrained. The major limitations in the statistics are related to crop output estimations and the inclusion of formal and informal trade data.

The most urgent capacity building needs have been identified in the following areas:

- Strengthen the capacity of the MoAI to produce accurate statistics for oil-crops development planning. This includes DAP, MAS, and SLRD.
- Strengthen the capacity of the MoAI department, relevant associations and the proposed 'Oil Crops Promotion Committee' to formulate policies in the oil crops sub-sector.

The establishment of the MOCPC requires financial support for the first three years through allocation of responsibilities on the OPEC project implementation in areas which require PPPs. Also, the proposed market research and development activities on the international market could be typically implemented by the committee. The committee may charge its members an annual fee to ensure institutional sustainability. MOCPC could be anchored to the UMFCCI, but for a higher operational independence and provided the private sector demonstrates interest in such institution, MOCPC may be created as an independent institution[21]. MOCPC would also require capacity building in policy formulation.

Recommendations on further studies

Further studies are required to complement the findings. Issues to be addressed are:

- Include oil palm in this oil crops sub-sector analysis by visiting production and processing areas in view of better assessing opportunities and constraints with this crop and producing finer forecasts on future domestic edible supply scenarios.

- Conduct a crop area and production statistical survey to provide a sound basis on oil crops production statistics, in collaboration with the SLRD of the MoAI.

- Conduct farming system analysis in various agro-ecological zones to further develop potential cropping patterns and oil crops expansion opportunities in new areas for on-farm trials and demonstrations.

- Conduct market researches and feasibility studies for the development of the identified 'actionable' opportunities by the study, with focus on Southeast Asian markets.

- Conduct feasibility studies for the establishment of processing plants for prepared edible groundnut, processed sesame and cold pressed sesame oils with the private sector.

- Conduct a feasibility study for upgrading and expending oil palm processing capacity in the Tanintharyi Division.

- Conduct a consumption survey to better understand the domestic market and regional differences.

21 Perhaps in a similar fashion as the CEXCs.

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ANNEXES

Annex I
Procedures for export/import

PROCEDURES FOR EXPORT CLEARANCE[1]

Preparation of documents and submitting

1. The exporter or his agent must fill Customs Declaration Form 2 (CUSDEC-2), which is also known as the Export Clearance Form, completely and correctly. The required particulars for customs purposes and foreign trade data must be typewritten. Pass-writer's service is arranged to help the exporter to fill in the declaration. Other documents to be submitted with the Export Declaration Form are as follows:
   - Export license or permit.
   - Sales contract.
   - Invoice.
   - Packing list.
   - Bank document, such as Letter of Credit or Exemption Certificate for Foreign Exchange or Payment Advice/Bank Memorandum endorsed with ITTP No.
   - Shipping Instruction or Booking Note.
   - Other documents that may be required by the existing laws and regulations.

   If necessary, sample must be called for and the exporter will fulfil the required measure.

Central Registry

2. After payment of port dues is made and document preparation is completed, Export Declaration and supporting documents must be submitted to the Central Registry where the receiving clerk will stamp the central registration number, date and time of receipt. Then the documents are sent to the Export Section.

Export Section

3. The Export Section will check the completion of documents and its declaration and then make the required noting.

Export Appraising Unit

4. After noting has been made, the Export Declaration Form and attached documents are forwarded to the Export Appraising Unit where the assessing officers, and in charge of this Unit, will check and scrutinize whether the form with documents are complete, whether the shipment is consistent with the Export Control Order issued by the MoC, and other existing laws and regulations concerned. If found in order, appraisement and assessment will be made. Valuation for export is based on FOB price mentioned on export license/permit.

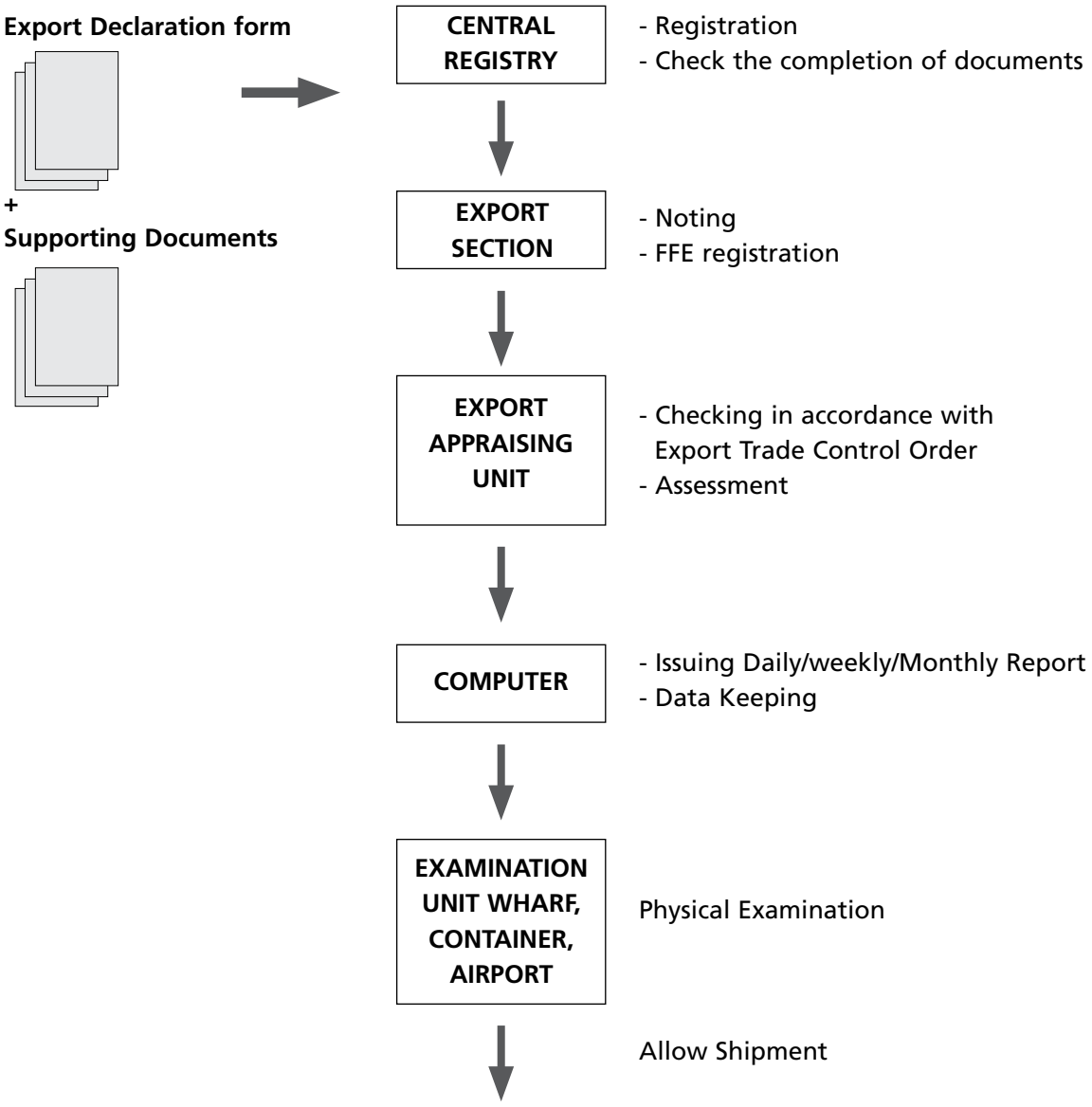
1 Source : E-trade and Ministry of Commerce.

5. At this time no export duty is levied on all of the exported commodity. Then the declaration and documents are returned to the Export Section to register and stamp the Free Foreign Exchange No. (FFE No.).

Export Examination Unit at Wharf/container terminal/airport

6. At this point, the Export Declaration is sent to the Export Examination Unit. This Unit will examine the goods in compliance with order passed down by the Export Assessing Officer, verify the relevant documents and sample (if any). If found correct the examined packages or containers are sealed and shipment is allowed.

Figure 45: Export procedures flow chart



Source: Ministry of Commerce

PROCEDURES FOR IMPORT CLEARANCE[2]

Preparation of documents and submitting

1. For the clearance of imported goods, the importer or his agent must fill Customs Declaration Form 1 (CUSDEC-1), which is also known as Import Clearance Form, completely and correctly. The required particulars for customs purposes and foreign trade data must be typewritten. Pass-writer's service is arranged to help the importer to fill in the declaration. Other documents to be submitted with the Import Declaration Form are as follows:
   - Original seller's invoice bearing bank stamp or if not bearing bank stamp, FE exemption certificate, commonly known as I.B.R exemption certificate issued by Central Bank, is required.
   - Bill of lading or airway bill.
   - Import permit or licence from the MOC as required in each case.
   - Packing list.
   - Sales contract.
   - Other relevant documents, such as certificates provided by laws and regulations for control measures.

Central Registry

2. After completion of the preparation of documents, the declarant must submit these documents to the Central Registry of Customs. Officers at the Central Registry check the completed documents and the accuracy of declared facts and data. If documents are found in order, the receiving clerk will stamp serial number and receiving date, together with the receiving time on the Import Declaration Form. Then the acknowledgement receipt, stamped with the registration number and date of the Declaration Form, will be returned to the importer or his agent and the declaration will be forwarded to the Import Section.

Import Section

3. At the Import Section, the Import Declaration is checked against the facts mentioned in the manifest for the manifest clearance. If found correct, the declaration is noted and the relevant manifest line number is struck out. After that, Declaration Forms and attached documents are sent to one of the Appraising Groups.

Appraising Group

4. At the Appraising Group, the respective assessing officer will see that the goods are imported in compliance with the existing laws and regulations for import trade control and also check the particulars, including descriptions of commodities, H.S. codes, rates of duties and taxes, quantities and measurements, etc., for purposes of right classification and calculation of duty.

Valuation Unit

5. The appraiser in the Valuation Unit will submit the proposed value for confirmation through the Assistant Director to the Director after checking with the recorded prices, catalogues and wholesale market prices if needed. Then the CUSDEC-1 will be returned to the Appraising Group concerned.

2 Source : E-trade and Ministry of Commerce

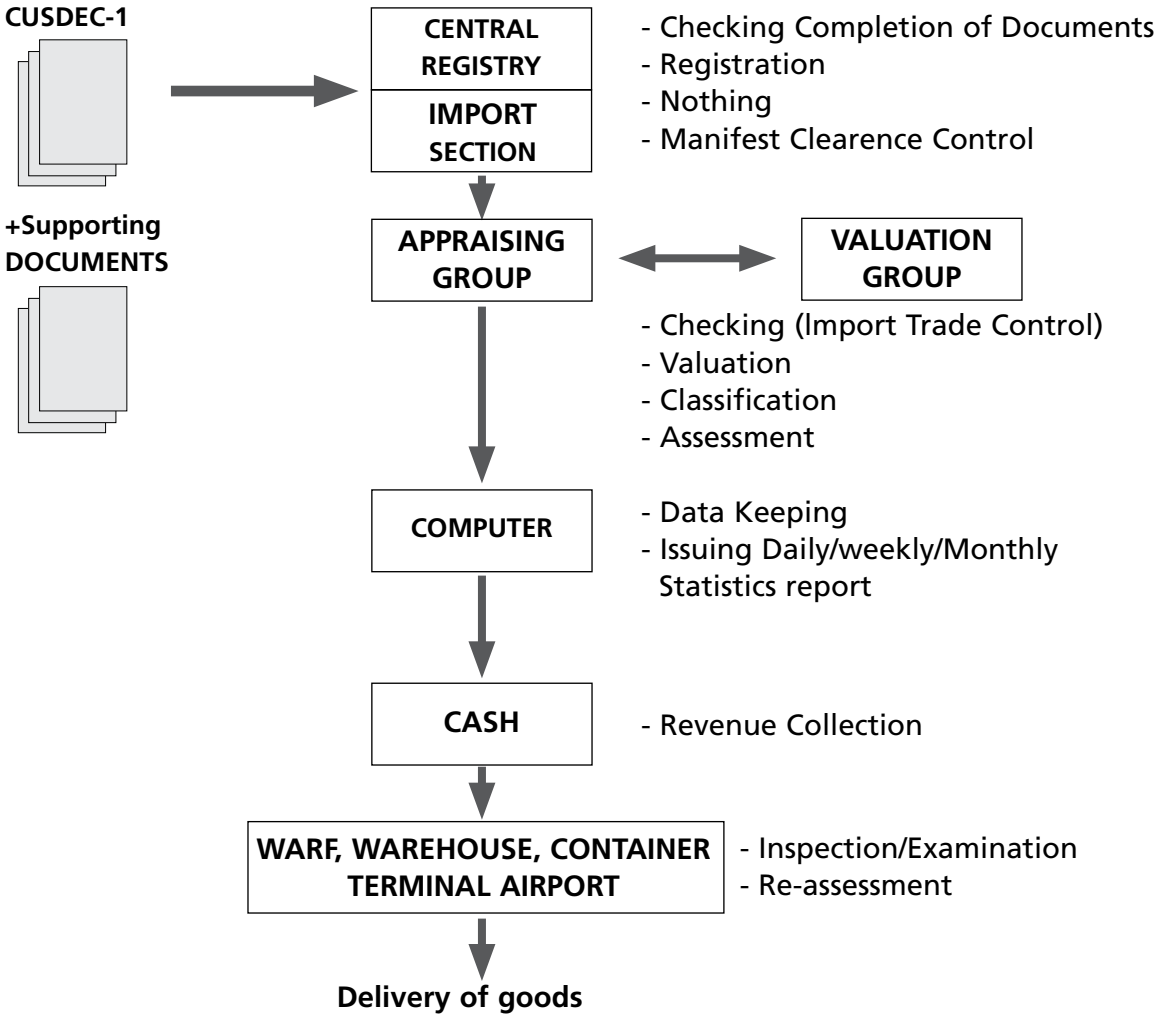
Cash Section

6. After the CUSDEC-1 has been finally disposed of in the Appraising Group and data is entered in the computer for compiling foreign trade statistics, the calculations of the amount of duty and tax will be made in the Cash Section. In the meantime the duty clerk will declare the name of the importer and the registration number and date of the CUSDEC-1, which has been assessed and ready for collection of duty and tax.

Wharf/warehouse/container terminal/airport appraising group

7. After collecting duties and taxes payable, the CUSDEC-1 with the relevant documents are forwarded to the respective Wharf/Container/Airport Appraising Group by correspondence. Meanwhile the importer or his agent needs to take the Delivery Order from the Shipping Agency Department, present the original bill of lading and pay port due. Then the Customs Examination Officers check the commodities against the declaration and relevant documents. If any discrepancy is found on examination, it will lead to the detention or seizure of goods, or reassessment and refund or recovery of duty as the case may be. As a result of the examination, if found correct the delivery of goods will be permitted by customs.

Figure 46: Import procedures flow chart



Source: Ministry of Commerce

Annex II
Ministry of health publication on edible oil quality control

MYANMAR ALIN (NEWLIGHT OF MYANMAR) – MYANMAR NEWSPAPER – 12 JULY 2007

Public notification on edible oil

1. The Ministry of Health controls and evaluates quality and safety of food and implements quality control.

2. Out of a sample of edible oils purchased from Yangon market, the following edible oils are not genuine and are mixed palm oil.

	Types of edible oil	Name and address
1	Aung groundnut oil	No64, (246), under groundfloor, Theingyizay market
2	Nobel brand, groundnut oil	PAHTAMA HTEIK TAN Production Co-operative Ltd. No.A/68,5th Floor, bahosi Housing Complex, Lanmadaw, Townsip, Yangon, Myanmar
3	Lanagar groundnut oil	Magway pure groundnut oil/sesame oil Shop No. (163), B-Block, underground floor, Theingyizay market, D compound
4	No name – groundnut oil	Chanmyae oil shop, Nyaung Bin Lay market
5	No name – groundnut oil	Oakauwmin oil shop, Nyaung Bin Lay market
6	No name – groundnut oil	Oil shop in No.14, LanmadawTownship
7	Aung sesame oil	No. 64, (246), underground, Theingyizay market.
8	Lanagar sesame oil	Magway pure groundnut and sesame oils Shop No. (163), B-Block, underground floor, Theingyizay market, Compound D
9	No name – Sesame oil	Chanmyae oil shop, Nyaung Bin Lay market

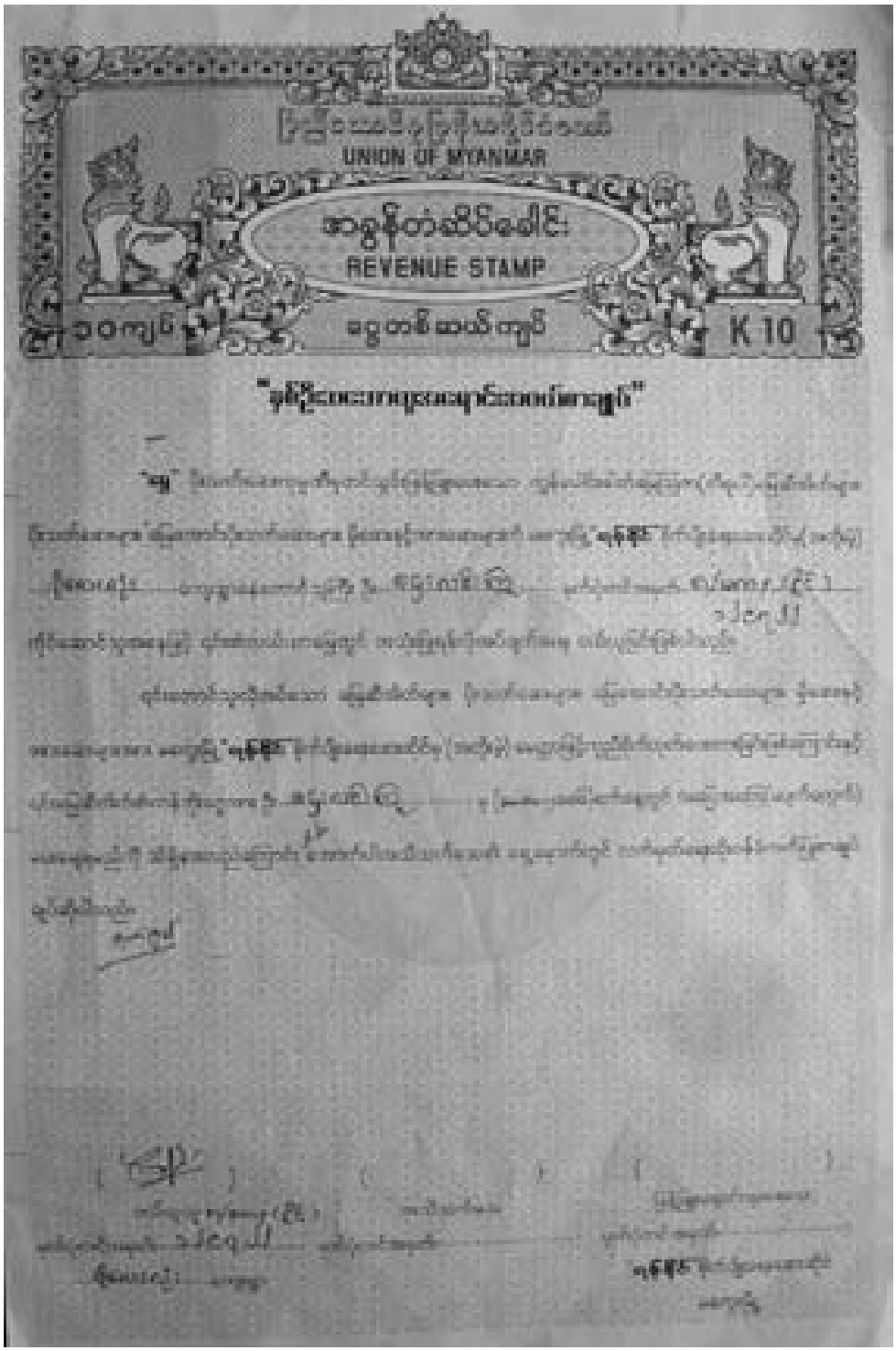
3. The following information must be indicated on edible oils sold: brand, name, type of edible oil, contents, weight, millers' name and address and date of production. The authorities will take necessary legal action, should this notification not be respected.

Annex III
Banned pesticide list, plant protection department

Plant Protection Department, Banned Pesticides List – May 2007

No.	Pesticide	Category	National Legistations	Stockpile
1.	Aldrin	I	banned for all use	nil
2.	Chlordane	I	not used, no registration	no use
3.	Diedrin	I	banned for all use	nil
4.	DDT	I	restricts to malaria control	25% EC 169 litres 75% WP 523 kg
5.	Endrin	I	banned for all use	nil
6.	HCB	F	not used, no registration	no use
7.	Heptachlor	I	not used, no registration	no use
8.	Mirex	I	not used, no registration	no use
9.	Toxaphene	I	banned for all use	no use

Annex IV
Contract format for fertilizer supply to farmers on credit in magway



UNION OF MYNMAR
REVENUE STAMP
(10KYATS STAMP)

AGREEMENT OF BUYING AND SELLING BETWEEN BUYER AND SELLER

Shwe Pesticide Company imports and distributes compound fertilizer, triple super phosphate fertilizer, pesticide, soil pesticide, fungicide and other growth stimulation, which is resold by Yanaing Agricultural input shop fertilizer. From this shop, U Htay Lin Kyu, Pholaylone Village, National Registration No. 8/Ma Ka Na (Naing) 129722 purchased fertilizer (without interest cost) to use on his crop, based on requirement.

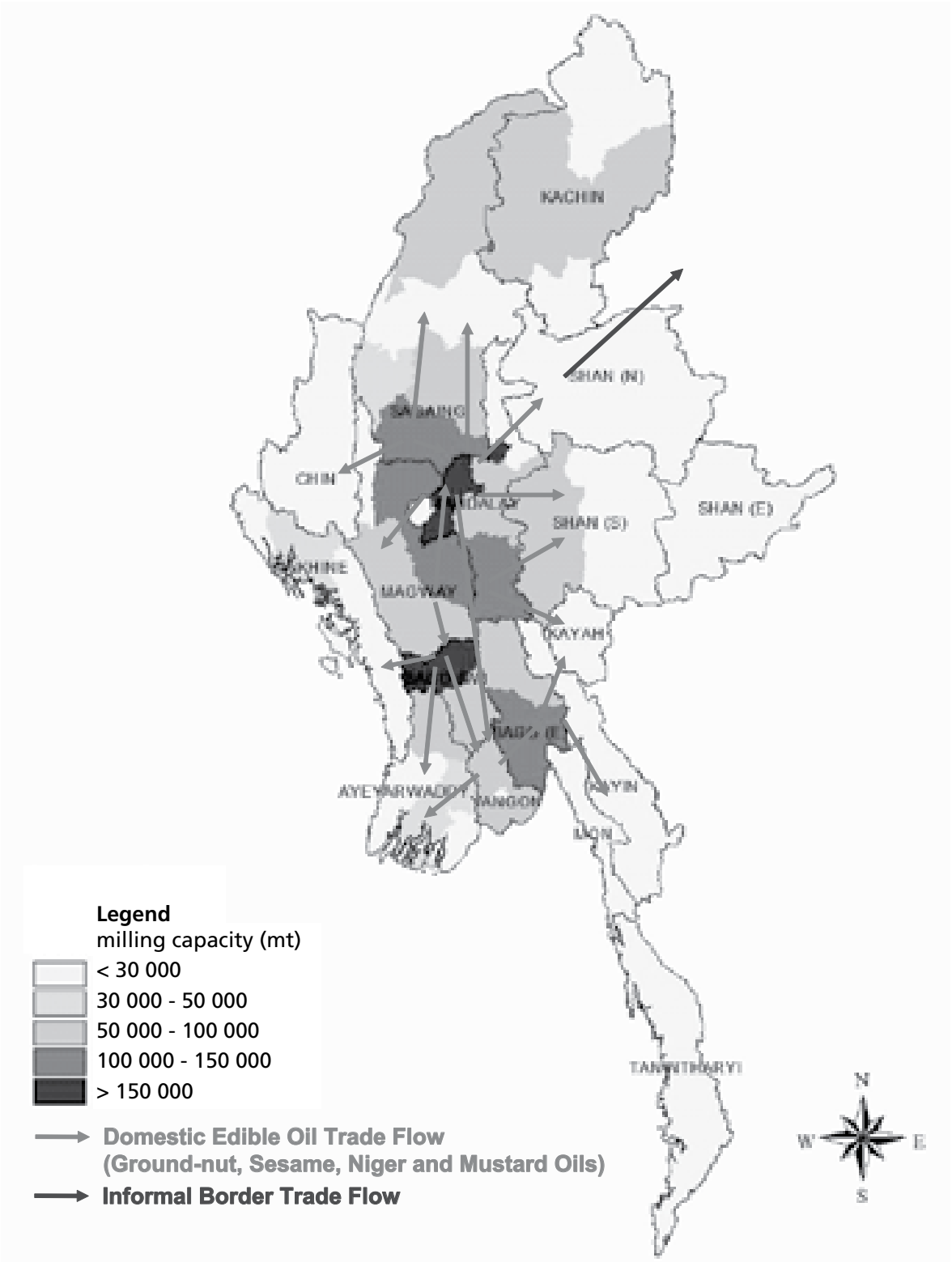
For these requirements, such as fertilizer bags, pesticides, soil pest pesticide, fungicide and other regulator chemicals, are provided by Yanaing Agricultural input shop without interest and all selling value of fertilizer must be paid by U Htay Linn Kyu who needs to understand and promises to pay back all value to the seller and signs on the presence of these persons.

( )	( )	(Distributor)
Buyer	National Registration	National Registration
National Registration	----------	----------
No.8/Ma Ka Na(Naing) 129722		Yanaing Agricultural
Pholaylone Village		input shop, Magway

***** Note that this agreement is an incomplete draft that was not signed by distributor and third party and does not include quantities and prices.

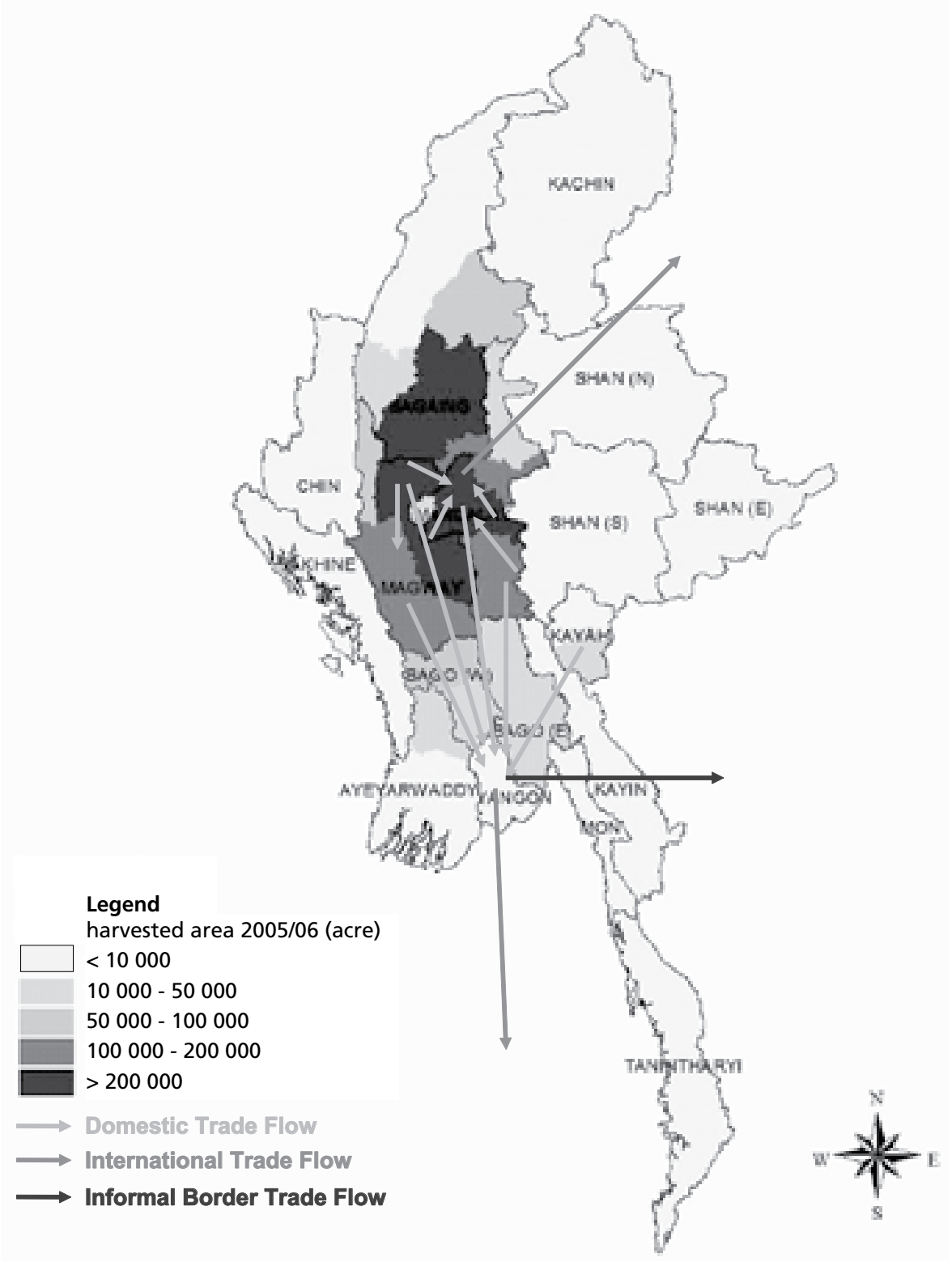
Annex V - Maps

MAP 5 - EXPELLER MILLING CAPACITY AND EDIBLE OIL TRADE FLOW



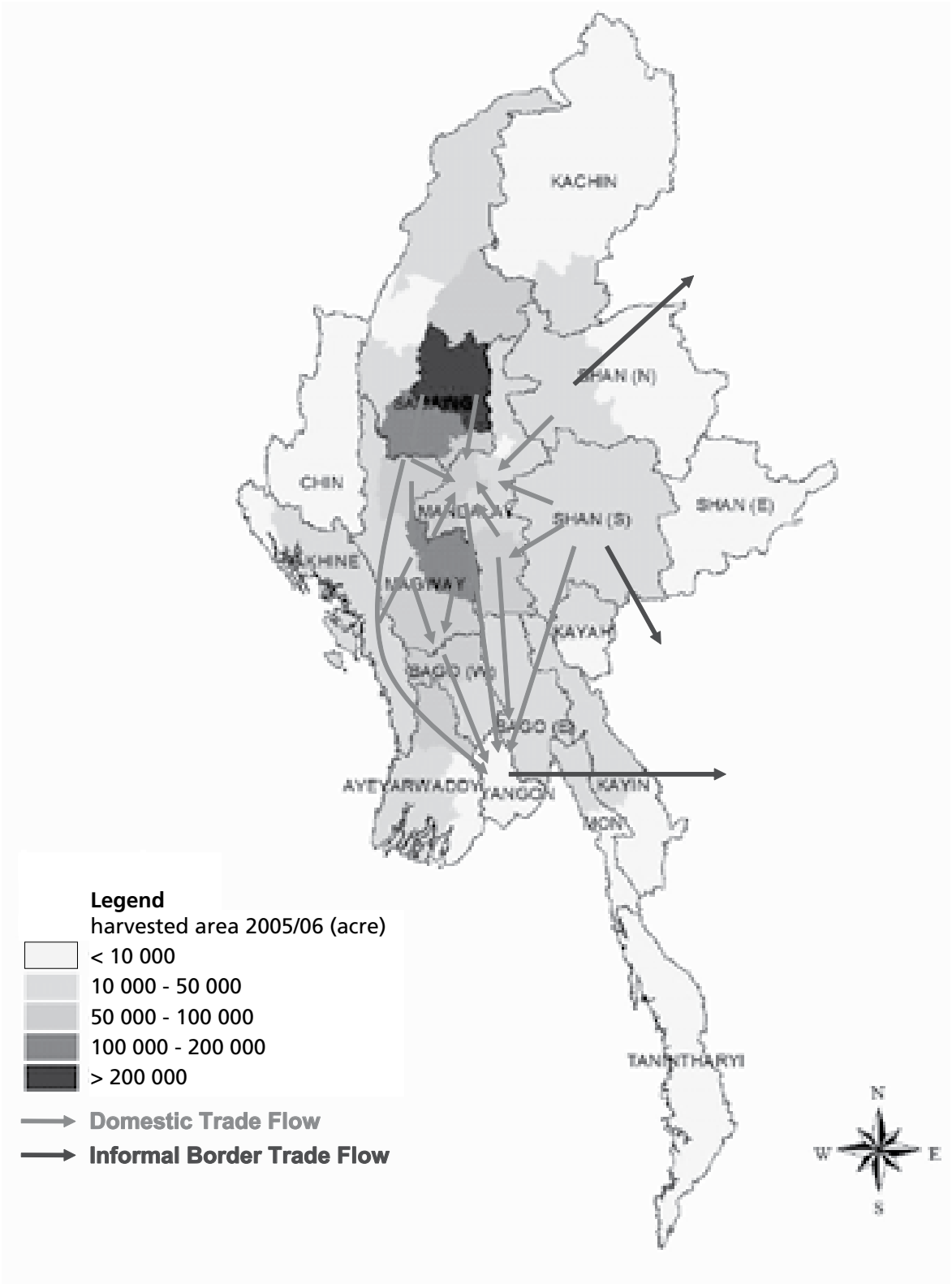
Source: FAO.2004. Myanmar Oilcrops Development Project (FAO/TCP/MYA/2904). Preparation Report. Volume I – Main Report", Investment Centre Division, Rome, & CSO, MoAI, MCSE and study estimates

MAP 6 - SESAME HARVESTED AREA 2005/06 AND TRADE FLOW



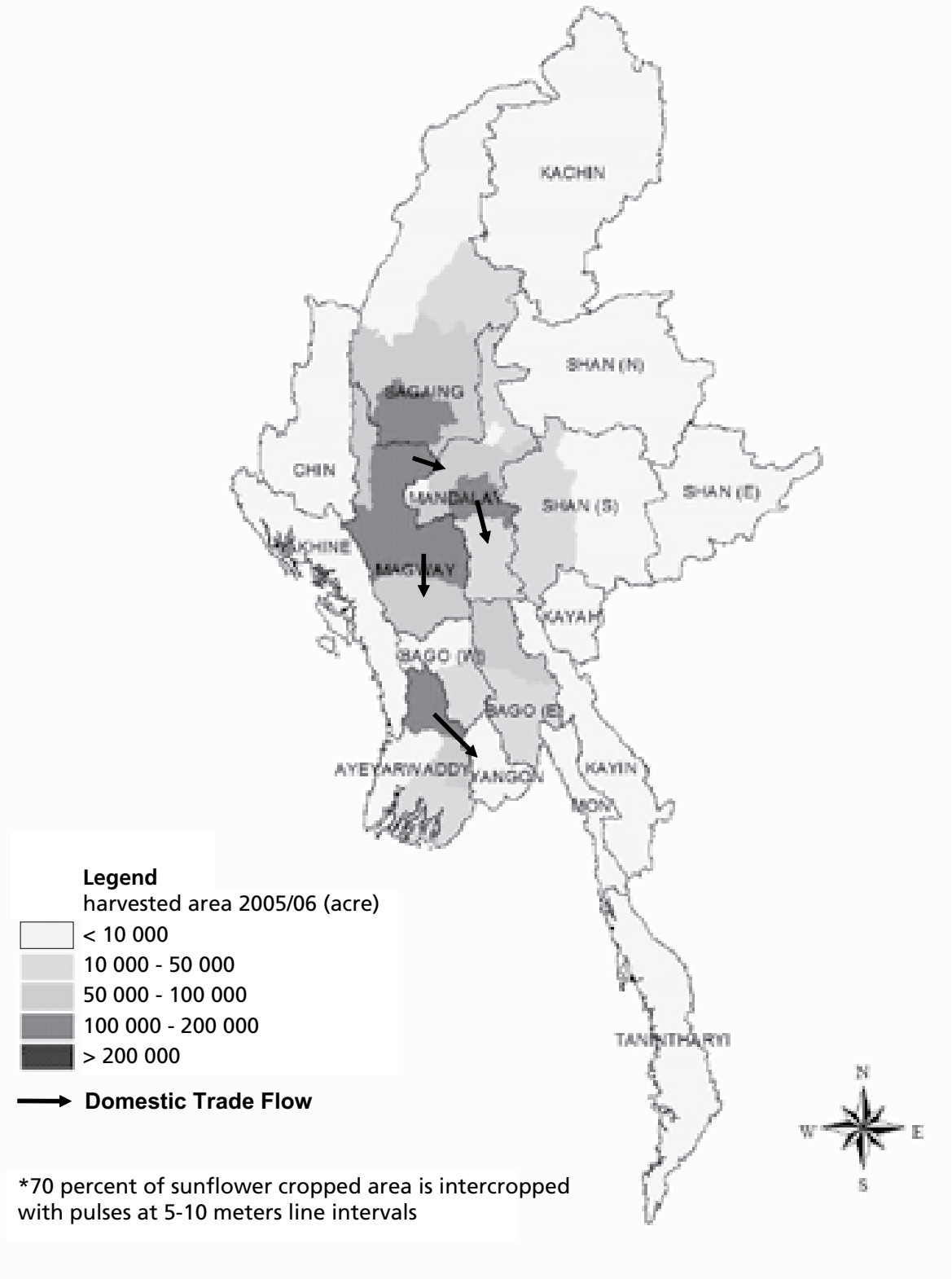
Sources: MAS and study team

MAP 7 - GROUNDNUT HARVESTED AREA 2005/06 AND TRADE FLOW



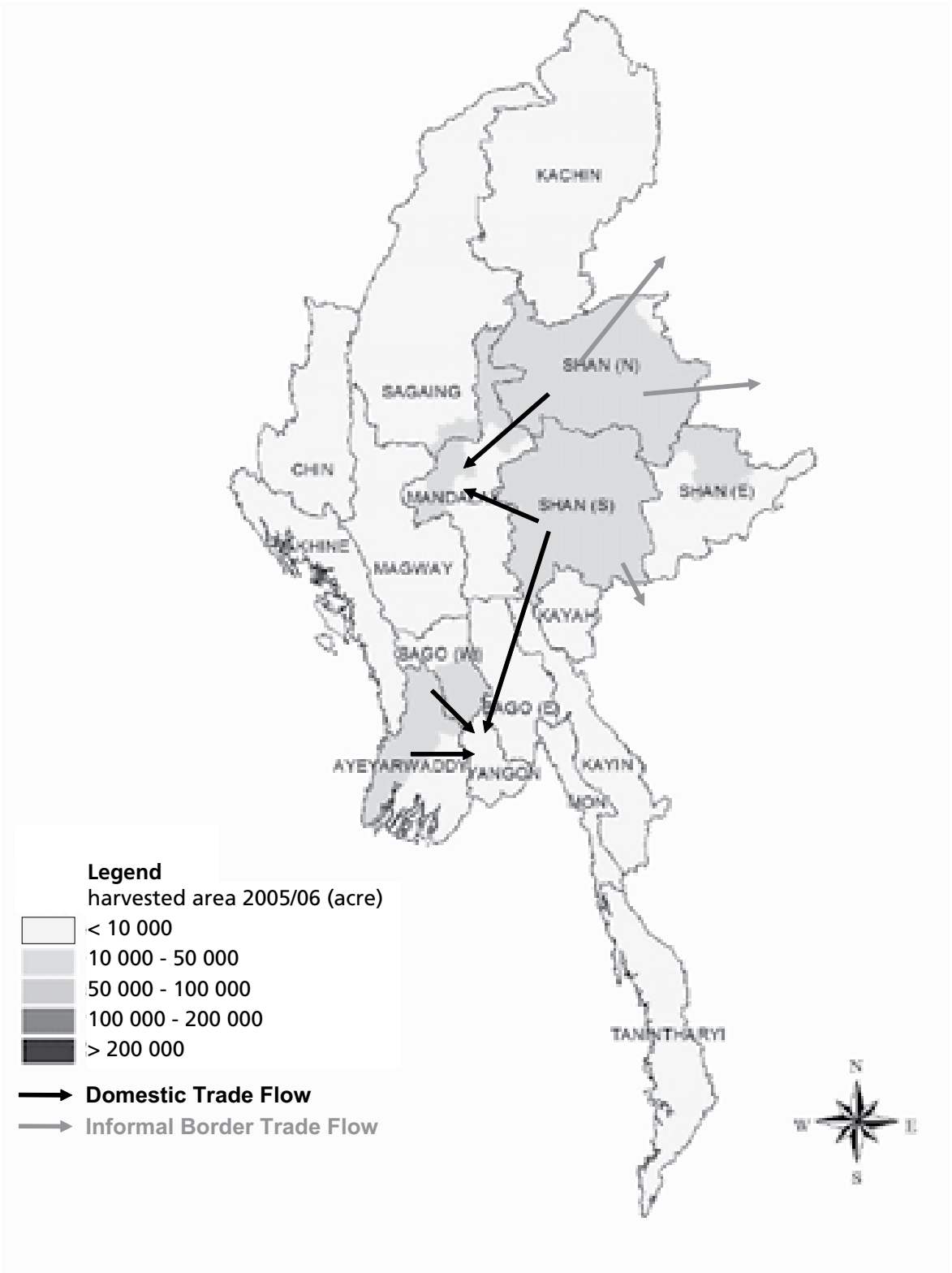
Sources: MAS and study team

MAP 8 - SUNFLOWER HARVESTED AREA 2005/06 AND TRADE FLOW*



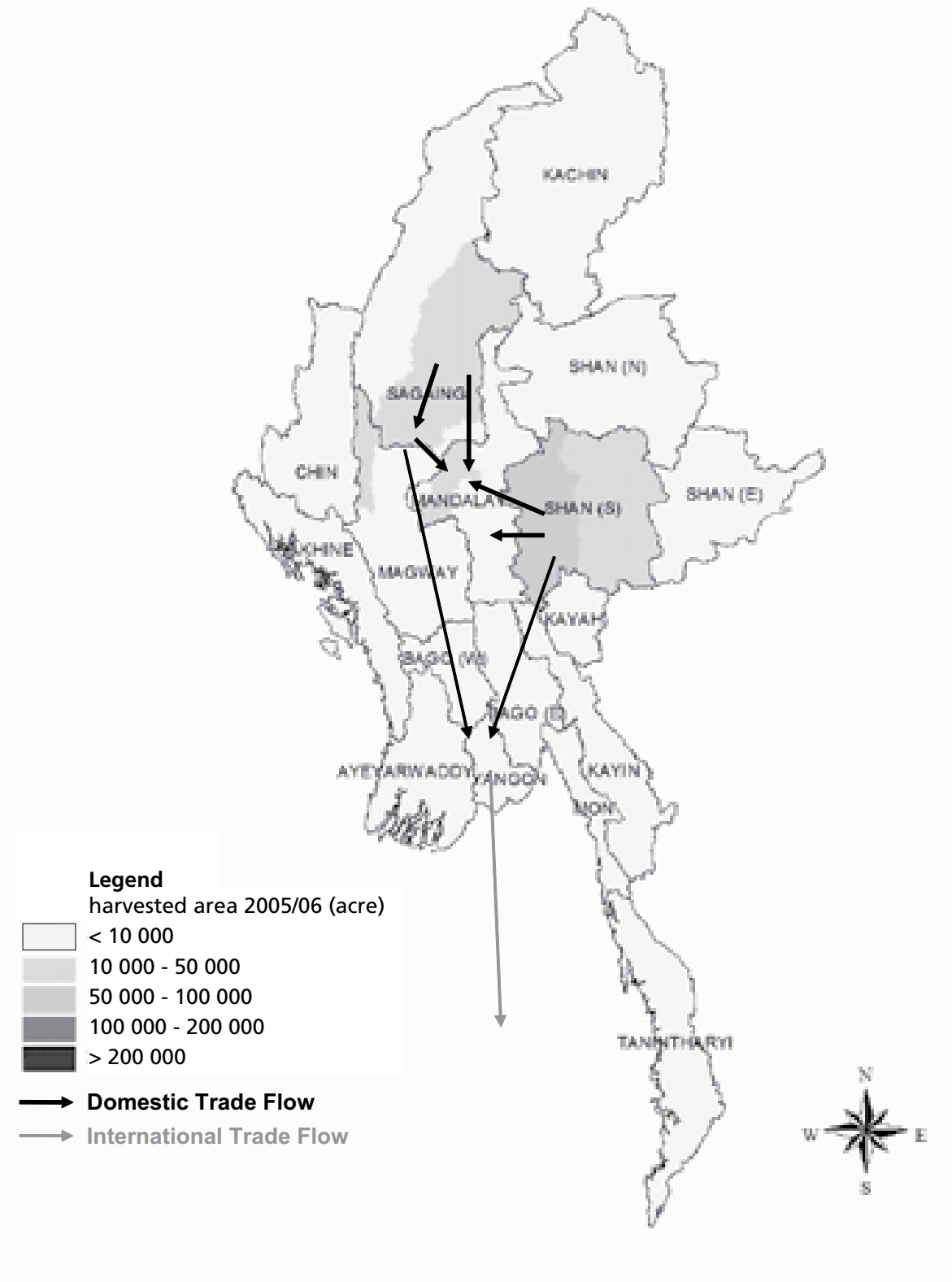
Sources: MAS and study team

MAP 9 - SOYBEAN HARVESTED AREA 2005/06 AND TRADE FLOW



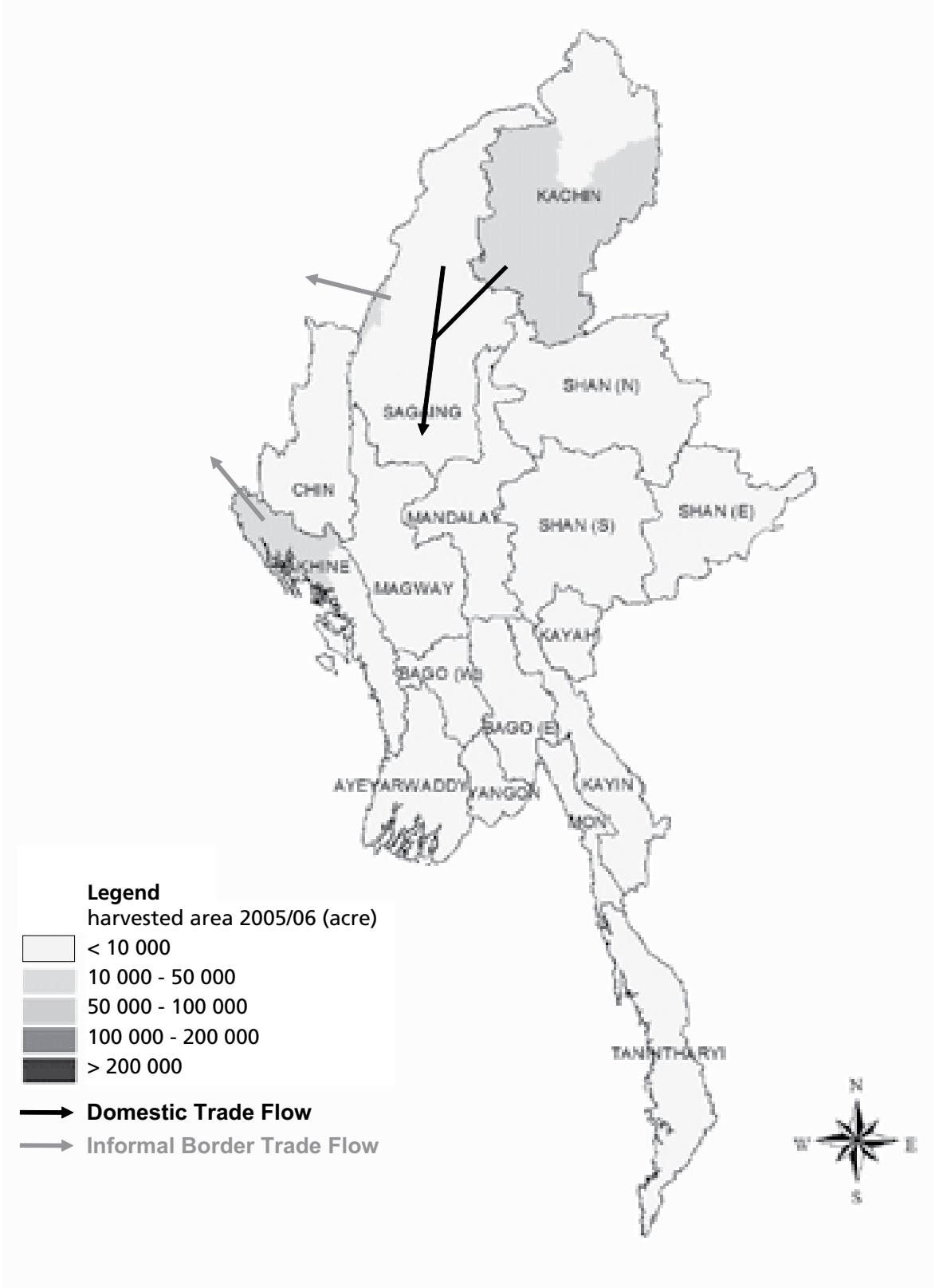
Sources: MAS and study team

MAP 10 - NIGER HARVESTED AREA 2005/06 AND TRADE FLOW



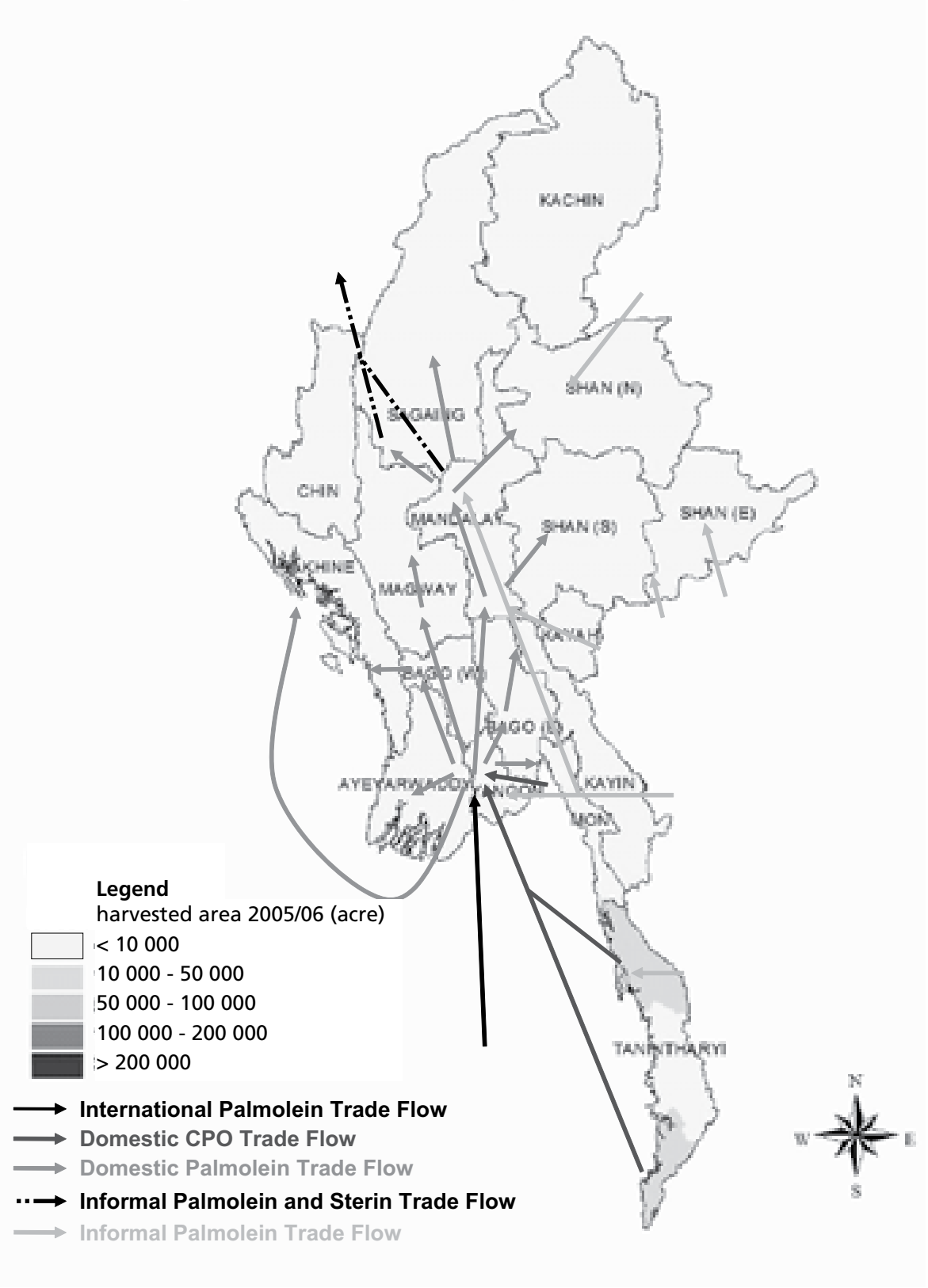
Sources: MAS and study team

MAP 11 - MUSTARD HARVESTED AREA 2005/06 AND TRADE FLOW



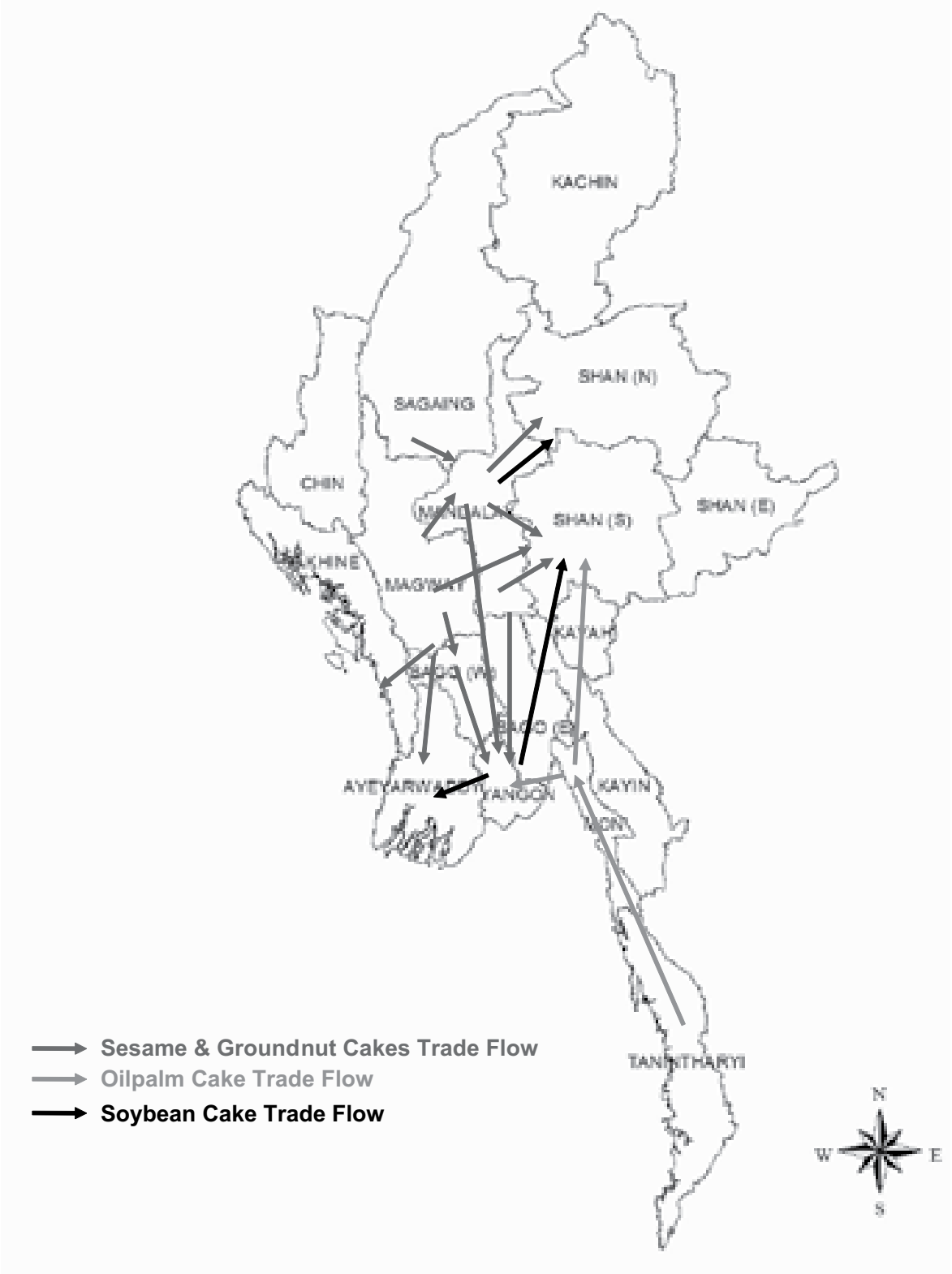
Sources: MAS and study team

MAP 12 - OILPALM HARVESTED AREA 2005/06 AND TRADE FLOW



Sources: MAS and study team

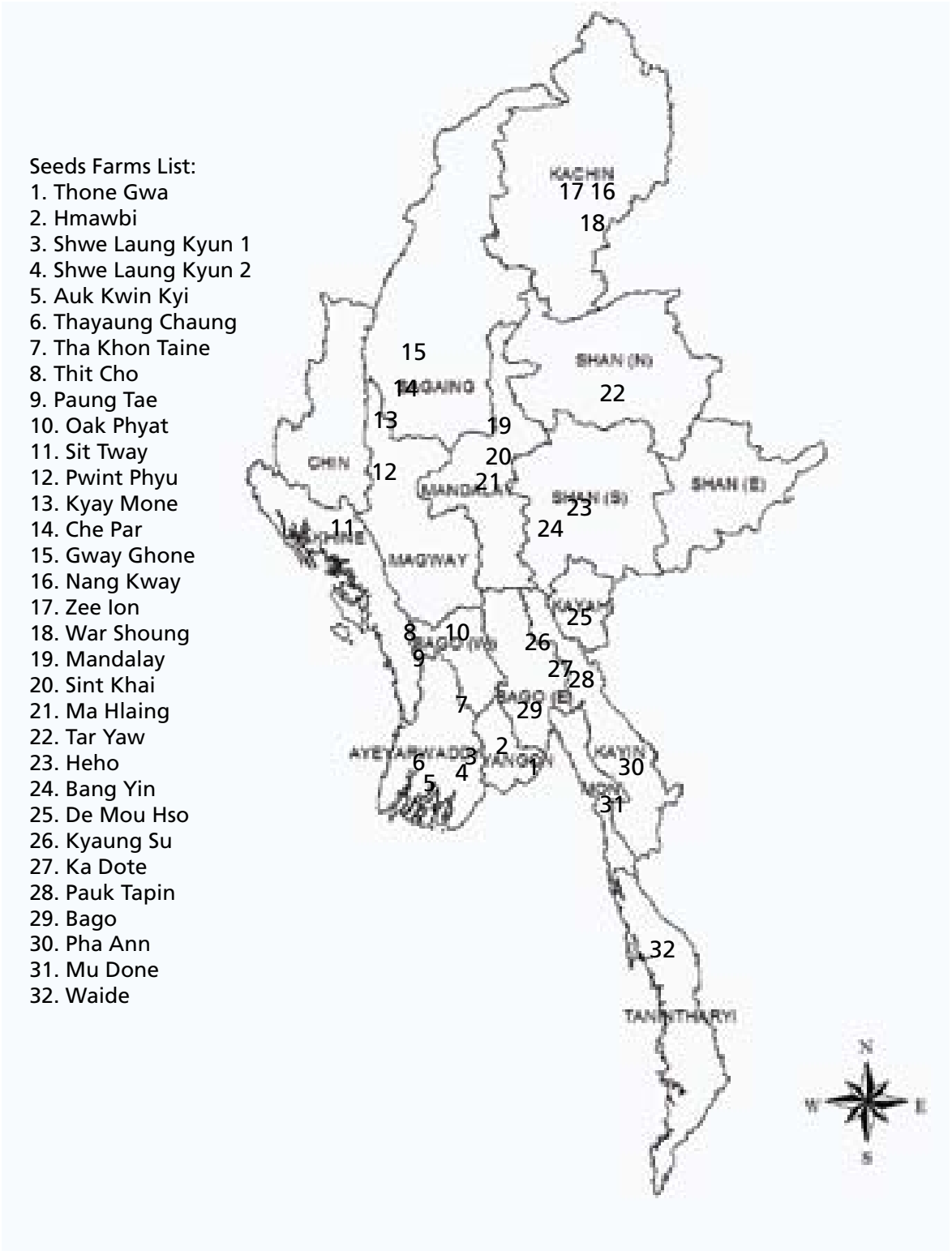
MAP 13 - MAIN OILCAKES TRADE FLOW 2006/07



Source: Study team

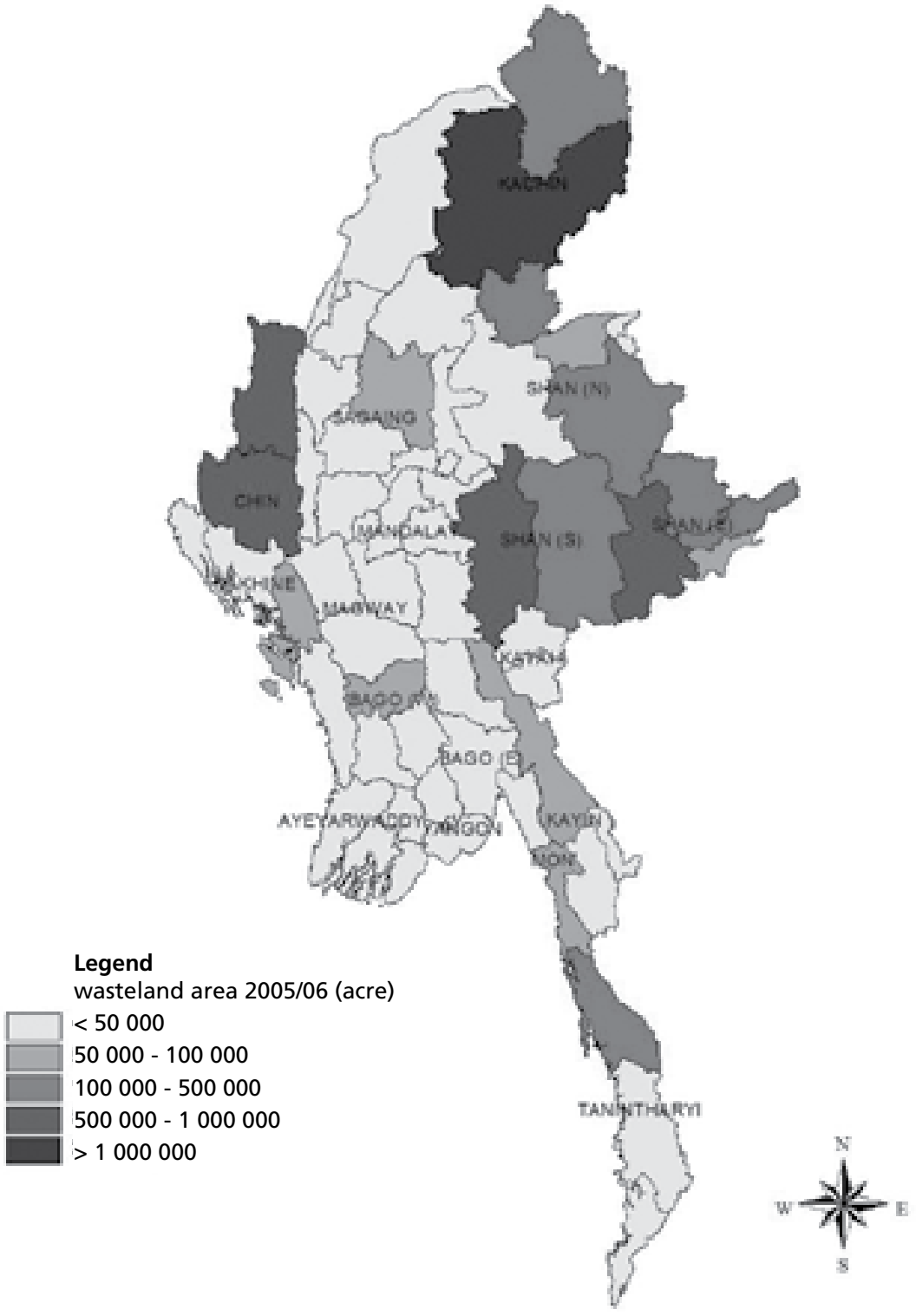
MAP 14 - LOCATION OF SEED FARM UNDER THE SEED DIVISION

Seeds Farms List:
1. Thone Gwa
2. Hmawbi
3. Shwe Laung Kyun 1
4. Shwe Laung Kyun 2
5. Auk Kwin Kyi
6. Thayaung Chaung
7. Tha Khon Taine
8. Thit Cho
9. Paung Tae
10. Oak Phyat
11. Sit Tway
12. Pwint Phyu
13. Kyay Mone
14. Che Par
15. Gway Ghone
16. Nang Kway
17. Zee Ion
18. War Shoung
19. Mandalay
20. Sint Khai
21. Ma Hlaing
22. Tar Yaw
23. Heho
24. Bang Yin
25. De Mou Hso
26. Kyaung Su
27. Ka Dote
28. Pauk Tapin
29. Bago
30. Pha Ann
31. Mu Done
32. Waide



Source: Seed Division

MAP 15 - DISTRIBUTION OF WASTELAND



Source: FAO.2005. Agricultural Atlas of the Union of Myanmar. Agricultural Year 2001-2002, Rome.

Annex VI
Tables

Table 31: Refined bleached deodorized palm olein monthly arrivals since January 2004

	2004	2005	2006	2007
January	8 489	13 319	15 899	16 298
February	6 897	11 198	20 798	28 321
March	13 394	11 198	19 649	43 460
April	10 298	13 699	16 049	14 454
May	12 114	16 998	26 849	30 991
June	9 098	13 898	25 298	
July	1 638	13 894	22 598	
August	12 239	22 196	28 491	
September	10 298	24 094	25 898	
October	1 494	19 287	35 897	
November	16 799	14 099	19 458	
December	13 898	11 199	17 551	
Total	116 656	185 079	274 435	133 524

Sources: Edible Oil Merchants Association

Table 32: Edible oil consumption and projection from 2001 to 2015 (in tonnes)

Region	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Population ('000)	51 140	52 170	53 220	54 300	55 400	56 510	57 660	58 820	60 010	61 220	62 460	63 720	65 010	66 320	67 660
Rural areas	8.6														
Urban areas	10.0														
National average	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9	10.0	10.1	10.2	10.3	10.4	10.5	10.6
Total consumption (t)	470	485	500	516	532	548	565	582	600	618	637	656	676	696	717
Agro-industry & restaurant use –15%	71	73	75	77	80	82	85	87	90	93	96	98	101	104	108
Total edible oil use	541	558	575	593	612	630	650	669	690	711	733	754	777	800	825

Source: CSO and study estimates

Table 33: Myanmar Agricultural Service 2005/06 edible oil supply estimates

2005–06	Sown Acre	Harvested Acre	Yield Baskets/ acre	Production Baskets	Losses Baskets	Seed requirements Baskets	Other uses Baskets	Total Baskets	Oil seeds for crushing Basket	Edible oil t
Groundnut	1 804 928	1 804 766	51	91 655 097	4 582 755	10 829 568	4 582 755	19 995 078	71 660 019	233 992
Sesame	3 306 493	3 117 984	7	20 560 841	411 217	413 312	1 028 042	1 852 570	18 708 271	183 265
Sunflower	1 701 893	1 699 227	23	38 520 356	770 407	425 473	1 926 018	3 121 898	35 398 458	144 484
Niger	318 082	318 082	8	2 574 377	51 488	39 760	128 719	219 967	2 354 410	21 142
Mustard	164 082	164 082	12	1 890 394	37 808	41 021	94 520	173 348	1 717 046	14 017
Total	7 295 478	7 104 141		155 201 065	5 853 674	11 749 134	7 760 054	25 362 861	129 838 204	596 900

Source: MAS

Table 34: Assumptions for the estimation of domestic oil and oilcake supply

	Yield (Basket/ Acre)	Percentage Losses	Seed rate	Use for snack/food (in percentages)	Milling rates (in percentages)
Groundnut	Le mye: 45 Kaing mye: 65 Yam ye: 35 Upland: 45	8	6 baskets with shell/acre (1 basket = 5Viss of Gnut without shell)	Magway: 50 Sagaing: 55 Mandalay: 25 other: 35 Average: 40	38% oil, 58% cake, 4% losses
Sesame	6.59 MAS estimates	6	2 Pyi/acre	7	45% oil, 51% cake, 4% losses
Sunflower	Hybrid: 20 OP field: 10 OP intercrop: 5	9	4 Pyi/acre	10	29% oil, 66% cake, 5% losses
Niger	8.09 MAS estimates	6	2 Pyi/acre	-	33% oil, 63% cake, 3% losses
Mustard	11.52 MAS estimates	6	4 Pyi/acre	5	30% oil, 66% cake, 4% losses
Soybean	15.00 MAS estimates	10	8 Pyi/acre	40	10% oil, 86% cake, 4% losses
Palm oil	3.46 tonne/acre in 2006/07 3.53 tonne/acre in 2011/12	-	-	-	20% FFB to CPO 80% cake 70.1% CPO to palm olein refined oil

Source : Study team

Table 35: MoAI assumptions for the estimation of domestic oil supply

	Yield (Basket/ Acre)	Percentage Losses	Seed rate	Other uses (in percentages)	Milling rates (in percentages)
Groundnut	50.79	5	6 baskets/acre	5	1 basket with shell - 2 viss (29%)
Sesame	6.59	2	2 Pyi/acre	5	1basket 6 viss (40%)
Sunflower	22.67	2	4 Pyi/acre	5	1basket 2.5 viss (28%)
Niger	8.09	2	2 Pyi/acre	5	1basket 5.5 viss (37%)
Mustard	11.52	2	4 Pyi/acre	5	1basket 5 viss (31%)
Palm oil	3.46 tonne/ acre in 2006/07 3.53 tonne/ acre in 2011/12	-	-		20% FFB to CPO 80% cake 70.1% CPO to palm olein refined oil

* Soybean: no estimation from MAS.

Source: MAS

Table 36: Type of land by agro-ecological regions

	Le	Yar	Kaing	Horticul.	Dani	Upland	Total
Hilly region	1 594 445	1 433 051	78 711	554 145	0	566 818	4 227 170
%	38	34	2	13	0	13	100
Kachin State	357 877	111 969	49 461	41 269	0	40 237	600 813
Kayah State	47 680	75 965	0	1 745	0	32 600	157 990
Kayin State	537 432	3 948	16 385	144 290	0	74 956	777 011
Chin State	22 478	450	4 357	14 115	0	192 239	233 639
Southern Shan	260 828	684 539	310	142 593	0	29 927	1 118 197
Northern Shan	216 820	437 367	8 173	180 881	0	130 805	974 046
Eastern Shan	151 330	118 813	25	29 252	0	66 054	365 474
Central dry zone	3 274 371	6 552 810	714 159	46 520	0	51 092	10 638 952
%	31	62	7	0	0	0	100
Sagaing Div.	1 660 961	2 430 641	338 088	15 069	0	34 377	4 479 136
Magway Div.	566 668	1 993 881	209 754	3 001	0	12 728	2 786 032
Mandalay Div.	1 046 742	2 128 288	166 317	28 450	0	3 987	3 373 784
Coastal region	1 266 901	23 816	13 878	530 962	36 584	101 072	1 973 213
%	64	1	1	27	2	5	100
Taninthayi Div.	253 215	0	434	455 251	21 100	86 032	816 032
Yakhine State	1 013 686	23 816	13 444	75 711	15 484	15 040	1 157 181
Delta region	8 184 935	266 827	483 529	1 126 794	61 677	25 506	10 149 268
%	81	3	5	11	1	0	100
Yangon Div.	1 202 703	0	15 051	197 796	6 169	0	1 421 719
Bago Eastern	1 535 605	72 121	36 666	145 663	183	2 661	1 792 899
Bago Westen	1 007 175	145 693	163 689	31 393	0	3 020	1 350 970
Mon State	741 293	0	11 712	425 877	15 756	19 312	1 213 950
Ayewady Div.	3 698 159	49 013	256 411	326 065	39 569	513	4 369 730
Union	14 320 652	8 276 504	1 290 277	2 258 421	98 261	744 488	26 988 603
%	53	31	5	8	0	3	100

Source: SLRD

Table 37: Crop budget analysis: Sesame irrigated pre-monsoon

CROP: Sesame					
Season: Pre-monsoon season					
Water source: Irrigation					
Land type: Le mye					
Division: Mandalay, Kyaukse					
Region: Central Dry Zone					
Value of production	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/acre**	**Total US$/ha**
Value of grain yield – Contract Sale	Basket	20 000	5	100 000	198
Value of grain yield – Market Sale	Basket	23 000	13	299 000	591
Value of crop residue					
Total revenues			**18**	**399 000**	**789**
Operating costs	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/acre**	**Total US$/ha**
Input costs					
Seed	Pyi	2 000	2.5	5 000	10
Armo chemical fertilizer 16:16:8 +13 S	50 kg Bag	32 000	1	32 000	63
FYM	Bullockcart	3 500	4	14 000	28
Pesticides	Lt	2 000	2	4 000	8
Rental back pump	Lump sum	1 000	1	1 000	2
Bags	Pcs	100	9	900	2
Irrigation and land tax		Kyats/ acre		600	1
Sub-total input costs				57 500	114
Labour costs					
Ploughing in November – Hand tractor + oxen	Lump sum	10 000	3	30 000	59
Land Preparation – ploughing (mono-axial tractor)	Lump sum	10 000	2	20 000	40
Land Preparation – harrowing	Oxen Day	2 500	2	5 000	10
Land Preparation – levelling	Oxen Day	2 500	2	5 000	10
FYM	Manday	600	2	1 200	2
Seeding	Manday	600	2	1 200	2
Thinning	Manday	600	8	4 800	9
Weeding 2x	Manday	600	16	9 600	19
Irrigation	Manday	600	4	2 400	5
Fertilizer application 3x	Manday	600	3	1 800	4
Inter-cultivation 2x	Oxen Day	2 500	4	10 000	20
Pesticide spraying	Manday	600	2	1 200	2
Harvesting and bundling	Manday	600	25	15 000	30
Threshing and winnowing	Manday	600	5	3 000	6
Transportation	Bullockcart	2 500	2	5 000	10
Drying	Manday	600	4	2 400	5
Sub-total labour cost				117 600	233
Total operating cost				**175 100**	**347**
Gross margin				**223 900**	**442**
Costs and returns ratio				**2.28**	

Source : Study team

Table 38: Crop budget analysis: Sesame Monsoon Season *yar mye*

CROP: Sesame					
Season: Monsoon season					
Water source: Rainfall					
Land type: Yar mye					
Region: Central Dry Zone					
Value of production	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/ acre**	**Total US$/ha**
Value of grain yield	Basket	21 000	5	105 000	208
Value of crop residue					
Total revenues			**5**	**105 000**	**208**
Operating costs	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/ acre**	**Total US$/ha**
Input costs					
Seed	Pyi	1 700	4	6 800	13
Foliar fertilizer	Lt	2 000	1	2 000	4
FYM	Bullock cart	3 500	3	10 500	21
Pesticides	Lt	4 000	1	4 000	8
Rental back pump	Lump sum	1 000	1	1 000	2
Bags	Pcs	100	2.5	250	0
Land tax				5	0
Sub-total input costs				24 555	48
Labour costs					
Land preparation – ploughing	Oxen Day	2 500	2	5 000	10
Land preparation -–harrowing	Oxen Day	2 500	3	7 500	15
Land preparation – levelling-furrowing	Oxen Day	2 500	2	5 000	10
FYM	Manday	600	1	600	1
Seeding	Manday	600	2	1 200	2
Weeding	Manday	600	10	6 000	12
Inter-cultivation	Oxen Day	2 500	1	2 500	5
Foliar fertilizer spraying	Manday	600	2	1 200	2
Pesticide spraying	Manday	600	2	1 200	2
Harvesting	Manday	600	5	3 000	6
Threshing and winnowing	Manday	600	5	3 000	6
Transportation	Bullockcart	2 500	1	2 500	5
Drying	Manday	600	2	1 200	2
Sub-total labour cost				39 900	78
Total operating cost				**64 455**	**126**
Gross margin				**40 545**	**82**
Costs and returns ratio				**1.6**	

Source : Study team

Table 39: Crop budget analysis: Sesame cool season *yar mye*

CROP: Sesame					
Season: Cool season					
Water source: Rainfall and residual moisture					
Land type: Yar mye					
Region: Central Dry Zone					
Value of production	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/ acre**	**Total US$/ha**
Value of grain yield	Basket	21 000	7	147 000	291
Value of crop residue					
Total revenues			**7**	**147 000**	**291**
Operating costs	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/ acre**	**Total US$/ha**
Input costs					
Seed	Pyi	1 700	4	6 800	13
Foliar fertilizer	Lt	2 000	1	2 000	4
FYM	Bullock cart	3 500	3	10 500	21
Pesticides	Lt	2 000	2	4 000	8
Rental back pump	Lump sum	1 000	1	1 000	2
Bags	Pcs	100	3.5	350	1
Land tax				5	0
Sub-total input costs				22 655	49
Labour costs					
Land Preparation – ploughing	Oxen Day	2 500	2	5 000	10
Land Preparation – harrowing	Oxen Day	2 500	3	7 500	15
Land Preparation – levelling-row	Oxen Day	2 500	2	5 000	10
FYM	Manday	600	1	600	1
Seeding	Manday	600	2	1 200	2
Weeding	Manday	600	10	6 000	12
Inter-cultivation	Oxen Day	2 500	1	2 500	5
Foliar fertilizer spraying	Manday	600	2	1 200	2
Pesticide spraying	Manday	600	1	600	1
Harvesting	Manday	600	7	4 200	8
Threshing and winnowing	Manday	600	6	3 600	7
Transportation	Bullock cart	2 500	2	5 000	10
Drying	Manday	600	3	1 800	4
Sub-total labour cost				44 200	87
Total operating cost				**68 855**	**136**
Gross margin				**78 145**	**154**
Costs and returns ratio				**2.1**	

Source : Study team

Table 40: Crop budget analysis: Groundnut monsoon season *yar mye*

CROP: Groundnut					
Season: Monsoon season					
Water source: Rainfall					
Land type: Yar mye					
Region: Central Dry Zone					
Value of production	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/ acre**	**Total US$/ha**
Value of grain yield	Basket	6 000	35	210 000	415
Value of crop residue	Bullock cart	7 000	3	21 000	42
Total revenues				**231 000**	**457**
Operating costs	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/ acre**	**Total US$/ha**
Input costs					
Seed	Basket	7 000	5	35 000	69
Compound fertilizer	50 kg Bag	22 000	1	22 000	43
Foliar fertilizer	Lt	2 000	2	4 000	8
FYM	Bullock cart	3 500	3	10 500	21
Pesticides	Lt	2 000	1	2 000	4
Rental back pump	Kyats	1 000	1	1 000	2
Rhizobium	Bag	100	1	100	0
Bags	Pcs	100	18	1 800	4
Land tax	Kyats/acre	5	1	5	0
Sub-total input costs				76 405	151
Labour costs					
Land preparation – ploughing	Oxen Day	2 500	4	10 000	20
Land preparation – harrowing	Oxen Day	2 500	5	12 500	25
Land preparation – levelling	Oxen Day	2 500	1	2 500	5
FYM	Manday	600	1	600	1
Seeding	Manday	600	2	1 200	2
Weeding 3x	Manday	600	15	9 000	18
Inter-cultivation	Oxen Day	2 500	2	5 000	10
Fertilizer application	Manday	600	2	1 200	2
Foliar fertilizer spraying	Manday	600	2	1 200	2
Pesticide spraying	Manday	600	1	600	1
Harvesting	Manday	600	35	21 000	42
Transportation groundnut with shell	bullock cart	2 500	1	2 500	5
Transportation harvested plant	bullock cart	2 500	3	7 500	15
Drying	Manday	600	3	1 800	4
Sub-total labour cost				76 600	152
Total operating cost				**153 005**	**303**
Gross margin				**77 995**	**154**
Costs and returns ratio				**1.51**	

Source : Study team

Table 41: Crop budget analysis: Groundnut cool season *yar mye*

CROP: Groundnut					
Season: Cool season					
Water source: Rainfall & Residual soil moisture					
Land type: Yar mye					
Region: Central Dry Zone					
Value of production	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/ acre**	**Total US$/ ha**
Value of grain yield	Basket	6 000	38	228 000	451
Value of crop residue	Bullock cart	7 000	3.5	24 500	48
Total revenues				**252 500**	**499**
Operating costs	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/ acre**	**Total US$/ ha**
Input costs					
Seed	Basket	7 000	5	35 000	69
Compound fertilizer	50 kg Bag	22 000	0.5	11 000	22
Foliar fertilizer	Lt	2 000	3	6 000	12
FYM	Bullock cart	3 500	3	10 500	21
Pesticides	Lt	2 100	1	2 100	4
Rental back pump	Kyats	1 000	1	1 000	2
Rhizobium	Bag	100	1	100	0
Bags	Pcs	100	19	1 900	4
Land tax		5	1	5	0
Sub-total input costs				67 605	134
Labour costs					
Land preparation – ploughing	Oxen Day	2 500	4	10 000	20
Land preparation – harrowing	Oxen Day	2 500	5	12 500	25
Land preparation – levelling	Oxen Day	2 500	1	2 500	5
Seeding	Manday	600	2	1 200	2
Weeding 2 x	Manday	600	10	6 000	12
Fertilizer application	Manday	600	2	1 200	2
Foliar fertilizer spraying	Manday	600	2	1 200	2
FYM	Manday	600	1	600	1
Inter-cultivation	Oxen Day	2 500	1	2 500	5
Pesticide spraying	Manday	600	1	600	1
Harvesting	Kyats/Basket	600	45	27 000	53
Transportation groundnut with shell	bullock cart	2 500	2	5 000	10
Transportation harvested plant	bullock cart	2 500	3	7 500	15
Drying	Manday	600	3	1 800	4
Sub-total labour cost				79 600	157
Total operating cost				**147 205**	**291**
Gross margin				**105 295**	**208**
Costs and returns ratio				**1.72**	

Source : Study team

Table 42: Crop budget analysis: Groundnut cool season *kaing mye*

CROP: Groundnut					
Season: Cool season					
Water source: Residual soil moisture					
Land type: Kaing mye					
Region: Central Dry Zone					
Value of production	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/ acre**	**Total US$/ha**
Value of grain yield	Basket	6 000	50	300 000	593
Value of crop residue	Bullock cart	7 000	4	28 000	55
Total revenues				**328 000**	**648**
Operating costs	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/ acre**	**Total US$/ha**
Input costs					
Seed	Basket	7 000	5	35 000	69
TSP fertilizer	50 kg Bag	8 000	0.5	4 000	8
Foliar fertilizer	Lt	2 000	3	6 000	12
Pesticides	Lt	2 100	1	2 100	4
Rental back pump	Kyats	1 000	1	1 000	2
Rhizobium	Bag	100	1	100	0
Bags	Pcs	100	25	2 500	5
Land tax		5	1	5	0
Sub-total input costs				50 705	100
Labour costs					
Cleaning field after flood recession	Manday	600	7	4 200	8
Land preparation – ploughing	Oxen Day	2 500	5	12 500	25
Land preparation – harrowing	Oxen Day	2 500	6	15 000	30
Land preparation – levelling	Oxen Day	2 500	1	2 500	5
Seeding	Manday	600	2	1 200	2
Weeding 2 x	Manday	600	10	6 000	12
Fertilizer application	Manday	600	3	1 800	4
Foliar fertilizer spraying	Manday	600	3	1 800	4
First inter-cultivation	Oxen Day	2 500	1	2 500	5
Pesticide spraying	Manday	600	1	600	1
Harvesting	Kyats/Basket	600	60	36 000	71
Transportation groundnut with shell	bullock cart	2 500	2	5 000	10
Transportation harvested plant	bullock cart	2 500	4	10 000	20
Drying	Manday	600	3	1 800	4
Sub-total labour cost				100 900	201
Total operating cost				**151 605**	**301**
Gross margin				**176 395**	**347**
Costs and returns ratio				**2.16**	

Source : Study team

Table 43: Crop budget analysis: Groundnut monsoon season *yar mye*, shifting cultivation in northern Shan state

CROP: Groundnut					
Season: Monsoon season					
Water source: Rainfall					
Land type: Yar mye shifting cultivation					
Region: Northern Shan State					
Value of production	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/ acre**	**Total US$/ha**
Value of grain yield	Basket	8 000	44	352 000	696
Value of crop residue	Bullock cart				
Total revenues				**352 000**	**696**
Operating costs	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/ acre**	**Total US$/ha**
Input costs					
Seed	Basket	8 000	5	40 000	79
Compound fertilizer	50 kg Bag	17 500	1.5	26 250	52
FYM	Bullock cart	3 500	11	38 500	76
Pesticides	Lt	2 000	1	2 000	4
Rental back pump	Kyats	1 000	1	1 000	2
Bags	Pcs	100	22	2 200	4
Land tax		5	1	5	0
Sub-total input costs				109 955	217
Labour costs					**0**
Land preparation – ploughing	Oxen Day	6 000	3	18 000	36
Planting (traditional method)	Manday	1 500	10	15 000	30
Weeding	Manday	1 500	23	34 500	68
Harvesting	Manday	1 500	40	60 000	119
Transportation	Small tractor	3 000	3	9 000	18
Sub-total labour cost				136 500	271
Total operating cost				**246 455**	**488**
Gross margin				**105 545**	**208**
Costs and returns ratio				**1.43**	

Source : Study team

Table 44: Crop budget analysis: Hybrid sunflower monsoon season *yar mye*

CROP: Sunflower-hybrid variety					
Season: Monsoon season					
Water source: Rainfall					
Land type: Yar mye					
Region: Central Dry Zone					
Value of production	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/ acre**	**Total US$/ha**
Value of grain yield	Basket	7 000	20	140 000	277
Value of crop residue					
Total revenues				**140 000**	**277**
Operating costs	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/ acre**	**Total US$/ha**
Input costs					
Seed	Kyats/Kg	366	15	5 490	11
Urea fertilizer	50 kg Bag	22 000	0.5	11 000	22
TSP fertilizer	50 kg Bag	8 000	0.25	2 000	4
Foliar fertilizer	Lt	2 000	1	2 000	4
FYM	Bullock cart	3 500	2	7 000	14
Bags	Pcs	100	10	1 000	2
Land tax		5	1	5	0
Sub-total input costs				28 495	57
Labour costs					
Land preparation – ploughing	Oxen Day	2 500	2	5 000	10
Land preparation – harrowing	Oxen Day	2 500	1	2 500	5
Land preparation – levelling	Oxen Day	2 500	1	2 500	5
FYM	Manday	600	1	600	1
Seeding	Manday	600	5	3 000	6
Fertilizer application	Manday	600	2	1 200	2
Thinning and weeding	Manday	600	10	6 000	12
Inter-cultivation	Oxen Day	2 500	2	5 000	10
Foliar fertilizer application	Manday	600	1	600	1
Harvesting	Manday	600	10	6 000	12
Threshing and winnowing	Manday	600	7	4 200	8
Transportation	Bullock cart	5 000	1	5 000	10
Drying	Manday	600	5	3 000	6
Sub-total labour cost				44 600	88
Total operating cost				**73 095**	**145**
Gross margin				**66 905**	**132**
Costs and returns ratio				**1.9**	

Source : Study team

Table 45: Crop budget analysis: Open pollinated sunflower monsoon season *yar mye*

CROP: OP sunflower					
Season: Monsoon					
Water source: Rainfall					
Land type: Yar mye					
Region: Central Dry Zone					
Value of production	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/ acre**	**Total US$/ha**
Value of grain yield	Basket	7 000	10	70 000	138
Value of crop residue					
Total revenues				**70 000**	**138**
Operating costs	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/ acre**	**Total US$/ha**
Input costs					
Seed	Pyi	500	4	2 000	4
Urea fertilizer	50Kg/Bag	24 000	0.5	12 000	24
Land tax		5	1	5	0
Sub-total input costs				14 005	28
Labour costs					
Land preparation – ploughing	Oxen Day	2 500	2	5 000	10
Land preparation – harrowing	Oxen Day	2 500	2	5 000	10
Land preparation – levelling-row	Oxen Day	2 500	1	2 500	5
Seeding	Manday	600	5	3 000	6
Thinning and weeding	Manday	600	8	4 800	9
Inter-cultivation	Oxen Day	2 500	2	5 000	10
Harvesting	Manday	600	5	3 000	6
Threshing and winnowing	Manday	600	4	2 400	5
Transportation	Bullock cart	2 500	1	2 500	5
Drying	Manday	600	2	1 200	2
Sub-total labour cost				34 400	68
Total operating cost				**48 405**	**96**
Gross margin				**21 595**	**42**
Costs and returns ratio				**1.4**	

Source : Study team

Table 46: Crop budget analysis: Soybean monsoon season *kaing mye*

CROP: Soybean					
Season: Monsoon					
Water source: Residual moisture					
Land type: Kaing mye					
Region: Central Dry Zone					
Value of production	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/ acre**	**Total US$/ha**
Value of grain yield	Basket	8 000	18	144 000	285
Value of crop residue					
Total revenues				**144 000**	**285**
Operating costs	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/ acre**	**Total US$/ha**
Input costs					
Seed	Pyi	8	450	3 600	7
Foliar fertilizer	Lit	1 250	2	2 500	5
Pesticides	Lt	2 000	1	2 000	4
Rental back pump	Day	1 000	1	1 000	2
Bags	Pcs	100	9	900	2
Land tax				5	0
Sub-total input costs				10 005	20
Labour Costs					
Land preparation – ploughing	Oxen Day	3	2 500	7 500	15
Land preparation – harrowing	Oxen Day	2	2 500	5 000	10
Land preparation – levelling	Oxen Day	1	2 500	2 500	5
Seeding	Manday	1	600	600	1
Foliar fertilizer application	Manday	2	600	1 200	2
Pesticide spraying	Manday	1 500	1	1 500	3
Weeding	Manday	600	8	4 800	9
Harvesting	Manday	600	14	8 400	17
Transportation	Bullock cart	2 500	5	12 500	25
Threshing and drying	Manday	600	17	10 200	20
Drying	Manday			0	0
Sub-total labour cost				54 200	107
Total operating cost				**64 205**	**127**
Gross margin				**79 795**	**158**
Costs and returns ratio				**2.2**	

Source : Study team

Table 47: Crop budget analysis: Soybean irrigated pre-monsoon *le mye*, northern Shan hills

Season: Pre-monsoon					
Water source: Irrigated					
Land type: Le mye					
Region: Hilly region (Northern Shan State)					
Value of production	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/ acre**	**Total US$/ ha**
Value of grain yield	Basket	16 000	24	384 000	759
Value of crop residue					
Total revenues				**384 000**	**759**
Operating costs	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/ acre**	**Total US$/ ha**
Input costs					
Seed	Basket	20 000	1	20 000	40
Compound fertilizer	50Kg/Bag	17 500	1.5	26 250	52
Rhizobium	Bag	100	1	100	0
Pesticides	Lt	2 000	1	2 000	4
Rental back pump	Day	1 000	1	1 000	2
FYM	Bullock cart	5 000	8	40 000	79
Bags	Pcs	100	12	1 200	2
Land tax		5	1	5	0
Sub-total input costs				90 555	179
Labour costs					
Land preparation – ploughing	Oxen Day	5 000	6	30 000	59
Land preparation – harrowing	Oxen Day	5 000	6	30 000	59
Furrowing manually	Manday	1 500	8	12 000	24
Sowing	Manday	1 500	2	3 000	6
Application of manure	Manday	1 500	3	4 500	9
Fertilizer application	Manday	1 500	3	4 500	9
Pesticide spraying	Manday	1 500	1	1 500	3
Weeding	Manday	1 500	15	22 500	44
Irrigation	Manday	1 500	6	9 000	18
Harvesting	Manday	1 500	15	22 500	44
Threshing machine	Basket	1 000	24	24 000	47
Drying	Manday	1 500	2	3 000	6
Sub-total labour cost				166 500	328
Total operating cost				**257 055**	**507**
Gross margin				**126 945**	**252**
Costs and returns ratio				**1.5**	

Source : Study team

Table 48: Crop budget analysis: Soybean monsoon season *yar mye*, improved farming technology

CROP: Soybean					
Season: Monsoon, improved farming technology (FAO project)					
Water source: Rainfall					
Land type: Yar mye					
Region: Hilly region (Southern Shan State)					
Value of production	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/ acre**	**Total US$/ha**
Value of grain yield	Basket	9 600	25	240 000	474
Value of crop residue					
Total revenues				**240 000**	**474**
Operating costs	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/ acre**	**Total US$/ha**
Input costs					
Seed	Basket	24 000	0.5	12 000	24
Armo chemical fertilizer 16:16:8 +13 S	50Kg/Bag	32 000	0.5	16 000	32
Rhizobium	Bag	100	1	100	0
Pesticides	Lt	2 000	1	2 000	4
Rental back pump	Day	1 000	1	1 000	2
FYM	Bullock cart	3 000	8	24 000	47
Bags	Pcs	100	12.5	1 250	2
Land tax				5	0
Sub-total input costs				56 355	111
Labour costs					
Land preparation – ploughing & harrowing	Oxen Day	2 500	2	5 000	10
Land preparation – second ploughing	Oxen Day	2 500	2	5 000	10
Land levelling	Oxen Day	2 500	2	5 000	10
Application of manure	Manday	1 000	3	3 000	6
Seeding	Manday	1 000	1	1 000	2
First weeding	Manday	1 000	18	18 000	36
Second weeding	Manday	1 000	15	15 000	30
Pesticide spraying	Manday	1 000	1	1 000	2
Manual control of pest and diseases	Manday	1 000	6	6 000	12
Harvesting	Manday	1 000	20	20 000	40
Transportation	Bullock cart	2 500	3	7 500	15
Drying	Manday	1 000	2	2 000	4
Sub-total labour cost				88 500	175
Total operating cost				**144 855**	**286**
Gross margin				**95 145**	**188**
Costs and returns ratio				**1.7**	

Source : Study team

Table 49: Crop budget analysis: Soybean monsoon season on *yar mye*

CROP: Soybean
Season: Monsoon
Water source: Residual moisture
Land type: Yar mye
Region: Hilly region (Southern Shan State)

Value of production	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/ acre**	**Total US$/ ha**
Value of grain yield	Basket	9 600	10	96 000	190
Value of crop residue					
Total revenues				**96 000**	**190**

Operating costs	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/ acre**	**Total US$/ ha**
InputcCosts					
Seed	Basket	24 000	0.5	12 000	24
Urea	50Kg/Bag	25 000	0.5	12 500	25
Triple Super Phosphate(TSP)	50Kg/Bag	10 000	0.5	5 000	10
Bags	Pcs	100	5	500	1
Land tax	Kyats	5	1	5	0
Sub-total input costs				30 005	60
Labour costs					
Land preparation – ploughing	Oxen Day	2 500	2	5 000	10
Planting – traditional method	Manday	1 000	30	30 000	59
Harvesting	Manday	1 000	10	10 000	20
Transportation	Bullock cart	2 500	2	5 000	10
Drying	Manday	1 000	2	2 000	4
Sub-total labour cost				52 000	103
Total operating cost				**82 005**	**163**
Gross margin				**13 995**	**27**
Costs and returns ratio				**1.2**	

Source : Study team

Table 50: Crop budget analysis: Irrigated paddy pre-monsoon season le mye

CROP: Paddy

Season: Pre-monsoon season
Water source: Pumping water from the Ayeyarwady River
Land type: Le mye
Division: Magway
Region: Central Dry Zone

Value of production	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/acre**	**Total US$/acre**
Value of paddy yield	Basket	6 000	80	480 000	949
Value of crop residue	Kyats				
Total revenues	**Kyats**		**80**	**480 000**	**949**

Operating costs	**Unit**	**Unit Price Kyats**	**Quantity**	**Total Kyats/acre**	**Total US$/acre**
Input costs					
Seed	Basket	5 000	3	15 000	12
Compound fertilizer	50 kg Bag	32 000	1	32 000	26
Urea chemical fertilizer	50 kg Bag	25 000	2	50 000	40
FYM	Bullock cart	3 000	1	3 000	2
Bags	Pcs	100	40	4 000	3
Irrigation fee (cost of pumping) and land tax	Lump sum	15 000	1	15 000	12
Sub-total input costs				119 000	95
Labour costs					
Land preparation nursery	Oxen day	2 500	3	7 500	6
Nursery maintenance	Manday	1 000	8	8 000	6
Uprooting of young plants from nursery	Bundle	2	5 800	11 600	9
Weeding before ploughing	Manday	1 000	2	2 000	2
Paddy field land preparation	Oxen Day	2 500	6	15 000	12
Land preparation – harrowing	Oxen Day	2 500	6	15 000	12
Land preparation – levelling	Oxen Day	2 500	2	5 000	4
FYM application	Manday	600	1	600	0
FYM	Bullock cart	3 500	1	3 500	3
Transplanting	Manday	1 000	14	14 000	11
Weeding	Manday	1 000	12	12 000	10
Irrigation	Manday	1 000	10	10 000	8
Fertilizer application	Manday	1 000	4	4 000	3
Harvesting and threshing	Manday	1 000	12	12 000	10
Transportation	Bullock cart	3 500	2	7 000	6
Drying	Manday	600	3	1 800	1
Sub-total labour cost				129 000	103
Total operating cost				**248 000**	**198**
Gross margin				**232 000**	**296**
Costs and returns ratio				**1.94**	

Source : Study team

Table 51: Protein and oil content of various soybean varieties (improved and local) grown in Myanmar

#	Improved varieties	Protein content (In %)	Oil c ontent (In %)	#	Local varieties	Protein content (In %)	Oil content (In %)
	DAR released						
1	PK-1024	34.92	19.19	10	Shansein	36.97	15.78
2	JS-335	36.32	18.26	11	Shanwarlonegyi	36.22	14.81
3	GM-84-17	38.29	18.87	12	Myingyan local variety	38.37	8.82
4	GM-91-18	37.19	14.18	13	Hinthada Ahtut Toe	38.31	19.77
5	SB-60	34.45	19.41	14	Teikpan	36.35	22.04
6	GM-8	33.94	13.64	15	Htate Tone	37.63	20.38
7	GM-9	33.74	14.59	16	Naungmon local variety	35.42	18.82
8	PK-1042	31.23	15.13	17	Kyaukme local variety	30.99	19.35
	CP variety			18	Tarchilate local variety	34.92	15.66
9	CP variety	40.23	23.12	19	Naungmon-1 local variety	36.75	20.72
				20	Sinshweli Peboke	33.19	18.01
				21	Theinni local variety	29.77	21.68

Source: DAR

Table 52: Rhizobial inoculants packet distribution (2002–2003 to 2006–2007)

#	Crops	2002–03	2003–04	2004–05	2005–06	2006–07
1.	Groundnut	11 815	10 002	11 320	9 790	5 100
2.	Chickpea	74 010	38 100	44 100	24 450	4 650
3.	Black gram	88 037	14 064	56 564	61 355	26 950
4.	Green gram	47 847	33 776	31 426	30 325	10 450
5.	Soybean	651	44 961	2 828	3 415	2
6.	Pigeon pea	25 400	11 503	14 707	12 600	-
7.	Cowpea	3	-	2	-	-
8.	Others	-	-	-	-	-
	Total	247 763	152 406	160 947	141 935	47 152

Source: DAR

Table 53: Number of oil mills by district and estimated milling capacity

Division	District	Number small oil mills	Number medium oil mills	Number large oil mills	Total number oil mills	Small mills capacity (0.5 tonne/ 8 hrs)	Medium mills capacity (2.25 t/ 8 hrs)	Large mills capacity (12 t/ 8 hrs)	Total annual capacity (25 days/month; 8 hrs/day)	Total annual capacity (25 days/ month; 16 hrs/day)	Total annual capacity (25 days/ month; 24 hrs/day)	Comments
Kachin	Myitkyina	86	2	0	88	43	5	0	14 250	28 500	42 750	
Kachin	Bhamo	18	1	0	19	9	2	0	3 375	6 750	10 125	
Kachin	Puta-O	0	0	0	0	0	0	0	0	0	0	none or no data
Kayah	Loikaw	21	7	0	28	11	16	0	7 875	15 750	23 625	
Kayah	Bawlake	0	0	0	0	0	0	0	0	0	0	none or no data
Kayin	Hpa-An	0	0	0	0	0	0	0	0	0	0	none or no data
Kayin	Myawaddy	0	0	0	0	0	0	0	0	0	0	none or no data
Kayin	Kawkareik	0	0	0	0	0	0	0	0	0	0	none or no data
Chin	Falam	10	0	0	10	5	0	0	1 500	3 000	4 500	
Chin	Mindat	5	1	0	6	3	2	0	1 425	2 850	4 275	
Sagaing	Sagaing	109	10	10	129	55	23	120	59 100	118 200	177 300	
Sagaing	Shwebo	96	46	4	146	48	104	48	59 850	119 700	179 550	
Sagaing	Monywa	165	37	6	208	83	83	72	71 325	142 650	213 975	
Sagaing	Katha	0	0	0	0	0	0	0	0	0	0	none or no data
Sagaing	Kalemyo	71	7	1	79	36	16	12	18 975	37 950	56 925	
Sagaing	Tamu	5	0	0	5	3	0	0	750	1 500	2 250	
Sagaing	Mawlaik	27	1	0	28	14	2	0	4 725	9 450	14 175	
Sagaing	Hkamti	84	3	0	87	42	7	0	14 625	29 250	43 875	
Tanintharyi	Dawei	2	1	1	4	1	2	12	4 575	9 150	13 725	
Tanintharyi	Myeik	1	0	0	1	1	0	0	150	300	450	
Tanintharyi	Kawthoung	0	0	0	0	0	0	0	0	0	0	none or no data
Bago (E)	Bago	58	40	15	113	29	90	180	89 700	179 400	269 100	
Bago (E)	Taungoo	85	25	4	114	43	56	48	44 025	88 050	132 075	
Bago (W)	Pyay	121	226	19	366	61	509	228	239 100	478 200	717 300	
Bago (W)	Thayarwaddy	46	13	8	67	23	29	96	44 475	88 950	133 425	
Magway	Magway	142	26	5	173	71	59	60	56 850	113 700	170 550	
Magway	Minbu	110	6	0	116	55	14	0	20 550	41 100	61 650	
Magway	Thayet	54	9	4	67	27	20	48	28 575	57 150	85 725	
Magway	Pakokku	125	53	8	186	63	119	96	83 325	166 650	249 975	
Magway	Gangaw	43	0	0	43	22	0	0	6 450	12 900	19 350	
Mandalay	Mandalay	164	72	37	273	82	162	444	206 400	412 800	619 200	
Mandalay	Pyin-Oo-Lwin	17	1	0	18	9	2	0	3 225	6 450	9 675	
Mandalay	Kyaukse	79	12	1	92	40	27	12	23 550	47 100	70 650	
Mandalay	Myingyan	144	67	9	220	72	151	108	99 225	198 450	297 675	
Mandalay	Nyaung-U	13	2	0	15	7	5	0	3 300	6 600	9 900	
Mandalay	Yamethin	135	34	3	172	68	77	36	54 000	108 000	162 000	
Mandalay	Meiktila	66	44	2	112	33	99	24	46 800	93 600	140 400	
Mon	Mawlamyine	19	1	5	25	10	2	60	21 525	43 050	64 575	
Mon	Thaton	2	7	3	12	1	16	36	15 825	31 650	47 475	

Division	District	Number small oil mills	Number medium oil mills	Number large oil mills	Total number oil mills	Small mills capacity (0.5 tonne/ 8 hrs)	Medium mills capacity (2.25 t/ 8 hrs)	Large mills capacity (12 t/ 8 hrs)	Total annual capacity (25 days/month; 8 hrs/day)	Total annual capacity (25 days/ month; 16 hrs/day)	Total annual capacity (25 days/ month; 24 hrs/day)	Comments
Rakhine	Sittwe	16	12	5	33	8	27	60	28 500	57 000	85 500	
Rakhine	Kyaukpyu	17	0	0	17	9	0	0	2 550	5 100	7 650	
Rakhine	Thandwe	8	1	0	9	4	2	0	1 875	3 750	5 625	
Yangon	Yangon(N)	0	14	17	31	0	32	204	70 650	141 300	211 950	
Yangon	Yangon(E)	0	4	6	10	0	9	72	24 300	48 600	72 900	
Yangon	Yangon(S)	0	18	16	34	0	41	192	69 750	139 500	209 250	
Yangon	Yangon(W)	0	2	5	7	0	5	60	19 350	38 700	58 050	
Shan (S)	Taunggyi	82	6	1	89	41	14	12	19 950	39 900	59 850	
Shan (S)	Loilen	31	0	0	31	16	0	0	4 650	9 300	13 950	
Shan (N)	Lashio	4	1	0	5	2	2	0	1 275	2 550	3 825	
Shan (N)	Muse	1	3	0	4	1	7	0	2 175	4 350	6 525	
Shan (N)	Kyaukme	33	3	0	36	17	7	0	6 975	13 950	20 925	
Shan (N)	Kunlong	4	0	0	4	2	0	0	600	1 200	1 800	
Shan (N)	Laukkaing	0	0	0	0	0	0	0	0	0	0	none or no data
Shan (E)	Kengtung	1	0	0	1	1	0	0	150	300	450	
Shan (E)	Mong Hsat	0	0	0	0	0	0	0	0	0	0	none or no data
Shan (E)	Tachileik	0	0	0	0	0	0	0	0	0	0	none or no data
Shan (E)	Monghpyak	0	0	0	0	0	0	0	0	0	0	none or no data
Ayeyarwaddy	Pathein	22	5	2	29	11	11	24	13 875	27 750	41 625	
Ayeyarwaddy	Hinthada	86	18	5	109	43	41	60	43 050	86 100	129 150	
Ayeyarwaddy	Myaungmya	51	9	3	63	26	20	36	24 525	49 050	73 575	
Ayeyarwaddy	Maubin	52	9	3	64	26	20	36	24 675	49 350	74 025	
Ayeyarwaddy	Pyapon	5	1	0	6	3	2	0	1 425	2 850	4 275	
Rakhine	Maungdaw	0	0	0	0	0	0	0	0	0	0	none or no data
Total		2 536	860	208	3 604	1280	1938	2 496	1 709 700	3 419 400	5 129 100	

Sources: FAO.2004.Myanmar Oilcrops Development Project (FAO/TCP/MYA/2904). Preparation Report. Volume I – Main Report", Investment Centre Division, Rome, & CSO, MoAI, MCSE and study estimates

Table 54: Total oil produce by the oil mills under the Ministry of Co-operatives in 2005–2006

#	State/Division/Township	Cooperative	Types of oil	2005–2006 (Viss)	2005–2006 (tonne)
1	Sagaing Division, Monywa	Thiha Syndicate	Groundnut oil	127 300	208
2	Bago Division, Pyay	Lay Gyun Man Dyine	Groundnut oil	237 166	387
3	Magway Division, Magway	Division Co-operative Union	Groundnut oil	38 000	62
4	Mandalay Division	Division Co-operative Union	Groundnut oil	28 782	47
5	Nyaung U	Myo Ma Syndicate	Sesame oil	7 731	13
6	Nyaung U	Aung Myae Thar Zan, Divisional GEC	Groundnut oil	19 554	32
	Total			458 533	749

Source : Ministry of Cooperatives

Table 55: Mandalay Crop Exchange Centre blackboard commodity prices Date: 24th May 2007

#	Commodity	Unit	Price	#	Commodity	Unit	Price
1	Wheat grain	60 Viss		19	Garden pea	59.25	
	Ngazun	60	40 000-44 000		Shwebo		55 000-60 000
	Myinmu	60			Kyun		
	Myaung	60			Kalay		
	Sartaung	60	43 000-43 500		China		
	Monywa	60			India		58 000-60 000
	Butalin	60		20	Maize (corn)	54	
	Taungbat	60	43 000		Shan		
	Shan	60	36 000-36 500		Myanmar		
	High yielding	60	37 000-37 500		High-yielding		
2	Pulses			21	Millet	53	
	Chickpea	56.25		22	Sanpyaung	59.25	
	(yellow, big size)			23	Groundnut		
	Chickpea	56.25			(snack purpose)		
	(yellow, small size)				Japan lone san	1	1 625
	Thaiwan variety	56.25	44 000		S1 Lonesan	1	1 650
3	Chickpea-small	56.25			Ball Lonesan	1	
	Pigeon pea				Mtwelve lone san	1	
	Shwebo	60	50 000-50 500		Kadokeni	1	
	Mixed colour of white	60	56 000	24	Kyatsu	36	
	Red colour	60			(For lubricant)		
4	Mixed colour of white	60		25	Sesame	45 Viss	
	Green gram	56.25			white colour		
	Big size	56.25			brown colour		76 000-78 000
	Small size	56.25			yellow colour		71 000

#	Commodity	Unit	Price	#	Commodity	Unit	Price
5	Chickpea	57.25Viss	57 000-57 500		black colour		71 000-76 000
	(Kalapeaphyulonegyi)				mixed colour		46 500-47 000
	Chickpea	57.25		26	Niger	45	45 000
	(Kalapeaphyulonethay)				Shan		
6	Lentil		20 000		Myanmar		
	(Peyarzar)	61.25		26	Sunflower	27	25 000
7	Cowpea	60	63 000-64 500	27	Sunflower		
	(Pealunphyu)				for oil purpose		
	Cowpea	60	31 500-32 000	28	Moelayhnan	49.25	
	(Pealunpyar)			29	Mustard		
	Cowpea	60			big size		
	(Pealunwah)				small size		
8	Lablab bean	55.25	59 000	30	Groundnut		
	(Kone pea)				(for oil extraction		
	Lablab bean-small size	55.25	50 000		purpose)		
9	Peakyar	56.25	36 000-38 000		Kone-san	1	
10	Peanipyar	55.25	34 000-36 000		Kyun-san	1	
	Soybean	53.25			Anyar	1	
	Shan	53.25			Thanroad	1	
	Myanmar	53.25	33 000-33 500		Myaelat	1	
11	Peachinbaung	60	28 000	31	Corriander	1Viss	7 100-7 300
12	Rice bean	60	26 000-27 000	32	Samonnat	1	
	Yellow colour			33	Samonsapar	1	
	black colour			34	Split chickpea	1	
13	Butter bean	56.25	52 000-54 000		Chickpea-big	1	1 060-1 070
	big size				yazar-chan	1	1 250
	small size				Black gram	1	1 100
14	Sultapya	58.25			Green gram	1	1 400
	Kathee		32 500-33 000		Pigeon pea	1	1 200
	Ordinary		31 000-31 500	35	Groundnut oil	1	3 500-3 700
15	Nainglun pea	59.25Viss	51 000	36	G-cake	1	500-590
16	Kidney bean	54	50 000-52 000	37	Sesame oil	1	3 200
17	Khitthit pea	57.25		38	S-cake	1	500-512
18	Black gram	60	58 000-60 000	39	Sunflower oil	1	
				40	Sun-cake	11	
				41	Mustard oil	1	
				42	Mus-cake	1	
				43	Palm oil	1	

Source : Mandalay Crop Exchange Centre

Picture 33: Mandalay Crop Exchange Centre blackboard *(Mandalay, 24 May 2007)*

Table 56: Transport cost in Myanmar

From	To Market	State/Division	Distance (Miles)	Distance (Km)	Ks/30 Viss	Ks/Viss	USD/mt per Km
Yangon City	Myingyan	Mandalay	456	734.16	5000	43	0.03
Yangon City	Pyay	West Bago	179	288.19	2500	18	0.03
Yangon City	Magway	Magway	331	532.91	4000	34	0.03
Yangon City	Mawlamyine	Mon	190	305.9	5000	43	0.07
Yangon City	Monywa	Sagaing	515	829.15	6000	52	0.03
Yangon City	Mandalay	Mandalay	430	692.3	5500	47	0.03
Yangon City	Taunggyi	Southern Shan	424	682.64		45	0.03
Yangon City	Aungban	Southern Shan	386	621.46		40	0.03
Yangon City	Myawadi	Kayin	279	449.19		40	0.04
Yangon City	Phaan	Kayin	180	289.8		25	0.04
Yangon City	Meik	Taninthayi	530	853.3		90	0.05
Yangon City	Dawei	Taninthayi	380	611.8		40	0.03
Yangon City	Hinthada	Ayeyarwady	96	154.56		20	0.06
Mandalay City	KyaukSe	Mandalay	42	67.62	300	10	0.07
Mandalay City	Myittha	Mandalay	72	115.92	500	17	0.07
Mandalay City	Myingyan	Mandalay	96	154.56	700	23	0.07
Mandalay City	Taungtha	Mandalay	111	178.71	800	27	0.07
Mandalay City	Nyaung Oo	Mandalay	200	322	900	30	0.05
Mandalay City	Meikhtila	Mandalay	96	154.56	550	18	0.06
Mandalay City	Pyimana	Mandalay	190	305.9	600	20	0.03
Mandalay City	Kyaukpadaung	Mandalay	170	273.7	600	20	0.04
Mandalay City	Madaya	Mandalay	30	48.3	200	7	0.07
Mandalay City	Lashio	Nothern Shan	113	181.93	1000	33	0.09
Mandalay City	Muse	Nothern Shan	288	463.68	2000	67	0.07
Mandalay City	Taunggyi	Southern Shan	204	328.44	1800	60	0.09
Mandalay City	Yenanchaung	Magway	189	304.29	700	23	0.04
Mandalay City	Chauk	Magway	177	284.97	700	23	0.04
Mandalay City	Magway	Magway	221	355.81	800	27	0.04
Mandalay City	Aunglan	Magway	329	529.69	900	30	0.03
Mandalay City	Taungoo	East Bago	255	410.55	650	22	0.03
Mandalay City	Nyaung Lay Bin	East Bago	332	534.52	900	30	0.03
Mandalay City	Pyay	West Bago	373	600.53	1200	40	0.03
Mandalay City	Yangon	Yangon	430	692.3	950	40	0.03
Mandalay City	Kalay	Sagaing	253	407.33	1800	60	0.07
Mandalay City	KalayWa	Sagaing	235	378.35	1800	60	0.08
Mandalay City	Monywa	Sagaing	85	136.85	700	23	0.08
Mandalay City	Shwebo	Sagaing	75	120.75	500	17	0.07
Monywa	Kalay	Sagaing	168	270.48		20	0.04
Monywa	Kalaywa	Sagaing	150	241.5		18	0.04
Monywa	Tamu	Sagaing	249	400.89		70	0.09
Monywa	Mandalay	Mandalay	85	136.85		12	0.04
Monywa	Yangon	Yangon	515	829.15		48	0.03
Aunglan	Yangon	Yangon	223	359.03		25	0.03
Aunglan	Mandalay	Mandalay	329	529.69		35	0.03
Pyay City	Yangon	Yangon	179	288.19		17	0.03
Pyay City	Mandalay	Mandalay	373	600.53		40	0.03

Source : Study team

Table 57: Auglan black sesame transport and export cost in 2006/07

	Cost Ks/Viss			Cost US$/t
	Min	Max	Average	Average
Transport cost from Auglan to Yangon	35	42	38	18.86
Cost bags	8	9	9	4.20
Cleaning cost	16	24	20	10.00
Fumigation	0	1	1	0.28
Packing for shipment	13	14	13	6.58
Inspection fees	0	1	1	0.30
Transport cost from warehouse to port	5	7	6	2.80
Port charges	0	1	1	0.26
Port exam charges	1	1	1	0.27
Stuffing	0	0	0	0.13
Fees for country origin certification	1	1	1	0.38
Fees for phytosanitary test	2	2	2	0.98
Fees of aflatoxin test	1	1	1	0.44
RAC	1	1	1	0.49
Security fees	2	2	2	0.89
Bill of lading	1	1	1	0.67
Clearing fees	1	1	1	0.36
Total cost	88	108	98	47.89

Source : Study team

Table 58: Local measures conversion table

1 Basket	16 Pyi
1 Pyi	8 Tins
1 Viss	1.63 Kg
1 Tonne	612.5 Viss
1 Kg	2.205 Pound
1 Pound	0.453 Kg
1 Acre	0.4047 Hectare
1 Mile	1.61 Kilometre

Source: CSO

Table 59: Myanmar official standard weight unit for oil crops

Oil crop	Unit	Viss	Pound	Kg
Sesame	1 Basket	15.0	54	24.49
Groundnut with shell	1 Basket	6.9	25	11.34
Sunflower	1 Basket	8.9	32	14.51
Niger	1 Basket	15.0	54	24.49
Mustard	1 Basket	16.0	57.6	26.12
Soybean	1 Basket	20.0	72	32.65

Source: CSO

Table 60: Wholesale price quotation unit adopted by traders in various Crop Exchange Centres in Viss

Crop	Yangon	Hinthada	Pyay	Aunglan	Myingyan	Magway	Mandalay	Monywa	Pakokku	Taunggyi	Aungban	Mawlamyine
Oilseeds crop												
Sesame		15	45	45	1	45	45	15	15	1		
Groundnut without shell			1	1	1	1	1	1	1	1		
Sunflower			9		1	9	27	9	9	1		
Niger					1		45	15	15	1		
Mustard							1	16				
Edible oil												
Groundnut	1	1	1	1	1	1	1	1	1	1	1	1
Sesame	1	1	1	1	1	1	1	1	1	1	1	1
Palm oil	1	1	1	1	1	1	1	1	1	1	1	1
Oilcake					1							
Groundnut cake	1	1	1	1	1	1	1	1	1	1	1	1
Sesame cake	1	1	1	1	1	1	1	1	1	1	1	1
Soybean cake	1	1	1	1	1	1	1	1	1	1	1	1

Source : Study team

Table 61: Myanmar Agricultural Produce Trading laboratory analysis and fees charged to the private sector

#	Particular	Fee (Kyats)	#	Particular	Fee (Kyats)
1	Crop analysis		5	Paddy	
	Moisture content	2 500		Quality of paddy	2 000
	Ash content	3 500		Milling quality of paddy analysis	3 000
	Protein content	5 800		Rice physical quality analysis	2 200
	Starch content	5 500		Foreign matter content	1 100
	Fibre content	5 500		Mixed colour content	1 100
	Gelatinization temperature	1 000	6	Pest damage	
	Amylase	6 500		Classification pest and identify pest	1 000
	HCN (hydrogencynitrate)	5 500		Durable slide for pest	900
	Sand and silica	4 500		Bio-assay test	1 400
	Sodium chloride (Nacl)	4 500		Pest damage and economic losses	2 200
	Calcium	5 500	7	Soil test	
	Gel consistency	1 500		Soil moisture	4 000
	Aroma	1 000		Mechanical analysis (texture)	4 000
	Food value	19 800		Soil (PH)	4 000
	Oil and albuminoids	14 300		Total Nitrogen	4 000
2	Pesticide residue			Phosphor level	4 000
	Chemical residue (RAC)			Exchangeable calcium	4 000
3	Toxic fungus analysis			Exchangeable magnesium	4 000
	Alfatoxin B.G.Y.F. test	6 000		Exchangeable sodium	4 000
	(Qualitative test)			Soil organic carbon and organic matter	4 000
	Romer with TIC (quantitative test)	10 000		Electrical conductivity	4 000
	Seed health test (germination test)	5 000		Water analysis	4 000
4	Edible oil and oilseeds crop				
	Oil property test	1 300			
	Oil colour test	2 550			
	Specific gravity test	2 000			
	Refractive index	1 750			
	Cloud point	2 500			
	Moisture test	2 300			
	Total oil content	8 500			
	Free fatty acid value	8 300			
	Saponification value	4 100			
	Iodine value	9 700			
	Peroxide value	6 300			
	Rancidity	1 750			
	Fatty acid analysed with GC	13 900			

Source: MAPT

Table 62: Food and drug Administration laboratory analysis on edible fats and oils

#	Foodstuff	Laboratory analysis
1	Edible fats, oils and related products	**Quality characteristics**
	Imported RBD palm oil	a) Colour
	Olive oil	b) Odour & taste
	Shortening	c) Acid value (%mm or mg KOH/g of oil)
	Margarine	d) Peroxide value (meq active oxygen/kg of oil)
	Bakery fat	e) Rancidity
2	Local production	**Chemical and physical characteristics**
	Groundnut oil	a) Relative density
	Sesame oil	b) Refractive index
	Soybean oil	c) Saponification value (mg KOH/g oil)
	Sunflower oil	d) Iodine value (5m/m absorbediodine)
	Maize oil	e) Unsaponifiable matter (g/kg)
		Identity characteristics
		f) GLC range of fatty acid composition
		(Expressed as % mm of monthly osters)
		g) Slip point
		Contaminants
		a) Volatile matter at 105 centigrade
		b) Insoluble impurities
		c) Soap content
		d) Mineral oils fats

Source: FDA

Table 63: Net sown area of Regional Crop Research Centres of the Department of Agricultural Research

#	Farm	Net sown area (acre)
1	Tatkone	162
2	Sebin	220
3	Kyaukse	61.5
4	Kyauktada	33.05
5	Myingyan	70.34
6	Zaloke	175
7	Pangone	54.25
8	Loikaw	52.75
9	Tarjaw	20
10	Thegone	13.5
11	Naungmon	144.4
12	Aungban	96.23
13	Kyinetone	24
14	Moenyin	48
15	Kyaukme	74
16	Myaungmya	55
17	Myittha	21.43
18	Htonebo	14
19	Kimontaung	23
20	Azin-2	11.01
21	Dawei-7 miles	24.39
22	Magway	127
23	Nyaungoo	88.19
24	Latpandan	98
	Total	1 711.04

Source: DAR