Agricultural Development

Project Number: 47152
June 2016

Proposed Loan
Republic of the Union of Myanmar: Irrigated Agriculture Inclusive Development Project

Asian Development Bank
ABBREVIATIONS

ADB – Asian Development Bank
ACIAR – Australian Center for International Agricultural Research
ADRA – Adventist Development and Relief Agency
AED – Agriculture Education Division
AMD – Agriculture Mechanization Department
ANR – Agriculture, Natural Resources and Rural Development Sector
BIMSTEC – Bay of Bengal Initiative for Multi-Sectoral, Technical & Economic Cooperation
CARI – Central Agricultural Research Institute
CARTC – Central Agricultural Research and Development and Training Center
CBO – Community Based Organization
CDZ – Central Dry Zone
CEXC – Crop Exchange Center
CSA – Climate Smart Agriculture
CSO – Central Statistical Office
DOA – Department of Agriculture
DAP – Department of Agricultural Planning
DAR – Department of Agricultural Research
DICD – Department of Industrial Crops Development
EA – Executing Agency
EIA – Environmental Impact Assessment
EU – European Union
FAO – Food and Agricultural Organization
FC – Frontline Center
FFS – Farmers’ Field School
GAP – Good Agricultural Practice
GOM – Government of Republic of Union of Myanmar
GMS – Greater Mekong Sub-region (GMS)
GRET – Group de Recherche et d’Echanges Technologiques
IAIDP – Irrigated Agriculture Inclusive Development Project
ICADP – Irrigation Command Area Development Project
ICDP – Integrated Community Development Project
ICRISAT – International Crops Research Institute for Semi-arid Tropics
ID – Irrigation Department
IMS – Integrated Management System
INGO – International Non-Government Organization
IPM – Integrated Pest Management
IPR – Intellectual Property Rights
IRRI – International Rice Research Institute
JICA – Japan International Cooperation Agency
Ks – Kyat (Myanmar currency)
LIFT – Livelihoods and Food Security Trust Fund
LUD – Land Use Division
MADB – Myanmar Agriculture Development Bank
MAPT – Myanmar Agricultural Produce Trading
masl – metres above sea level
M&E – Monitoring & Evaluation
MEB – Myanmar Economic Bank
MFI – Micro-Finance Institution
MIS – Management Information System
MML – Mott MacDonald Ltd
MOALI – Ministry of Agriculture, Livestock, and Irrigation
MOLFRD – Ministry of Livestock Fisheries and Rural Development
NGO – Non-Governmental Organization
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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</thead>
<tbody>
<tr>
<td>NSC</td>
<td>National Seed Committee</td>
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<tr>
<td>NSP</td>
<td>National Seed Policy</td>
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<tr>
<td>O&amp;M</td>
<td>Operation and Maintenance</td>
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<tr>
<td>PACT</td>
<td>Private Agencies Collaborating Together</td>
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<tr>
<td>PAM</td>
<td>Project Administration Manual</td>
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<tr>
<td>PFS</td>
<td>Pre-Feasibility Study</td>
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<tr>
<td>PPMS</td>
<td>Project Performance Monitoring System</td>
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<tr>
<td>PPP</td>
<td>Public Private Partnership</td>
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<tr>
<td>PPTA</td>
<td>Project Preparation Technical Assistance</td>
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<tr>
<td>RRP</td>
<td>Report and Recommendation to the President</td>
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<tr>
<td>SLRD</td>
<td>Settlement and Land Records Department</td>
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<tr>
<td>UNDP</td>
<td>United Nations Development Program</td>
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<td>UNOPS</td>
<td>United Nations Office for Project Services</td>
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<td>USAID</td>
<td>United States Agency for International Development</td>
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<td>VC</td>
<td>Value Chain</td>
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<tr>
<td>VDC</td>
<td>Village Development Committee</td>
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<tr>
<td>WB</td>
<td>World Bank</td>
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<td>WRUD</td>
<td>Water Resources Utilisation Department</td>
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<tr>
<td>WDC</td>
<td>Water Distribution Committee</td>
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<tr>
<td>WFP</td>
<td>World Food Programme</td>
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<tr>
<td>WRUD</td>
<td>Water Resources Utilization Department</td>
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<tr>
<td>WUA</td>
<td>Water User Association</td>
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<tr>
<td>WUG</td>
<td>Water User Group</td>
</tr>
<tr>
<td>YAU</td>
<td>Yezin Agricultural University</td>
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NOTES

(i) The fiscal year (FY) of the Government of the Republic of the Union of Myanmar and its agencies ends on 31st March. FY before a calendar year denotes the year in which the fiscal year ends, e.g., FY2016 ends on 31st March 2016.

(ii) In this report, "$" refers to US dollars unless otherwise stated.

CURRENCY EQUIVALENTS
(As of 1st September 2015)

<table>
<thead>
<tr>
<th>Currency</th>
<th>Equivalent</th>
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<tbody>
<tr>
<td>US$ 1.00</td>
<td>Kyat (MMK) 1273</td>
</tr>
</tbody>
</table>

TABLE OF CONVERSIONS AND LOCAL UNITS

| 1 hectare       | = 2.471 acres |
| 1 kg             | = 0.61 viss   |
| 1 viss (a measure of weight) | = 1.64 kg |
| 60 tickles       | = 1 kg        |
| 100 tickles      | = 1 viss      |
| 16 pyi (a measure of volume) | = 1 basket |
| 1 basket (a measure of volume) of: |
| • Paddy          | = 20.9 kg     |
| • Rice (milled)  | = 34.1 kg     |
| • Maize          | = 25.0 kg     |
| • Wheat          | = 32.7 kg     |
| • Sorghum        | = 24.5 kg     |
| • Sesame         | = 24.5 kg     |
| • Groundnuts (unhusked) | = 11.4 kg |
| • Sunflower      | = 14.5 kg     |
| • Soyabean       | = 32.7 kg     |
| • Lentil         | = 32.7 kg     |
| • Chickpea (split) | = 31.4 kg |
| • Green/black gram | = 32.7 kg |
| • Pigeon pea     | = 32.7 kg     |
| • Rice bean      | = 13.1 kg     |
| • Red/purple/lima bean | = 31.4 kg |
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MAP OF CENTRAL DRY ZONE MYANMAR

Dry Zone Map

Map ID: WFP_Burma_DryZone02
Source: WFP

Disclaimer: The names shown and designations used on this map do not imply official endorsement or acceptance by the United Nations.
AGRICULTURAL DEVELOPMENT COMPONENT
SUMMARY SHEET

<table>
<thead>
<tr>
<th>Project Title:</th>
<th>Irrigated Agricultural Inclusive Development Project (IAIDP)</th>
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<tr>
<td>Component:</td>
<td>Agricultural Development</td>
</tr>
<tr>
<td>Implementing Agency:</td>
<td>Department of Agriculture (DOA), MOALI, Nay Pyi Taw, Myanmar</td>
</tr>
<tr>
<td>Project Location:</td>
<td>Department of Agriculture (DOA), Department of Agricultural Research (DAR), Agricultural Mechanization Department (AMD) – at District and Township level in Magway and Yamethin Districts</td>
</tr>
<tr>
<td>Duration:</td>
<td>2017 to 2023, seven years.</td>
</tr>
<tr>
<td>Project Impact:</td>
<td>Improved household incomes in the project area</td>
</tr>
<tr>
<td>Project Outcome:</td>
<td>Increased income and welfare gains for farmers and rural populations in the Project areas</td>
</tr>
<tr>
<td>Component Output Statement:</td>
<td>Agricultural support for increasing productivity and livelihoods through value chain and private sector development.</td>
</tr>
</tbody>
</table>

Outputs:

1. Value Chain Development
2. Cross-cutting Value Chain Development Support

Activities:

1. Value Chain Development
   1.1 Improved seed supply – provision of support to seed supply system to develop a viable PPP between government (DOA & DAR) and private sector; involves a detailed assessment of the required modalities and preparation of a workable PPP arrangement, training of key stakeholders, including seed inspectors, plus demonstrations and trials on improved varieties on farmers’ fields.
   1.2 Extension of Good Agricultural Practices (GAP) to farmers – includes a detailed assessment of all the available, appropriate and relevant GAP including, crop water management, cropping systems, CSA, IPM, INM, SRI, rhizobia inoculum use, on-farm post harvest operations, etc., and the subsequent preparation of high quality training materials, and training of trainers including the training of DOA staff (for agronomic aspects) and ID staff (for crop water management).
   1.3 Agribusiness support to post harvest operations and marketing – financial and technical assistance to the private sector involved in post-harvest operations (drying, cleaning, milling, oil expelling, ginning, grading, storage) and marketing, includes provision of advice on possibilities of contract farming ventures with smallholder farmer groups and cooperatives; support to funding for processors/traders will be sought through general credit financial institutions for the purchase of processing equipment and storage infrastructure; close involvement of the trade associations and Chambers of Commerce will be essential for this activity to succeed.

2. Cross-cutting Value Chain Development Support
   2.1 Establishment and support to Frontline Centers – these centers have the objective to be a “one stop shop” resource center providing information & training for farmers, landless & women in a range of on-farm and off-farm activities, they will be located at two levels at the District level and the irrigation system level, with former being a larger central hub based at the DOA District Office it will be the link between the private sector and government & provide resources to the agribusinesses involved in the agricultural value chains, from input supply, post-harvest operations, through to marketing; the Frontline Center at the irrigation system level will provide key support to the communities and farmers in the system, the project will provide funds for the design, construction, furnishing & equipping (including IT equipment), and for motorcycles for the FC staff and irrigation system extension workers. Subsequent to the establishment of the FC the project will support their
implementation for 3 years with provision of expertise on training methods, training of the FC managers, Training of Trainers (ToT); on-farm demonstrations on GAP, Farmers Fields Schools, & strengthening links with Contact Farmers, farmer groups, WUG & private sector; additional support will be provided in training AMD staff, farmers and mechanics in improved smallholder on-farm mechanization. Special attention will be provided to training for the landless and IGAs for women, this will be expedited with the assistance of NGOs with key experience in the CDZ.

2.2 **Support to improved input supply** – a key issue to all farmers in the irrigation systems is access to quality agricultural inputs at reasonable and affordable prices which is not generally the case in Myanmar more particularly CDZ; the project will endeavor to develop workable PPP input supply arrangements between the farmers/farmer groups/cooperatives/ WUAs and the input supplier, which involves the oversight of the DOA to ensure input quality/standards especially for fertilizers & pesticides (and when available improved seeds) & agricultural equipment (both pre- and post-harvest); provision TA to review & develop workable PPP modalities, training workshops for key stakeholders (public & private), and support costs for DOA oversight.

2.3 **Development of Information System** – comprehensive information on input supply and commodity markets both national, regional and international needs to be seriously upgraded to improve the competitiveness for Myanmar commodities particularly for rice, oilseeds and pulses, all of which have huge potential for expansion; the project will also use the information distribution systems to provide accessible information on good agricultural and farm practices; the project will support the development of a sophisticated telecommunications based Information Systems (IS) which will be accessible to all key stakeholders in the value chains – farmers, processors, traders etc.; in addition to the development of the system, IT equipment will be provided to DOA and selected Chambers of Commerce, the IS will be installed within the FC for easy public access; a public awareness creation exercise will be undertaken to inform the public of the IS; funds will be provided for the updating of the information database on a daily basis.

2.4 **Support to value chain development** – further information is required on the key value chains for rice, oilseeds and pulses, in addition information is much needed on other crops of importance (e.g., onions, chilies, tomatoes, cotton and other industrial crops, vegetables and fruit, etc.) the project will review and evaluate these value chains in a participatory to supporting partnerships with the private sector, Chambers of Commerce, financial institutions and GoM in leveraging the weak links; funds will be provided for market promotion and facilitation and collaboration with the commodity Associations and Chambers of Commerce, and other key private sector stakeholders.

| Inputs: | • **Civil Works**: construction of (a) two District Frontline Centers – large centers); and (b) about 5 irrigation systems/satellite Frontline Centers (smaller centers).  
| | • **Vehicles and Equipment**: motorcycles, officer furniture, equipment (office, communication & IT, agricultural and seed processing).  
| | • **Training**: comprehensive range training aimed primarily at the farming community, landless, women and private sector, also includes training of DOA and AMD staff on a range of technical and agribusiness topics related to GAP & other key topics.  
| | • **Technical Assistance**: TA to be provided for Value Chain Development, Seed Multiplication, GAP Support, Agribusiness, Legal Advisor, Training of Trainers (ToT), PPP and Input Supply, and Information System development. Also professional staff in FC and NGO support for landless and women.  
| | • **Operating Costs**: for training allowance of counterpart staff, travel allowances (running costs of motorcycles & phone), operating expenses (Frontline Centers), on-farm research trials and demonstrations.  
| Beneficiaries: | • **Primary beneficiaries** from this component will be the farming and landless communities (individual farmers, farmer groups, cooperatives & WUGs) in the irrigation systems in the CDZ, plus the important private sector agribusinesses which are key part of the value chains, especially those involved in input supply,
post-harvest operations and marketing. It is important to note that the poor, landless and women will be particularly targeted.

- **Secondary beneficiaries** are the GoM staff involved in extension (DOA and AMD) and research (DAR), especially those working in the FC and the irrigation systems.
- **Tertiary beneficiaries** will be the other players in the various value chains through an improved MIS and greater awareness of the issues as regards to the development of irrigated agriculture.

| Summary: | The Agricultural Development Component is to provide support to the farming and landless communities in the irrigation systems and the other key participants in the agricultural sector in the CDZ through value chain and private sector development. This is to be achieved through key interventions: (i) improved seed supply, extension of GAP, and assistance to improved post-harvest operations; and (ii) support to a range of broad-based cross-cutting value chain and private sector development interventions, including the establishment of Frontline Centers (FC) at the District and Township/irrigation systems levels. The FCs will be bases to support the farming community, landless and women, and support partnerships with the private sector. This includes support to improved input supply, development of Information Systems and further analyses and review of the key value chains important in the CDZ. |
I. INTRODUCTION

A. Development Context

1. Government's FESR\(^1\) states that “it is also critical to improve supply chain management in the trading and marketing of agricultural produce, as farmers currently face high transaction costs, lack of technology and know-how, and poor access to credit.”

2. ADB’s country diagnostic study\(^2\) summarizes its assessment of the present state of Myanmar's agriculture: "... agricultural productivity trails far behind Myanmar’s neighbors, causing high indebtedness among farmers, and malnutrition ... Multiple factors have held back agricultural development, including low investment, outdated technology, unpredictable government policies, poor water control and management, inefficient and unbalanced land distribution, high transportation costs, weak rural financial institutions, and exports of low-value unprocessed products alongside a lack of diversification in export markets.” The study proposed strategy for agriculture is to: “Restructure agricultural support to increase productivity and value-adding opportunities along the entire supply chain through a supply-chain management approach that views agriculture as an agribusiness system; increase public investments in agri-support services, including research, extension, marketing, credit, and organization of smallholders; strengthen input markets and promote the proper use of quality seeds, fertilizers, and pesticides through targeted investments and regulation; and extend and rehabilitate irrigation and drainage systems for rice and high-value crops.”

3. The Government and ADB strategies are entirely congruent and the Irrigated Agriculture Inclusive Development Project is ADB's first major intervention to directly address agriculture sector development. The project includes a major irrigation component to rehabilitate a pipeline of irrigation subprojects in the Central Dry Zone (CDZ) and proposes an agricultural development component to address the diverse issues required to produce comprehensive sector development. This component is set in the framework of value chain development oriented to meet location specific stakeholder requirements.

B. Approach and Methodology

4. This study is complex and necessitated close collaboration of a wide range of stakeholders in government, donor agencies, civil society, the private sector, and especially the farming community in the project areas. Collaboration within the PPTA team was needed to address the many cross-cutting and interdisciplinary issues involving infrastructure, surface and groundwater management, environment and climate change, economics, institutional development, and social and gender issues. A detailed review of area relevant documentation was made (Annex 2) and a Socio-Economic Survey undertaken, which included an assessment at farmer level of the farming and cropping systems in the two core sub-project irrigation systems – Natmauk and Chaungmagyi. In order to clarify various terms related to value chain development a glossary is presented in Annex 3.

5. In formulating the agricultural development interventions for the IAIDP, a sector approach was undertaken following ADB strategic plan for Myanmar, which is in line with the Government of Myanmar (GOM) policy objectives as discussed above. There is a focus on value chains and private sector development which form the basis for this proposed intervention. The approach is illustrated with analyses of three priority agricultural value

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\(^1\) "Framework for Economic and Social Reforms : Policy Priorities for 2012-2015 towards the Long-Term Goals of the National Comprehensive Development Plan" 12/14/2012

\(^2\) "MYANMAR: Unlocking the Potential" ADB, August 2014
chains for rice, oilseeds and pulses in Annex 7 - each of these is of major importance to the livelihoods of the communities in the CDZ.

6. In this context, irrigation development and improved water availability are considered as an input to crop production and agricultural development and form only a part of the value chain development in the same context as other inputs such as improved seed supply and appropriate fertilizer use.

7. An analytical framework for understanding constraints to increased competitiveness of value chains has been developed, using a classical value chain methodology (innovation, vertical and horizontal linkages, end markets, enabling environment, potential for value addition at all stages of the chain). This document makes proposals for interventions addressing all agricultural value chains, building on specific recommendations for each of the three crop commodity groups in Annex 7 and suggests priorities for short and long term interventions appropriate to the project area, more especially for the irrigation systems in the Magway and Mandalay Regions of the CDZ.

C. Value Chains in the Central Dry Zone

8. Agribusiness and value chains are a crucial “lever” of rural development and income improvement in Myanmar, especially in the CDZ. The primary actor in this scenario is the private sector and these entities (including, stakeholders involved in the whole chain from smallholder farmers at the production level through to the SMEs involved in post-harvest operations, processing, trading, marketing and retail) will be the primary beneficiaries of the project. Government should, in this context, play the role of facilitator, regulator and policy formulator in the process rather than as a substantive implementer. It is important to create a strong alliance and appropriate linkages between the government and private sector, one of these modalities being through the formation of Public Private Partnerships (PPP) to enable contract farming, input supply and even micro-finance with smallholder farmers and landless.

9. Rationale and Approach: The Agricultural Development Component is to provide support to the farming and landless communities in the project areas and other key participants the agricultural sector in the CDZ through value chain and private sector development. This is to be achieved through two key interventions: (i) support to value chain development (improved seed supply, extension of GAP, and assistance to improved post-harvest operations; and (ii) support to a range of broad-based cross-cutting value chain and private sector development interventions, including the establishment of Frontline Centers (FC) at the District and irrigation system levels. The FCs are a form of “one stop shop” for advice and assistance to the farming community, landless and women, and business community. This sub-component also includes support to improved input supply, development of a Marketing Information System, and further analyses and review of the key value chains important in the CDZ.

10. It is planned that during the project period of seven years a total of five irrigation systems will be supported in two Districts. Developments will be both at the irrigation systems level (especially on-farm production actions) and at the District/Township level for other agribusiness actions related to input supply, post-harvest operations and marketing.

11. Benefits: The benefits from the interventions to be implemented under the project will include a significant increase in production, processing, trading and sales of agricultural products including rice, oilseeds and pulses. Furthermore, there will be an increase in number of profitable farmer groups/cooperatives and agro-enterprises, and increased incomes of agro-enterprises situated in the Townships and Districts in which the irrigation systems are located. The main beneficiaries are the poor smallholder farmers, women and landless communities in the irrigation systems and areas targeted by the project and other
actors along the value chain, including input suppliers, service providers, processors, traders and entrepreneurs.

12. **Risks**: The five key risks to Component implementation are identified as: (a) Government support for higher value cropping and crop diversification is not maintained, (b) farmers do not accept the change of their cropping plans and farming methods, (c) lack of business skills, and groups or enterprises fail due to unsound management, (d) illegal practices, or natural disasters including severe climate change events, and (e) risks may arise from inadequate capacity of the executing agency and understaffed implementing agency district offices. These risks will be addressed through project support and capacity enhancement support and technical backstopping by outsourced technical assistance, and in this respect agribusiness, value chain and managerial development capacity building will be required.
II. SECTOR APPROACH

13. This Section provides a sector assessment of the farming and cropping systems in Central Dry Zone (CDZ) pertaining to the project area and selected irrigation systems, with background on government and ADB policies and plans, and an outline of the Agricultural Development Component for Irrigated Agriculture Inclusive Development Project (IAIDP), with details on the component and sub-component intervention logic.

A. Sector Assessment

1. Farming Systems in Central Dry Zone

14. For the subprojects surveyed (Natmauk and Chaungmagyi) the farming system was predominantly based on cropping, to a lesser degree, some mixed farming with some livestock enterprises (Annex 4). However livestock were important in providing some cash income, draught power and the much needed animal manure for crop production. The household income from on-farm activities was estimated to be in the region of 50-60% of the total household income, with off-farm income generation mainly coming from employment, minor trading and small scale income generating activities remittances from migrant labor. For further more detailed information on the farming and livelihood systems in the Chaungmagyi and Natmauk reference should be made to Supplementary Document 4 – Detailed Financial and Economic Analysis

15. The cultivation of monsoon paddy which is the major crop grown, is mainly for subsistence with the excess sold for cash, while most other crops, mainly pulses and oilseeds, and some cotton and vegetables were for the most part cash crops (Annex 5). Paddy, mainly monsoon grown with small areas of summer paddy were found to be almost without exception the only crops irrigated in the systems using the surface water from the dams. Yields of irrigated rice were estimated to be low by regional standards at around 1,200 kg/acre. Largely as a result of water scarcity and the low rates of improved seed use, current agricultural productivity levels within the non-irrigated rainfed areas are low. The area is known as a production area of oil-crops and pulses, where national production share reaches 70 - 90% in the case of oil-crops and around 40 to over 90% in terms of pulses except black gram that is produced in the delta.

16. Livestock comprise an important element in the CDZ production systems, even in the irrigated farming systems of Natmauk and Chaungmagyi. Cattle, with their essential role in land preparation and transport, were the most common animal, being kept by nearly one-half of all farmers, but chicken were also widespread. Small ruminants were much less commonly owned as were pigs. Ducks, buffalo and horses were even less common. Nevertheless, it is worth noting that few animals are slaughtered or eaten at village level, and most animals are kept as a saleable asset in case of need. Livestock particularly the cattle are heavily reliant on crop residues from the pulses and cereal crops. Stall feeding is common for the cattle, and also the goats/sheep, but most of the fodder comes from the rainfed lands and the paddy fields.

17. Farm Size, Land Tenure and Sharecropping: Average farm sizes across the CDZ were found by the LIFT Baseline Survey (2012) to be 4.5 acres; less than in the coast/delta areas of Myanmar (10 acres/household), but more than in hilly areas (2 acres per household). This compares with the IAIDP Socio-Economic Survey data which averaged 2.9 acres per household for Chaungmagyi (2.0 acres canal irrigated, 0.3 acres from groundwater and 0.6 acres rainfed) and 4.5 acres/HH for Natmauk (2.1 acres canal irrigated, 0.4 acres from groundwater and 2.0 acres rainfed). Land holding varied very little in size between the head, middle and tail areas of the two irrigation systems. Most of the land was owned and farmed by the household, where sharecropping and the leasing of land was uncommon.
When this did take place payments were usually made in kind at around 20 baskets of paddy per acre/season (175 kg per acre/season). It is important to note that the dispersed nature of the household farm plots and uneven layout of the plots within the irrigated lands makes land consolidation, with the consequent benefits of better water management and land cultivation, often difficult to attain.

18. **Agriculture Inputs:** Without exception it was found that the necessary inputs for crop production were readily available in both large and small urban centers and at weekly markets. The problems to the farming households related more towards the poor quality of these inputs (fertilizers and pesticides) and their expense. Improved seeds of paddy were not readily available as were oilseeds and pulse seeds. Improved seed for maize (hybrids), selected other upland crops (cotton) and vegetables seeds are available. However more needs to be done to ensure that improved varieties of paddy, pulses and oilseeds in particular are made accessible to the farmers. Overall, the use of improved inputs in the irrigations systems surveyed in the CDZ was found to be moderate to low. The most common constraint to crop production is the lack of funds to purchase inputs. Limited capital equipment (tools, daft animals, mechanical power) and land are also common constraints. Overall, constraints to crop production are generally with low-intensity production techniques that could be addressed with increased availability of credit, technical advice and improved access to land, and problems associated with lack of infrastructures for irrigation and water control. Currently there is a reliance on both organic and inorganic fertilizers, but crop production is constrained by the shortage of organic manures sufficient to sustain cropping systems on even the smallest of farms, and the present high price and poor quality of inorganic fertilizers. The cause of the decline in paddy production over the last few years is considered to be as a direct result of the high price of inorganic fertilizer.

19. **Improved Seed:** As regards to the availability of improved seed the overall performance of the seed sector is weak although there are some positive aspects that are emerging. The weakness of the sector can easily be captured by the low coverage of certified seed. Rice certified seed reach a minority of farmers who continue to have a low replacement ratio of their seed stock. Informal seed exchange system is predominant and formal seed system in rice hardly reaches 10% of the sown area. The situation is even worse for the supply of improved seed of pulses and oilseeds where it is particularly important to introduce high yielding drought tolerant varieties for the CDZ as was found in Natmauk and Chaungmagyi irrigation systems. Production of certified seed of all major crops cover only a fraction of the total planted area. Estimates indicate that production of certified seed of rice may cover about 2% of the demand, and for pulses and oil seeds the coverage ranges from 0.1 to 0.25%. While rice receives a major share of allocations for seed production, pulses and oil seeds lack almost entirely a seed production program. There is some involvement of the private sector in seed production, but this is still relatively limited and mainly focuses on the production of hybrids. In addition, the monitoring of the health status and quality of the certified seed, even for rice, does not comply with required technical and international standards.

20. Most commercial varieties of major crops have been released a long time ago (most in the 1980’s or even before), which coupled with an inefficient seed production process, render them outdated, mixed, accumulated with detrimental mutations, susceptible to pests and diseases, and unresponsive to inputs. Although several improved varieties and hybrids have been released by the research institutions in recent years, many are not adopted by a significant number of farmers, and especially for the monsoon cropping season. The yield gap (the difference between actual yield and potential) remains high. More worryingly yield growth seems to be slowing down and there is the danger it might even reverse. At the same time, hybrid vegetable seed are thriving particularly with the emergence of private foreign and domestic seed companies investing in Myanmar. The agricultural sector is currently attracting the interest of various investors and with the formation of the Myanmar Rice
Federation (MRF) private companies have gained access to registered seeds from DOA for multiplication purposes and the production of certified seeds.

21. In the current formal seed system, the Department of Agricultural Research (DAR) is responsible for research and generation of breeder and foundation seeds. DOA is responsible for the production of the registered seeds which are distributed either to private seed growers and, more recently, to private seed companies under the support of MRF. Multiplication of registered seeds yields certified seeds that are then distributed to farmers and market. Most notable for the Myanmar seed sector is the absence of seed associations, and also lacks the presence of coordination mechanisms such as Seed Working Group or Seed Tasking Force (different from Seed Committee which is in charge only of release of new varieties).

22. Private sector involvement in the seed industry. The Myanmar Rice Industry Association (MRIA) has been formed in 2007, which has been transformed into Myanmar Rice Federation (MRF) in 2011. Under the organization and management of MRF, (57) Rice Specialized Companies (MRSC) have been formed. MRSCs are implementing Contract Farming Programs. A number of private companies are currently working on seed for rice, hybrids (also maize and vegetables), namely: CP Company, Known You Seed Company, Malar Myaing, Myat Min and Bayer Crop Science. In the case of maize and vegetables there seems to be high interest in private companies to engage in seed production, but less so is the case with rice. The implementation of the Seed Law might change this situation.

23. Farm Power and Agricultural Mechanization: The degree to which farmers across the irrigation systems in the CDZ use improved forms of agricultural mechanization varied according to location with the two systems in Kayah State more advanced in the use of hand tractors to cultivate their lands, as compared to Magway and Mandalay Regions where draught power predominated, mainly oxen. Farmers cited in the latter case the importance of the need for FYM and the relative expense of mechanization, however they were concerned at the shortage and cost of labor to work on the farms, due to the high levels of migration (seasonal and longer term) of the male members of the households.

24. Agricultural mechanization is still in its early stages of development. More needs to be done to both improve the efficiency of animal draught power through better equipment and animal husbandry, and to introduce appropriate farm machinery that is both economically viable and is suited to the farming systems. There are repercussions to be considered when animal draught power is replaced by mechanized systems, particularly with regards to the current reliance in many areas on the use of farm yard manure as a source of crop nutrients, especially as inorganic fertilizers are expensive and of poor quality. Agricultural mechanization has been carried out by utilizing farm machinery and equipment for various activities of agricultural production through private sector participation in addition to the state sector activities where the Agricultural Mechanization Department (AMD) through its tractor hire services at Township and irrigation system level is involved, especially with regards to the use of large tractors on medium to large sized land holdings. Increased cropping intensity has expanded the use of machinery in agriculture from land preparation to harvesting and post-harvest activities. Required machinery is being produced and assembled locally (Mandalay and Yangon) or imported for distribution to the farmers. AMD has a well-resourced staff, farmer and private sector mechanic training center in the CDZ – Meiktila Agricultural Mechanization Training Center, which is to be supported by the World Bank ADSP.

25. Efforts are being made to totally eliminate the traditional way of threshing paddy on the threshing floor, through the introduction of threshers and combine harvesters, however these efforts are still in their infancy. A number of model mechanized villages (23 locations)
were established with MOALI support throughout the country to demonstrate to farmers the benefits of farm mechanization, and more needs to be done in this respect.

26. Land development activities for the transformation from conventional agriculture to mechanized agriculture are being undertaken as follows: (a) construction of feeder and farm land roads, (b) construction of canals and drainage for irrigation, (c) transforming small plots to larger one acre plots through land consolidation, and (d) facilitating the purchasing process by introducing an installment payment system for agricultural machinery in order to have access and affordable by farmers. The need for agricultural mechanization has been heightening due to the shortage of labor during the busiest seasons for farming in many areas in CDZ. Paddy after harvesting is often left in the farm land for one month due to the shortage of labor, which results in lower rice quality. Farm mechanization has benefited the farmers in terms of savings in time and human labor costs. In addition, it has contributed to increased cropping intensity of the country, where cropping intensity has increased from 133% in 1996/97 to 158% in 2012/13.

27. Transformation from conventional to mechanized agriculture is considered by Government to lead to the establishment of modernized mechanized farmers throughout the country enabling farmers to grow double and multiple crops. It will be not only of benefit for farmers through increased crop production but also for the increase of per capita income. However, expansion of use of farm machinery must be approached with caution. Introduction of machines in production systems which are not profitable/suitable as is quite often the case in CDZ, may be counter-productive. However, machines can have a significant economic impact if included in production systems that are suited to their use, such as intensive land use (double or triple cropping) or farming of large areas. In the latter case land consolidation is required, which is challenging given the need to collectively reorganise plots of land in the close requirement for farmer group participation.

28. **Rural Finance and Credit:** Small-scale farmers and the landless poor in the CDZ, as was found in the Natmauk and Chaungmagyi irrigation systems, lack access to credit (in terms of adequacy and affordability of terms and conditions of loans) to invest in agricultural inputs, as well as credit to invest in small income generating activities. Rural finance was consistently reported by farmers as their most severe constraint in crop production. The availability of formal rural finance services is low – while 70 percent of the population is engaged in agriculture, which produces 32 percent of GDP, only 1 to 3 percent of formal bank credit is provided to the sector. Lack of access to credit and micro-finance at affordable rates is creating a problem of growing indebtedness as the rural population must resort to credit from local money lenders and traders. This problem requires innovative interventions, including targeted cash interventions, the provision of in-kind agricultural inputs and supporting a sustainable microfinance sector in the CDZ to provide small credit to farmers and landless laborers at affordable rates. The Government has set as a priority the establishment of loan programs through public sector development banks, including the Myanmar Agricultural Development Bank (MADB) in all states and divisions. Supportive government policies introduced recently could open the door to new service providers and should encourage donors to expand microfinance operations.

29. To address indebtedness, the development community, including ADB, would need to encourage communities to form self-help or self-reliance groups to be the recipients of seed capital. These groups could then provide cash grants to their members coming from poor and most vulnerable households and create a social fund to provide credit at favorable rates for emergencies such as medical fees, to stop families falling into debt. There is also a need to support new service providers in micro-finance, such as agro-industries and traders in agricultural produce, to expand their credit operations. Innovative social protection and safety net mechanisms need to be introduced and adapted to the local socio-economic
system. Such measures could include crop insurance, farmer pension schemes, cash transfer for meeting conditional criteria or long-term cash hand-outs.

30. Thus far, provision of rural finance has focused on credit only and has been supply driven, based on 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 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.

31. 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 (MEB) at 14 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. Table 1 summarizes the terms and conditions of available rural credit identified in the CDZ.

Table 1: Identified Rural Credit Available in CDZ

<table>
<thead>
<tr>
<th>Lender</th>
<th>Interest Rate per Month (%)</th>
<th>Annual Interest Rate (%)</th>
<th>Ceiling</th>
<th>Collateral</th>
<th>Reported Repayment Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>MADB</td>
<td>1.42</td>
<td>17</td>
<td>MMK 100,000/ acre paddy; others MMK 20,000/ acre</td>
<td>No</td>
<td>100%</td>
</tr>
<tr>
<td>Cooperative Department</td>
<td>1.15</td>
<td>13.8</td>
<td>MMK 100,000 /acre for members only Plan: MMK 300,000</td>
<td>No</td>
<td>100% (every 6 months)</td>
</tr>
<tr>
<td>PACT Myanmar</td>
<td>0.98</td>
<td>12</td>
<td>MMK 100,000 – 300,000. For women only</td>
<td>No</td>
<td>100% (25 X payment)</td>
</tr>
<tr>
<td>Commercial Banks</td>
<td>1.08</td>
<td>12.9</td>
<td>MMK 100,000/ acre</td>
<td>Yes</td>
<td>100%</td>
</tr>
<tr>
<td>Government pawn shop (MEB)</td>
<td>3</td>
<td>36</td>
<td>Max 40% of collateral value</td>
<td>Yes</td>
<td>100%, if not auction sale of collateral</td>
</tr>
<tr>
<td>Private pawn shops or local money lenders</td>
<td>3 to 5</td>
<td>36 to 60</td>
<td>Up to 80% of collateral value</td>
<td>Yes</td>
<td>Near 100%</td>
</tr>
<tr>
<td>Private pawn shops or local money lenders</td>
<td>7 to 10</td>
<td>84 to 120</td>
<td>Depending on trust &amp; social background of lenders</td>
<td>No</td>
<td>Depending on trust, but reportedly near 100%</td>
</tr>
<tr>
<td>Fertilizer dealers</td>
<td>2 to 4</td>
<td>24 to 48</td>
<td>Variable</td>
<td>No</td>
<td>98-100%</td>
</tr>
<tr>
<td>Contract farming*</td>
<td>2 to 5</td>
<td>24 to 60</td>
<td>Variable</td>
<td>No</td>
<td>98-100%</td>
</tr>
</tbody>
</table>

* 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 marketing price at harvesting time is not yet known.
Source: IAIDAP PPTA team.
32. 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. 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.

33. 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 usury 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 2: Sources of Finance for Rural Households

<table>
<thead>
<tr>
<th>Location</th>
<th>Government</th>
<th>Cooperative</th>
<th>MADB</th>
<th>NGO</th>
<th>Rich Farmer</th>
<th>Relatives</th>
<th>Friends</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chaungmagyi</td>
<td>5%</td>
<td>34%</td>
<td>1%</td>
<td>22%</td>
<td>7%</td>
<td>30%</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>Head</td>
<td>3%</td>
<td>17%</td>
<td>3%</td>
<td>38%</td>
<td>7%</td>
<td>32%</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>Middle</td>
<td>3%</td>
<td>48%</td>
<td>0%</td>
<td>15%</td>
<td>8%</td>
<td>26%</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>Tail</td>
<td>11%</td>
<td>39%</td>
<td>0%</td>
<td>11%</td>
<td>6%</td>
<td>33%</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>Natmauk</td>
<td>9%</td>
<td>18%</td>
<td>7%</td>
<td>29%</td>
<td>13%</td>
<td>24%</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>Head</td>
<td>7%</td>
<td>27%</td>
<td>10%</td>
<td>21%</td>
<td>10%</td>
<td>24%</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>Middle</td>
<td>4%</td>
<td>16%</td>
<td>6%</td>
<td>38%</td>
<td>15%</td>
<td>21%</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>Tail</td>
<td>15%</td>
<td>11%</td>
<td>6%</td>
<td>26%</td>
<td>12%</td>
<td>27%</td>
<td>2%</td>
<td></td>
</tr>
</tbody>
</table>

Source: IAIDP PPTA Socio-economic Survey

34. 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, at least until the recent banking reforms that have taken place in Myanmar. 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. Fertilizer dealers could greatly expand their business if they would provide fertilizers on a credit basis. However, although the reported repayment rate is close to 100 percent in most cases, the majority of fertilizer 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.

35. **Agricultural Advisory Services**: The main official provider of extension advice is the DOA - though "other farmers", radio and the private sector are more frequently cited sources of technological information (Table 3). For the two core subproject irrigation systems evaluated the quality of DoA service varied quite considerably, but overall the level of support and advice from the Department was poor at best. The main finding was that in general far more could be done to assist the farmers in the provision of advice on existing crops and improved land and water management.

36. DOA has a large staff most of whom are based at the village tract level. It is responsible for imparting Good Agricultural Practices (GAP) to the farmers through a range of modalities and interventions, however these recommendations need to be updated. Currently the Government run extension system is under-resourced and is deemed to have little impact on smallholder farmer crop productivity. Current staffing levels in the two
feasibility study irrigation systems are as follows: Chaungmagyi – Pyawbwe Township, AMD 3 staff and DOA 5 extension staff, total 8; Natmauk – Myothit Township, AMD 3 staff and DOA 4 extension staff, total 7, and Natmauk Township, AMD 3 staff and DOA 4 extension staff, total 7 (grand total Natmauk system AMD 6 staff and DOA 8 staff).

Table 3: Source of Technology Transfer

<table>
<thead>
<tr>
<th>Location</th>
<th>Books / Printed</th>
<th>Radio</th>
<th>DoA</th>
<th>Other Farmers</th>
<th>Private Sector</th>
<th>NGOs</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chaungmagyi</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farmers %</td>
<td>3%</td>
<td>33%</td>
<td>24%</td>
<td>62%</td>
<td>28%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Citations %</td>
<td>2%</td>
<td>22%</td>
<td>16%</td>
<td>40%</td>
<td>18%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Natmauk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farmers %</td>
<td>12%</td>
<td>46%</td>
<td>16%</td>
<td>53%</td>
<td>20%</td>
<td>0%</td>
<td>3%</td>
</tr>
<tr>
<td>Citations %</td>
<td>8%</td>
<td>31%</td>
<td>10%</td>
<td>35%</td>
<td>14%</td>
<td>0%</td>
<td>2%</td>
</tr>
<tr>
<td>Both Core Subprojects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farmers %</td>
<td>7%</td>
<td>39%</td>
<td>20%</td>
<td>57%</td>
<td>25%</td>
<td>1%</td>
<td>3%</td>
</tr>
<tr>
<td>Citations %</td>
<td>5%</td>
<td>26%</td>
<td>13%</td>
<td>38%</td>
<td>16%</td>
<td>1%</td>
<td>2%</td>
</tr>
</tbody>
</table>

Source: IAIDP PPTA Socio-economic Survey

37. While there is an establishment of reasonably trained extension force and subject matter specialist, available for technology transfer in some areas of Myanmar other areas including the CDZ are short of the necessary properly trained manpower. Extension is currently provided to facilitate the achievement of central production targets for the core crops and especially for rice. To have a more significant impact on farm incomes, crop production and in the alleviation of rural poverty the service requires re-orientation within a new enabling environment for farm production. Its' main role should be to improve farm incomes through the development of sustainable integrated farming systems based on sound farm management practices. Extension should focus on key themes including: (i) adoption of quality seeds and planting materials of new high yielding and drought tolerant varieties; (ii) integrated balanced plant nutrition, capitalizing on the already good work in the use of organics combined with increased use of chemical fertilizer; (iii) integrated pest management techniques in pest and disease control; (iv) integrated cropping and farming systems; (v) water use efficiency in irrigated systems and rain-fed conditions; and (vi) support to farm enterprises and value chains such as kitchen gardening, horticulture, and enterprises especially relevant for the small and marginal farmers and the landless.

38. Agricultural Research Services: A wide range of government research and development bodies share public spending that remains extremely low and centrally planned programs focus on production rather than a broader approach including issues of post-harvest marketing and profitability to enhance productivity growth. Most agricultural research does not account for issues of profitability, production cost, marketing, agro-ecological constraints and socio-economic limitations of farmers. They do not form building blocks of a program targeted to reach a well-defined objective. Priorities are often set at headquarters without effective involvement of field staff, extension agents, and farmers. They emphasize research increasing agricultural production rather than adopting a broader perspective of the farm as an agri-business unit.

39. The Department of Agricultural Research (DAR) has seven Crop Research Centers and 17 Satellite Farms, a number of which are located in the CDZ (e.g., Magway District – Magway Oilseeds Research Center, and Sebin Satellite Farm, Mandalay Region). The mission of DAR is “to systematically conduct research activities that would suit to the needs of all stakeholders which include producers, distributors and consumers in developing and
dissemination of regionally adapted crop varieties and crop production technologies". Although DAR is carrying out suitable research, particularly with new varieties, there still remains the problem of applying this to the farmers’ fields on a large scale and the adequate connection of this knowledge with extension to the farmers.

40. **Non-Government Organizations:** Activities by NGOs in agricultural sector are briefly as follows. Though majority of NGOs provide activities related to food security and livelihood improvement, some other organizations offer activities for improving agricultural productivity, consolidating irrigation infrastructure, provision of micro-credit etc., while many others focus support on health and education. Almost all the NGOs working in Myanmar are international, which have signed Memoranda of Understanding (MOU) or Letters of Agreements (LOA) with the government. In spite of certain difficulties in working in the field mainly caused by international sanctions, there were about 65 NGOs active in various sectors in Myanmar including agriculture, health and post-disaster rehabilitation. Most of their funding comes from Japan, United Kingdom, The Netherlands, France, Norway and Italy. Examples of such NGOs are: Action Aid Myanmar (AAM), Water Research and Training Center – Myanmar (WRTC-Myanmar), World Vision Myanmar (WVM), Capacity Building Initiative (CBI), Population Services International (PSI), PACT and GRET.

41. The activities of NGO's in the irrigation systems surveyed under this PPTA were found to be very limited (Table 3), with PACT/UNDP established in Natmauk providing micro-finance to the rural community. This entity was not however present in Chaungmagyi but the irrigation system had an FAO AVSI program and Mercy Corps were implementing a community health program.

42. **Farming Systems Constraints:** The key constraints as identified were as follows: (a) the high level of indebtedness and lack of micro-finance for the farmers; (b) inefficient marketing system, at least from the perspective of the farmers, with the need for market development including post-harvest value addition; (c) expensive and often poor quality inputs, especially with regards to fertilizers, and where seed of improved crop varieties, especially for pulses and oilseeds, is difficult to obtain; (d) the continuous sole cropping of paddy on the irrigated lands has serious repercussions for soil health, high water requirements and low financial returns; (e) critical lack of knowledge among farmers and staff of DOA and ID, on new crop and water management technologies, especially with regards to the needs to address climate change; (f) serious labor shortages due to migration of household members increasing labor costs often at critical periods in the cropping cycle, necessitating the need to consider a range of labor saving technologies and mechanization; and (g) the main and central need to improve the water management of the irrigation systems, to be both more equitable and efficient, where it is notably the wastage of water in the monsoon period that is especially high often impacting negatively on the availability of stored water in the dams/reservoirs for the summer cropping season.

2. **Cropping Systems**

43. **Existing Cropping Systems:** The cropping systems in the CDZ follows two distinct patterns for the irrigated and rainfed areas. In the irrigated areas, almost without exception, a rotation of monsoon paddy and summer paddy and sesame is followed. Where the cultivation in the summer season is wholly reliant on the availability of water stored in the irrigation reservoirs/dams; a factor dependent on the highly variable rainfall patterns in the CDZ. Cropping intensities in the irrigated systems are usually not more than 110-130%. In the rainfed areas dryland cropping is followed which involves a range of cropping patterns including mainly pulses (pigeon pea, black and green gram, chick pea, lablab bean etc.), and oilseeds (sesame, groundnut and sunflower), plus other cash crops including cotton, tobacco, vegetables, grapes and sugar cane. Some cereals sorghum and maize are also
grown as are small plots of vegetables in the lower lying farmlands. Cropping intensities in the rainfed areas range from <80% to 120% depending on location and the seasonal rainfall.

44. The typical current cropping patterns for Natmauk and Chaungmagyi are presented in Annex 5, where for both irrigation systems monsoon paddy predominates followed by cotton (unirrigated crop) in Chaungmagyi and sesame in Natmauk (predominantly unirrigated crop). Summer paddy was particularly important in Natmauk as compared to Chaungmagyi. Cropping intensities were 125% for Chaungmagyi and 141% for Natmauk.

45. **Proposed Alternative Cropping Systems:** Alternatives to these cropping systems based on both farmer preference and the need for introduction of new and improved existing technical innovations are: (a) in the irrigated monsoon season consider replacement of paddy with alternative crops (groundnut, sunflower, and/or cotton) in areas of the system that are well drained and have a water management system that allows for irrigation according to crop water requirements; (b) in the monsoon paddy cropping season introduce alternative methods of rice cultivation that are more economical with the use of water (simply irrigating according to specific crop water requirements for rice, "wet and dry" cultivation technology, and system of rice intensification – SRI); (c) in monsoon season introduction of dry cultivation of rice similar to rainfed rice with just supplementary irrigation; (d) replace existing summer paddy varieties with short term rice varieties with good grain quality preferably with a lower water requirement than existing cultivars; and (e) introduction of alternative more drought tolerant crops/varieties that require low CWR to replace summer paddy, particularly of pulses (green gram), oilseeds (sesame), pre-monsoon cotton, and summer season vegetables.

46. It is important for farmers to realize and action the current change in Government policy for the free choice of crops that can be grown under irrigation, more especially in the summer season. Importance of considering the implications of climate change and the need to be aware of the wide range of technical innovations as outlined in the Climate Smart Agriculture (CSA) as advocated by FAO, in order to take into account climate change adaptation and mitigation.

Table 4: Farmer’s Perception of Freedom to Choose Crops

<table>
<thead>
<tr>
<th>Core Sub-project</th>
<th>Total</th>
<th>Not Free</th>
<th>Free Monsoon Only</th>
<th>Free Summer Only</th>
<th>Free</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natmauk</td>
<td>100%</td>
<td>15%</td>
<td>25%</td>
<td>2%</td>
<td>58%</td>
</tr>
<tr>
<td>Natmauk</td>
<td>100%</td>
<td>37%</td>
<td>6%</td>
<td>3%</td>
<td>54%</td>
</tr>
</tbody>
</table>

Source: IAI DP PPTA Socio-economic Survey

47. In order to model potential alternative cropping systems for Chaungmagyi and Natmauk three scenarios were considered as presented in Annex 5. These include three alternatives for the summer season: (a) all summer paddy; (b) 50% summer paddy & 50% summer sesame (increased land area x2); and (c) 100% summer sesame (increased land area x2 increase). There was no perceived change in cropping patterns for the monsoon season, only the fact that the land area was increased taking into account the implications of the improved supply of water due to the rehabilitation of the two systems infrastructure as a result of IAI DP intervention. The best use of available water was found to be with Scenario 3 where irrigated sesame was grown in the summer season on twice the area of land as a result of its lower water requirement. This model was also considered to be a more positive change in regards to the impact on climate change, where growing crops which were more efficient as regards to production per unit of water as compared to summer paddy. Crops like sesame are also more profitable than paddy, where returns to the latter are generally low.
3. Value Chains and Private Sector Development in Central Dry Zone

48. While in relation to IAIDP it is critical to stress the importance of smallholders being at the core of Myanmar’s agricultural and rural development strategy, this does not imply a hostile or negative attitude towards larger-scale commercial agriculture and agribusiness. Clearly in some subsectors, including sugar (Kinmon Taung), large-scale plantation based agriculture may well have an important role to play and can also be an effective complement and support to smallholders operating in the same subsectors. However, where agribusiness has its most critical role is in the development and improvement of the supply chain. On the output side this not only includes traditional areas such as storage, processing and marketing but also value-addition in terms of packaging, branding, and logistics services. On the input side it includes the supply of production inputs, particularly fertilizers and agro-chemicals, seeds, feed, irrigation equipment, power tillers, tractors, threshers, combine harvesters, and increasingly extension and also finance.

49. Based on the survey by LIFT (2012) and confirmed by the PPTA Agricultural Survey, it was found that very few farm households in the CDZ organize themselves for group/collective marketing of their crops. Overall 90% of households sell their crops individually and consequently have no bargaining power with buyers and traders. Household knowledge of crop sale process and access to price information is lacking. Nearly a quarter of households marketing crops had no price information before they sell their crops. Large land holders are more likely to know the price of their main crops before selling them. Crop price information is predominantly from family and friends and crop buyers.

50. The majority of households sell their main crop immediately upon harvest (62%). Only 17% of households sell their crops two or more months after harvest. Larger and wealthier agricultural producers are more likely to store and sell their crops some months after the main harvest season. Currently there is no market information system for farmers or the rural communities. Post-harvest crop losses are high where crops are stored but as most crops are sold immediately after harvest this does not pose so much of a problem. However, if farmers do change to storing their crop produce longer then storage technologies will need to be introduced.

51. During field investigations the marketing arrangement for pulses and oilseeds in the project townships was considered competitive and farmers generally had good access to markets for their crops. Transport links and roads to township markets were rated as generally good. The LIFT Qualitative Social and Economic Monitoring Report (LIFT, 2012) found that villages in the CDZ had much better access not only to local but also to markets elsewhere in the country, than villages in other States. This had knock-on effects down the chain. Regular transport and good roads in the dry zone enabled farmers to grow cash crops for sale in other markets, rather than simply paddy or crops for household consumption. Good transport links in the CDZ reduced the cost of getting goods to market, which kept such goods competitive and, because farmers could themselves travel to township markets and choose among brokerage houses, they were in a stronger negotiating position on prices than farmers elsewhere. A diagram of the typical crop marketing arrangements in the CDZ is presented in Figure 1.
52. Infrastructure and transport links to township markets and to the rest of the country were much better in the CDZ than in other places. Villages in the dry zone—particularly in Mandalay Region—had the best market access. In the CDZ farmers tended to sell their products directly at Commodity Exchange Centers (CEXC) and brokerage houses in townships, where buyers were often part of larger trade networks. Transportation to such brokerage houses was good and regular, especially during harvest time. It usually took the form of a regular truck travelling between the village and the brokerage houses/commodity exchange centers. Brokerage houses then sold the goods on to retailers, local processors or to other larger commodity exchanges such as Mandalay or Yangon where produce was also sold to exporters for shipment to China or India. Farmers sell to traders or brokers in the commodity exchanges by bringing produce to the traders’ premises or they occasionally sell to trader agents who buy the produce at the village on behalf of traders.

53. The Commodity Exchange membership comprises mainly traders and brokers but millers (oilseed, pulses and feed millers) are also members. Trading (selling or buying) on the exchanges is only open to Exchange members who often are acting as agents of traders on other exchanges, especially Mandalay and Yangon. Trading in all the exchanges is done by samples placed on trading tables which are then viewed and bid upon by the exchange members (traders, millers or brokers). Price information from other exchanges is made available on the trading floors and is the basis for price setting.

54. The IAIDP Agricultural Survey indicated the need to improve the post-harvest processing of paddy and oilseeds (groundnuts and sesame), more for local use by households and to improve the quality of the processed rice and oil for export to other parts.
of Myanmar. Drying facilities for all crops was also important to ensure better storage and to attain better commodity prices as a result of improved quality.

55. In an effort to improve farm input credit, the government instituted a system of Rice Specialization Companies (RSC) in 2008 under which registered firms were encouraged to provide paddy inputs on credit under contract farming schemes in return for rice export permits. Although 57 rice specialized companies have registered, many face difficulties in running viable contract farming schemes for paddy. Due to the heavy cost of input financing and poor repayment rates resulting from crop losses, flooding and low paddy prices, only a handful of RSCs continued contract farming in Monsoon crop of 2012.

B. Government Sector Strategy

1. Sector Performance, Problems and Opportunities

56. Some of the key constraints associated with the agriculture, natural resources and rural development sector (ANR) have been identified as: (a) the need to involve the landless in development; (b) weak land and water resource management; (c) limited access to agriculture support services – input supply, research and extension, market information, and credit (at both farm level and along the entire agricultural value chain); (d) low capacity of farmers and irrigation water users' organizations; (e) weak, inadequate and poorly integrated marketing; (f) limited and low-quality infrastructure (hardware and software); (g) limited investment and private sector involvement in value chains; (h) less that fully supportive policy environment; and (i) MOALI’s effectiveness constrained by inadequate budget, lack of relevant technical expertise, and poor access to many rural areas.

57. There is an important need to make agriculture more commercially oriented, by adopting a value chain approach to agriculture in an effort to develop sustainable inclusive growth for all members of the rural community both farmers and landless. The key to development is the need to fully support Myanmar’s potential in agricultural export markets, where the country has a comparative advantage in rice production particularly regionally, and where large export potential exists in beans, pulses and oilseeds.

58. In order to promote and sustain Myanmar’s competitiveness, there is need to take into account that the continuing emphasis on rice is necessary but insufficient to generate more growth, employment, rural development and inclusive growth. Hence in the medium to long term growth of the sector will be determined by the extent of economic diversification (horizontally and vertically). Growth in regional market demand is most significant for fruits and vegetables, pulses and edible oils, creating a derived demand for inputs and related services.

2. Governments Agriculture Sector Strategy

59. The general theme of current government sector strategy is that agricultural development is considered one of the main pillars of economy and foundation for broad-based development and inclusive growth. However it is recognized that actual practice does not match GOM stated objectives. Where there is a need to: (a) allocate adequate resources and strengthen key institutions in the sector, and (b) adopt policies that promote the involvement of the private sector in rural and agricultural development in areas such as marketing, processing, storage and supply of inputs.

60. The three main themes of MOALI’s Agriculture Sector Development Strategy are: (i) a shift from a commodity and sub-sector approach to a market-oriented farming systems and community-based approach, (ii) a continuation of the move away from centrally planned development towards locally determined priorities and institutions, and (iii) a change in the
role of government from operations to ensuring an appropriate enabling environment, regulations, and infrastructures.

61. Actions for value-added production in agriculture sector and agro-based industries as outlined in the Ministry of Commerce’s development strategy are as follows: (a) the livestock sector has to fulfill the local consumption demand while the agriculture sector is to support the need for animal feed; (b) reduce unnecessary import of edible oils through domestic production of oilseeds; (c) the importance of encouraging the building of modern rice mills and edible oil processing plants to promote the quality of milled rice for export and edible oil respectively; (d) to build agro-based industry as a downstream industry for value addition; (e) to encourage promotion of small and medium scale agro-based industries; (f) to facilitate the free flow from local and foreign investment for downstream industries; (g) to encourage the production not only of priority crops; rice, pulses, and oilseeds, but also the value-added products such as the canned, juice, and wine etc. from vegetables and fruits; and (h) to support contract farming system by cooperating with farmers, local and foreign private sector enterprises (including FDI), for adequately producing the required crop volumes of good quality in order to attain good market prices.

C. ADB Sector Program in Myanmar

62. ADB, through its program in Myanmar, supports government’s priority of inclusive economic growth, by stimulating rural development through promoting better access to markets and improved productive infrastructure. The 2015-2017 operational plan for agriculture, rural development and rural development (ANR) is focused on two projects: (i) Irrigation Command Area Development Project (ICADP - $75 million, 2015), renamed by ADB as Irrigated Agriculture Inclusive Development Project, and (ii) Climate-Friendly Agribusiness Development Project (CFADP - $20 million, 2017). These projects aligned with stated government priorities on food security and agricultural growth (as outlined in the Framework for Economic and Social Reforms), with emphasis on (i) rural infrastructure, small and medium scale irrigation systems and improved roads, and (ii) the restructure and redirection of key agri-support institutions and investments to drive broad-based agricultural productivity growth along the supply chains. The key focus therefore is development of a comprehensive program of support for an agribusiness value chain.

63. It is important to note that the design of the Irrigated Agriculture Inclusive Area Development Project, which is the subject of this PPTA report, is to be used as basis especially as regards to agricultural development to inform the design of CFADP. This latter regional project is intended to improve the competitiveness of agricultural value chains in Myanmar by improving aggregation, processing, storage, marketing, and logistics infrastructure. A key area of focus will be the development of the rice seed industry, including production of certified seed, seed testing and multiplication, phytosanitary standards, and improving milling and processing infrastructure, especially for rice in the rainy season, and enhancing technology standards for post-harvest storage and processing. Support for other value chains, in particular pulses and edible oils (groundnut, sesame, sunflower), livestock feed, fruits and vegetables, poultry and fish or seafood will be assessed and prioritized based on domestic and regional demand, agro-ecological suitability, and investment potential. The project will invest in agribusiness facilitation centers, building on the existing model of agribusiness service centers and linking up with the growth centers, industrial zones, and special economic zones.

64. The ADB Sector Results Framework (2015-2017) with which the IADIP has to conform, indicates that the main outputs expected from ADB interventions and planned key activity areas are as follows: (i) efficient and effective agricultural extension and marketing service, (ii) value chains for priority commodities mapped, and (iii) post-harvest processing, testing, storage, marketing, and logistics infrastructure assessed.
III. VALUE CHAIN DEVELOPMENT

A. Value Chain Approach

65. Agricultural commercialization is based on delivery to the consumer of quality products at competitive prices. It involves the production of niche products for sale rather than on-farm consumption and the use of sale proceeds to buy family and farm requirements. To maximize benefits (or value added) from the business activity and be sustainable, each participant in the delivery chain from producer to consumer must operate efficiently, profitably and in collaboration with other participants in the chain. To be efficient each link in the chain should be operating with the most appropriate technology, in full knowledge of market requirements, and within a business environment where a fair and transparent tax regime applies, trade impediments are minimized and acceptable quality controls are in place. This is the concept of the value chain. A generic value chain system for agricultural products is illustrated in Figure 2 presented below.

Figure 2: Generic Agricultural Value Chain System

66. Value chain activities are not isolated from one another. Rather one value chain activity often affects the cost or performance of other ones. Each step in the agricultural value chain can be defined as a value chain in itself, and the whole sequence of separate value chains linked into a value chain system as illustrated in Figure 2. Strong linkages and effective communication related to market information (prices and standards, supply and demand information) between stakeholders along the system is necessary for the value chain to function efficiently. In addition, a consistent and fair trade and fiscal environment provides an important framework for an efficient value chain system.

67. Of overall importance is the need for an institutional arrangement that will continue to provide ongoing, active management and coordination for the whole value chain system. Isolated or unconnected inputs are unlikely to achieve a sustainable improvement in the performance of the value chain – a systemic view and complementary program of inputs must be adopted. Design of project interventions must be sustainable and avoid dependence on the project and project finance itself.

68. The primary mechanisms for enhancing value chain performance are by: (a) reducing costs at any point along the value chain, (b) differentiating products by making them uniquely attractive to the consumer, (c) introducing appropriate technology at any point in the value
chain system, and (d) improving the performance and collaboration between stakeholder organizations involved in the value chain.

69. The sector analysis indicates that there are few, if any, fully functioning value chain systems in the agricultural sector in Myanmar. This is based on lessons learned on designing commodity value chain development projects as ascertained by IFAD (2014), a summary of which is presented in Annex 6. Most existing value chain systems suffer from weak linkages between component value chains, especially in relation to market information and lack of overall coordination. They face market impediments in the form of Sanitary and Phytosanitary (SPS) and non-tariff trade barriers, and an unpredictable fiscal regime. The overall business environment has been severely disrupted by a poor policy and legal framework, which has hampered the ability of government to deliver its development programs and necessary infrastructure investments and has limited international and national private sector confidence to invest in processing and marketing facilities.

70. The challenge for agriculture commercialization in Myanmar is to create mechanisms for working with industry stakeholders to plan and manage the commercialization processes by focusing on individual value chain systems and their linkages. The objective of such a project, and in this case the IAIDP, would be to maximize aggregate value added by improving productivity and/or reducing costs and increasing scale of production in selected value chain systems.

71. Such a project would work with interested stakeholders to identify, plan and manage implementation of an integrated support program for selected value chain systems. The project would be demand-driven by the willingness of stakeholders to participate in the planning and implementation process. It is appropriate that the concerned stakeholders themselves, through appropriate institutions, would as far as possible be responsible for management of individual value chain programs; the role of government would be to deliver agreed public sector goods (such as infrastructure, SPS and trade framework, research and training) and assist with delivery of semi-public goods (such as industry specific research or trade missions) where benefiting stakeholders (from producers to consumers) would be expected to contribute according to their ability. The project would be seen as a private sector driven project, supported and enabled by government. The project will adopt and build on the successful models of Public Private Partnerships found in South and South East Asia.

B. Rationale for Proposed Interventions

72. A preliminary review and analysis was undertaken of the prospects for high value/diversified crops, and relates to the need for more water efficient crops and cropping systems, which give a greater returns to land, water, and particularly labor. Improvements in the value chain are essential to enable producers and the private sector to gain both financially and from a broader livelihood standpoint.

73. There is good potential to mitigate the risks of the on-going "poverty trap" and associated debt ridden problems intrinsic to the communities in the CDZ, even those on the irrigation schemes, through the move away from the continuous reliance on the cultivation of paddy through crop diversification. This being attained through R&D and extension delivery of improved cropping systems, especially the greater integration of pulses and oilseeds into the irrigated farming systems, with benefits not only for returns per unit area of land and per unit of water, but also for improved human nutrition.

74. As regards to investment and activity options in relation to improvements to value chains and marketing of oilseeds and pulses, there is scope to warrant investments in regard to post harvest operations, processing and marketing. Production volumes will need however to be increased and marketed in a collective manner. Farmers however, will have
to overcome their resistance to group marketing and insistence on individual marketing which most probably reflects their past experience of single channel marketing through former cooperatives when the state procured all cash crops. In this regard training of Village Development Committee members in the benefits of group marketing and procurement (transport and inputs) should be instituted.

75. Project activities should prioritize investments aimed at enhancing the production base viz. improved seeds, access to other quality farm inputs at reasonable prices, improved access to water and securing increased and more reasonable access to production credit (amount, cost and duration). In parallel to production levels being increased, farmers need to be supported to engage in post-harvest operations, with investments in household or village level storage and postharvest processing. This will be augmented with support to the private sector entities involved in post-harvest operations and marketing.

76. The key issues in respect to the proposed interventions is to get stakeholders to move away from conventional thinking of the problems associated with agricultural development, irrigation and climate change, and to "think outside the box": where bold changes in both irrigation management and cropping systems are essential if any gainful changes are to be made to the livelihoods of the resource poor farmers in the irrigation subprojects in the CDZ.

77. Cropping intensities under irrigation will only increase if farmers are allowed to respond to market demand and price when deciding on crops to grow. There is hence a need for more innovative approaches to irrigated farm management systems. Where irrigation water supply is guaranteed, farmers are willing to invest more in the use of modern inputs, labor and services, taking into account the reduced climatic risks such as drought and flooding. However, irrigation on its own without the other key-elements of high productivity will not guarantee crop yield increase, hence the importance of following a value chain development approach.

78. The proposed interventions are through a range of activities including: (i) higher value cropping for the major crops grown in the CDZ, namely rice (monsoon and summer paddy), oilseeds (sesame, groundnut and sunflower) and pulses (green gram, black gram, chickpea and pigeon pea); (ii) improved connectivity with markets and value chains; (iii) promotion of investments in postharvest and value chain activities; (iv) introduction of technologies to improve on-farm crop management and labor productivity including mechanization; and (v) training in response to women farmers identified needs. The interventions are structured into two sub-components:

- Value chain development, discussed in this section, and
- Frontline Center (cross-cutting) support to value chain development, detailed in Section IV.

C. Value Chain Case Studies in the CDZ

79. The value chains which will be promoted by the project will be chosen in a demand driven, participative manner with the communities in each of the selected sub-project areas. This is consistent with government's reforms to increase the freedom of farmers to make their own decisions on the allocation of their land, labor and financial resources. Case studies have been prepared and presented in Annex 7 for rice, oilseeds and pulses value chains - which are expected to feature prominently in the CDZ but should not be imposed on beneficiaries.

80. Within the CDZ cropping patterns the communities may choose such crops as cotton, sugar, vegetables as well as the basic commodity crops. As discussed later, the agriculture
and social teams in project implementation will work with communities in each selected area to analyze the location specific value chains and the constraints/opportunities in each value chain to address in order to produce the maximum impact on household incomes (project impact) and agricultural production (project outcome). They may choose one or more value chains and may concentrate on particular parts of several value chains, such as availability of quality seeds or market information systems.

81. The three analyses in Annex 7 serve as real example cases of CDZ value chains and their main conclusions for each commodity are presented here.

1. Rice Value Chain

82. The assessment of the rice value chains (monsoon and summer paddy) indicates that the key leverage points were primarily associated with production of high yielding quality rice of varieties which were not only well adapted to the agro-ecology of the CDZ and its changing climate but also had the brand recognition of known varieties for both consumption in Myanmar and export. Secondly, milling and processing were identified as important and where post-harvest operations needed improvement especially with regards to the provision of milling, drying and storage facilities, thereby enhancing the quality of the finished marketable product.

83. To address these key issues, recommendations for the short term include: (a) increasing productivity by using good-quality or certified high-yielding seeds and modern production techniques; (b) promoting rational and selective dry season diversification into high value crops where appropriate; (c) improving water management and agri-support services; and (d) expanding rural financial services to improve access to inputs and reduce reliance on money lenders, all targeted at the upstream segment of the rice value chain.

84. For the midstream segment, improving post-harvest handling; improving food safety and traceability; promoting strategic end-uses and rice co-products and by-products/wastes; encouraging private sector participation in processing rice, and developing linkages to upstream and downstream segments of rice value chain so as to facilitate the development and strengthening of comprehensive supply chains.

2. Oilseeds

85. The main bottleneck along the oil crops value chains (sesame, groundnut and sunflower) is at the production level and specifically the supply of farm inputs. 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 also have a high priority.

86. Farmers' constraints in the cultivation of oilseeds crops - like many other crops grown the CDZ - are critical as they are trapped in a low yield vicious circle maintained by scarcity within the ‘farming inputs-credit complex’, which needs to be broken through by an integrated approach. Such an approach should address simultaneously seeds and fertilizers supply as well as rural credit. Partnership between farmers, private sectors and the government is necessary in this regards. The creation of genuine farmers’ interest groups is a prerequisite to addressing farmers’ constraints and is a high priority within the oilseeds sub-sector as with other crops grown in CDZ.

87. It is important to note that farmers’ marketing groups/cooperatives have reportedly failed in Myanmar, essentially because farmers have options to market their products amongst numerous competing traders, as a result, farmers capture a reasonable proportion of the market price. The essence of farmers’ interest groups is different here in the sense
that it responds to an existing need for rural credit and farming inputs at the production end of the value chain.

88. The current edible oil processing capacity of oilseeds is sufficient for the current production as well as future production, in the short term at least, hence additional investments by the private sector is not required. However, oil expeller technology is sub-optimal and crushing efficiency and quality of edible oil produced can improve, hence technical assistance to the private sector is required in this regard.

89. The oil crops sub-sector in Myanmar is characterized by a high efficiency in areas where the sub-sectors participants are allowed to operate freely, more particularly in the post-harvest operations, trading and marketing end of the value chain. This efficiency originates from the high degree of entrepreneurship displayed by the Myanmar private sector. In contrast, policy constraints at all levels of the chain, poor infrastructure and support services are inhibiting 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.

3. Pulses

90. Rice has been Myanmar’s main export commodity and many financial and technical support measures are in place solely for it. However, the pulses sector (green gram, black gram, chickpea and pigeon pea) with all its importance in Myanmar’s export trade, does not enjoy the same benefits. The main problem within the current pulses value chain is a lack of R&D and extension support from both the private and public sector. Finding ways to provide high quality seeds, improve crop yields and enhance farming conditions is necessary.

91. Improving the Myanmar pulses brand image on the international stage is also crucial. The edible quality of Myanmar pulses is high but improving its appearance through post-harvest processing/grading and hence creating good quality stocks for export is necessary. With key infrastructural changes such as road and logistics developments, improvements to the financial and banking system, and modernization of the Crop Exchange Centers (CEXC) in Myanmar, the oilseed sub-sector could grow rapidly.

92. The potential success of higher yielding legume crops is partly subject to improvement in integrated farming methods including use of fertilizer, improved inoculants, pest management, better storage facilities, inter-cropping and supplementary irrigation. The training of farmers in these methods and Good Agricultural Practices (GAP) is important in this respect. Seed production (including formal contract seed production at the village level and village seed banks) is a critical step in promoting new, high-yielding varieties due to the lack of a sufficient seed supply, seed grading, seed networks and poor storage facilities.

93. Additionally, the establishment of PPPs and workable business loan systems could be further established to provide financial and technical assistance to the pulses sector and trade. Vertical diversification can also occur into non-farm activities along the pulses value chain such as marketing, storage, and processing if infrastructural support can be attained. Provision of machinery and equipment needed for production aspects of the chain as well as processing of pulses will be important.

D. Improved Seed Supply

94. The case studies summarized above indicate both the wide range and the varied combinations of activities needed to strengthen the value chains. Three major themes are identified and expected to play a significant role in any CDZ value chain likely to be
addressed. These are discussed below and are: quality and volume of seed supply; adoption of Good Agricultural Practices; and support for post-harvest activities and marketing.

95. Interventions on improved seed supply apply to the three value chains for rice, oilseeds and pulses and at least to some degree for other crops. The use of good quality seed of high yielding varieties is a key factor in the improvement of the cropping sector. Advances in varietal development have improved the agronomic efficiency of crops, allowing them to convert water, sun and minerals into grain more effectively. Both the development and release of higher yielding varieties and an improvement in the distribution of quality seed of each variety will form core activities of value chain development.

96. The multiplication of good quality seed adds an extra dimension to the release of improved varieties even in developed countries where higher yielding varieties have been utilized for a number of years. Poor seed generally causes even greater yield reduction for other crops due to uneven maturation, and increased disease and insect pest susceptibility. In Myanmar, many farmers are not using varieties with high yield potential nor do they have wide-spread access to high purity seed. The potential to raise yields by changing varieties and improving the seed system in Myanmar is therefore considerable.

97. However, the experiences of other countries indicate that a concerted and targeted effort is required to ensure success. Support to both the varietal evaluation and seed multiplication programs will address this issue. These activities will be implemented under a program approach to ensure the released crop varieties and amount of seed multiplied will cater directly for farmer requirements. Initially the public sector will be involved in quality control but private sector involvement in the seed industry is expected to evolve over the project duration.

98. The project will finance and/or support activities in the project areas to: (i) carry out adaptive trials to evaluate the performance of various crop varieties; (ii) produce breeder and foundation seeds for farmers; (iii) multiply registered seeds for farmers; (iv) multiply certified seeds for farmers; and (v) provide technical assistance to strengthen public seed inspection services to ensure the quality of seeds produced under the project.

99. There are a number of private seed companies in Myanmar active in hybrid seed production, but there are no private producers for non-hybrid seed. All such seed for rice and non-rice crops is produced through the seed farms of MOALI, which is also the main source for improved varieties through its breeding programs. The project will support the seed multiplication program of MOALI and strengthen seed supply chains for public and private distribution of quality seeds to farmers. It will foster improvements to the MOALI varietal development and seed breeding programs. The ultimate aim is to improve farmer profitability in the project areas through higher yields and increased crop diversification by using more adaptable crop varieties and through the distribution of quality seed. The following activities would be supported:

a. Evaluation of a range of crop varieties identified in participatory planning in each project area through adaptive trials on farmers’ fields - expected to include rice, pulses, beans and oil seed crops amongst others. These trials will be installed and supervised by DAR in collaboration with DOA and farmers. Trial results will be discussed with DOA personnel and farmers with shortlisted entries being selected for inclusion in extension demonstration implemented by the FCs on farmers’ plots.

b. Production of Breeder and Foundation seed on MOALI research stations and seed farms. The breeder and foundation seed will be produced by DAR and the minimum amounts required for project beneficiaries will be determined at the annual planning
meetings between DAR and DOA based on incremental project seed requirements. Funding for this activity is the responsibility of MOALI.

c. Multiplication of Registered Seed will be supported in DOA seed farms or by contract farmers through the Seed Division of DOA. The minimum amount of incremental registered seed required by the project will be based on annual planning meetings between DAR and DOA according to the planned requirements for the farmers in the project areas. Similar to (b) funding for this activity is the responsibility of MOALI.

d. Multiplication of Certified Seed through seed multiplication groups under the contract between farmers and the private sector. This will be a pilot under a PPP arrangement to determine working guidelines for commercially viable, sustainable and replicable seed production. The aim here is not to fund the seed multiplication operation but to facilitate its development as a self-financing commercial activity, with the close involvement of the DOA and DAR.

e. Training will be provided to MOALI staff, farmers and private sector entities on seed multiplication procedures, quality control and storage techniques, including training of trainees.

f. Strengthening of the public seed inspection services to ensure quality of seed produced and sold under the project.

100. On-farm trials and extension demonstrations will be the cornerstone for the introduction of improved crop varieties to farmers. These will lead to changes in the cropping patterns for maximizing farmers’ incomes. The project will develop bottom-up and gender sensitive approaches to identify suitable rice and non-rice varieties and related changes in cropping patterns resulting from improved availability and control of irrigation water on farmers’ fields. This will be achieved by the following steps:

a. identification of possible alternative crops on the basis of their potential to grow in the area, their market potential, their potential for increasing farming households income, and their suitability for woman headed households;

b. demonstrations and trials will be organized by DOA extension staff at the township level with the assistance of the DOA central subject matter specialists and DAR; and

c. adoption of new technologies and farming techniques by farming households, once demonstrations and trials have proven to be successful and there is an evidence that improved crop varieties or alternative cropping patterns would have potential to generate a larger income than the traditional varietals or cropping patterns.

d. E. Extension of Good Agricultural Practices to Farmers

101. Improvement of farmers’ agricultural practices depends on the effective transfer of technical messages to the farmers - effective in that they are received and applied to improve production and incomes. This activity requires a detailed assessment of all the available and appropriate GAP relevant to the crops identified in the participatory planning process and will include technologies such as cropping systems, CSA, IPM, INM, rhizobia use, and on-farm post-harvest operations (especially storage). Subsequently it will be necessary to prepare high quality training materials appropriate to present conditions - including multi-media and internet media as well as traditional written materials. These training aids then feed into the various training methods to be implemented by the FCs, including the following: staff training, training of trainers, on-farm demonstrations on GAP, and Farmers Fields Schools.
102. The identification, dissemination and adaptation of the farming technologies and knowledge generated under the project is the key to achieve project objectives within the Agricultural Development Component. This must include all the latest technologies which are appropriate to the CDZ, especially in regards to Climate Smart Agriculture (CSA). This information on GAP will support the training activities to be conducted through the FCs, more particularly at the irrigation system level. This requires proper extension and farm advisory services which are based on farmers’ needs and technical constraints, farming systems and market opportunities.

103. The project will need to ensure a better adoption rate than experienced thus far. The project can include delivery of specific messages as “pilots” and aim at capacity development, including for government staff, with the intention that it be institutionalised to contribute to improving extension quality.

104. The Extension Division of DOA is currently the only viable government option for the delivery of farm advisory services to farmers at scale, but they need intensive training and close technical guidance and backstopping from other DOA Divisions and DAR, as well as operational resources. In Myanmar most extension messages are centrally designed, and mechanically implemented by field staff over a diverse range of agro-ecological and socio-economic conditions, without proper consideration of farmers’ needs and limitations or market requirements, resulting in a low adoption rate of technical recommendations.

Figure 3: Percentage of Core Subproject Farmers Citing Source of Technical Information.

Source: IADP PPTA Socio-economic Survey

105. A traditional approach and lack resources has produced an ineffective extension service, which is perceived to be so by the farmers themselves. In the responses to the socio-economic survey, tabulated in Table 3 and illustrated in Figure 3, both “other farmers” and radio ranked far ahead of DoA as an identified source of technical information - 80% of farmers failed to cite DoA as such a source. The private sector is also ahead of DoA whilst printed materials, NGOs and other source are cited by few farmers.

106. Effective communication relies on the content of the message and the delivery mechanism. The project will build upon the role of leading farmers as examples of good practices by working closely with such farmers in demonstrations and field schools. As reform of radio networks progresses the project will seek to use regional radio programs as a means of communicating messages to farmers. Liberalisation of telecommunications has led to a vast increase in access to the internet and e-mail as a means of communication, and this can be used to supply information on good practices as well as market prices. The
private sector is willing to fund demonstration of its products and the skills needed to use them - farmers indicate awareness that this is a commercial activity, not altruistic. The project will use such channels to communicate value chain relevant information but will also seek to develop the capacity of MOALI units so that they can become more effective.

107. The front-line extension workers are the village managers who need to be more oriented towards farmers’ problems to be more effective. The bottom-up approach from Village Tracts to Townships to Districts up to Regions/States initiated to formulate 2011-15 development plans and poverty reduction programs may support such change. Further, regular training sessions, particularly of village managers, will be conducted to improve the knowledge of production technology, communication skills and leadership abilities.

108. Under this activity the project will finance: (i) conduct surveys in the project areas to determine the range of technological problems which face the farmers and landless, (ii) work with DOA and DAR to document all the available GAP's which are applicable to the crops grown in the CDZ, (iii) development of related educational recommendations and guides based on the assessment of GAP’s related to the major crops and farming practices, (iv) production of related educational materials (printed and multi-media), and (vi) inform the staff of DOA at the District and Township levels and the FCs and circulate the GAP material and information.

IV. FRONTLINE CENTER SUPPORT TO VALUE CHAINS

A. Cross-cutting Value Chain Development

109. The Cross-cutting Value Chain Development activity is to provide general support in areas such as information transfer, input supply, and input/output MIS to aid the value chain development in CDZ. The focus is on assisting the farmers/farmer groups, landless, women and private sector trading, processing and marketing entities in partnerships to develop value chains. The four main activities are: (i) establishment and support of Frontline Centers, (ii) general support to value chain development (iii) specific support to improved input supply, (iv) development of an Information System on inputs, outputs and good practices. Detail on the sub-component activities are as follows:

110. Establishment and support of Frontline Centers: The Frontline Centers (FC) have the objective to be a “one stop shop” resource center providing information, contacts and training for farmers, landless, women and the private sector in a range of on-farm and off-farm activities. They will be located at two levels - at the District level and irrigation system level. The former - Hub FC - will be a larger central hub based at the DOA District Office where it will be the link between the private sector and government and provide resources to the agribusinesses involved in the agricultural value chains, from input supply, post-harvest operations through to marketing. The Frontline Center at the irrigation system level - Satellite FC - will provide key support to the communities and farmers in the system.

111. The project will provide funds for the design, construction, furnishing and equipping (including IT equipment), and for motorcycles for the FC staff and irrigation system extension workers. Subsequent to the establishment of the FC the project will support their implementation with provision of expertise on value chains, training methods, training of the FC managers, Training of Trainers (ToT), on-farm demonstrations, Farmers Field Schools and training in agricultural mechanization; especially attention will be provided to training for the landless and IGAs for women, this will be expedited with the assistance of DOA and NGOs with key experience in the CDZ.
112. **Support to value chain development:** Further information is required on the key value chains for rice, oilseeds and pulses, in addition information is much needed on other crops of importance in the CDZ (e.g., onions, chilies, tomatoes, cotton and other industrial crops, vegetables and fruit, etc.). At the beginning of implementation in each system the project will review and evaluate value chains in a participative process with a view to supporting the private sector and GOM in leveraging the weak links. Funds will be provided for market promotion and facilitation and collaboration with the commodity associations and Chambers of Commerce, and other key private sector stakeholders.

113. **Support to improved input supply:** A key issue to all farmers is access to quality agricultural inputs at affordable prices which is not generally the case in Myanmar more particularly CDZ. The project will endeavor to develop workable PPP input supply arrangements between the farmers/farmer groups/cooperatives/WUGs and the input supplier - promoting mutually acceptable credit arrangements.

114. This will also involve the oversight of the DOA to ensure input quality/standards especially for fertilizers and pesticides as well as improved seeds. There is provision of TA to review and develop workable PPP modalities, training workshops for key stakeholders (public and private), and support costs for DOA oversight.

115. **Development of Market Information System:** Comprehensive information on agriculture inputs and commodity markets at national, regional and international levels needs to be seriously upgraded to improve the competitiveness for Myanmar commodities particularly for rice, oilseeds and pulses, all of which have huge potential for expansion. The project will support the development of a sophisticated Information Systems for market and other project information which will be accessible to all stakeholders in the value chains – farmers, input suppliers, processors, traders etc. Reforms over the project period are expected to facilitate the use of radio for information dissemination - the second most widely cited source of technical information (Figure 3) - as well of use of an internet website to provide information to the rapidly rising number of smart phones.

116. In addition to the development of the system, IT equipment will be provided to DOA and selected Chambers of Commerce, the IS will be installed within the FC. A public awareness creation exercise will be undertaken to inform the public of the system and how to access it. Funds will be provided for the updating of the information database on a regular/daily basis, especially relating to input and output prices, suppliers and buyers.

117. **Technical Assistance** is to be provided for the following: Value Chain Development specialist/team leader; Seed Multiplication specialist; GAP Support specialist, Agribusiness Development specialist, Legal Advisor, Training of Trainers (ToT) specialist, Public Private Partnership and Input Supply specialist, and Information System Development specialist. Details of these TA positions are provided in Annex 8.

B. **Principle Value Chain Activities**

1. **Establishment and Support of Frontline Centers**

118. In a similar manner to the IFAD FARM project the IAI DP under the Agricultural Development Component will support the establishment and/or rehabilitation of existing DOA Frontline Centers (FC), which under the IFAD project are known as Knowledge Centers (KC).

119. Services for rural farming and landless households will be delivered through a network of Frontline Centers (FCs) which will build on the existing structure of MOALI’s
extension service and officers. Five satellite FCs (one for each irrigation system) and two District hub FCs will be established across the project area to serve as focal points for the provision of services (possibly including the supply of inputs, and collection and aggregation of outputs), thus facilitating links among value chain stakeholders. MOALI has already identified potential premises for these facilities in the two core subproject irrigation systems – Natmauk and Chaungmagyi.

120. The establishment and operation of FCs will build on regional and global best practice. FCs will share with these models a set of key principles: a decentralized and bottom-up approach; pluralism of actors in service delivery; promotion of partnerships, particularly public-private partnerships (PPPs); strong market orientation; and, vision for eventual cost recovery. By 2017 most IFAD Knowledge Centers will have been in operation for two years, providing significant experience and lessons of which the project can build. Considering the novelty of this approach in the Myanmar context care will be necessary but the two District hub FC should be established in 2017 and the satellite FC as soon as subproject systems are firmly identified, thus probably one each in Chaungmagyi and Natmauk in 2017. Early establishment will allow improvement of farming systems with good practices and better access of seeds, fertilizer and other inputs in anticipation of improved irrigation water supplies – promoting a faster build-up of yields and benefits.

121. Project satellite FCs are low-cost facilities to be set up on the basis of a PPP arrangement, similarly the larger scale District FCs will follow the same modality but provide greater scope and service delivery commensurate with being located in the District center, and having key linkages with the major stakeholders in the private sector. They will be owned by MOALI, governed by an elected, gender-balanced Board representing all socio-economic categories of the rural population (as well as MOALI representation), and managed on day-to-day basis by a MOALI-seconded extension officer to be trained by the project for this purpose. While a multidisciplinary team may be preferable, the cost implications would be too high and the prospects for sustainability unacceptably low. Instead, the selected extensionists would manage the FC and mobilize the services required, utilizing the back-up resources of the hub FC and existing capacities in both the public and the private sectors. A financial mechanism will be elaborated for members to contribute to the costs of operation and maintenance.

122. Each satellite FC at the irrigation system level will cover, depending on the actual size of the system, between 5,000 to 25,000 acres, corresponding to about 1,500 to 6,350 farming households and an equal number of landless households.

123. To facilitate the delivery of services and maximize their impact, farming households will be organized into gender-balanced common interest groups of about 20 self-selected members each, revolving around WUGs for irrigated farms and geographically for rainfed farms, as appropriate. Two or three group members will interface with the FC’s manager and service providers, and then train and share information with other group members; a revolving mechanism will be set up for the annual selection of the leading group members. Training and other activities will be organized at FC-level on 500 acre blocks covering about 10 WUGs. Landless households will also be organized in common interest groups of about 20-25 people based on their activities.

124. FCs will coordinate agricultural demonstrations and trials at farming household level (selected based on willingness, land availability, skills) in collaboration with MOALI’s Department of Agriculture Research (DAR), Yezin Agricultural University (YAU), and private sector companies (SADCs, RSCs, input suppliers, and other value chain actors). Ten

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3 This section draws closely on the design of the IFAD knowledge centers
demonstrations/trials will be organized annually by each satellite FC. The costs will initially be covered by the project but subsequently by private sector input suppliers - already agreed by a range of input suppliers.

125. MOALI seed inspectors will be supported to become service providers for farmers interested to participate in multiplication of seeds for sale to other farmers. The introduction of Farmers’ Field Schools (FFS) will be initiated, particularly to facilitate the link between new crops/new technologies, GAP and improved harvest/post-harvest processing. Active private sector participation will be encouraged and MOALI extension staff capacities will be strengthened through an intensive training program to improve their skills and participatory methods to deliver services responsive to the priorities of small farmers. The FFS approach calls for a bottom-up planning process to extension service. Flexibility is essential to allow trials and demonstrations that respond to farmers’ needs. Trials and demonstration options should identify best potential areas for yield improvement, which may be outside of the CDZ.

126. The responsibility for organizing the provision of services to farm households will be assumed by FC managers, with the support of a contracted NGO and private sector participants. These services will include the creation of farmers’ common interest groups; training of representative farmers; demonstrations and trials jointly with DAR and DOA; and capacity building support for WUGs. The NGO and FC staff will support farming households by undertaking simple agricultural value chain analyses; fostering contractual linkages among commodity chain actors (farmers, input suppliers, traders, buyers, processors); defining post-harvest processing options; and ensuring integration of project-supported farmers into professional organizations.

127. The same NGO will also be responsible for the provision of services to landless entrepreneurs. It will organize landless entrepreneurs into common activity groups; identify technical needs and create links with vocational training institutes; provide business management training; support the elaboration of business plans, market studies, and loan applications; undertake simple value chain analyses and marketing studies; and foster linkages with financial institutions and other value chain stakeholders. Assistance will be provided by the NGO to women in the communities through support in alternative income generating activities.

128. Training of selected extension officers to serve as FC managers will cover partnership building, value chain management, networking, technologies and management. The selected officers will have performance-based contracts for FC management. The project will finance their equipment (mobile phone running costs, motorcycle) and operating costs (field allowances at official MOALI rates). The NGO, selected by the Project Management Unit, will have an annual performance-based contract, renewable subject to satisfactory assessment of performance by project management and beneficiaries.

129. Farm mechanization activities will be implemented by AMD staff who at the irrigation system level will use the FC as focal point for farmer training. The Meiktila Mechanization Training Center in Mandalay Region will be used to provide more and better quality vocational training to the staff of AMD Mechanization Service Stations, farmers, and private sector. The project will also support AMD Mechanization Service Stations in the irrigation systems, through the facilitation of collaboration with private sector, to promote climate-smart mechanization technologies for farmers, provide cost-effective mechanization services suitable for the use in smallholder farming systems in CDZ, and train farmers. Training and demonstrations run by the staff of AMD will be carried out with the support of DOA and target the members of the farmer groups, cooperatives and WUGs. Equipment suppliers and financial institutions will be introduced to facilitate the purchase of equipment, including through hire purchase arrangements, presently up to 3 years.
130. FC sustainability will depend on the ways that public funding can catalyze into viable PPPs for service delivery. Cost recovery on business services will be considered and introduced gradually. Involvement of and cooperation with the private sector in FC operation will be critical for their sustainability, but this will be carefully phased in during implementation as the private sector emerges, grows, and adopts ethical business practices. TA will be provided to build capacities in managing the knowledge platform as a business/PPP venture in the medium term. ADB best practices in cost recovery for service delivery will be applied gradually.

2. Support to Value Chain Development

131. Further information is required on the key value chains for rice, oilseeds and pulses, in addition information is much needed on other crops of importance (e.g., onions, chilies, tomatoes, cotton and other industrial crops, vegetables and fruit, etc.). Prior to commencing work in each area a participatory value chain analysis will be undertaken involving farmers, women and landless supported by project TA, staff, contracted NGO and private sector stakeholders. The project will review and evaluate these value chains with a view to supporting the private sector and GOM in leveraging the weak links. Funds will be provided for market promotion and facilitation and collaboration with the commodity Associations, Chambers of Commerce, financial institutions and other key private sector stakeholders.

132. The analyses that will serve two different purposes and targets: (i) farming households, and (ii) landless entrepreneurs. For farming households, value chain analyses will be undertaken on the main irrigated and rained crops, whether currently farmed or to be gradually introduced under the project within the current rice cropping pattern as alternative crops to increase farming household incomes. Analyses will identify constraints in terms of access to improved inputs and sustainable markets, opportunities for smallholders to access these inputs and outputs markets and/or to link with processors, current relationship among stakeholders (inclusive of marketing channels, production/inputs flows, pricing and breakdown of value added among them), and training needs for farming households. The analyses will also determine the procedures to be implemented so as to ensure that smallholders are effectively part of the value chains and that they will benefit from (i) increased prices; (ii) increased production; (iii) improved market access, and (iv) access to technical support and training.

133. The analyses will also determine the financial needs of each stakeholder as well as their access to the formal financial sector. Finally the analyses will examine the possibility for farmers, processors and financial institutions to enter in a tripartite contractual arrangement under the model developed for tobacco, sugar cane, cotton, tea and coffee. Each value chain analysis will be followed by a workshop during which the options and recommendations will be validated by all stakeholders of the value chain under review (inclusive of financial service providers). As a result of the workshop, leaflets, investment prospectus and other media will be elaborated for distribution to potential investors, private and public sectors relevant institutions/companies, FCs managers and NGO.

134. For landless entrepreneurs, value chain analyses will be conducted on main activities implemented by landless entrepreneurs. Points examined in these analyses are similar to the ones related to farming households. However, a stronger focus will be placed on access to markets, commercialization channels and marketing. Value chain analyses/market studies recommendations and options will be summarized in a specific leaflet, investment prospectus and media to be distributed to FCs managers, project-contracted NGO and relevant private and public sectors institutions/companies.

135. It is envisaged that about six agricultural value chain analyses will be undertaken, mostly based on alternative crops to be introduced within the current cropping pattern and
that another six value chains/market studies will be undertaken for major activities implemented by landless entrepreneurs - among others: fish production in tanks, poultry and quail raising, small ruminants fattening, handicraft, and textile. Value chain analyses and market studies shall be completed at the commencement of the final irrigation system development under the project.

3. **Support to Improved Input Supply**

136. An important issue to all farmers is access to quality agricultural inputs at reasonable and affordable prices which is not generally the case in the CDZ. The project will develop workable PPP input supply arrangements between the farmers/farmer groups/ cooperatives/WUG and the input suppliers and contract farmers. This will involve the oversight of the DOA to ensure input quality/standards especially for fertilizers and pesticides (and when available improved seeds). It is important that there is a provision for TA to review and develop workable PPP modalities. The activity will also include funding provision for training workshops for the key stakeholders (public & private), and support costs for DOA oversight, particularly in regards to the quality control aspect of the inputs sold by the input suppliers.

137. There are opportunities to develop ‘tripartite partnerships’ between farmers, the private sector and the MOALI/DOA 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 value chain.

138. 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 producers are 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. 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.

139. It is planned under the project that a pilot PPP should be implemented aiming at building trust between actors in the input supply end of the value chain. DOA would facilitate the creation of farmers’ interest groups in pilot areas through a bottom up approach. It would also build on the already working arrangements between input suppliers and farmers found in the local urban markets in the nearby towns and Township centers. A simple agreement of shared responsibilities toward credit received by farmers’ groups from the input supplier can be signed and deposited within DOA offices. In case of conflicts between farmers and fertilizers dealers/export traders, DOA 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.

4. **Development of Information System**

140. Comprehensive information on agriculture inputs and commodity markets both national, regional and international needs to be seriously upgraded to improve the competitiveness for Myanmar commodities particularly for rice, oilseeds and pulses, all of which have huge potential for expansion. The project will support the development of a sophisticated Information Systems which will be accessible to all key stakeholders in the value chains – farmers, processors, traders etc., and stakeholders both from the private and public sectors.
141. Socio-economic survey results, presented in Figure 3 clearly show the predominance of "other farmers" as a source of technical information for farmers. This is followed by "radio" media cited by 39% of farmers whilst only 7% cited printed media. The project will be more effective through extensive use of demonstrations on plots volunteered by leading farmers - ideally supported with private sector financed inputs and possibly trainers - so that "other farmers" become channels for communication of project messages.

142. Reforms of the radio systems are likely to provide access to this second most important means of communication during the project period and it should be exploited when available. At present it appears that air time is commercially available only on the Yangon City FM station of the Yangon City Government with coverage which appears not to include the CDZ. Mandalay FM covers 80 miles from Mandalay - the major part of the project areas - but cannot yet sell sponsored programs.

143. However, liberalization in the telecommunications sector already makes access available on mobile devices, and this is likely to be affordably accessible to most people in the near future. The cheapest phones - about $20 - can receive text messages and smart phones for about $100 can access the internet. Often family members appear to provide phones to poorer relatives in rural areas. Much cheaper call charges have also contributed to a boom in mobile device use - rising from less than 1 million in 2010 to 6.8 million in 2013 and 26.6 million in 2014 (Figure 4). Basic text messages can be used to communicate key prices of inputs and outputs and similar simple information whilst a website, accessible through "smart" phones can provide more complex information on markets, quality of available products/inputs, agricultural practices and the like.

Figure 4: Mobile Phone Subscribers in Myanmar, 2000-2014

Ministry of Communications and Information Technology through ITU

144. Media skills will be hired from commercial sources with project staff responsible for providing content to be uploaded and only directly entering only simple data - such as price information and short messages - which needs to be changed frequently. Technical content will be provided by project staff and TA with regular inputs sought, for example, from Chambers of Commerce on local prices and trading conditions.

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4 A current example of the service available for some MMK 545,000 per year ($428) includes: (i) domain registration; (ii) unlimited pages, disk space and bandwidth; (iii) 8 web-mails at registered domain; (iv) web-design based on discussions and suitable for PC, laptop, tablet or mobile; (iv) enquiry/contact form; (v) up to 24 large updates each year by service provider and unlimited access for user edits; (vi) social network integration to give project pages on Facebook, Twitter, Google+ and LinkedIn liked to the website.
145. In addition to the development of the information system, IT equipment will be provided to DOA and selected Chambers of Commerce so that the information system will be publicly available and a public awareness creation exercise will be undertaken to inform the public of the IS and means of accessing it at public places, online and ultimately on-air. Funds will be provided to update the information database on a regular daily basis.

146. During harvest seasons, FCs managers will obtain daily market information by phone and/or internet for all crops produced within FC communities. Information will be supplied by SMS to members. Within the project period it should be possible as internet connectivity increases to jointly develop a trade portal for farmers, Chambers of Commerce and other stakeholders.

C. Private Sector Value Chain Stakeholders

1. Commercial Associations

147. The Union of Myanmar Federation of Chambers of Commerce and Industry (UMFCCI) is the leading Myanmar business community organization which participates in efforts for national economic development, providing consultation and dialogue with the businessmen in the private sector. The UMFCCI supervises and coordinates rice marketing for local consumption as well as for exports. It acts as a bridge between the State and the Private Sector to develop more competitive businesses and SMEs - most enterprises engaged in value chains are SMEs.

148. UMFCCI could collaborate directly and indirectly with project in value chain development at each stage of production, collection, processing, wholesale and retail marketing. A project link with UMFCCI and its regional chambers can introduce farmers to reputable, member enterprises well connected to markets and safeguard the interests of farmers through the Chambers enforcement of standards on its members.

149. The local buyers/ farmers group can collect the products from farmers and use Chamber support to distribute at wholesale and retail market - to promote ethical trading, wholesale markets are running under regional Chambers of Commerce. Farmers can also contact Regional Chambers of Commerce to search reliable suppliers for production inputs of good quality and price. Local distributors and exporters become members and they, as well as farmers, get price, trading and marketing information from wholesale and export markets in a timely manner.

150. The associated Myanmar Rice Federation knows that current rice production needs to improve technology to meet export market needs - especially quality seeds production, agricultural mechanization and post-harvest operation - if it is to increase market share and prices. In addition to rice production value added products such as varieties of snack, energy drink, soft drink, souvenir, and rice paper can be produced from rice and its byproducts to boost the local economy and incomes. Some members of UMFCCI and regional chambers are engaged in the production, trading and marketing of food products and can provide a value added outlet for farmers. They need technology, know-how, and credit access.

151. The Chambers are able to help members develop business plans and working with CDZ businesses, the project and farmer groups could develop specific plans to support value chain development and seek commercial bank financing, as discussed below. UMFCCI can issue guarantees to support member SME loan requests, with or without collateral, if commercial banks are willing to negotiate. The UMFCCI can also provide relevant business and vocational training both for farmer groups and for landless people and women seeking to develop off-farm and non-farm business activities.
152. As part of its regular revenue generating commercial and value chain related activities, UMFCCI is not a financial institution but can also offer support to member SMEs to get Credit Guarantee Insurance (CGI). As part of its own revenue inflows the UMFCCI issues Commercial Documents and Certificates of Origin for goods to be exported.

2. Financial Institutions

153. For value chain development, SMEs need loan financing to extend businesses as well as to provide credit to supplying or contract farmers through sales of inputs on credit of on-lending for such purchases by farmers. Farmers and farmer groups need to buy materials and equipment to develop their businesses and typically have more difficult access to formal financial institutions than SMEs.

154. Bank loans are not easily accessible due to limited definition of eligible collateral loan, short loan terms - up to one year and renewable - and commercial bank interest rates perceived to be "high". The perception is derived from markets influenced in some cases by donor grants e.g. LIFT and IFAD FARM, and knowledge of loans between Government institutions at 4%, e.g. from Myanmar Economic Bank (MEB) to state economic enterprises and Myanmar Agricultural Bank MADB) - which on-lends to farmers at a mark up to 17%. In fact, in Table 1 the commercial banks 13% interest is higher only than the PACT NGO's 12% and lower than the Cooperative Departments 13.8%, MADB's 17% and all other lenders.

155. The conservative stance of the commercial banks reflects the prudence of the Central Bank of Myanmar (CBM) as it cautiously reforms the banking sector as Myanmar continues to open up. Undoubtedly over the project period, expected to be to 2023, CBM will continue to make significant reforms in the financial sector so that it can better develop and serve the people and the country. The sector will also by supported by non-distorting interventions, such as the World Bank/IFC also convertible loans to strengthen local private banks (YOMA US$ 5 million and MOB US$ 7 million). As the project seeks to develop sustainable benefits its activities will build upon and adapt the developing financial markers rather than proposing unsustainable grants and special credit programs co-terminus with the project. The loan investments needed for significant value chain development in the CDZ are of a scale which will require formal lending.

156. The project will work with farmers, farmer groups and small businesses in cooperating with UMFCCI and others to make best use of the available financial instruments. Banks need to operate sustainably through recovering loans from the creditworthy and avoiding loans to the un-creditworthy. The project and its value chain partners will thus work to help potential borrower/investors make the best business plan and proposal to increase the probability of a securing the required finance.

157. Loans and Overdrafts: Local private banks provide loans and advances to businesses engaged in production, trade, transportation, construction and service industries. Commercial banks under CBM regulations lend to businesses at interest rates 13% per annum and are constrained by the required offer rate for saving account of 8.25% rising to a fixed deposit is 10% per annum. The loan period is for one year but can be rolled-over subject to bank liquidity and borrower creditworthiness.

158. Hire Purchase: Hire purchase is available for a period up to 3 years at annual interest rates of: 7% per year for one year, 12% per year for 2 years, and 19% per year for 3 years. The period can be extended by mutual agreement. A cash down payment of 30% to

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5 In addition to document searches this section is based on formal meetings with: Myanmar Economic Bank, YOMA Bank, KBZ Bank, and Myanmar Oriental Bank.
50% is required and the project could encourage potential hire purchasers - of tractors, for example, to accumulate savings in the bank concerned in order to establish a credit record. Dealers and other borrowers go to the bank to sign the hire-purchase agreement.

159. **Credit Guarantee Insurance (CGI):** New CGI rules were introduced by Myanma Insurance on 1st September 2015 after a pilot beginning in June 2014. Commercial banks will approve SME loans with or without collateral but the SME need to buy CGI Insurance. If the loan is not paid back, CGI will cover the loan balance. SMEs submit the loan application form to bank, which sends to Myanma Insurance to certify or not the insurance of the loan. After CGI, the bank signs to issue loan. The premium fees are based on collateral - if loan applicant has collateral, premium fee is from 1% to 3%.

160. Most of local banks provide user-friendly instruments such as Call Center, ATM card (Myanmar & English versions), credit card, debit card, mobile money for loan repayment, online service, MPU etc.. These, such as ATM cards/machines, indicate the dramatic changes which can be made in the financial sector. Internet and mobile banking can make major reductions in transaction costs both for the bank and the rural borrower (farmer, landless and women) and greatly improve rural dwellers access to formal financial services, avoiding the need to travel to make small repayments and transactions. To be effective, the project needs to be able to follow such developments.

3. **Private Enterprises**

161. Private sector companies are empowering Myanmar’s farmers through the provision of affordable and scalable technologies; high-quality, cost-effective and environmentally sustainable inputs; and most importantly, the use of culturally appropriate and innovative training methods. They have collective experience spanning every major agro-ecological region and virtually every segment of the value chain, from field and research to seed and bio-fertilizer production to agro-processing, marketing and sales. The private sector knows the export and domestic markets and is essential if the project is to increase production of crops - such as paddy, pulses, oilseeds, cotton and others - were production exceeds domestic demand. They supply equipment and inputs to farmers by credit, with choice repayment by cash or crop, as part of production partnerships.

162. By supporting and building sustainable, mutually beneficial relationships with smallholder farmers they can develop a trusted a platform giving farmers access to national and international markets, proven technologies, high-quality and affordable inputs and training. As technology develops and smallholders capacity to absorb and utilize these technologies, the private sector will gradually introduce more modern farming technologies, inputs and practices.

163. The project will invite private companies to develop partnerships such as supplying seed, fertilizer and pesticide and introducing appropriate technology and equipment to the project area through machinery, knowledge, training and research. This could lead to development of complementary local, agriculture-based industries and off-farm employment for the landless and women as well as underemployed farmers.

164. Private companies have substantial agriculture-related interests spanning the production, procurement, marketing and/or distribution of multiple agricultural inputs that can be beneficially introduced into the project areas:

- hybrid and open pollinated seeds of various field crops, cash crops and horticulture crops;
- insecticides, fungicides, herbicides, plant growth regulators and other farm chemicals;
- low cost drip irrigation systems: and
- solar pumps for groundwater or conjunctive irrigation.

165. As part of commercial activities, private companies, working closely with farmers, establish value chains to supply farmers their production needs - seed, fertilizers, pesticides and machinery for cultivation, including irrigation pumps. Their efforts include research on best practices regarding pesticide management, soil quality maintenance, fertilizer use, and specific crop-related impacts to demonstrate the quality of their products and/or proposed activities. They will launch training programs for farmers on the cultivation paddy, pulses, oilseeds, cotton and other crops, with the aim of generating revenue through: (i) sufficient raw material to make attractive commercial investments in value-added production and processing facilities; (ii) increase production of the appropriate quality of the crop they trade; and/or (iii) develop their production partnership with the farmer.

166. The Chambers of Commerce, financial institutions and the private sector can all derive sustainable revenues from supporting project agricultural and income results and encouraging them to do so gives leverage to the project and increases cost effectiveness. Activities through which self-interest could be used to guide the private sector to support project objectives include:

- forming farmers’ group with ideal villagers (middle and poor) in the village with each interest group around 10 individuals.
- motivated leaders chosen from village groups and conduct related trainings for them (1 motivator covers for 3 - 5 villages), if necessary, trainer will be outsourced for training.
- farmers produce improved seed to use in own farm and supply to others and change seed if required, e.g. more climate friendly crop, profitable crop etc.)
- train farmers awareness of how calculate profitability and basic farm management.
- plant a demo plot in the interest farmer’s land and show others as a proof for yield.
- deliver fertilizer / pesticide to farmers at the right time of use, through motivator with only credit sales for material so no cash/loan issue to buy it.
- farmers can sell product at company’s mill or store.

167. In the socio-economic survey undertaken with the PPTA in Table 3, 25% more farmers cited the private sector as a source of technical information than cited the DoA.

4. NGOs

168. As noted above, the Chambers of Commerce, financial institutions and the private sector all derive sustainable revenues from the agriculture value chain, as it is intended the farmers, landless and women will do. These are not co-terminus with the project as a contracting NGO undertaking community organization or specific training activities will be. For the promotion of value chains a permanent stakeholder in the value chain is preferred.

169. NGOs have a strong presence in Myanmar and some recent NGOs appear to be specializing in value chain development on a permanent basis and appear to complement the private sector stakeholders as potential value chain partners for farmers. Unlike the private sector, these NGOs do not trade on their own behalf but facilitate trading between farmers and farmer groups with merchants and SMEs. Examples with whom discussions have been held include:

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6 The absence of such revenue opportunities reduces the scope to mobilize funds for the irrigation component.
7 This serves to define the specific type of NGO which is required to participate and the experience it needs.
8 Use of the examples is not a recommendation of their appointment or use.
• **Karuna Mission Social Solidarity (KMSS):** Established in 2011 focuses on pro-poor market development through capacity building and facilitation in exports and processing by linking producers and processor/traders. Support has been given to marketing of corn, banana, sesame and pigs. Technical assistance and training have been provided since 2011 in relation to: market awareness; micro-finance and bookkeeping; livestock; home gardening; and sewing.

• **Multi-Agri Development Association (MADA):** Established in 2014 is starting operations adopting a similar facilitation/linking role. Selected crops to export include: dried fruits and vegetables (e.g. mango); rice; beans; herbs; canned vegetables. Within the first half of 2015 they report 4 training sessions/demonstrations on organic technologies for a total of some 380 people.

170. In any partnership supporting the value chain activity candidate NGOs - and other participants - should be carefully screened to ensure that they have relevant value chain experience and the intent and capacity to be long term stakeholders in partnership with project farmers, landless and women.

### Annex 1 References


FAO (2013). Climate-Smart Agriculture: Sourcebook. Report prepared by the Food and Agriculture Organization of the United Nations


LIFT. (2013). Opportunities/constraints and options for consideration in a Dry Zone programme. Lars Birgegaard. 1 March 2013. UNOPS, Yangon, Myanmar.

LIFT. (2013). Dry Zone Programme Formulation Concept Note. Livelihoods and Food Security Trust Fund (LIFT). UNOPS.


Ministry of Agriculture and Irrigation (2010). Myanmar Agriculture at a Glance


World Concern (2007). National Symposium on Farmer-Led Agricultural Extension Approaches in Myanmar (held 28-30 March, 2007); Summaries of papers
Annex 2  Glossary

**Agencies:** development organizations – funded by aid or other non-commercial sources – who act as funders or facilitators in pursuit of developing market systems.

**Agribusiness:** In agriculture, agribusiness is a generic term applied to businesses involved in some or all of the following agricultural production systems: crop production, including farming and contract farming, seed supply, agrichemicals, farm machinery, wholesale and distribution, processing, marketing, and retail sales.

**Approach:** a set of principles, frameworks and good practice points to guide both analysis of a market system and actions to bring about change.

**Asymmetric information:** when one party in a market transaction – supplier or consumer – knows more than the other.

**Basic services:** a range of services important in building people’s capacities, where consumption serves not just individuals but impacts on the wider economy and society. This includes education, health, water and sanitation.

**BDS:** business development services.

**BMO:** business membership organization or business association (see Representative organization).

**Core function:** the central set of exchanges between providers (supply-side) and consumers (demand-side) of goods and services at the heart of a market system. The medium of exchange can be financial or non-financial (such as through accountability mechanisms).

**Crowding-in:** the central process in – and purpose of – facilitation through which interventions catalyse or bring other players and functions into the market system so that it works better for the poor. Crowding-in can result in enhanced breadth (more transactions in the core of a market), depth (supporting functions) or reach (new areas or markets).

**Externalities:** negative or positive spill-over effects that are not reflected in a market price.

**Facilitation / facilitator:** action or agent that is external to a market system but seeks to bring about change within a market system in order to achieve the public benefit objective of systemic change.

**Gift exchange:** exchange based around shared values and reciprocity that is non-financial but still conducted on an informal transactional basis.

**Hierarchical exchange:** exchange where one party, for example a large firm, has relatively more power in setting the terms of exchange with vertically-integrated suppliers.

**Inclusive business finance:** refers to capital that supports the creation, growth, and sustainability of entrepreneurs, small holders, and small enterprises who were previously excluded from the financial markets. The instruments used in inclusive business finance include, but are not necessarily limited to: debt, equity, quasi-equity, grants, insurance, guarantees, development finance and various shared risk instruments and mechanisms. The definition of inclusive business finance also goes beyond exclusively referring to the funding activities of regulated and non-regulated, formal and informal, financial services providers. It also includes the provision of a variety of financial resources (guarantees, loans, equity, leasing) by corporations to small holders and MSME’s as distributors and suppliers within their value chains.

**Institutions:** structures and mechanisms of social, political and economic order and cooperation – formal and informal – in a society/economy which shape the incentives and behavior of market players. Institutions therefore refer both to the supporting functions and rules – sometimes referred to collectively as ‘rules of the game’– in a market system.
**Intervention:** a defined package of temporary activities or actions through which facilitators seek to affect change in a market system.

**Lead firms:** businesses capable of exerting a leading influence on other firms and other players because of, for example, their size or their reputation for innovation.

**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. If opportunities for leveraged intervention do exist they constitute the skeleton of the project design or revision.

**M4P:** the making markets work for the poor or market development approach.

**Market:** a set of arrangements by which buyers and sellers are in contact to exchange goods or services; the interaction of demand and supply.

**Market player:** organizations or individuals who are active in a market system not only as suppliers or consumers but as regulators, developers of standards and providers of services, information, etc. This therefore may include organizations in the private and public sectors as well as non-profit organizations, representative organizations, academic bodies and civil society groups.

**Market system:** the multi-player, multi-function arrangement comprising three main sets of functions (core, rules and supporting) undertaken by different players (private sector, government, representative organizations, civil society etc) through which exchange takes place, develops, adapts and grows. A construct through which both conventionally-defined markets and basic services can be viewed.

**Missing middle:** this relates to small-farms and MSMEs and the fact that they aren't missing because they wouldn't be profitable: they are missing because finance is not reaching them in an effective way. This shows that access to finance is a significant barrier, and that there is a massive profit opportunity for those who are able to successfully finance these firms.

**Organizations:** entities with a formal structure that play a range of roles in the market system.

**Public goods:** goods or services which are non-rival and non-excludable and therefore cannot be offered by private firms.

**Public private partnerships:** PPPs refer to the collaboration between public entities and private companies to realize public projects and objectives, arranged so that tasks, responsibilities and risks are optimally allocated among the partners. Over the last 20 years, PPPs have been increasingly recognized as a viable option for realizing development objectives. However, experience with PPPs is not exclusively positive. The following range of views on PPPs are frequently expressed: (a) PPPs are particularly useful for implementing large-scale projects, primarily based on contractual relations between public and private entities, mostly through design–build–finance and operate/maintain (DBFO or DBFM) type contracts; (b) PPPs are an instrument for generating private-sector creativity which may contribute to the cost coverage and thus fast implementation of various socially desirable projects; (c) PPPs are a structure in which public and private entities cooperate, preferably in a separate legal entity, which can be applied in various sectors of the economy; and (d) PPPs do not affect public responsibility. Government stays responsible. Under public responsibility, firms are invited to provide services either to government or directly to the public.
Representative organization: an organization which acts to advance the interests of a specific group, such as a trade union or a consumer rights body. Also referred to as a membership organization (see also BMO).

Rules: formal (laws, regulations and standards) and informal (values, relationships and social norms) controls that provide a key input in defining incentives and behavior in market systems.

Sectors: The economy may be classified into subdivisions called sectors (also called industries) in several ways. Sectors may be further subdivided into sub sectors. There is no fixed system in doing so.

Sub sectors: A subsector can be defined as follows as a group of firms that buy & sell from each other in order to supply a group of closely related products or services to final consumers. A sub sector has different market channels to reach distinct consumer groups.

Value chains exist within a subsector. A value chain maps the transformation of a product along only one market channel. There are usually several value chains within a subsector.

Supporting functions: a range of functions supporting the core exchange helping the market to develop, learn, adapt and grow including, for example, product development, skills enhancement, R & D, coordination and advocacy.

Sustainability (M4P definition): the market capability to ensure that relevant, differentiated goods and services continue to be offered to and consumed by the poor beyond the period of an intervention.

Sustainable agriculture: is the act of farming using principles of ecology, the study of relationships between organisms and their environment. It has been defined as "an integrated system of plant and animal production practices having a site-specific application that will last over the long term: (a) satisfy human food and fibre needs, (b) enhance environmental quality and the natural resource base upon which the agricultural economy depends, (c) make the most efficient use of non-renewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls, (d) sustain the economic viability of farm operations, and (e) enhance the quality of life for farmers and society as a whole."

Strategic framework: a hierarchy of objectives linking an M4P program’s final goal of poverty reduction with an intervention focus on sustainable market system change.

Systemic change: change in the underlying causes of market system performance – typically in the rules and supporting functions – that can bring about more effective, sustainable and inclusive functioning of the market system.

Tools/instruments: relatively standardized methodologies for market analysis (e.g. value chain analysis or usage, attitude and image surveys) or for intervention (e.g. vouchers or challenge funds).

Transaction costs: the costs associated with the basic process of exchange including costs concerned with searching, screening, negotiating, contracting, monitoring and enforcing transactions; the “cost of running the economic system”.

Value chain: a value chain links the steps a product takes from the farmer to the consumer. It includes research and development, input suppliers and finance. The farmer combines these resources with land, labor and capital to produce commodities. In the traditional selling system farmers produce commodities that are "pushed" into the marketplace. Farmers are isolated from the end-consumer and have little control over input costs or of the funds received for their goods. In a value chain marketing system, farmers are linked to consumers’ needs, working closely with suppliers and processors to produce the specific goods consumers demand. Similarly, through flows of information and products, consumers are linked to the needs of farmers.
**Value chain analysis:** facilitates an improved understanding of competitive challenges, helps in the identification of relationships and coordination mechanisms, and assists in understanding how chain actors deal with powers and who governs or influences the chain. Developing value chains is often about improving access to markets and ensuring a more efficient product flow while ensuring that all actors in that chain benefit.
### Annex 3  Agriculture Survey Results – Chaungmagyi and Natmauk

<table>
<thead>
<tr>
<th>Data</th>
<th>Natmauk</th>
<th>Chaungmagyi</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Irrigation System</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Region/State</td>
<td>Magway</td>
<td>Mandalay</td>
</tr>
<tr>
<td>District</td>
<td>Magway</td>
<td>Yamethin</td>
</tr>
<tr>
<td>Township</td>
<td>Natmauk/Myothit</td>
<td>Pyawbwe</td>
</tr>
<tr>
<td>Irrigation scheme</td>
<td>Formal canal</td>
<td>Formal canal</td>
</tr>
<tr>
<td>Location</td>
<td>Lon: 95.242545 E Lat: 20.191692 N</td>
<td>Lon: 95.575924 E Lat: 20.370104 N</td>
</tr>
<tr>
<td>Type irrigation</td>
<td>Formal irrigation (100%); 1 (2) crop/yr Scheme name: Natmauk</td>
<td>Formal irrigation (80%); 1 (2) crop/yr Scheme name: Chaungmagyi</td>
</tr>
<tr>
<td>Irrigation source</td>
<td>Surface and groundwater</td>
<td>Surface &amp; groundwater</td>
</tr>
<tr>
<td>Command area irrigated (max %)</td>
<td>Total design area: 36,000ac Current irrigated area (2014): 25,380ac</td>
<td>Total design area: 7,255ac Current irrigated area (2014): 6,039ac</td>
</tr>
<tr>
<td>Irrigation method</td>
<td>Monsoon &amp; summer paddy - flood irrigation</td>
<td>Monsoon - flood irrigation</td>
</tr>
<tr>
<td>Main constraints</td>
<td>• Irrigation channels broken &amp; difficult to repair, sandy soils. • Large conveyance losses • Poor water distribution between H, M &amp; T • Low rainfall in 2014</td>
<td>• Lack of water especially during 2014 • Parts of systems have not had summer paddy for last 5 years • Decline in cultivation cotton due to lack water • Salinity not general an issues in this system</td>
</tr>
<tr>
<td>Priority works</td>
<td>• Severe sedimentation upstream of the main canal intakes at weir, large due to uncontrolled inflows between dam and weir. • Second problem is flood damage to the RMC as there is insufficient cross drainage.</td>
<td>• System in relatively good condition down to distributary cabal level, with LMC good condition &amp; RMC heavily silted. • Ungated drop structures provide limited degree of control</td>
</tr>
<tr>
<td><strong>2. Agro-ecology / environment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Altitude</td>
<td>190 masl</td>
<td>212 masl</td>
</tr>
<tr>
<td>Soil type</td>
<td>Clay to sandy loam</td>
<td>Clay loam to sandy loam</td>
</tr>
<tr>
<td>Soil fertility level</td>
<td>Medium (20% to poor (80%)</td>
<td>Medium-high</td>
</tr>
<tr>
<td>Depth groundwater</td>
<td>20-40m</td>
<td>&gt;20-70m</td>
</tr>
<tr>
<td>Salinity - % land affected</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>Irrigation system topography</td>
<td>Mostly level but some areas need to be levelled, no consolidation works were mentioned by villagers</td>
<td>System generally level in most areas; however not level for some areas, needs levelling;</td>
</tr>
<tr>
<td><strong>3. Farming System</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type farming system</td>
<td>Predominantly cropping system; with some mixed irrigated cropping &amp; small scale livestock</td>
<td>Mixed irrigated cropping &amp; livestock; predominantly crops</td>
</tr>
<tr>
<td>Main on-farm activities (prioritised)</td>
<td>• Monsoon paddy</td>
<td>• Monsoon paddy</td>
</tr>
<tr>
<td></td>
<td>• Summer paddy</td>
<td>• Summer paddy</td>
</tr>
<tr>
<td></td>
<td>• Sesame</td>
<td>• Cotton</td>
</tr>
<tr>
<td></td>
<td>• Green gram</td>
<td>• Sesame</td>
</tr>
<tr>
<td></td>
<td>• Chick pea</td>
<td>• Green gram</td>
</tr>
<tr>
<td></td>
<td>• Groundnut</td>
<td>• Sunflower</td>
</tr>
<tr>
<td></td>
<td>• Livestock</td>
<td>• Chick pea</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Onion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Livestock</td>
</tr>
<tr>
<td>Total income % mainly</td>
<td>90%</td>
<td>70-80%</td>
</tr>
<tr>
<td>from this activity</td>
<td>(low % in tail areas)</td>
<td></td>
</tr>
<tr>
<td>--------------------</td>
<td>----------------------</td>
<td></td>
</tr>
<tr>
<td>Average farm size</td>
<td>2.0-6.0ac (3-5 plots)</td>
<td>3-5 ac irrigated; 3.0ac rainfed (4-5 plots)</td>
</tr>
<tr>
<td>Irrigated (ac)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off-farm activities</td>
<td>• Mainly on-farm</td>
<td>• Mainly on-farm</td>
</tr>
<tr>
<td></td>
<td>• Migration</td>
<td>• Trading</td>
</tr>
<tr>
<td></td>
<td>• Some laboring</td>
<td>• Laboring</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Migration,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Hair cleaning/grading – export to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>China</td>
</tr>
<tr>
<td>Land owned &amp; cultivated by farmer (%)</td>
<td>90-95% Some sharecropping (5-10% land area) to landless (20 basket paddy or 420 kg/ac). No land renting</td>
<td>&gt;90% Some sharecropping (10% land area) to landless (20 basket paddy or 420 kg/ac). Also rent land</td>
</tr>
<tr>
<td>Input supply</td>
<td>• Easy to obtain inputs from Natmauk, Myothit &amp; Taungdwingyi towns, but expensive</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Farmers need finance to purchase inputs, a major problem: from MADB &amp; PACT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Very easy to obtain inputs from Pyawbwe town, but expensive</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• One small outlet in the system village on main road</td>
<td></td>
</tr>
<tr>
<td>Market system</td>
<td>Most farmers only sell paddy to local rice mill for processing. Other crops sold to traders who either collect produce (e.g., sesame) or the farmer takes to the nearby town (Taungdwingyi or even Magway) for sale with brokers or in the market.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Only paddy sold in the village, other crops are sold in Pyawbwe &amp; Meiktila towns which are close by. The commodities sold include sesame, chick pea, onion, tomato. Note the three major crops are paddy, cotton &amp; sesame. Some brokers store commodities in the major town near the irrigation system. there is some contract farming with some brokers</td>
<td></td>
</tr>
<tr>
<td>Processing facilities</td>
<td>Have rice mills, oil extraction (sesame &amp; groundnut), paddy thresher, animal feed chopper</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Small scale rice mills in the larger villages, but other mills situated close by, usually paddy milled for home consumption. No grain drying facilities. Cotton ginning done in Pyawbwe town</td>
<td></td>
</tr>
<tr>
<td>Livestock importance</td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Average livestock No/HH</td>
<td>2 cattle (oxen), 1 pig, 5-8 chickens [10-12 total]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2-5 cattle (oxen), 1 pig, 5-10 chickens [10-12 total]</td>
<td></td>
</tr>
<tr>
<td>Land cultivation</td>
<td>Some farmers for initial cultivation use tractors (2 wheel), but most cultivation is done by draught power; many farmers have more than 1 pair oxen; cost hiring pair oxen Ks 4,000 per morning per acre.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use both power tillers and draught power on paddy lands; draught power accounts for 70% of land cultivation; cost for one pair oxen to plough for half day Ks 5,000 – plough in this time 0.3 acre or harrow 0.5 acre. Some of the larger hire tractors from the AMD service which has three large tractors for hire.</td>
<td></td>
</tr>
<tr>
<td>Extension advice</td>
<td>DOA provides limited technical advice on GAP (fertilizer &amp; plant protection); most farmers need good quality seeds &amp; finance however. Finance is a big problem.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DOA provides little advice, private fertilizer &amp; pesticide traders provide advice to farmers; ID gives some advice during water delivery in monsoon season. There is a poorly equipped Frontline Center in the system which is used for meetings and a few trainings – it needs upgrading.</td>
<td></td>
</tr>
<tr>
<td>NGO activity</td>
<td>PACT provides micro-finance; no other NGOs.</td>
<td>FAO &amp; AVSI have a technology dissemination program; Mercy Corps many health issues; no PACT</td>
</tr>
<tr>
<td>-------------</td>
<td>------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Farmer training</td>
<td>Main constraint is the lack of mobility for the extension staff to travel from Township center. Need advice on two main crops – paddy &amp; cotton, also on irrigated water management, utilisation of good quality seeds, marketing (MIS) There are a number of demonstration plots for paddy and other crops from the DOA.</td>
<td>Farmers want more advice on better water management &amp; crop diversification – want information on how to grow and improved seeds of HYV. Very little awareness of GAP Main constraint is the lack of mobility for the extension staff to travel from Township center There are a number of demonstration plots for paddy and other crops from the DOA Chaungmagyi Farm &amp; the DICD Cotton Research Station.</td>
</tr>
</tbody>
</table>

### 4. Cropping Pattern

**Crops grown**

- **Major**: paddy – monsoon (80%),  
- **Secondary**: summer paddy (15-20%), sesame, groundnuts, lablab beans  
- **Minor**: vegetables  
- **Winter fallow**: 80%  
- **Not grown (but would like to grow)**: only grow existing crops as are familiar with them.  
- **Note**: that paddy and some sesame are irrigated crops rest (groundnuts, green gram, sorghum) are rainfed crops, grown on uplands around irrigated lands.  

- **Major**: paddy – monsoon (80%),  
- **Secondary**: sesame, cotton, onion, green gram, sunflower pulses  
- **Minor**: summer paddy vegetables  
- **Winter fallow**: 80%  
- **Not grown (but would like to grow)**: only grow existing crops as are familiar with them.  
- **Note**: that paddy & onion mainly are irrigated the rest are rainfed, some water is occasionally provided to cotton

<table>
<thead>
<tr>
<th>Most profitable crops (prioritised)</th>
<th>Sesame, paddy (summer) if can grow this crop</th>
<th>Onion, tomato, pulses &amp; oilseeds depending on the prevailing market prices, paddy is mainly grown for home consumption.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length fallow period</td>
<td>No real fallow depends on water availability</td>
<td>No real fallow depends on water availability. More fallow land at the tail end of the system.</td>
</tr>
</tbody>
</table>
| Cropping intensity                  | Irrigated lowland 133% singe & some double cropping (monsoon paddy + summer paddy); rainfed 150% (sesame, green gram & groundnut, green gram) | Irrigated 125%  
|                                    | Rainfed 150%  
|                                    | Double & single cropping                      |
| Changes in cropping pattern last 5 years | The system was constructed in 1995 which brought upland areas into irrigated land. Profitability of paddy declined due to cost of inputs. Farmers fixed on summer paddy cultivation | No change, only incidence of drought is increasing impacting on the availability of water in the dam; very little summer paddy is grown; greater reliance on groundwater sources irrigation in recent years |
| Priority crops for fertilizer application | Mainly paddy, on which apply both chemical & FYM | Mainly FYM on paddy, chemical fertilizers on some paddy & other cash crops (cotton, vegetables). Farmers consider fertilizers as too expensive. |
| Pesticide use                       | Low use of pesticides, but mainly on stem borer of paddy | Low use some pesticide use on tomato & other vegetables. A lot of pesticides are applied to cotton. |
| Improved seed use                   | Mainly using own traditional | Only have seed of traditional cvs; |
monsoon paddy cvs & some hybrid paddy. Not for other crops Seed provided by DOA, which has also a demo plot for hybrid rice. hybrid rice has just been introduced recently. The lack of availability of improved quality seed for major crops grown is a major constraint for farmers.

| Factors influencing crop choice | Crop adaptability to soil & weather conditions
| Expect increased income
| Importance to farmers of paddy for subsistence
| Prefer to still grow existing crops, farmers are risk averse.
| Request to get information on crop alternatives |
| Most crop choice based on home consumption & then after which for cash sale
| Farmers need more advice on technologies & on more profitable crops
| If had more water would grow summer paddy and cotton |

### 5. Crop Water Management

#### Water scheduling
Water scheduling depends on sharing system with ID organizing with village groups; sometimes there are conflicts; WUA have been established, but not yet operating as intended. Traditional arrangement and rules still followed so quite formal water management.

The farmers coordinate & negotiate with the ID for water; farmer on upper plots close to canal get water first then to then below; no WUA just informal.

#### Water charges
Pay by the acre Ks 1950/ac for paddy per season & Ks 900 for other crops (e.g., maize & groundnut). Responsibility is with the ID to collect the charge.

Pay by the acre Ks 1950/ac for paddy per season Responsibility is with the ID to collect the charge.

#### Crop pre-watered
Done for paddy lands prior to transplanting

Done for paddy lands prior to transplanting

#### Responsibilities of water manager
WUA leader only responsible for controlling of water supply; does not provide any other services to the farmers, this is done by the individual farmers & the VDC

WUA leader only responsible for controlling of water supply; does not provide any other services to the farmers, this is done by the individual farmers & the VDC

#### Constraints in water supply - time of yr
Can even be problems of water availability in the monsoon, severe during the summer season especially during years of limited rainfall.

Can be even during the monsoon period, but very severe during rest of the year. Water from dam generally available from late July through to November, after which little water; varies with season & amount rainfall.

#### Farmers consider which priority crops for available water
Paddy mainly, but would like to have supplementary water for other important crops grown currently under rainfed conditions

Paddy mainly, but would like to have supplementary water for other important crops grown currently under rainfed conditions especially for cotton & sesame.

#### Quality of water management
Management of on field irrigation system which is done by WUA leader usually to satisfaction of the other users; there can however be problems due to shortages water

The water management seems OK but not formal. Management of on field irrigation system which is done by WUA leader usually to satisfaction of the other users. No conflicts over water were mentioned.

#### If get more water would farmers change crops
The main crop preferred will always be paddy in summer season, but this can be down to pressure from DOA.

As crops mostly for home consumption still keen to grow the crops which they are familiar with, particularly summer paddy & cotton.
<table>
<thead>
<tr>
<th>Farmers irrigation knowledge</th>
<th>The farmers are fully aware of growing irrigated paddy but not for other crops for which further advice is required.</th>
<th>Farmers are fully aware of growing irrigated paddy and the irrigation of crops like onion and a range of vegetables; further advice would be useful however.</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-farm water losses</td>
<td>Nil on-farm but can be as high as 75% on the main &amp; DY’s according to farmers, due to earthen channels. Conveyance loss 40-50%</td>
<td>0-10% on-farm; but can be high on the main &amp; DY’s because of earth built channels.</td>
</tr>
</tbody>
</table>

### 6. General Comments

#### Constraints to irrigated agriculture
- Water shortage & some conflicts
- Lack of alternative crops to grow
- Lack of proper understanding of crop water management for alternative crops.
- The layout of the field plots with cascading plots causing problems for proper water management
- High cost of inputs
- Marketing problems & low prices for commodities
- Micro-finance

#### Main constraints overall (prioritised)
- Lack of knowledge on new crop technologies & new cash crops
- Improve & better water supply especially to tail areas of the system
- Need help to better manage the distribution of water, currently not fair.
- Need finance, micro-finance to farmers
- Market development & proper value chains, value addition

- Need help to better manage the distribution of water, currently not fair with multiple users
- Need finance, micro-finance to farmers
- Market development & proper value chains, value addition
- Lack of knowledge on new crop technologies & new cash crops
- Improved seed supply needed
- Large water losses due to poor state of channels & delivery ditches
- Mechanization is needed where appropriate.
### Annex 4  IAIDP Subproject Cropping Patterns

<table>
<thead>
<tr>
<th>Subproject</th>
<th>Season</th>
<th>Irrigated Area (acre)</th>
<th>Monsoon Paddy</th>
<th>Summer Paddy</th>
<th>Cotton</th>
<th>Green Gram</th>
<th>Sesame</th>
<th>Chick Pea</th>
<th>Groundnut</th>
<th>Maize</th>
<th>Tomato</th>
<th>Lab Lab Bean</th>
<th>Total</th>
<th>Crop Intensity %</th>
</tr>
</thead>
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<tr>
<td><strong>Current Cropping Pattern (%)</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Chaungmagyi</td>
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<td>6,038</td>
<td>80.8</td>
<td>0.8</td>
<td>31.3</td>
<td>1.2</td>
<td>7.1</td>
<td>1.2</td>
<td>2.7</td>
<td>82.0</td>
<td>3.9</td>
<td>93.4</td>
<td>125</td>
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<tr>
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<td>59.3</td>
<td>17.9</td>
<td>0.8</td>
<td>28.9</td>
<td>12.2</td>
<td>4.6</td>
<td>11.0</td>
<td>1.6</td>
<td>4.1</td>
<td>73.2</td>
<td>19.7</td>
<td>17.9</td>
</tr>
<tr>
<td><strong>Alternative Cropping Pattern (%) – Scenario 1 (additional monsoon paddy, plus summer paddy)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>31.3</td>
<td>1.2</td>
<td>7.1</td>
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<td>3.9</td>
<td>38.4</td>
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<tr>
<td>Natmauk</td>
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<td>65.3</td>
<td>33.8</td>
<td>0.8</td>
<td>28.9</td>
<td>12.2</td>
<td>4.6</td>
<td>11.0</td>
<td>1.6</td>
<td>4.1</td>
<td>79.1</td>
<td>19.7</td>
<td>33.8</td>
</tr>
<tr>
<td><strong>Alternative Cropping Pattern (%) – Scenario 2 (additional monsoon paddy, plus summer paddy and summer sesame [50% each])</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>3.9</td>
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<td>16.9</td>
<td>0.8</td>
<td>28.9</td>
<td>12.2</td>
<td>4.6</td>
<td>11.0</td>
<td>1.6</td>
<td>4.1</td>
<td>79.1</td>
<td>19.7</td>
<td>50.7</td>
</tr>
<tr>
<td><strong>Alternative Cropping Pattern (%) – Scenario 3 (additional monsoon paddy, plus summer sesame)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Chaungmagyi</td>
<td>Monsoon Winter Summer Pre-monsoon</td>
<td>6,904</td>
<td>92.4</td>
<td>31.3</td>
<td>1.2</td>
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<tr>
<td>Natmauk</td>
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<td>65.3</td>
<td>12.2</td>
<td>0.8</td>
<td>28.9</td>
<td>67.6</td>
<td>4.6</td>
<td>11.0</td>
<td>1.6</td>
<td>4.1</td>
<td>79.1</td>
<td>19.7</td>
<td>67.6</td>
</tr>
</tbody>
</table>

Note: Three scenarios: (a) all summer paddy; (b) 50% summer paddy & 50% summer sesame (increased land area x2); and (c) 100% summer sesame (increased land area x2 increase)
Annex 5  Lessons Learned from Value Chain Development Projects

Extract adapted from IFAD (2014) Lessons learned commodity value chain development projects. Sustainable inclusion of smallholders in agricultural value chains Strategic recommendations. October 2014. IFAD Rome, Italy. Drawing from these lessons learned, this section outlines strategic recommendations for the design of VC projects. All of these points are elaborated in the How-To-Do-Note on designing commodity VC development projects.

- “VC approach” versus “VC development project”. The VC approach is being increasingly adopted as an analytical and operational tool for the latest generation of IFAD-funded projects. However, in the context of IFAD’s mandate, this does not necessarily mean that all IFAD projects should directly address the comprehensive development of an entire VC; instead, they can focus on specific elements of a chain.

- The VC approach is not a blueprint but needs to be adjusted to each country/context based on a systemic and comprehensive examination of the interactions between small-scale producers and other VC actors (including both micro and macro aspects). This enables the identification of key entry/leverage points to make a VC work better for small-scale producers. By looking beyond bottlenecks at the production level, the VC approach helps identify issues at different levels of the VC or in the business environment (legislation, regulatory framework, policies, infrastructure, etc.) that affect producers’ capacity to be sustainably included in a particular VC.

- An essential area for policy dialogue is the role of the government and the overall public sector in creating the enabling environment and institutions for better functioning VCs and in providing public goods to address market failures (e.g. transportation infrastructure, public food standards) and to create incentives to make investment in a VC and partnership with small-scale producers economically more viable and/or less risky for the private sector.

- At the project design stage, there may not be enough time and resources to carry out an in-depth commodity VC study. However, it is critical to identify in advance the commodity VCs in which there is a business case for involving small-scale producers – i.e. in which small-scale producers have a comparative advantage – and in which VC actors are committed to engaging in mutually rewarding win-win arrangements. A more comprehensive analysis of the commodity VC should be carried out during implementation, using a participatory approach with VC players.

- It is important to realize that the poorest segments of the rural population (the bottom of the pyramid) are often unable to meet the requirements for sustainable integration into dynamic VCs (modern markets). However, less competitive and demanding traditional (local) markets can offer many opportunities for these segments of the rural population.

- It is also critical to analyze the roles of women (and youth) within the VC. Typically, women and youth face additional constraints in obtaining access to assets (e.g. land) and services (credit) and are underrepresented in farmers’ organizations, despite the enormous amount of work they do at particular stages of the production and marketing process. VC opportunities may exist in farming (e.g. branding of women farmers’ produce), off-farm microenterprises or wage employment.

- VCs evolve continuously and can change rapidly. The focus should, therefore, be on building the capacity of VC actors to remain competitive, particularly by responding to and/or anticipating market and VC changes. Flexibility in project design is critical to allow adjustment in a very dynamic context.

- IFAD does not implement its projects directly; government is the implementing agency. The relationship between the public and private sectors is often a country-specific challenge so a third party facilitator/broker is needed to build mutual trust among the different parties (farmers’ organizations, private sector companies, the government) and to help identify issues of common interest for a more efficient and profitable VC.
• It is important to analyze all the possible business models that allow sustainable inclusion of small-scale producers in VCs, in addition to IFAD’s typical project entry point (producer organizations in producer-driven models). Evidence shows that alternative buyer- or intermediary driven models can be equally effective in achieving the necessary economies of scale.

• A critical dimension of a VC is the type of contractual relationship between small-scale producers (suppliers) and large-scale investors such as agribusiness companies (e.g. processors or exporters). Contract farming has become increasingly important in modern markets – particularly for highly perishable and labor-intensive crops – and may generate win-win situations. However, for both parties (small-scale producers and agribusinesses) there are also risks, which depend on context-specific factors that need to be carefully analyzed (e.g. the law enforcement environment, the bargaining capacities of producers and their organizations, the motivation of agribusinesses, the nature of the commodities). Alternative contractual arrangements such as management contracts, tenancies and joint ventures all have their own advantages and disadvantages, depending on the context.

• Fair and transparent governance of the VC is key to ensuring better quality and consistency of production and stable benefits for small-scale producers. The agreed terms of trade, quality standards and pricing structure (including premiums and penalties) throughout the chain should be made clear from the outset. Support to small-scale producers in contract negotiations with other VC actors is a crucial area of intervention for a development project. Governance should be carefully monitored during implementation to ensure that communication flows along the chain and that no actor takes an “elite capture” attitude.

• The constraints faced by small-scale producers and rural microenterprises and small and medium sized businesses in obtaining access to working and investment capital in the context of the VC should be analyzed. Among VCs, the financing arrangements between buyers and suppliers are many and varied. Tripartite arrangements involving farmers, buyers and a financial institution are also possible. Cash flow problems resulting from delayed payments from buyers can be addressed by the piloting of factoring and warehouse receipt schemes, while leasing of small production equipment may also be an option. IFAD should map all existing arrangements throughout the chain to determine whether there is a financing gap and whether additional financing mechanisms may be needed.

• Integration into a VC requires a high level of product specialization (technology, farming practices, certification, etc.), which conflicts with the natural tendency of small-scale producers to diversify. This makes small-scale producers potentially more exposed to risks (climate change, natural and market-related). A VC approach should help to identify strategies and mechanisms for sharing risks and costs more equitably throughout the chain (equitable risk management business models) and look for innovative risk management instruments (e.g. weather index insurance, guarantee schemes).

• The VC approach offers opportunities to identify from the outset win-win, public-private-producer partnerships (4Ps) at the local, domestic and global levels, building on current trends that go beyond fair trade and corporate social responsibility. For sustainability, it is critical to leverage incentives that increase the competitiveness of the VC, generate wealth for all participating actors and put the private business sector in the driver’s seat of VC development.
Annex 6  Value Chains of Three Major Crops in the Central Dry Zone

I.  Rice value chain development

This section presents a situation analysis of the rice value chain as it pertains to Myanmar and more particularly the CDZ and the sub-project irrigation systems. Subsequent to this the constraints and opportunities along the chain both horizontally and vertically are identified. Cost and benefits associated with the value chain are also outlined. The section concludes with details on the proposed intervention to improve rice value chain development.

A.  Situation Analysis

The paddy production in terms of total of rainy season crop in the CDZ area has a share of 22% of national total, and in terms of the dry season crop (irrigated) a share of 29% on the national total. The top-priority in national agricultural development is attached to rice production/promotion associated with both ensuring rice self-sufficiency and the production of surplus for export.

There has also been an increase in exported rice since the second liberalization in 2003, especially from 2008 onwards with the formation of the Rice Specialization Companies (RSC). At the disaggregated level, it is clear that the major traditionally surplus areas are Ayeyarwaddy Region, followed by Bago (comprising East and West Bago) in Lower Myanmar, and Sagaing Region in the CDZ in Upper Myanmar. In contrast, the traditionally deficit areas are Chin State as well as Mandalay and Magway Regions.

A generalized rice value chain in Myanmar together with the economic activities along the supply chain is presented in Figure 3 and Figure 4, and which illustrates some key points, including how agriculture can be leveraged to drive overall growth.

Figure 6.1. Generalized Rice Value Chain: Potential Economic Activities

Source: Modified from Wong 2011.
Figure 6.2. Detailed Structure of Rice Supply Chain in Myanmar

1. Differentiated Rice Supply Chains or Sub-chains

It is possible in Myanmar to segregate the rice value (supply) chain into four different sub-chains (USAID, 2013), these being:

a) **Traditional rice value chain**: The most traditional rice value chain where the producers milled the bulk of their output for their own consumption through custom milling (using huller mills) with the excess sold to local small mills or collectors. This form is prevalent in both surplus and deficit regions, especially when far away from district and state/division capitals as well as where infrastructure is still poor, and is found in the irrigation systems in the CDZ. Antiquated and small mills are used to supply to the local community and surrounding areas. This chain is still quite large as it was estimated that an average of 30% of overall production is retained by farmers for their home-consumption.

b) **Rice value sub-chain involved in special arbitrage**: A sub-chain involved in spatial arbitrage, by linking rural to urban and/or surplus to deficit areas. This is also a traditional rice value chain involving small and medium size mills and traders involved in both spatial and temporal arbitrage, as well as larger mills dealing with bigger volumes linking or operating in distribution hubs to channel rice from surplus to deficit areas. This chain is probably the largest in terms of number of farmers, millers, wholesalers, and retailers involved as well as volume of rice involved. Hence, this chain should not be neglected in terms of technology transfer, financing, and all other recommendations, while emphasizing Myanmar’s intent to re-establish itself as a major rice exporting country.

Source: Larry C.Y. Wong and Eh Mywe Aye Wai, USAID (2013)
c) **Supply chain to support international trade in rice:** A supply chain that has been developed since 2003 after the withdrawal of Myanmar Agricultural Produce Trading (MAPT), to support the international trade of rice (white rice, broken rice, and parboiled rice) that is exported almost exclusively from Yangon. A subset of this chain involves the Rice Specialization Companies (RSC) who owns or are strategically aligned to large modern mills, are involved in contract farming and the provision of seeds and fertilizers as well as mechanization services on credit. These RSCs are also involved with MRF in operating a rice reserve pilot scheme at the behest of the government which also operates as a buffer stock in order to stabilize the supplies and prices of paddy as well as rice. Most of their mills have mechanical dryers, wet polishers, and colour sorters and hence, capable of producing high quality rice which are exported as higher quality Myanmar rice (better than the normal Emata 25% exported by most exporters) to more discerning, non-traditional (other than African and Bangladesh) markets.

d) **Supply chain for border trade in rice:** A new but fast developing chain which supports the border trade via border posts to the neighbouring countries of China, India, Bangladesh, and Thailand. The most significant is that via Muse to Shweli (Ruili) in China, which as mentioned earlier registered an incredible 620,000 MT in 2012. This chain can be potentially very large. However, at the moment it is still evolving and is blurred as it also involves those traditionally operating in chain (b) as well as chain (c). Finally, new sub-chains are also expected to develop with impending plans to produce and export special quality rice in future such as Japanese firms preparing to produce Japonica rice in Shan State as well as Thai investors interested in producing the rice variety Khao Hom Mali in Mon State.

Overall it was found that the biggest chain is probably (b) spatial arbitrage followed by (a) and then (c) and (d) in 2013. It would be interesting to see the impact of the dynamics and transformation of supply chain as the demarcations between these sub-chains are blurred and as players shift between sub-chains.

B. **Value Chain Benefits and Costs**

1. **Economics of Rice Production, Marketing and Trading**

   In terms of costs and returns at the farm level, the USAID (2013) study utilized data from a comprehensive survey. These data are presented in Annex 7 Table 1 and Table 2 for the monsoon and summer paddy crop of 2011/12 and serves to illustrate the economics along the rice value chain. From these tables it can be seen that the average margin for the 2011/12 monsoon season at the farmer level (including transportation cost to mill) was $63 per ton; at the mill level (including milling cost) was USD 21; at Yangon trader level (excluding transportation cost) was $11; and at exporter level (excluding cargo preparation, transportation, and documentation) is $28. Besides providing an indication of the relative margins along the rice value chain, it also highlights the point that the relative competitiveness between exporting countries is not so much dependent on the cost of production at the farm level (i.e., $120.84/MT) but also, if not more importantly, milling efficiency/cost, transportation cost, handling, export documentation, and loading costs. The feedback from people involved in the supply chain confirms the problems at the milling and post-harvest stage as well as in transportation (due to poor road condition, high fuel cost, and hence, trucking charges), and costs embodied in export procedures and activities.

2. **Rice Value Chain Investments**

   Although there have been significant investments in the upstream, midstream, and downstream segments of Myanmar’s rice value chain, it is evident that the milling/processing segment of the supply chain is increasingly becoming the pivot for linking the upstream segment of inputs and farming to the downstream segment of wholesaling, retailing and exports. Hence, there has been a surge of investment in new rice mills as well as the upgrading of existing milling facilities in the main rice growing areas and Yangon, involving...
state-of-the-art European, Japanese, Korean, Thai, and Chinese made dryers, wet-polishers, color-sorters, and packers. Most of these are owned or strategically linked to RSCs. Though on a smaller scale there has been some investment by local RSCs and other private entities in the Townships and Districts in which both Chaungmagyi and Natmauk irrigation systems are situated, where millers and traders have invested in improved drying, milling and other post harvest processing operations. However a lot more needs to be done in this respect.

It is hard to detail exactly what the economic benefits to improved investments in post-harvest operations for rice, but the following aspects need to be taken into account:

- It is envisaged that with improved production of high value rice varieties that yields would be possibly increased by 10-15% with GAP and quality of the commodity would be improved, impacting positively on the price paid to the farmers by the trader and/or miller.
- With investments in post-harvest operations especially by the millers in drying facilities and improved milling equipment it is expected that the proportion of broken grains would be reduced from in the region of 20-25% in some cases with old mills down to 5%. The positive impact on economic benefits to the millers are large in this respect.
- Cost of equipment varies considerable with cost in the region of $3,500 for an AMD manufactured flatbed drier to large scale driers costing upwards of $20,000. Similarly, the cost of milling equipment ranging from $600 for a small scale village unit to $ 5,500 for the larger commercial units.
- For further value addition some millers in other areas of the CDZ have invested in parboiling equipment at large cost ($25,000 to $35,000 for a large scale commercial unit).

C. Constraints and Opportunities

The strength of the rice value chain is determined by its weakest links as depicted in Figure 6.3 presented below.

**Figure 6.3. Myanmar Rice Value Chain: Weak Links**

Source: USAID 2013

From Figure 6.3 the identified constraints or weak links along the value chain are divided into four broad categories:
(i) **Constraints on interface between inputs and farming/production levels:** The interface between inputs and the farming/production level where the contributory factors are the purity and quality of seeds which is so important if Myanmar wishes to regain its position as a significant dependable exporter in the global rice market. This is especially so for the identified high quality rice varieties like Paw San Hmwe. Another weakness is the dubious quality and appropriateness of fertilizers and pesticides. For example, there have been reports of urea sold to farmers having only around 20% N (instead of the standard 46%). Pesticides that are banned in neighbouring countries for rice are still widely sold in pesticides shops in the CDZ. This is exacerbated by the weak and underfunded agricultural R&D and extension system. As a result Input supplies need to be improved – especially seeds and fertilizers. There is a need for PPP in certified seed production. Agri-support services – research, extension, marketing, and credit are still weak and need supporting.

(ii) **Constraints on interface between the farming and mill levels:** This link is at the interface between the farm and the mill and comprises three main considerations; (i) the critical observation that present cultural practice of farmers, especially those who are rushing to establish a pulse crop after the monsoon crop harvest, often leave their harvested paddy crop in the field as the harvest usually occur in a dry period. However, during this period, the day and night time temperature variation is very significant leading to sun-cracking or fissures in the paddy grain which will lead to a higher degree of broken rice during milling irrespective of milling equipment upgrade; (ii) there is a lack of proper drying facilities for the summer crop which is harvested in wetter months; and (iii) largely due to financing constraints (high interest rates), many of the mills do not (cannot afford to) purchase and store enough paddy to run at or near rated capacity. Some mills in the CDZ are seemingly circumventing this by offering farmers free storage capacity at their mills and only pay the farmers when their paddy is eventually milled (timing mutually decided) at prevalent market price then. Another factor is the lack of value adding at the mills and processing plants for other end-uses. Acting together all these have put a cap on productivity growth as well as the transmission of low paddy prices to farmers. The overall impact relates to paddy quality, high broken rice grains faced by rice millers due to improper post-harvest techniques. Similarly purity of paddy varieties was deemed a major constraint for rice millers. Proper drying, milling and storage facilities are required. Rice bran oil and other end uses of rice products and by-products very limited.

(iii) **Constraints on interface between the milling and wholesaling levels:** This link is at the interface between the milling and the wholesaling (or distribution trade) as well as export and stockpiling levels of the rice supply chain. There is an interplay of three major issues: (i) To be considered a reliable exporter of choice, Myanmar must improve its consistency of supply and quality and be more proactive and demand driven in seeking out and developing markets for its range of white rice by variety as Myanmar is blessed with a range of varieties and indeed sells and exports rice by variety. This will enable Myanmar to meet consumer preferences of different major traditional as well as emerging rice importers. (ii) Myanmar’s current attempt at involving the private sector (through MRF) in national stockpiling operations (for buffering to stabilize paddy and rice prices as well as food security purposes) would require the development of standard operating procedures coupled with transparency of trigger mechanisms and how private sector can configure the operations to be self-financing and Government to work out its support and regulatory oversight required. (iii) Current informal or parallel markets to China, Bangladesh and Thailand as well as India should be increasingly formalized and exploited to facilitate cross-border trading networks in the Greater Mekong Sub-region (GMS) and Bay of Bengal Initiative for Multi-Sectoral, Technical and Economic Cooperation (BIMSTEC) region. It is expected that China will import rice more regularly for snacks, feed and human consumption as China’s rationalization program for competing use of increasingly scarce water resources coupled with its ambitious water transfer scheme from the south to the water starved north unfolds. In summary there is inconsistent quality and supply for exports. Domestic price and supply volatility
problematic – require proper rice stock pile doubling as buffer stock (MRF now started initiative – need to nurture). Border trade (legal and informal) not properly monitored and managed.

(iv) **Constraints that impact on the entire supply/value chain:** There are four issues which are: (i) Generally, data is patchy and available along the supply chain and worse still are invariably not shared or reconciled for a variety of uses and users. Furthermore, as government agencies as well as representative private sector associations focus only on specific levels of the rice supply chain that is under their purview or affecting them directly, there have been various misrepresentations, intentionally or otherwise, that has led to sub-optimal government interventions and even those have often made the situation worse. Fortunately the MRF, is addressing this issue together with the MOALI, MOC, and the Ministry of National Planning and Economic Development. (ii) Transportation and logistics cost are high arising from antiquated regulations and the prevailing structure of the water, road and rail transportation. This needs urgent attention and resolution as it can either support or hinder Myanmar’s ability to maximize the potential benefits of increasingly connecting with the region via overlapping regional constructs – ASEAN, GMS, BIMSTEC, as well as bilaterally with its immediate neighbours. (iii) Related to connectivity is its current low level of mobile phone and internet penetration. Interestingly, efforts are in place to liberalize and accelerate penetration rates by liberalizing the telecommunication sector. (iv) Not only is financing an issue at the farmers level but it pervades the entire rice supply chain which calls for a more holistic and sequenced approach in addressing and resolving this overarching problem which together with data and organizational capacity has hindered and constrained the full utilization of agriculture as an engine of growth to drive Myanmar’s transformation. In summary the lack of quality, consistency and transparency in even basic data and information along the rice supply chain is challenging both for policy makers and investors (especially FDI).

The above highlights the range of key issues and the various obvious weak links in the rice industry which must be approached in a more holistic manner. Now, as in any chain, its strength is in its weakest link. Therefore, these identified weak links must be addressed in tandem and resolution sequenced where necessary and implementation well supported by a structured monitoring and evaluation system. This should be affected through various forms of PPPs to create a demand-oriented industry-wide system linking back all the way to paddy production and the farmers.

**D. Proposed Intervention to Improve Rice Value Chain Development**

1. **Rationale for the Intervention**

This assessment of the rice value chain summarises the findings where at the end of an assessment of Myanmar’s rice value chain with particular regard to the CDZ, key recommendations for the short term included: (a) increasing productivity by using good-quality or certified high-yielding seeds and modern production techniques; (b) promoting rational and selective dry season diversification into high value crops; (c) improving water management and agri-support services; (d) maintaining and upgrading rural roads and developing farm roads (feeder networks); and (e) expanding rural financial services to improve access to inputs and reduce reliance on money lenders, all targeted at the upstream segment of the rice value chain. For the midstream segment, improving post-harvest handling; improving food safety and traceability; promoting strategic end-uses and rice co-products and by-products/wastes; encouraging private sector participation in processing rice and other end uses, and developing linkages to upstream and downstream segments of rice value chain so as to facilitate the development and strengthening of comprehensive supply chains which compete with each other. A further analysis of both long and short term interventions to improve the rice value chain are presented in E.
At the downstream level, recommendations include enhancing trade facilitation and improving export processing; targeting niche export markets for better quality (5 to 15% brokens) of specific varieties/types of rice rather than continue exporting low quality (25% brokens) of a generic category; improving grading and quality standards; improving branding and highlighting unique selling points of Myanmar rice; shorten supply chains by increasingly by-passing intermediaries like international traders and sell direct to strategic overseas markets; and develop more structured border trade, especially to China. In terms of easy options that will bridge to long term structural reforms, recommendations include improving statistical and resource data base, especially the stocks and flows of inputs and outputs at various levels of the value chain as part of rigorous ground-based statistical surveys, combined with latest satellite based measurement systems; and synthesizing expert opinion on current best practices for specific upstream, midstream, and downstream situations

2. Intervention Activities and Outputs

Objective statement for the sub-component is as follows: the provision of production, post-harvest and marketing support to aid the development of the rice value chain. The onus of the sub-component is therefore on assisting the farmers, farmer groups and privates sector trading, processing and marketing entities in this endeavor. The three main activities for this sub-component are: (i) improved rice seed supply, (ii) extension of rice Good Agricultural Practices (GAP) to farmers, and (iii) agribusiness support to rice post-harvest operations and marketing. These activities are further augmented through a number of cross-cutting value chain interventions as detailed in Section 6, including the establishment of Frontline Centers, support to improve input supply, development of Market Information System (MIS) and general support for value chain development. Detail on the sub-component activities are:

- **Improved rice seed supply** – provision of support to rice (monsoon and summer paddy) seed supply system to develop a viable PPP between government (DOA and DAR) and private sector; involves a detailed assessment of the required modalities and preparation of a workable PPP arrangement as a pilot venture, training of key stakeholders, including seed inspectors, plus demonstrations and trials on improved rice varieties on farmers’ fields.

- **Extension of rice Good Agricultural Practices (GAP) to farmers** – includes a detailed assessment of all the available and appropriate GAP relevant to rice including, improved water management techniques, CSA, IPM, INM, SRI, on-farm post harvest operations, etc., and the subsequent preparation of high quality training materials, training of trainers including the training of DOA staff (for agronomic aspects) and ID staff (for water management).

- **Agribusiness support to rice post-harvest operations and marketing** – financial and technical assistance to the private sector involved in rice post-harvest operations (drying, milling, grading, storage) and marketing, includes provision of advice on possibilities of contract farming ventures with smallholder farmer groups and cooperatives; funding to the processors/traders will be provided to through innovative loan schemes involving a range of financial institutions (including possibly the MEB) for the purchase of processing equipment and storage infrastructure; close involvement of the rice associations and Chambers of Commerce will be essential for this activity to succeed.

E. Short and Long Term Activities to Develop Rice Value Chain in CDZ.

1. Short term

_ Key recommendations for the upstream segment of the value chain include:_

- Improving the productivity of monsoon rice through improved certified seeds (increasingly led by selected RSCs working closely with DOA and DAR towards the development of a viable seed industry) for both contract farmers as well as sale to other farmers; improved agronomic practices; better quality fertilizers and appropriate
agro-chemicals coupled with optimized fertilizer and input dosage and application; and integrated pest management.

- Promoting rational and selective dry season (summer crop) diversification into higher value crops (especially where water availability is insufficient to support a summer rice crop); and improving water management and agri-support services.
- Expending rural financial services to improve access to inputs and reduce reliance on informal money lenders.

**Key recommendations for the midstream segment of the rice value chain include:**

- Improving post-harvest handling – especially to avoid sun-cracking by organizing quick collection of harvested rice, improve drying facilities and ensure consistent and cost effective power source at mills.
- Improving food safety and traceability by developing comprehensive supply chains and production of branded packed rice by variety.
- Promoting strategic end-uses and by products (as championed by MAPCO) to generate more value adding and facilitate transmission of better paddy prices back to farmers.
- Improving linkages to upstream and downstream segments to facilitate the strengthening of comprehensive supply chains which compete with each other so as to contribute to increased competitiveness and increased productivity.

**Key recommendations for the downstream segment of the rice value chain include:**

- Targeting niche export markets for specific type/varieties of rice.
- Improving branding and highlighting of unique selling points as well as developing branding for Myanmar rice as a whole.
- Shortening supply chains by by-passing intermediaries like international traders and securing strategic international markets
- Facilitating food security
- Improve statistical and resource base especially in addressing the current data weakness as well as tracking the stocks and flows of inputs and outputs at different levels of the value chain as part of rigorous ground-based statistical surveys.
- This should combine with the latest satellite-based measurement system which enables the forecasting not only of production but also potential damage by drastic weather changes and pest outbreaks.
- Synthesizing expert opinion on current best practices for specific upstream, midstream, and downstream settings.

2. **Long term**

**Key recommendations for long term include:**

- Creating a farmer-centered, market-oriented research system where outputs can contribute to guiding the future development of the rice industry as well as enable on-course corrections and shaping the transformation process.
- Promoting transparent predictable policies to regulate and support the private sector which is so important in view of the stepping up of public-private-partnership with RSCs, the involvement of the private sector in managing Myanmar’s rice stockpile and the increasingly more encompassing activities of MAPCO.
- Investing in rural financial system serving the different segments of the value chain.
- Supporting farmer organizations (including the newly formed Farmers Association), water user groups and small and medium scale enterprises (SMEs) involved in or supporting the different level of the supply chain to be integrated into the entire value chain.
- Developing an integrated intermodal logistics system to overcome noticeably escalating transportation costs so that Myanmar’s rice supply chain and trading network becomes increasingly more competitive.
II. Oilseeds Value Chain Development

This section presents a situation analysis of the oilseeds value chains as it relates to the CDZ and the sub-project irrigation systems. Subsequent to this the constraints and opportunities along the chain both horizontally and vertically are identified. Cost and benefits associated with the value chain are also outlined. The section concludes with details on the proposed intervention under the project to improve oilseed value chain development.

A. Situation Analysis

1. Oilseeds Value Chains Overview

Sesame and groundnuts are the two principal oilseeds produced commercially in Myanmar; sunflower seed is also grown and is often processed at village level by farmers for domestic use. Sesame is mainly grown in the CDZ where it is mainly sown in the monsoon season (74%). These oilseeds are used domestically for oil production but have to compete with cheaper palm oil imports; when export prices for oilseeds, especially sesame, are high which has been the case in the past year, oilseeds are exported in raw form rather than sold to processors who cannot compete with export prices.

Since both sesame and groundnuts are also used in confectionary there is also a large market for sesame and groundnuts which are exported unprocessed. Both sesame and groundnuts are shipped to Muse on the China Border and traded to Shweli (Ruili) for sale in China. In Yangon, roasted sesame powder is traded to South Korea. Exports of sesame in 2012-2013 were 136,000 tons valued at $235.7 million or an average export price of $1734 per ton. Because of the high prices and demand on export markets, virtually the whole sesame crop was exported in 2012-13. Groundnut exports in 2012-13 were 62,370 tons valued at $93.6 million at an average price of $1500 per ton. Prior to 2011, there were restrictions on the export of sesame (excluding black and white) and sesame by-products, groundnuts and locally produced oils but these restrictions were lifted in 2011. Palm oil imports were also opened up to the private sector.
There are three distinct groups of oil crops, as regards the flow of the product along the value chain:

- **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).

- **Group II**: Oil crops for which oils are sold on the market as Refined Deodorized Bleached (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.

- **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.

![Figure 6.5. Oilseeds Value Chain in CDZ](image)

The value chain maps showing the flow for oil Crop Groups I which includes two oilseed crops common to the CDZ (groundnut and sesame) and more particularly Natmauk and Chaungmagyi, are summarized in Figures 6, with more detail focusing on the CDZ in Figure 6.5.

### 2. Marketing of Oilseed Crops

The general pattern of marketing oil crops shows a variety of situations where transactions occur at farm, village, township, urban centers and Crop Exchange Center (CEXC) 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; and (6) exporters: backward integrating sesame production for export to international markets.

**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 in 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 Centers (CEXCs):** 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 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 centers 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, Pakkoku, Magway, Myingyan and Taunggyi and refer to the price and demand situation of the Mandalay market.

**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.

### 3. Processing and Marketing of Oil

In Myanmar, the bulk of oil goes to the consumer as crude filtered oil as is the case in the CDZ, and for the most part groundnut, sesame, niger and mustard oils are not refined. There are five well identified marketing channels in existence: (a) farmers milling the oil themselves using the traditional wooden mill, for their own consumption or village markets; (b) farmers renting a mill for their own consumption or to supply village markets; (c) small and medium size oil millers to local wholesale markets and/or retailing themselves, (d) larger oil millers to wholesalers in larger urban centers; and (e) large oil millers marketing branded oil to supermarkets, showrooms or door to door services.

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.

**Small-scale Millers:** These 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 center, retailing their own oil, as well as other consumables.

**Large-size Millers:** Larger mills are supplying oil to wholesalers in larger urban centers. 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. 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. 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, supermarkets or door to door services (min.5 viss for door to door service).

**Marketing of Oilseed Cake:** 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: (a) farmers crushing their own oil crops in small expeller mills or traditional mills using the cake generally for their own livestock or selling it in the village to other farmers; (b) medium size mills are selling oil cakes generally to a local wholesale market or CEXCs in Mandalay or Yangon, and (c) 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.

### B. Value Chain Benefits and Costs

1. **Economics of Oilseed Production, Marketing and Trading**

   Similar to rice an attempt has been made to determine at least at the farmer level what the economics of oilseed production are. Data is presented in Annex 7 where Table 3 presents production cost and returns for sesame crop, 2013/14 for both Natmauk (Magway District) and Chaungmagyi (Yamethin District), and Table 4 presents production cost and returns for groundnut crop, 2013/14 for both irrigation systems. For both crops it was found for 2013/14 season that the net margin (return) per acre was significantly better for Magway as compared to Yamethin due to the lower yields in the latter. No data was available on prices related to oil milling and trading of the commodity or oil. Feedback from people involved in the supply chain confirms the problems at the oil milling and post-harvest stage and costs embodied in export procedures and activities.

2. **Investments along Oilseed Value Chain**

   Although there have been some investments in the midstream segments of Myanmar’s oilseed value chain in CDZ, it is evident that the milling/processing segment of the supply chain is increasingly becoming the pivot for linking the upstream segment of inputs and farming to the downstream segment of wholesaling, retailing and exports, in a similar manner to the rice value chain. It is hard to detail exactly what the economic benefits to investments in post-harvest operations for oilseeds, but the following aspects need to be
taken into account. It is envisaged that with improved production of high value oilseed varieties that yields would be possibly increased by 35-50% with GAP and quality of the commodity would be improved, impacting positively on the price paid to the farmers by the trader and/or oil processing entity. The costs associated with the midstream segment of the value chain related to improved drying and storage facilities and the purchase of better and more efficient oil expellers (small units costing in the region of USD 5,000 to USD 10,000).

C. **Constraints and Opportunities**

There has been a significant increase in the volumes and values of oilseeds produced in Myanmar in recent years. The marketing system functions competitively and farmers report few marketing problems. However, the profitability and competitiveness of these value chains in the CDZ are constrained by the increasing variability in yields (production) caused by unreliable weather and limited availability of improved, short duration drought resistant varieties. The DAR has developed new, improved varieties of green gram, pigeon pea, black gram, groundnuts and sunflower but there availability is strictly limited. Farmers are invariably using retained seed which in many cases has degenerated which severely impacts on the size, quality and yields of the different produce. The availability of improved seeds will be a key determinant of future crop profitability and competitiveness in overseas markets. Possibilities for value addition are limited as oilseeds and pulses are traded along the value chain as raw, unprocessed products. Farmers do sometimes undertake cleaning and grading of their crops before selling at the commodity exchanges but grading and cleaning to export standards is done by the traders according to specific standards and cannot be done at village level more than is presently the case.

Inputs (seeds, fertilizers, pesticides and tools) are in general adequate in most Townships. The private sector is not involved in commercial seed production and supplies are seemingly dependent on what the government seed farms can supply. A study of input supplies and availability in Myanmar in general and especially in the CDZ with recommendations on how to improve the situation (including improved credit availability to input stockists and to producers) is considered necessary in order to improve the situation.

Improving returns to farmers will be dependent on a number of factors. Group marketing is not practiced by farmers and whilst some traders would like to buy from groups, in order to reduce transaction costs, farmers prefer to undertake individual marketing. The benefits of group marketing in order to have a better negotiation position with traders and especially crop processors as volumes offered will be greater, needs to be explained to farmers. If improved higher yielding sesame and groundnut varieties were to be planted then villages could eventually envisage establishing simple, manual oil presses to provide sunflower oil to village households and nearby villages. Procurement of inputs would also be cheaper if farmers bought together. The project envisages group training of Village Development Committee members and training in group marketing and procurement should be a part of the envisaged training.

Storage of crops to take advantage of seasonal price differences, which can exceed 30%, is not practiced in the villages because of the necessity to repay credit immediately after harvest. If the credit terms, duration and costs were to be modified then short term storage of crops to take account of seasonal price differences could eventually be envisaged and a warehouse receipt system could also eventually be considered. However, crop volumes will require to be increased through better seeds and better husbandry before meaningful investments in domestic or village storage facilities could be envisaged and farmers would need to understand the benefits that could accrue from engaging in group storage and marketing.

D. **Proposed Intervention to Improve Oilseeds Value Chains**

1. **Rationale for the Intervention**
The main bottleneck along the oil crops chain is at production level and specifically the supply of farm inputs. 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. Farmers’ constraints in Myanmar are critical as they are trapped in a low yield vicious circle maintained by scarcity within the ‘farming inputs — credit complex’, which needs to be broken through by an integrated approach. Such an approach should address simultaneously seeds and fertilizers supply as well as rural credit. Partnership between farmers, private sectors and the government is necessary.

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. 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.

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.

The oil crops sub-sector in Myanmar is characterized by a high efficiency in areas where the oil crops sub-sector participants are allowed to operate freely. This efficiency originates from the high degree of 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.

2. Intervention Activities and Outputs

Objective statement for the sub-component is as follows: the provision of production, post-harvest and marketing support to aid the development of the oilseeds value chains. The onus of the sub-component is therefore on assisting the farmers, farmer groups and private sector trading, processing and marketing entities in this endeavor. The three main activities for this sub-component are: (i) improved oilseed crops seed supply, (ii) extension of oilseed Good Agricultural Practices (GAP) to farmers, and (iii) agribusiness support to oilseed post harvest operations and marketing. These activities are further augmented through a number of cross-cutting value chain interventions as detailed in Section 6, including the establishment of Frontline Centers, support to improve input supply, development of Market Information System (MIS) and general support for value chain development.

Detail on the sub-component activities are as follows:

- **Improved oilseed seed supply** – provision of support to oilseeds (sesame, groundnut and sunflower) seed supply system to develop a viable PPP between government (DOA and DAR) and private sector; involves a detailed assessment of the required modalities and preparation of a workable PPP arrangement, training of key stakeholders, including seed inspectors, plus demonstrations and trials on improved oilseed crop varieties on farmers’ fields.

- **Extension of oilseed GAP to farmers** – includes a detailed assessment of all the available and appropriate GAP relevant to oilseeds including, cropping systems, CSA,
IPM, INM (including inoculum), on-farm post-harvest operations, etc., and the subsequent preparation of high quality training materials, training of trainers including the training of DOA staff (for agronomic aspects) and other concerned stakeholders.

- **Agribusiness support to oilseed post-harvest operations and marketing** – financial and technical assistance to the private sector involved in oilseeds post-harvest operations (drying, oil expelling, storage) and marketing, includes provision of advice on possibilities of contract farming ventures with smallholder farmer groups and cooperatives; funding to the processors/traders will be provided to through innovative loan schemes involving a range of financial institutions (including possibly the MEB) for the purchase of processing equipment and storage infrastructure; close involvement of the oilseeds associations and Chambers of Commerce will be essential for this activity to succeed.

E. **Overview of Recommended Interventions for Oilseeds**

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 MOA, 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.

1. **Recommendations at Production Level**

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. 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.

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’:

- 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.
- 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 as rural credit. Partnership between farmers, private sectors and the government is necessary.

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 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.

2. 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.
• 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.

### 3. Recommendations at Marketing Level

Oil crops marketing and distribution within Myanmar is characterized 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.

It is important to note that 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.

Another limitation 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, and 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:
  o 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
  o 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.
o Enable the most dynamic Myanmar traders to effectively utilize internet-based trade and marketing platforms by developing targeted business support services in this area.

o With all stakeholders of the oil crops sub-sector trade, develop brands for Myanmar oil crops products (sesame products in particular).

4. 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 MOLFRD 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.

5. 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 MOA.
- 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 consumption survey to better understand the domestic market and regional differences.
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 MOALI 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.

III. Pulses Value Chain Development

This section presents a situation analysis of the pulses and grain legumes value chains as they pertain to Myanmar and more particularly the CDZ and the sub-project irrigation systems. Subsequent to this the constraints and opportunities along the chain both horizontally and vertically are identified. Cost and benefits associated with the value chain are also briefly outlined. The section concludes with details on the proposed intervention to improve pulses value chain development.

A. Situation Analysis

The second priority after rice in the agricultural sector production in Myanmar is placed on pulses. The reason of high priority may reside in intake of protein from these pulses, but more convincing reason exists in the significance of earning foreign currency with their major export destination targeted to India. Mainly constitutes the following pulse crops, namely: green gram, black gram, chickpea and pigeon pea (grown solely on the upland areas which are rainfed).

Myanmar is a significant producer (where most of the production is in the CDZ) and exporter of pulses (green and black grams and pigeon peas) which totaled some 1.25 million tons, valued at $793 million in 2012-2013. Chickpea exports were 46,900 tons ($34.3m). Domestic prices are therefore based on international export prices and fluctuate with international price movements. It also means that volumes able to be exported are basically unlimited if prices are competitive. Black gram is purchased by pulse millers in Mandalay and Yangon and is also exported to India through local exporters and traders who sell FOB Yangon. Red pigeon peas are produced mainly in the CDZ and sold to India via Yangon. Green gram is mainly produced in the CDZ and shipped to Muse for sale in China (Shweli – Ruili). Chickpeas are sold to local pulse mills and traders and shipped to Yangon where local exporters ship it to India. Prices can vary up to 30% over the year as stocks after harvest are run down.
MOALI has promoted pulse production by means of the provision of high quality seeds of green gram and chickpea for distribution among farmer producers oriented to the exports during the period 1990s to early 2000s. New varieties of pulses have shorter crop duration and are less susceptible to drought as result of this. For example, new varieties can be harvested in 90 – 110 days comparing with hitherto chickpea varieties that require maturity period of around 125 days from sowing to harvest.

Also in the case of green gram, as against traditional varieties with growing period of 120 days, new varieties are harvestable in only 75 days. In the case of chickpea, since it has hitherto been cropped during winter season as catch crop in paddy land, emergence of export markets is considered to be the maximal driving force to expand production. However, the decisive reason that enabled the introduction of green gram into pre-monsoon season that comes just before main paddy crop in rainy season was the success in breeding of new varieties with shorter growing period. Namely, it is notable that expanded production of these pulses was enabled not by the expansion of cultivated area but by more intensive farming practices.

Average yields of the legume crops remain low for a number of reasons due to lack of irrigation, low-yielding seeds, limited access to high quality seeds, poor soil conditions, crop management practices, management of biotic and anti-biotic stresses, and lack of or sub-optimal application of fertilizers. In addition lack of market access and capital also placed limitations on overall productivity/prices. Agencies have struggled to address these issues while also faced significant obstacles in identifying and introducing crop diversification and higher value commodities (such as groundnuts, potatoes, dried onions, dehydrated onions etc.). As number of INGOs and donors: Welthunger Hilfe (WHH), Cesvi, EcoDev and ACIAR have been particularly engaged in this area. While ACIAR, which is mainly research-focused, has developed and tested promising higher yielding and hybrid strains of legumes in cooperation with government agencies, little information is provided on barriers to adaption among farmers, (projected) rates of adaption post-project and hence the overall sustainability of the suggested new/improved strains of legumes.

**Figure 6.6. Main Pulse Crops Grown In Myanmar**

![Image of pulse crops]

The issues as regards to the production of pulses at the farmer level are associated with the use of improved varieties, use of phosphatic fertilizer and rhizobia. Over 20 varieties of
Beans and pulses are produced in Myanmar and because of relatively low national consumption, many of these varieties are export-only commodities. The main bean and pulses varieties produced in Myanmar are black gram (matpe), green mung bean, and pigeon peas, with matpe production over two times that of the next two highest, green mung and pigeon peas (Figure 6.6). Myanmar produces beans and pulses in three quality grades: first quality (FQ), special quality (SQ), and fair average quality (FAQ). The majority of FAQ beans are sent to India with most FQ and SQ beans sent to higher quality demanding markets such as Korea, Japan and China.

Pulses are usually grown in the CDZ during the winter period beginning in November making use of the residual moisture left in the soils after rice crops have been sown. Growing periods for beans and pulses are usually much shorter than for other crops such as rice, only taking about 3 to 4 months from plantation to harvest. Winter crops from November are usually harvested in January. Those crops planted at a later period during winter are usually harvested around February or March.

1. **Pulses Value Chain Overview**

There are similarities in the way that marketing of pulses are done with oilseeds at least up until the post-harvest processing stage, where pulses are usually sold unprocessed and the commodity is directly traded as grains. The supply chain of Myanmar’s pulses trade involves several key parties: farmers, local traders, Yangon traders, large wholesalers/ exporters and agents. The supply chain is sometimes convoluted and farmers rarely do direct negotiations with large wholesale traders, relying on several middle parties to make their deals. The below Figure 9 outlines the steps in the supply chain according to representatives from the Myanmar Pulses, Beans and Sesame Seeds Merchants Association, and local export import experts.

**Figure 6.7. Pulse and Bean Crops Supply Chain**

*From farmers to local traders*: Harvested pulses are bought from farmers by local traders who sometimes offer to give farmers support through small loans and use of machinery. The relationships between farmers and local traders can become complicated when the farmers come to rely on the traders for financial and technical support. When borrowing from local traders there are often informal agreements for the farmers to sell back their goods to those respective traders. The traders determine the prices, leaving much room for exploitation. Furthermore, after the beans and pulses are harvested, farmers are often in a rush to sell all of their stocks in order to pay off debts as soon as possible. Farmers are thus left in difficult
situations where selling goods to pay off debts becomes the main goal, even when more profits could be made if selling were stalled until a more profitable period or crops were saved for other traders that could offer higher prices.

**From local traders to large wholesalers:** Local traders then sell their commodities to larger rural companies that then resell their commodities to Yangon traders. Large wholesalers that are the main handlers of exports buy from Yangon traders making deals through commodity exchange centers such as Bayint Naung Market or directly from the traders themselves. Almost all of the beans and pulses exports are made from Yangon. Therefore, the supply chain usually ends in the country’s commercial hub with Yangon traders, large wholesalers and commodity exchange centers are the key actors.

**From wholesalers to overseas markets:** Once the commodities are in the hands of the wholesalers, those wholesalers with the capacity to process their own products can do so to produce Ready-Cargo (RC) stock. Otherwise, the commodities are sent again to another processing-capable company and sent back to the original wholesaler to be ready for export. Raw beans and pulses are easier to store but wholesalers also keep RC processed stocks available at all times. Warehousing companies also make up a major part of the supply chain. Large wholesalers export their commodities directly or sell them to warehouses located in Yangon, often in the industrial zones. These warehouses are important for the trade as they are responsible for hoarding the commodities and selling them throughout the year depending on price fluctuations. The warehouses are often involved in speculative selling but ensure that there is a steadier stream of beans and pulses supplied to international markets.

**The agents:** As the pulses change hands from local traders to large wholesalers the process is often far from straightforward. Deals often involve buying and selling agents that are offered healthy commission fees, even up to one percent of the deal, for their work buying commodities on behalf of larger companies. Cutting out the middle parties to establish direct links between farmers and wholesalers does not seem likely in the near future as the trade has become highly reliant on these in-between agents. The agents are highly knowledgeable of the industry and often act as advisors or consultants to the wholesale companies they make deals for, knowing where to buy and when to buy. Farmers rarely have the opportunity to negotiate prices and do not participate in speculation, relying on these middle parties to do so, as there is often a rush to sell within the three to four month after harvest time frame. Additionally, without any effective farmers’ associations to increase bargaining power, local traders, Yangon traders up to large wholesalers appear to be the ones in most control of the trade.

**Current Commodity Exchange Centers:** Myanmar has a total of 44 commodity exchange centers across the country with Bayint Naung Market as its largest. Located in Northwestern Yangon, Bayint Naung Market is the country’s main agricultural commodity trading center. Since 2009, it has been a requirement that all domestic and international transactions under the Myanmar Pulses, Beans and Sesame Seeds Merchants’ Association be conducted through this market. Thus, the market has become central to the trade, handling thousands of transactions daily.

**Current Processing Methods:** Beans and pulses processing usually involves two steps: (a) primary processing consists of receiving, cleaning and quality sorting of seeds; and (b) secondary processing consists of preparing seeds for consumer use and can include dry packaging, canning and the making of soup mixes, powders and flour. In Myanmar, secondary processing is minimal with the processing sequence ending at dry packaging. High-quality color sorting machines are now available and factories have been quick to adopt these technologies to cut back on labor costs. However, of Myanmar’s approximately one million tons of beans and pulses exported annually, only 5 to 10 percent goes through any processing. Cleaning and sorting of the beans can occur in the hands of the farmers, although lack of funding and technological support has severely limited this from occurring.
The small-scale machinery at this stage is often backward and upgrading has been expensive, thus, many of these beans and pulses are sent in their raw state to the local traders. Much of the processing occurs instead by large wholesalers in processing factories just before export.

B. Value Chain Benefits and Costs

1. Economics of Pulses Production, Marketing and Trading

In a similar way to rice and oilseeds an attempt has been made to determine at least at the farmer level what the economics of pulses production are. Data is presented in Annex 7 where Table 5 presents production cost and returns for green gram crop, 2013/14 for both Natmauk (Magway District) and Chaungmagyi (Yamethin District), and Table 6 presents production cost and returns for chickpea, 2013/14 for both irrigation systems. For both crops it was found for 2013/14 season that the net margin (return) per acre was significantly better for green gram grown in Yamethin as compared to Magway due it seems to the higher selling price. For chickpea there was little difference in the net returns between the two locations in CDZ. No data was available on prices related to trading of the commodity. Feedback from people involved in the supply chain confirms the problems at both the production and trading stages of the value chain.

2. Investments along Pulses Value Chain

There has been little in the way of investments in the midstream segments of the pulses value chains in CDZ, as unlike oilseeds the commodities are sold in their unprocessed state. It is hard to detail exactly what the economic benefits to investments in post-harvest operations for pulses, but the following aspects need to be taken into account. It is envisaged that with improved production of high value pulse varieties that yields would be possibly increased by 35% with GAP and quality of the commodity would be improved, impacting positively on the price paid to the farmers by the trader. The costs associated with the midstream segment of the value chain related to improving grading and storage facilities are not considered to be large, with driers costing between $5,000 to $15,000 for small to medium units respectively, and graders at around $15,000 to $20,000. Graders are import to ensure the visual purity of the pulse and bean seeds which command a much higher price on the market.

C. Constraints and Opportunities

The pulses trade is badly regulated and suffers from a lack of focus in general on organization or research and development which has hindered its development in contrast to the better developed and organised rice trade.

1. Risks to Farmers

**Adverse weather conditions:** Agricultural commodities are heavily reliant on appropriate weather conditions for growth. Untimely rainfall and droughts have affected commodity prices in the past, greatly reducing the quality of crops and resulting in frequent price crashes. Weather risk is one of the most difficult production risks to manage in the agricultural sector. Some developing countries have adopted traditional crop insurance programs where insurers travel to crop sites to make assessments after the damage has occurred. A new type of insurance, index insurance, based notably on weather indexes, has also been tried in other developing countries with great potential. Myanmar farmers, however, still lack access to any crop insurance system and are thus extremely vulnerable to weather risk. The Myanmar government has only recently allowed for private insurance companies to begin operations within the country. Because the companies will begin
focusing on categories such as car, house, and life insurance policies, farmers in Myanmar will still have a while to go before any sort of crop insurance scheme can be developed.

**Lack of research and development:** The sector severely lacks R&D resulting in a shortage of high quality seeds. Farmers often resort to mixed or inferior quality seeds as high quality seeds are either unavailable or inaccessible because of their high prices. Therefore, there are two negative outcomes. Firstly, farmers are unable to produce high quality products from the seeds and secondly, there is often a high disparity amongst the pulses that are produced. A lack of standardization in the types of seeds across local farmers also means that quality control is harder to maintain. Additionally, with the seeds that are available, farmers resort to careful planting methods, saving seeds from one planting season to use in the next season to ensure steadier income. These practices drastically cut back on Myanmar’s potentially higher annual harvest amounts.

**Minimal access to capital:** Farmers cannot receive separate loans for growing pulses on their farm. Farmers usually grow two to three crops a year but most Myanmar farmers do not have sufficient financial backing to do so. On average one pulses crop can cost between 200,000 to 300,000 Kyats per acre including labor, fertilizer and seed costs. Currently, farmers can receive loans from the state-owned MADB with an interest rate of 8% per annum. The loan scheme is 20,000 Kyats per acre and the maximum amount available to loan is Kyats 200,000 for 10 acres. Many of Myanmar’s microfinance schemes are still under development and with high interest rates from non-government lending sources, and a clear focus on the rice industry from government-sponsored lending sources; it does not seem likely that there will be huge improvements for farmers within the pulses sector.

2. **Risks to Traders and Exporters**

**Default risk:** Default risk is particularly rampant in Myanmar’s beans and pulses industry mainly due to price falls caused by bad weather and lack of regulation regarding payment policies. Additionally, risks in general cannot be traded through derivatives as in more sophisticated trading systems. Nevertheless both futures trading and verbal agreement sales are still common with a lack of stringent regulations to control them.

**Price control by the Indian market:** Because India enjoys such a large market influence, Myanmar’s beans and pulses commodity prices are closely linked to India’s. It is noted that Indian informers are largely aware of the size of pulse stocks within the major commodity markets such as Bayint Naung and with ten Indian trading representative offices directly doing trade in the pulses industry, prices can still be manipulated. If Myanmar prices are higher than those of India’s then the buyers will refuse to purchase. Although this price play has been diminishing over the years, Myanmar traders still end up tying their prices closely to Indian markets in an attempt to make sales. However, Union of Myanmar Federation of Chambers of Commerce and Industry (UMFCCI) officials have said that India and Myanmar have been working more closely in recent years to keep their market prices aligned to make for steadier predictions of demand and supply. Understanding India’s pulse industry is crucial to controlling risks within the Myanmar industry, for this market intelligence is crucial.

**Difficulties with international monetary transfers:** Along with an outdated trade payment system, more difficulties are faced when transferring money directly from buyers to seller. In the past, Indian companies were not able to make direct payments to Myanmar banks due to sanctions imposed against local banks such as Myanmar Foreign Trade Bank, thus making the payment through third party companies, mostly Singapore firms.

3. **Risks to Overseas Importers**

**Lack of strong quality control:** Another key risk to the Myanmar beans and pulses industry is the heavy lack of high quality control. Currently, Societe Generale de Surveillance (SGS), Myanmar Inspection and Testing Services (MITS) and Overseas Merchandise Inspection
Co. (OMIC) are the key agencies responsible for the testing of samples before export. However, inspections of samples are often done negligently. These practices although uncommon are still a risk to the industry as one exporter’s unethical approach will affect the entire image of the Myanmar pulses market.

**Outdated export payment system:** Currently, monetary transactions for the export of beans and pulses from Myanmar are conducted through a Telegraphic Transfer in advance system. This system of payment is highly unfavorable for international buyers because of the associated risks. Risks for international buyers include true stocks not being congruent with the initial stock sample or the loss of stocks along the trade route.

D. Proposed Intervention to Improve Pulses Value Chains

1. Rationale for the Intervention

Rice has been Myanmar’s main export industry and many financial and technical support measures are in place solely for it; however, the pulses sector does not enjoy the same benefits. The main problem within the current pulses trade is a lack of R&D from both the private and public sector. Finding ways to provide high quality seeds, improve crop yields and enhance farming conditions is necessary. International assistance through aid programs should also go towards not only the rice sector but other important sectors including those for pulses and oilseeds. Improving the Myanmar pulses brand image on the international stage is also crucial. The edible quality of Myanmar pulses is high but improving its appearance and creating good quality stocks is necessary. With key infrastructural changes such as road and logistics developments, improvements to the financial and banking system, and modernization of CEXC in Myanmar, the sector could grow rapidly.

The potential success of higher yielding legume crops is partly subject to improvement in integrated farming methods including use of fertilizer, improved inoculants, pest management, better storage facilities, intercropping and supplementary irrigation. The training of farmers in these methods and GAP is important in this respect. Seed production (including formal contract seed production at the village level and village seed banks) is a critical step in promoting new, high-yielding varieties due to the lack of a sufficient seed supply, seed grading, seed networks and poor storage facilities.

Both the country’s average spending per agricultural scientist and its research intensity ratio are among the lowest in the world. Although in most economies agricultural R&D is done by both the private and public sectors, currently, Myanmar private agribusinesses do not have the full capacity to provide full-fledge research investments. Thus, substantial government support, along with international donor support is key. R&D programs will need to focus on beans and pulses crop improvement strategies, including the production of high performance, marketable seeds for distribution to farmers. With the lifting of sanctions and donor contributions allowed again within Myanmar, an increase in R&D programs with international assistance is now a viable option. Additionally, PPPs could be further established to provide financial and technical assistance to the pulses sector and trade. The government has the necessary technical expertise and contacts but severely lacks funding. The pulses focused company can provide high quality seeds and small loans to farmers.

Vertical diversification can also occur into non-farm activities along the pulses value chain such as marketing, storage, and processing if infrastructural support can be attained. Provision of machinery and equipment needed for production aspects of the chain as well as processing of pulses will be important.

2. Intervention Activities and Outputs

Objective statement for the Sub-component is as follows: the provision of production, post-harvest and marketing support to aid the development of the pulses value chains. The onus
of the sub-component is therefore on assisting the farmers, farmer groups and private sector trading, processing and marketing entities in this endeavor. The three main activities for this sub-component are: (i) improved pulses seed supply, (ii) extension of pulse Good Agricultural Practices (GAP) to farmers, and (iii) agribusiness support to pulse post-harvest operations and marketing. These activities are further augmented through a number of cross-cutting value chain interventions as detailed in Section 6, including the establishment of Frontline Centers, support to improve input supply, development of Market Information System (MIS) and general support for value chain development. Detail on the sub-component activities are as follows:

- **Improved pulses seed supply** – provision of support to pulses (green gram, black gram, chick pea and pigeon pea) seed supply system to develop a viable PPP between government (DOA and DAR) and private sector; involves a detailed assessment of the required modalities and preparation of a workable PPP arrangement, training of key stakeholders, including seed inspectors, plus demonstrations and trials on improved pulses crop varieties on farmers’ fields.

- **Extension of pulses GAP to farmers** – includes a detailed assessment of all the available and appropriate GAP relevant to pulses including, cropping systems, CSA, IPM, INM, rhizobia use, on-farm post-harvest operations (especially storage), etc., and the subsequent preparation of high quality training materials, training of trainers including the training of DOA staff (for agronomic aspects) and other concerned stakeholders.

- **Agribusiness support to pulses post-harvest operations and marketing** – financial and technical assistance to the private sector involved in pulses post-harvest operations (drying, cleaning, storage) and marketing, includes provision of advice on possibilities of contract farming ventures with smallholder farmer groups & cooperatives; funding to the processors/traders will be provided to through innovative loan schemes involving a range of financial institutions (including possibly the MEB) for the purchase of processing equipment & storage infrastructure; close involvement of the associations and Chambers of Commerce will be essential for this activity to succeed.
Annex 7   Economics of Commodity Production, Marketing and Trading

Rice Value Chain

In terms of costs and returns at the farm level, the USAID (2013) study utilized data from a comprehensive survey. These data are presented in Table 1 for the monsoon and summer paddy crop of 2011/12.

Table 1. Production Cost and Returns for Monsoon and Summer Paddy, 2011/12

<table>
<thead>
<tr>
<th>Particular</th>
<th>Unit</th>
<th>Monsoon paddy</th>
<th>%</th>
<th>Summer paddy</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hired labor</td>
<td>Ks / acres</td>
<td>72,100</td>
<td>55</td>
<td>84,800</td>
<td>41</td>
</tr>
<tr>
<td>2. Agro-input cost</td>
<td>Ks / acres</td>
<td>53,000</td>
<td>41</td>
<td>116,400</td>
<td>56</td>
</tr>
<tr>
<td>Total cash cost</td>
<td>Ks / acres</td>
<td>125,100</td>
<td>96</td>
<td>201,200</td>
<td>97</td>
</tr>
<tr>
<td>3. Farm family labor</td>
<td>Ks / acres</td>
<td>4,800</td>
<td>4</td>
<td>6,000</td>
<td>3</td>
</tr>
<tr>
<td>4. Cost of production</td>
<td>Ks / acres</td>
<td>129,900</td>
<td>100</td>
<td>207,200</td>
<td>100</td>
</tr>
<tr>
<td>5. Paddy yield per acre</td>
<td>Basket / acre</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Paddy yield per acre</td>
<td>Tons / acre</td>
<td>1.25</td>
<td></td>
<td>1.77</td>
<td></td>
</tr>
<tr>
<td>7. Break-even price of paddy (4)/(5)</td>
<td>Ks / basket</td>
<td>2,165</td>
<td>2,438</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Marketing cost paddy to be sold at rice mill</td>
<td>Ks / basket</td>
<td>250</td>
<td>250</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Break-even cost of production &amp; marketing</td>
<td>Ks / basket</td>
<td>2,415</td>
<td>2,688</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Selling price at rice mill</td>
<td>Ks / basket</td>
<td>3,550</td>
<td>3,550</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Net margin for farmers (8-9)</td>
<td>Ks / basket</td>
<td>1,135</td>
<td>862</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Net margin (returns) per acre</td>
<td>Ks / basket</td>
<td>68,100</td>
<td>73,270</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Adapted from USAID (2013)

Average cost of production of paddy varied between $151.05/ac and $120.84/MT for monsoon paddy and $240.93/ac and $138.58/MT for summer crop. Therefore, cost of production of summer paddy was more than that of monsoon paddy both in terms of cost per ac and cost per unit output. Consequently, average profit margin for monsoon and summer crop was 68,100 Kyats or USD79 per acre (or USD63/MT) and 73,270 Kyats or USD85 per acre (or USD48/MT), respectively. Using simple averages, farmers’ average margin in 2011/12 was USD82/acre and USD55.5/MT.

Furthermore, consideration is given to the marketing margins from the farm to rice export (freight on board [FOB] Yangon), using survey data for 2011/12 monsoon crop. Farmers sold their harvested paddy at a rice mill at an average of 35,500 Kyats per 100 baskets (or at USD182 per ton). The Emata 25% FOB Yangon price averaged USD330 per ton. The price structure and margins along the rice supply chain are summarized in Table 2.

Table 2. Price Structure and Margins along the Rice Supply Chain for Exported Rice Monsoon Crop 2011/12

<table>
<thead>
<tr>
<th>Market participants</th>
<th>$ per ton (Emata 25% rice)</th>
<th>(%) Percent on farmer selling price of paddy</th>
<th>Margin ($ per ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paddy: Ex. mill price</td>
<td>182</td>
<td>100</td>
<td>63</td>
</tr>
<tr>
<td>Rice: (conversion ratio, milling cost)</td>
<td>270</td>
<td>148</td>
<td></td>
</tr>
<tr>
<td>Rice millers (selling price of rice)</td>
<td>291</td>
<td>160</td>
<td>21 (291-270)</td>
</tr>
<tr>
<td>Rice traders in Yangon REXC</td>
<td>302</td>
<td>166</td>
<td>11 (302-291)</td>
</tr>
<tr>
<td>Rice exporters (f.o.b. YGN) price</td>
<td>330</td>
<td>181</td>
<td>28 (330-302)</td>
</tr>
</tbody>
</table>

Source: USAID (2013)

Note: USD=860 Kyats, cost of rice bag for rice millers (paddy price + milling) = 11,629 Kyats per bag (USD13.52 per bag) or USD270 per ton), rice selling price at rice mill is USD291 per ton. REXC: Yangon Bayint Naung Rice Exchange Center; Yangon Bayint Naung Wholesale Market.
From Tables 1 and 2, it can be seen that the average margin for the 2011/12 monsoon season at the farmer level (including transportation cost to mill) was USD63 per ton; at the mill level (including milling cost) was USD21; at Yangon trader level (excluding transportation cost) was USD11; and at exporter level (excluding cargo preparation, transportation, and documentation) is USD28. Besides providing an indication of the relative margins along the rice value chain, it also highlights the point that the relative competitiveness between exporting countries is not so much dependent on the cost of production at the farm level (i.e., USD120.84/MT) but also, if not more importantly, milling efficiency/cost, transportation cost, handling, export documentation, and loading costs. The feedback from people involved in the supply chain confirms the problems at the milling and post-harvest stage as well as in transportation (due to poor road condition, high fuel cost, and hence, trucking charges), and costs embodied in export procedures and activities.

Oilseeds Value Chain

Table 3. Production Cost and Returns for Sesame Crop, 2013/14

<table>
<thead>
<tr>
<th>Particular</th>
<th>Unit</th>
<th>Magway (Ks/acre)</th>
<th>%</th>
<th>Yamethin (Ks/acre)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hired labor</td>
<td>Ks / acres</td>
<td>64,000</td>
<td>47</td>
<td>66,000</td>
<td>61</td>
</tr>
<tr>
<td>2. Agro-input cost</td>
<td>Ks / acres</td>
<td>27,000</td>
<td>20</td>
<td>14,000</td>
<td>13</td>
</tr>
<tr>
<td>Total cash cost</td>
<td>Ks / acres</td>
<td>91,000</td>
<td>67</td>
<td>80,000</td>
<td>74</td>
</tr>
<tr>
<td>3. Farm family labor</td>
<td>Ks / acres</td>
<td>44,000</td>
<td>33</td>
<td>28,000</td>
<td>26</td>
</tr>
<tr>
<td>4. Cost of production</td>
<td>Ks / acres</td>
<td>135,000</td>
<td>100</td>
<td>108,000</td>
<td>100</td>
</tr>
<tr>
<td>5. Sesame yield per acre</td>
<td>Basket/acre</td>
<td>11.71</td>
<td></td>
<td>5.02</td>
<td></td>
</tr>
<tr>
<td>6. Sesame yield per acre</td>
<td>Tons / acre</td>
<td>0.28</td>
<td></td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>7. Break-even price of sesame (4/5)</td>
<td>Ks / basket</td>
<td>11,528</td>
<td></td>
<td>21,513</td>
<td></td>
</tr>
<tr>
<td>8. Marketing cost sesame sold at oil mill</td>
<td>Ks / basket</td>
<td>500</td>
<td></td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>9. Break-even cost of production &amp; marketing</td>
<td>Ks / basket</td>
<td>12,028</td>
<td></td>
<td>22,013</td>
<td></td>
</tr>
<tr>
<td>10. Selling price at oil mill</td>
<td>Ks / basket</td>
<td>30,000</td>
<td></td>
<td>42,000</td>
<td></td>
</tr>
<tr>
<td>11. Net margin for farmers (10-9)</td>
<td>Ks / basket</td>
<td>17,972</td>
<td></td>
<td>19,987</td>
<td></td>
</tr>
<tr>
<td>12. Net margin (returns) per acre (5x11)</td>
<td>Ks / acre</td>
<td>210,452</td>
<td></td>
<td>100,334</td>
<td></td>
</tr>
<tr>
<td></td>
<td>U.S. Dollar($) per acre</td>
<td>207.54</td>
<td></td>
<td>98.95</td>
<td></td>
</tr>
</tbody>
</table>

Source: DOA and Traders. Note Ks = Kyats. 1 basket = 24 kg. 1 ton = 1000 kg

Table 4. Production Cost and Returns for Groundnut Crop, 2013/14

<table>
<thead>
<tr>
<th>Particular</th>
<th>Unit</th>
<th>Magway (Ks/acre)</th>
<th>%</th>
<th>Yamethin (Ks/acre)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hired labor</td>
<td>Ks / acre</td>
<td>122,000</td>
<td>42</td>
<td>40,000</td>
<td>32</td>
</tr>
<tr>
<td>2. Agro-input cost</td>
<td>Ks / acre</td>
<td>107,500</td>
<td>36</td>
<td>62,800</td>
<td>50</td>
</tr>
<tr>
<td>Total cash cost</td>
<td>Ks / acre</td>
<td>229,500</td>
<td>78</td>
<td>102,800</td>
<td>82</td>
</tr>
<tr>
<td>3. Farm family labor</td>
<td>Ks / acre</td>
<td>62,000</td>
<td>22</td>
<td>22,000</td>
<td>18</td>
</tr>
<tr>
<td>4. Cost of production</td>
<td>Ks / acre</td>
<td>291,500</td>
<td>10</td>
<td>124,800</td>
<td>100</td>
</tr>
<tr>
<td>5. Groundnut (unshelled) yield per acre</td>
<td>Bskt/acre</td>
<td>58.29</td>
<td>0</td>
<td>36.58</td>
<td></td>
</tr>
<tr>
<td>6. Groundnut (unshelled) yield per acre</td>
<td>Tons / acre</td>
<td>0.64</td>
<td></td>
<td>0.40</td>
<td></td>
</tr>
<tr>
<td>8. Marketing cost groundnut (unsh’d) sold oil mill</td>
<td>Ks / basket</td>
<td>300</td>
<td></td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>9. Break-even cost of production &amp; marketing</td>
<td>Ks / basket</td>
<td>3,585</td>
<td></td>
<td>3,911</td>
<td></td>
</tr>
<tr>
<td>10. Selling price (unshelled) at oil mill</td>
<td>Ks / basket</td>
<td>7,000</td>
<td></td>
<td>7,000</td>
<td></td>
</tr>
<tr>
<td>11. Net margin for farmers (10-9)</td>
<td>Ks / basket</td>
<td>3,415</td>
<td></td>
<td>3,089</td>
<td></td>
</tr>
<tr>
<td>12. Net margin (returns) per acre (5x11)</td>
<td>Ks / acre</td>
<td>199,060</td>
<td></td>
<td>112,995</td>
<td></td>
</tr>
<tr>
<td></td>
<td>U.S. Dollar($) per acre</td>
<td>196.31</td>
<td></td>
<td>111.43</td>
<td></td>
</tr>
</tbody>
</table>

Source: DOA and Traders. Note Ks = Kyats. 1 basket = 11 kg. 1 ton = 1000 kg.
Pulses Value Chain

Table 5. Production Cost and Returns for Green Gram Crop, 2013/14

<table>
<thead>
<tr>
<th>Particular</th>
<th>Unit</th>
<th>Magway</th>
<th>%</th>
<th>Yamethin</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hired labor</td>
<td>Ks / acre</td>
<td>102,000</td>
<td>54</td>
<td>42,000</td>
<td>28</td>
</tr>
<tr>
<td>2. Agro-input cost</td>
<td>Ks / acre</td>
<td>64,000</td>
<td>34</td>
<td>55,000</td>
<td>36</td>
</tr>
<tr>
<td>Total cash cost</td>
<td>Ks / acre</td>
<td>166,000</td>
<td>88</td>
<td>97,000</td>
<td>64</td>
</tr>
<tr>
<td>3. Farm family labor</td>
<td>Ks / acre</td>
<td>22,000</td>
<td>12</td>
<td>54,000</td>
<td>36</td>
</tr>
<tr>
<td>4. Cost of production</td>
<td>Ks / acre</td>
<td>188,000</td>
<td>100</td>
<td>151,000</td>
<td>100</td>
</tr>
<tr>
<td>5. Green gram yield per acre</td>
<td>Basket/acre</td>
<td>14.79</td>
<td></td>
<td>8.95</td>
<td></td>
</tr>
<tr>
<td>6. Green gram yield per acre</td>
<td>Tons / acre</td>
<td>0.47</td>
<td></td>
<td>0.28</td>
<td></td>
</tr>
<tr>
<td>7. Break-even price of green gram (4)/(5)</td>
<td>Ks / basket</td>
<td>12,711</td>
<td></td>
<td>16,871</td>
<td></td>
</tr>
<tr>
<td>8. Marketing cost green gram sold at market</td>
<td>Ks / basket</td>
<td>400</td>
<td></td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>9. Break-even cost of production &amp; marketing</td>
<td>Ks / basket</td>
<td>13,111</td>
<td></td>
<td>17,371</td>
<td></td>
</tr>
<tr>
<td>10. Selling price at pulses trader</td>
<td>Ks / basket</td>
<td>22,000</td>
<td></td>
<td>38,200</td>
<td></td>
</tr>
<tr>
<td>11. Net margin for farmers (10-9)</td>
<td>Ks / basket</td>
<td>8,889</td>
<td></td>
<td>20,829</td>
<td></td>
</tr>
<tr>
<td>12. Net margin (returns) per acre</td>
<td>Ks / acre</td>
<td>131,468</td>
<td></td>
<td>186,419</td>
<td></td>
</tr>
<tr>
<td></td>
<td>U.S. Dollar ($ per acre)</td>
<td>129.65</td>
<td></td>
<td>183.85</td>
<td></td>
</tr>
</tbody>
</table>

Source: DOA and Traders. Note Ks = Kyats. 1 basket = 32 kg. 1 ton = 1000 kg

Table 6. Production Cost and Returns for Chickpea Crop, 2013/14

<table>
<thead>
<tr>
<th>Particular</th>
<th>Unit</th>
<th>Chickpea Magway (Ks/acre)</th>
<th>%</th>
<th>Chickpea Yamethin (Ks/acre)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hired labor</td>
<td>Ks / acre</td>
<td>44,000</td>
<td>45</td>
<td>16,000</td>
<td>17</td>
</tr>
<tr>
<td>2. Agro-input cost</td>
<td>Ks / acre</td>
<td>43,400</td>
<td>44</td>
<td>53,500</td>
<td>56</td>
</tr>
<tr>
<td>Total cash cost</td>
<td>Ks / acre</td>
<td>87,400</td>
<td>89</td>
<td>69,500</td>
<td>73</td>
</tr>
<tr>
<td>3. Farm family labor</td>
<td>Ks / acre</td>
<td>10,000</td>
<td>11</td>
<td>25,000</td>
<td>27</td>
</tr>
<tr>
<td>4. Cost of production</td>
<td>Ks / acre</td>
<td>97,400</td>
<td>10</td>
<td>94,500</td>
<td>100</td>
</tr>
<tr>
<td>5. Chickpea yield per acre</td>
<td>Basket/acre</td>
<td>19.76</td>
<td>0</td>
<td>13.35</td>
<td></td>
</tr>
<tr>
<td>6. Chickpea yield per acre</td>
<td>Tons / acre</td>
<td>0.61</td>
<td></td>
<td>0.41</td>
<td></td>
</tr>
<tr>
<td>7. Break-even price of chickpea (4/5)</td>
<td>Ks / basket</td>
<td>4,929</td>
<td></td>
<td>7,078</td>
<td></td>
</tr>
<tr>
<td>8. Marketing cost chickpea to be sold at trader</td>
<td>Ks / basket</td>
<td>400</td>
<td></td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>9. Break-even cost of production &amp; marketing</td>
<td>Ks / basket</td>
<td>5,329</td>
<td></td>
<td>7,578</td>
<td></td>
</tr>
<tr>
<td>10. Selling price at oilseed trader</td>
<td>Ks / basket</td>
<td>15,000</td>
<td></td>
<td>20,200</td>
<td></td>
</tr>
<tr>
<td>11. Net margin for farmers (10-9)</td>
<td>Ks / basket</td>
<td>9,671</td>
<td></td>
<td>12,622</td>
<td></td>
</tr>
<tr>
<td>12. Net margin (returns) per acre (5x11)</td>
<td>Ks / acre</td>
<td>191,098</td>
<td></td>
<td>168,503</td>
<td></td>
</tr>
<tr>
<td></td>
<td>U.S. Dollar ($ per acre)</td>
<td>188.46</td>
<td></td>
<td>166.18</td>
<td></td>
</tr>
</tbody>
</table>

Source: DOA and Traders. Note Ks = Kyat. 1 basket = 31 kg. 1 ton = 1000 kg
Annex 8  Technical Assistance Terms of Reference

Technical Assistance (TA) under the project to be provided for the following positions.

**Team Leader / Value Chain Development Specialist (International) – 18 person months**

The specialist will have at least 15 years practical work experience and be tasked to:

a) act as Team Leader in planning and implementing the component, giving advice to the Project Director and Project Manager and giving guidance to the team of consultants in the implementation of their Terms of Reference;

b) in a participatory processes with irrigated and rainfed farmers, analyze existing strengths and weaknesses within the value chain of each product grown or desired to be grown and prioritize the products for phased implementation during the investment project period;

c) design implantation strategy to ensure the development of the products and establishment of enterprises, market linkages and private sector participation where feasible;

d) suggest upgradation strategies for each product, laying emphasis on both upstream as well as downstream intervention or leverage points;

e) suggest potential enterprise development opportunities for each product that will enhance income opportunities for project area inhabitants, develop linkages to related enterprise and micro-enterprise development projects;

f) identify investment opportunities through trade associations and Chambers of Commerce that will offer enterprise opportunities and strengthen the product development;

g) assess the potential role of PPP in product development and marketing and particularly: (i) assess opportunities for private sector participation and partnerships for improved product development and quality enhancement; (ii) design and formulate public private partnership mechanisms for selected products with high potential; and (iii) suggest options for building such partnership with strong linkages with community institutions, cooperatives, federations and Chambers of Commerce;

h) identify the potential products that demand private sector partnerships for development in consultation with the Public Private Partnership and Input Supply Specialist (International);

i) design the institutional mechanisms for the private sector partnership best suited for the particular product, suggest the potential private sector players for each product to be approached for partnerships;

j) (suggest, for each selected product, at what level potential partnerships should be established and suggest the nature of involvement of the private sector and suggest various options for partnership development specific to a product;

k) suggest quality improvement of product pre- and post-harvest value addition to meet national and international certification requirements and establish the linkages between certifying institutions and producer groups;

l) suggest possible branding strategies for product promotion and take into account local traditions and culture, district development strategy and potential for national and international markets;

m) draw upon lessons learned from other similar projects in the region;

n) establish linkages with stakeholders public and private in the CDZ; and

o) facilitate market promotion activities and awareness creation workshops.

**Seed Multiplication Specialist (international) – 10 person months**

The Seed Multiplication Specialist shall have at least 10 years practical work experience and be tasked to:
a) assist PIUs in identifying appropriate varieties for specific locations and organize foundation/certified seed production in project areas though organized frontline demonstrations cum seed villages;

b) review the various seed multiplication options for contract farming and PPP modalities and work with DAR/DOA and private sector to formulated a working model for implementation as a pilot;

c) identify groups of small-scale farmers, (who have some experience in seed production) arrange training and input supply to undertake quality seed production (certified and “truthfully labelled seeds”);

d) organize training and skill empowerment programs covering the major seed production techniques such as removal of off-types, rouging, timely harvest, processing and storage of seeds in the frontline demonstration blocks;

e) organize seed growers and assist them in certified seed production, where possible;

f) awareness creation on advantages of using good quality seeds and in promoting the use of quality seeds;

g) support the project FFS/Farmer Training Specialist in the implementation of Farmer Field Schools to demonstrate and extend, not only improved crop seeds, but best practices (GAP) in conservation agriculture, integrated plant nutrient management, integrated pest management and on-farm water management, and post-harvest processing and storage.

Agronomist / Good Agricultural Practice Specialist (International) – 10 person months

The Specialist will have at least 10 years practical work experience and be tasked to:

a) be responsible for the planning, implementation and monitoring of the crop development activities of the project in collaboration with the DOA, DAR, YAU and other R&D entities and projects;

b) review all the available GAP technologies relevant to the crops grown in the project area, especially but not limited to rice, oilseeds and pulses;

c) prepare in collaboration with high quality technical training materials for use by the staff in the Frontline Centers and for use by the private sector and farmers, these training materials are to be produced at various levels depending on the standard of education and the target audience;

d) network with other crop and agribusiness development initiatives and investors to ensure continuous sharing of experiences, effective learning and creation of functional networks and synergies;

e) support the DOA extension staff and the ID staff in the implementation of improved water management and conservation agriculture, taking into account the need for highlighting the importance of climate smart agriculture;

f) support continuous development of agriculture and agribusiness activities through capacity building and information sharing, monitoring of activities, demonstrations and surveys;

g) ensure that the implementation of the project Agricultural Development Component is in line with national development policies regarding agriculture, value chain and agribusiness development; and

h) ensure that adaptation to climate change, environmental protection, landless and gender issues are mainstreamed in all activities;

Agribusiness Development Specialist (International) – 12 person months

The specialist will have at least 10 years practical work experience and be tasked to:

a) provide technical assistance to the project in capacitating the project beneficiaries in the private sector in developing business enterprises;

b) assist project in implementing activities related to agribusiness support to post-harvest operations and marketing;
c) review current agribusiness practices in collaboration with the concerned commodity associations and Chambers of Commerce at District and Township levels;

d) provide technical support and guidance to the project in identifying enterprises and evaluating private sector entities in developing business plan that would provide great impact to the farmers, landless and women;

e) prepare a set of detailed criteria for the selection of viable private sector entities for the project supported grant schemes;

f) review all available modalities for financing for the SME’s in agribusiness, agro-processing and marketing both in government and private sectors;

g) assist in coaching and mentoring project staff, government staff (DOA, AMD etc.) and private sector in the review and evaluation of business plans to ensure viability and sustainability of the enterprises to be supported by the project;

h) assist in the development of marketing plans and strategies that promote market opportunities of product outputs and services to ensure/maintain steady generation of profits from the agribusiness enterprises;

i) coordinate with GOM and private sector agencies in identifying the appropriate technology for a proposed subproject or enterprise;

j) assist the PMU in recruiting 4 recent Myanmar graduates in business or commerce to be service providers (2 in each district FC) as Business Advisers and provide mentoring in carrying out the above tasks, including when the consultant is absent and has completed inputs to the project.

Legal Advisor (National) – 4 person months

The Advisor will have at least 10 years practical work experience and be tasked to:

a) work with the project and the communities in the project irrigation systems to identify locations for the siting of the satellite Frontline Centers in a village located in the system;

b) in liaison with the District DOA office determine the arrangements for the siting of the District level Frontline Centers and that there are no conflicts on the land to be used for the center;

c) check and approve that the transfer arrangements for the land to be used for the FC’s is free from any conflicts and that there no legal issues related to the use of the land for the purpose;

d) finalise the legal arrangements for the use of the land for the FCs and that this is binding to the satisfaction of the community, the project, the Government and ADB; and

e) advise the project on the form of contractual arrangements to be made in relation to PPP, partnerships with the private sector and with farmers providing locations for demo farms and field schools and the like.

Agricultural Training of Trainers Specialist (International) – 7 person months

The Specialist The specialist will have at least 10 years practical work experience and be tasked to:

a) assist the project in preparing guidelines, strategies and conduct Training of Trainers designed to build the capacity of participating target groups including the staff of DOA and ID at the District, Township and irrigation systems levels;

b) determine the training and capacity building needs of participating line departments (DOA, AMD, DAR and ID), NGOs/CBOs, farmers, landless and women’s groups and other private sector stakeholders involved in the implementation of project activities at all levels;

c) identify specific capacity building requirements and define the skills needed for the different participating stakeholders;

d) develop and cost capacity building workshops and farmers Field Schools for participating stakeholders;
e) identify and cost appropriate training materials for target groups in close collaboration with the Agronomist/Good Agricultural Practice Specialist;

f) conduct Training of Trainers workshops at District, Township and irrigation system levels and submit training reports to the PMU; and

g) evaluate TOT workshops.

**Public Private Partnership and Input Supply Specialist (International) – 9 person months**

The Specialist will have at least 10 years practical work experience and be tasked to:

a) work across all outputs, serving as lead and subject matter expert on PPP financial and/or commercial matters;

b) take the lead in developing public models to mobilize private investment in input supply services on a sustainable, financially viable, and economically productive basis;

c) support the development of policies, rules, process, criteria, and supporting documentation appropriate for procuring, contracting, and managing PPPs through competitive bidding or other contracting modalities, founded on the principles of good financial management;

d) work includes pre-qualification criteria (e.g., know your-client standards, organization, and litigation), request for proposal (RFP) elements, model concession agreements, and project contracts;

e) advise the government regarding the principles of government guarantees and direct agreements that may be needed to support PPP financing; and

f) work with the private sector entities which are involved in input supply (including consumable and capital items) to farmers and the provision of credit to farmers/farmer groups/cooperatives to develop workable and practical PPP’s between the private entity, the farmers and the DOA/AMD, the latter to provide, if necessary, oversight to ensure correct procedures and standards are followed.

**Information System Development Specialist (International) – 12 person months**

The Specialist will have at least 5 years practical work experience and be tasked to:

a) working with the project stakeholders, farming communities, government and private sector review and determine the requirements for a user friendly Marketing Information System, taking into account the need for information to be provided on both inputs and outputs for the various value chains common the crop and livelihood systems in the CDZ;

b) develop a web-based, high tech software interface and computer database accessible through SMS and internet, including remote entry of data by approved sources, e.g, price and market data from Chambers of Commerce, that can be easily used to inform the various stakeholders in the agricultural sector;

c) work with web-based service providers to provide inter-active services covering short messages as well as web-based information and training materials on Good Agricultural Practices, input availability, value chain opportunities;

d) monitor developments in the availability of radio programs/sponsorship for the project to broadcast news, technical and market information related to project activities;

e) install the IS software on IT equipment located at district and township levels with government and private organizations accessible to the public;

f) conduct a series of training workshops for the stakeholders at various levels to ensure that they are full conversant with the IS and are able to utilize its full potential;

g) ensure through a public awareness campaign that the concerned stakeholders in the private sector are informed of the system; and

h) through oversight ensure that the information in the system is regularly updated, and where output market information on commodity prices is updated on a daily basis, working with Chambers of Commerce and other information sources.