May 2016

DEVELOPMENT OF MASTER PLAN FOR CROP PRODUCTION IN CAMBODIA BY 2030

FINAL REPORT

Prepared for

Ministry of Agriculture Forestry and Fisheries

Tonle Sap Poverty Reduction and Smallholder Development Project (TSSD)

By

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PREFACE

This document[1] is the Final Report for the assignment *Development of Master Plan for Crop Production in Cambodia by 2030*. The report has been prepared by Dr. Francesco Goletti and Dr. Sin Sovith under the guidance of the Project Director H.E. Sen Sovann and H.E. Sokhan Rythikun. Its final version has benefitted from various stakeholders from General Directorat of Agriculture, Ministry of Agriculture, Forestry, and Fisheries; heads of Provincial Departments of Agriculture, private sector, and development partners.

Phnom Penh, 26 May 2016

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[1] To be referred to as Goletti, F., and S. Sin (2016) *Development of Master Plan for Crop Production in Cambodia by 2030*. *Final Report.* Prepared for Ministry of Agriculture Forestry and Fisheries (MAFF), Tonle Sap Poverty Reduction and Smallholder Development Project (TSSD), May 2016.

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ABBREVIATIONS

ACI	Agrifood Consulting International
AEA	Agro-Ecosystem Analysis
AEC	ASEAN Economic Community
ASDP	Agricultural Strategic Development Plan
ASEAN	Association of Southeast Asia Nations
CARD	Council of Agriculture and Rural Development
CARDI	Cambodian Agricultural Research and Development Institute
CMP	Crop Master Plan
CSES	Cambodia Socioeconomic Survey
CTIS	Cambodia's Trade Integration Strategy
EbA	Everything but Arms
EFSA	European Food Safety Authority
ELC	Economic Land Concessions
FA	Forestry Administration
FAO	Food and Agriculture Organisation of the United Nations
GDA	General Directorate of Agriculture
GDP	Gross Domestic Product
GI	Geographic Indication
ITC	International Trade Center
MAFF	Ministry of Agriculture Forestry and Fisheries
MOC	Ministry of Commerce
MOE	Ministry of Environment
MOWA	Ministry of Women Affairs
MOWRAM	Ministry of Water Resources and Meteorology
MRD	Ministry of Rural Development
NGO	Non-Governmental Organization
NSDP	National Strategic Development Plan
PDA	Provincial Department of Agriculture
RGC	Royal Government of Cambodia
RUA	Royal University of Agriculture
SEZ	Special Economic Zone
SFFSN	Strategic Framework for Food Security and Nutrition
SPS	Sanitary and Phytosanitary
TTRI	Trade Training and Research Institute
VCA	Value Chain Analysis

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SUMMARY

1. The Master Plan for Crop Production in Cambodia to 2030 is based on the prioritization of a small number of value chains based on an assessment of past trends and future growth drivers. The Crop Master Plan (CMP) recognizes that the future of agriculture in Cambodia is inextricably linked to the structural transformation of the sector from one based on traditional agriculture to one based on a modern agricultural system capable of generating high value added and multiplier effects in the rural and urban economy through the development of agroindustry, agribusiness, and non-farm employment.

2. The strategic approach to the CMP consists in prioritizing a few value chain to ensure that focused government policy, regulations, and investment can have the highest payoffs in terms of growth, employment generation, natural resources sustainability, export growth, and poverty reduction.

3. The result of the prioritization undertaken during the preparation of the CMP indicates that out of an initial list of 28 crops, 8 value chains were chosen based on criteria including (i) contribution to GDP and employment; (ii) contribution to growth; (iii) difficulty of investment; and (iv) other criteria such as environmental sustainability and geographic spread.

Table 1 Prioritized Value Chains and Value of Production

Prioritized Value Chain	Rank in Prioritization	Value of Production in 2015 (USD million)
Rice	1	3,134
Maize	2	118
Cassava	3	770
Mungbean	4	76
Mango	5	334
Cashews	6	110
Pepper	7	95
Vegetables	8	199

4. Consistently with the overall vision of agriculture in Cambodia as a sector that is contributing to food security and poverty reduction, and moving towards commercialization and diversification, the CMP relies on the following vision for crop agriculture in 2030:

VISION FOR CROPS TO 2030
Cambodia is a reliable source of high quality, safe, and competitive crops in the global economy while ensuring sufficient volumes of safe food to meet food and nutrition security of its own citizens in a sustainable and climate resilient way.

5. The crop vision is further articulated in terms of individual crop visions as follows:

Table 2 Vision for each Crop to 2030

Rice	**Cambodia is one of the three main exporters of fragrant rice in the world**
Maize	**Cambodia is a reliable supplier of feedgrains (maize and pulses) to the Asian Economic Community (AEC)**
Cassava	**Cambodia is a sustainable and major supplier of cassava starch and cassava chips to Asia**
Mungbeans	**Mungbean is an important source of improved soil fertility and crop rotation in addition to meeting market demand**
Mango	**Cambodia is one of the five major exporters of quality fresh mango in the world**
Cashew	**Cambodia is the world leader in organic cashews**
Pepper	**Cambodia is a leading exporter of pepper including the globally recognized Kampot pepper**
Vegetables	**Cambodia is a largely self-sufficient producer of safe vegetables**

6. For each targeted value chain, the CMP envisages a strategy that includes investment, institutional reforms, and policy and regulatory support. Consistent with a value chain approach, the CMP articulates each value chain program as a collection of subprograms and activities aiming to improve productivity, farmers' income, and value added along the stages of the value chain.

7. The budget for the value chain programs over the period 2016-2030 is USD 272.3 million, with rice absorbing 51%, followed by cassava with about 12% and vegetables with 10% of total budget. The budget does not include capital expenditures.

Table 3 Value Chain Program Budget

Crop	Program Budget (USD million)	Percentage of Total Budget
Rice	138.7	50.9%
Maize	15.9	5.8%
Cassava	33.8	12.4%
Mungbean	12.8	4.7%
Mango	18.4	6.7%
Cashews	17.5	6.4%
Pepper	8.2	3.0%
Vegetables	27.2	10.0%
Total	**272.3**	**100.0%**

8. In addition to the value chain programs, the CMP will require a set of policies, regulations, monitoring, and capacity building of MAFF and GDA staff to support the implementation of the value chain programs.

9. An assessment of costs of these other supporting activities is presented in the following budget:

Table 4 Budget to support the CMP 2016-2

No	Item	Amount (USD million)
1	Value Chain Programs	272.3
2	Policy	8.5
3	Monitoring	1.1
4	Capacity Building	30.7
	Total	**312.6**
	Average per year	20.8

10. The summary of value chain programs detailed budget in provided in the following table.

Table 5 Budget for Value Chain Programs 2016-2030.

Program ID	Program	Sub program ID	Sub program	Activity ID	Activities	Budget (US$'000)
1	Rice	1.1	Seed	1.1.1	Breeding	25,000
1	Rice	1.1	Seed	1.1.2	Seed Certification	900
1	Rice	1.1	Seed	1.1.3	Foundation Seeds	20,000
1	Rice	1.1	Seed	1.1.4	Adoption of Seed	6,000
1	Rice	1.2	Production	1.2.1	Contracts	3,000
1	Rice	1.2	Production	1.2.2	Supply chain MIS	1,500
1	Rice	1.2	Production	1.2.3	Machinery	300
1	Rice	1.2	Production	1.2.4	Farmer Organizations	4,500
1	Rice	1.2	Production	1.2.5	Market Information	1,200
1	Rice	1.2	Production	1.2.6	Extension	12,000
1	Rice	1.2	Production	1.2.7	Land levelling	3,000
1	Rice	1.2	Production	1.2.8	Alternative Wetting and Drying	3,000
1	Rice	1.2	Production	1.2.9	Weather Indexed Crop Insurance	6,000
1	Rice	1.2	Production	1.2.10	Soil fertility	4,800
1	Rice	1.2	Production	1.2.11	Pests and diseases	4,500
1	Rice	1.2	Production	1.2.12	In-farm water mangement	15,000
1	Rice	1.3	Postharvest	1.3.1	Postharvest losses	3,000
1	Rice	1.3	Postharvest	1.3.2	Drying	1,500
1	Rice	1.3	Postharvest	1.3.3	WRS	9,000
1	Rice	1.4	Marketing and Trade	1.4.1	Associations	1,500
1	Rice	1.4	Marketing and Trade	1.4.2	Brand	1,500
1	Rice	1.4	Marketing and Trade	1.4.3	Market Information	1,500

Program ID	Program	Sub program ID	Sub program	Activity ID	Activities	Budget (US$'000)
1	Rice	1.4	Marketing and Trade	1.4.4	Market infrastructure	10,000
					Subtotal Rice	**138,700**
2	Maize	2.1	Value Chain Assessment	2.1.1	Value Chain Study	150
2	Maize	2.1	Value Chain Assessment	2.1.2	Statistics	300
2	Maize	2.2	Production	2.2.1	Research	1,800
2	Maize	2.2	Production	2.2.2	Inputs	600
2	Maize	2.2.	Production	2.2.3	Extension	1,500
2	Maize	2.2	Production	2.3.4	Green Technology	600
2	Maize	2.2	Production	2.3.5	ICT	600
2	Maize	2.2	Production	2.3.6	Pests and Diseases	3,000
2	Maize	2.2	Production	2.3.7	In-farm water mangement	4,500
2	Maize	2.3	Postharvest	2.3.1	Storage	300
2	Maize	2.3	Postharvest	2.3.2	Processing	900
2	Maize	2.3	Postharvest	2.3.3	Training Processing	600
2	Maize	2.4	Marketing and trade	2.4.1	Linkage	450
2	Maize	2.4	Marketing and trade	2.4.2	Contracts	600
					Subtotal Maize	**15,900**
3	Cassava	3.1	Value Chain Assessment	3.1.1	Study	450
3	Cassava	3.1	Value Chain Assessment	3.1.2	Statistics	300
3	Cassava	3.2	Production	3.2.1	Research collaboration	600
3	Cassava	3.2	Production	3.2.2	Selection program	3,000
3	Cassava	3.2	Production	3.2.3	Nurseries	1,500
3	Cassava	3.2	Production	3.2.4	Sustainable production	400
3	Cassava	3.2	Production	3.2.5	Extension program	6,000
3	Cassava	3.2	Production	3.2.6	Pests and diseases	900
3	Cassava	3.2	Production	3.2.7	Soil Fertility	1,500
3	Cassava	3.2	Production	3.2.8	In-farm water mangement	3,000
3	Cassava	3.3	Processing	3.3.1	Demonstration	900
3	Cassava	3.3	Processing	3.3.2	Investment Fund	8,000
3	Cassava	3.3	Processing	3.3.3	Waste Management	6,000
3	Cassava	3.3	Processing	3.3.4	Promotion large enterprises	600
3	Cassava	3.4	Marketing and Trade	3.4.1	Associations	600
					Subtotal Cassava	**33,750**
4	Mungbean	4.1	Value Chain Assessment	4.1.1	Study	150
4	Mungbean	4.1	Value Chain Assessment	4.1.2	Statistics	150
4	Mungbean	4.2	Research capacity	4.2.1	Stations	900
4	Mungbean	4.2	Research capacity	4.2.2	Collaboration	450
4	Mungbean	4.3	Production	4.3.1	Variety Selection	1,500
4	Mungbean	4.3	Production	4.3.2	Hybrids	600
4	Mungbean	4.3	Production	4.3.3	Registration	200

Program ID	Program	Sub program ID	Sub program	Activity ID	Activities	Budget (US$'000)
4	Mungbean	4.3	Production	4.3.4	Standards	200
4	Mungbean	4.3	Production	4.3.5	Extension	3,000
4	Mungbean	4.3	Production	4.3.6	Pests and Diseases	1,500
4	Mungbean	4.3	Production	4.3.7	In-farm water mangement	1,500
4	Mungbean	4.4	Processing	4.4.1	Processing technology	300
4	Mungbean	4.4	Processing	4.4.2	Innovations	1,500
4	Mungbean	4.4	Processing	4.4.3	Feed	200
4	Mungbean	4.5	Marketing and Trade	4.5.1	Association	300
4	Mungbean	4.5	Marketing and Trade	4.5.2	Contracts	300
					Subtotal Mungbean	**12,750**
5	Mango	5.1	Value Chain Assessment	5.1.1	Study	300
5	Mango	5.1	Value Chain Assessment	5.1.2	Statistics	300
5	Mango	5.2	Institutional Strengthening	5.2.1	HR capacity building	800
5	Mango	5.2	Institutional Strengthening	5.2.2	Stations	1,500
5	Mango	5.3	Production	5.3.1	Research collaboration	600
5	Mango	5.3	Production	5.3.2	Variety selection	4,500
5	Mango	5.3	Production	5.3.3	Registration of variety	300
5	Mango	5.3	Production	5.3.4	Soil testing	450
5	Mango	5.3	Production	5.3.5	Nurseries	600
5	Mango	5.3	Production	5.3.6	GAP	300
5	Mango	5.3	Production	5.3.7	Standards	100
5	Mango	5.3	Production	5.3.8	Extension	1,500
5	Mango	5.3	Production	5.3.9	PPP	100
5	Mango	5.3	Production	5.3.10	Pests and Diseases	3,000
5	Mango	5.3	Production	5.3.10	In-farm water mangement	1,500
5	Mango	5.4	Processing	5.4.1	Demonstration	400
5	Mango	5.4	Processing	5.4.2	Investment Fund	900
5	Mango	5.4	Processing	5.4.3	Large enterprises	300
5	Mango	5.5	Marketing and Trade	5.5.1	Associations	300
5	Mango	5.5	Marketing and Trade	5.5.2	Brand	600
					Subtotal Mango	**18,350**
6	Cashews	6.1	Value Chain Assessment	6.1.1	Studies	450
6	Cashews	6.1	Value Chain Assessment	6.1.2	Statistics	300
6	Cashews	6.2	Production	6.2.1	Research collaboration	600
6	Cashews	6.2	Production	6.2.2	Selection Program	1,500
6	Cashews	6.2	Production	6.2.3	Nurseries	600
6	Cashews	6.2	Production	6.2.4	GAP	300
6	Cashews	6.2	Production	6.2.5	Extension	3,000
6	Cashews	6.2	Production	6.2.6	Soil Fertility	3,000
6	Cashews	6.2	Production	6.2.7	Pests and Diseases	1,500
6	Cashews	6.2	Production	6.2.8	In-farm water mangement	1,500

Program ID	Program	Sub program ID	Sub program	Activity ID	Activities	Budget (US$'000)
6	Cashews	6.3	Processing	6.3.1	Processing Technology	500
6	Cashews	6.3	Processing	6.3.2	Innovation Fund	3,000
6	Cashews	6.3	Processing	6.3.3	Promotion large	300
6	Cashews	6.4	Marketing and Trade	6.4.1	Associations	300
6	Cashews	6.4	Marketing and Trade	6.4.2	Organic	600
					Subtotal Cashews	**17,450**
7	Pepper	7.1	Value Chain Assessment	7.1.1	Studies	150
7	Pepper	7.1	Value Chain Assessment	7.1.2	Statistics	150
7	Pepper	7.2	Instituional Strengthening	7.2.1	HRD	300
7	Pepper	7.2	Instituional Strengthening	7.2.2	Stations	300
7	Pepper	7.3	Production	7.3.1	Research collaboration	150
7	Pepper	7.3	Production	7.3.2	Variety Selection	300
7	Pepper	7.3	Production	7.3.3	Registration	100
7	Pepper	7.3	Production	7.3.4	Soil testing	100
7	Pepper	7.3	Production	7.3.5	Nurseries	200
7	Pepper	7.3	Production	7.3.6	GAP	300
7	Pepper	7.3	Production	7.3.7	Standards	100
7	Pepper	7.3	Production	7.3.8	Extension	1,500
7	Pepper	7.3	Production	7.3.9	Information	100
7	Pepper	7.3	Production	7.3.10	Pests and Diseases	1,500
7	Pepper	7.3	Production	7.3.11	In-farm water mangement	1,500
7	Pepper	7.4	Processing	7.4.1	Processing Technology	200
7	Pepper	7.4	Processing	7.4.2	Innovation	500
7	Pepper	7.4	Processing	7.4.3	Promotion large	100
7	Pepper	7.5	Marketing and Trade	7.5.1	Association	200
7	Pepper	7.5	Marketing and Trade	7.5.2	Brand	200
7	Pepper	7.5	Marketing and Trade	7.5.3	GI	250
					Subtotal pepper	**8,200**
8	Vegetables	8.1	Value Chain Assessment	8.1.1	Studies	300
8	Vegetables	8.1	Value Chain Assessment	8.1.2	Statistics	300
8	Vegetables	8.2	Production	8.2.1	Extension	4,500
8	Vegetables	8.2	Production	8.2.2	Input quality	1,500
8	Vegetables	8.2	Production	8.2.3	Research	3,000
8	Vegetables	8.2	Production	8.2.4	Innovations	4,500
8	Vegetables	8.2	Production	8.2.5	Postharvest	1,500
8	Vegetables	8.2	Production	8.2.6	Soil Fertility	3,000
8	Vegetables	8.2	Production	8.2.7	In-farm water mangement	1,500
8	Vegetables	8.3	Processing	8.3.1	Processing technology	900
8	Vegetables	8.3	Processing	8.3.2	Attract large companies	600
8	Vegetables	8.3	Processing	8.3.3	Innovation fund	3,000

Program ID	Program	Sub program ID	Sub program	Activity ID	Activities	Budget (US$'000)
8	Vegetables	8.4	Marketing and trade	8.4.1	Associations	300
8	Vegetables	8.4	Marketing and trade	8.4.2	Market linkages	450
8	Vegetables	8.4	Marketing and trade	8.4.3	Market Information	300
8	Vegetables	8.4	Marketing and trade	8.4.4	Market infrastructure	1,500
					Subtotal Vegetables	**27,150**

1 INTRODUCTION

1.1 Background

11. The RGC aspires to reach the status of an upper-middle income country[2] by 2030. Several elements contribute to realize this aspiration. One of these elements is a more prosperous agricultural sector and, within it, a thriving crop subsector. Within this context, MAFF is preparing a Master Plan for Crop Production in Cambodia for the period 2016 to 2030. The Master Plan is expected to play a crucial role in shaping the country's future socio-economic development scenarios in the agriculture sector. Moreover, it is anticipated that changing trade and demographic dynamics, including the integration into the ASEAN Community in 2015, will to a greater extent also influence the agriculture development scenarios in both the medium-and long-term.

12. In order to explore these issues the MAFF/General Directorate of Agriculture (GDA) has undertaken diagnostic studies which aim to answer questions concerning the possible direction of longer term further transformations in Cambodian agriculture and the implication of these changes for smallholder farm incomes. MAFF is interested in identifying conditions which would facilitate the evolution of smallholder agriculture to enable farm profitability to compete with off-farm and urban income opportunities. These diagnostic studies will lead to the identification of the potential for future growth in Cambodian agriculture and enable the definition of a Master Plan for Crop Production in Cambodia by 2030.

13. Specifically the Master Plan for Crop Production will:

- Define and develop an improved information database to enable evidence-based recommendations for the introduction of more competitive, climate resilient and sustainable smallholder farming systems in Cambodia.
- Identify the long term strategic agriculture sector goals for the Master Plan for Crop Production in Cambodia by 2030.
- Prepare a road map for the Ministry of Agriculture, Forestry and Fisheries (MAFF) and the Supreme National Economic Council (SNEC) for the implementation of the Master Plan for Crop Production in Cambodia by 2030.
- Develop recommendations for public policies and spending programs to support agricultural growth and development.

1.2 Approach and Methodology

14. The preparation of the draft Crop Master Plan (CMP) is based on:

i. Preliminary Assessment and Identification of Key Issues
ii. Field Validation and Filling the Information Gaps
iii. Scenario Analysis

[2] As of 1 July 2014, low-income economies are defined as those with a GNI per capita, calculated using the *World Bank Atlas* method, of $1,045 or less in 2013; middle-income economies are those with a GNI per capita of more than $1,045 but less than $12,746; high-income economies are those with a GNI per capita of $12,746 or more. Lower-middle-income and upper-middle-income economies are separated at a GNI per capita of $4,125. In the GNI Tables of WB, in 2014, the GNI per capita of Cambodia was $1,010. That implies that Cambodia will have to grow at an annual growth rate of 9.2% over the 16 years period 2014-2030 to achieve middle income status.

1.2.1 Preliminary Assessment and Identification of Key Issues

15. During this Phase, the consultants reviewed the literature, compiled and analyzed secondary data, conducted consultative meetings, and identified key issues and information gaps for the preparation of the Crop Master Plan. A work plan for the completion of the assignment was also prepared in this phase. The outputs of this phase are the Inception Report and the Summary of the Consultative Meeting held at MAFF/GDA to discuss the findings and work plan of the Inception Report.

1.2.2 Field Validation and Filling the Information Gaps

16. The field validation provide a way to get feedback on the key issues identified in the preliminary assessment and also to fill the information gaps. This phase consisted of field surveys, focus group discussions, collaborative work with GDA to produce crop profiles, and consultative meetings to define vision, priorities, indicators, and targets. The output of this phase was a Mid-Term Progress Report.

1.2.3 Value Chain Prioritization

17. Starting from the list of crops identified in the Inception Report, 8 crops have been prioritized based on a methodology that include different criteria such as (i) contribution to GDP and employment; (ii) growth; (iii) difficulty of investment; and (iv) other criteria such as Government priority and environmental sustainability. The specific criteria and weights can be changed and the prioritization might yield different results. It is essential that MAFF builds consensus around the process of prioritization, its methodology, and its results.

1.3 Organization of the Report

18. The Report is organized into 12 chapters as follows:

Chapter 1 Introduction
Chapter 2 Crop Productivity and Profitability: Past Trends and Current Situation
Chapter 3 Policy Framework, Challenges, and Gaps
Chapter 4 Drivers of Future Growth and Implications for the Crop Master Plan
Chapter 5 Strategy
Chapter 6 Value Chain Prioritization
Chapter 7 Vision
Chapter 8 Value Chain Programs
Chapter 9 Policies to Support the Crop Master Plan
Chapter 10 Monitoring and Evaluation of the Crop Master Plan
Chapter 11 Budget
Chapter 12 Next Steps

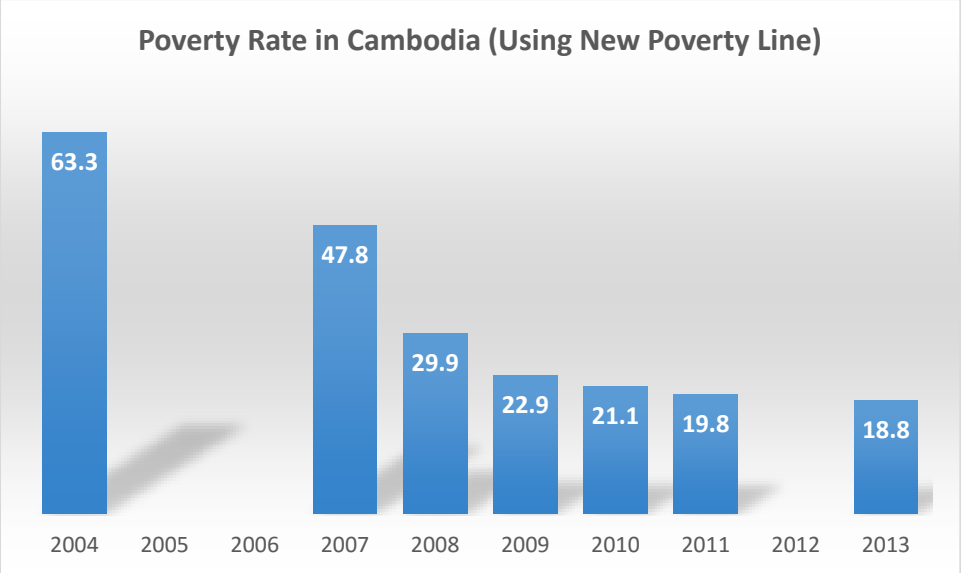
2 CROP PRODUCTIVITY AND PROFITABILITY: PAST TRENDS AND CURRENT SITUATION

2.1 Agricultural GDP Growth and Poverty Reduction

19. Performance of agriculture in Cambodia over the past decade has been impressive. Over 2001-2011, annual agricultural GDP growth has averaged 4.6%, one of the highest in the world. Production of many crops has been spectacular. In the case of rice, the main subsector of agriculture, over the past 10 years (2003-2012) production had doubled (through a combination of land expansion and yield increase.

20. As in other agrarian societies whether the majority of population lives in rural area (80%) and derives its livelihood from agriculture, agricultural growth is a fundamental source of poverty reduction. In Cambodia, poverty rate declined dramatically in the past decade, by about 4% per year (see Figure 1).

Figure 1 Poverty Rate between 2004and 2013



Source: Cambodia National Institute of Statistics (NIS)/Ministry of Planning

2.2 Agricultural GDP and its composition (crop, livestock, fisheries, and forestry)

21. In spite of rapid growth of agricultural GDP by international standards, the contribution of agricultural GDP to total GDP has been declining, representing about 28.7% of total GDP in 2014 and declining more than 1% per year since 2010 (see Table 6). The decline of agricultural GDP is not necessarily a negative sign of poor performance, but rather an indication that other sectors, such as industry and services grow faster than agriculture. It should be noted that intersectoral linkages and multiplier effects from one sector to another imply that growth of agriculture is affected and affects also other sectors through the development of non-farm activities such as agroindustry, agribusiness, agricultural trade, logistics and transportation of agricultural products. The decline of agricultural GDP as a share of total GDP is one of the key features of agricultural transformation that we will mention again in this report (see section 4.6).

Table 6 Share of Agriculture in GDP

Shared Sectors	2010	2011	2012	2013	2014
Agriculture, Forestry & Fisheries	33.9	34.6	33.5	31.6	28.7
Industry	21	22.3	23	24.1	25.5
Services	38.3	37.5	37.8	38.5	40

Source: Annual Agricultural Report, MAFF 2015

22. Within agriculture, crops are the most important subsectors in terms of GDP contribution. Over the past five years (2010 to 2014) their contribution has increased from 56% to 60% of agricultural GDP. During the same period fisheries contribution to agricultural GDP has remained constant at about 22%, whereas both livestock and forestry subsectors contribution to agricultural GDP has decreased. In the case of livestock, the decline is related to the rapid increase in mechanization and the parallel decrease in draught animals; in the forestry sector the regulations affecting the prohibition of logging has also implied a declining forestry GDP.

Table 7 Share of each Subsectors in Agricultural GDP

Sub-sector	2010	2011	2012	2013	2014
Crops	56%	60%	60%	59%	60%
Livestock & Poultry	13%	12%	12%	11%	11%
Fisheries	22%	21%	21%	22%	22%
Forestry & Logging	8%	8%	7%	7%	7%
Total	100%	100%	100%	100%	100%

23. The declines of both livestock and forestry might be a medium term phenomenon, not necessarily indicative of long-term trends. In fact, long-terms global trends would be towards an increasing important of livestock. In the case of Cambodia, a resolution of some key policy issues and enforcement issues related to forestry sector, might eventually set the stage for a sustainable plantation mode of using forestry products and a considerable long term potential in this subsector.

2.3 Labor in Agriculture

24. Between 2009 and 2013, the share of agricultural labor in the total labor force has declined by about 9% (see Table 8). Industry and services have gained in almost equal percentages. The statistics mask a more complex dynamics whereby seasonal work (eg construction workers moving from rural to urban areas during the dry season), permanent work (eg women moving to garment factories), and migration work (eg Thailand) interact to create a situation of labor scarcity in agriculture. Scarcity of labor in agriculture has two consequences: higher agricultural and rural wages; and rapid agricultural mechanization. The two features are very likely to continue in the next 15 years to 2030, thus putting an important push towards modernization and focus on profitability and competitiveness.

Table 8 Percentage of Labor force in Agriculture Sector

Sector	2009	2010	2011	2012	2013
Agriculture	57.6	54.2	55.8	51	48.7
Industry	15.9	16.2	16.9	18.6	19.9
Services	26.5	29.6	27.3	30.4	31.5

Source: Annual Agricultural Report, MAFF 2015

2.4 Trade

25. Agricultural trade statistics in Cambodia would benefit from a better organization. Currently, there is no source on reliable agricultural trade statistics that is readily available to the public. Data obtained from official sources are sometimes incomplete, contradictory and inconsistent. Sometimes only data on volumes are available, and other times only data on values. As a result, analysis of agricultural trade is constrained by this limitation in available data. In spite of this limitation, there are some clear trends in exports statistics that are worthwhile to note.

26. The data on agricultural exports obtained from the GDA and reported below suggest impressive rate of growth of exports for all commodities in Table 9.

Table 9 Exports of Agricultural Products from Cambodia (metric tons)

	2010	2011	2012	2013	2014
Cashewnut	93	1,238	12,038	81,209	270,696
Cassava chip	0	203,004	126,267	1,269,653	1,419,142
Crude Palm Oil	8,423	6,202	21,200	19,827	12,211
Groundnut	135	180	286	2,866	3,528
Milled Rice	55,301	201,899	205,717	378,856	387,061
Natural Rubber	575	217	34,915	297,840	134,157
Pepper	23	184	133	679	1,159
Sesame	583	56	1,951	644	11,661
Soybean	0	297	8,516	63,362	128,940
Tapioca Starch	93	1,757	48,874	1,920	15,325
Tobacco leave	702	3,173	7,345	83,468	8,088
Vegetables and fruits	0	29	1,140	1,687	1,138
Yellow Maize	0	4,229	32,807	184,746	106,682

Source: GDA

27. In order to have some alternative verification of the data, the Consultant has checked sources from available international trade data. This verification confirms the trend of increasing export of agricultural products from Cambodia.

28. For export and import values, the Consultant has accessed the ITC TradeMap database where value of exports and imports of one country are mirrored with official data of imports and exports from other countries. The overall trend of exports and imports is illustrated in Figure 2 and shows an impressive growth of agricultural exports (increase by almost 10 times from 2005 to 2013) while agricultural imports grow but less than agricultural export. In fact, when compared to growth of overall exports of Cambodia and even to the growth of the

apparel subsector, agricultural exports are actually doing quite well. This is the case even though relatively little value chain development and promotion of exports has occurred.

29. Agricultural exports grew by an annual growth rate of 30% between 2005 and 2014, which compares favorably to the growth of overall exports (17%) and even the growth of the apparel subsector (13%). As a result, agricultural exports have increases from a marginal value of 2.5% of total exports in 2005 to 7.2% in 2013, with a value over $668 million in 2013 (see Table 10).

Table 10 Agricultural Imports, Exports and Total Imports and Exports (USD '000)

Year	Ag Imports	Ag Exports	Total Imports	Total Exports	Ag Imports as % Total Imports	Ag Exports as % Total Exports
2005	184,274	76,090	2,551,964	3,018,613	7.2%	2.5%
2006	197,741	85,031	2,989,224	3,566,413	6.6%	2.4%
2007	226,111	83,380	3,554,841	3,531,237	6.4%	2.4%
2008	271,527	68,053	4,416,653	4,358,188	6.1%	1.6%
2009	271,185	115,377	3,905,714	4,992,010	6.9%	2.3%
2010	384,492	217,642	4,902,524	5,590,104	7.8%	3.9%
2011	484,044	425,468	6,143,333	6,704,137	7.9%	6.3%
2012	587,928	420,036	7,062,617	7,838,101	8.3%	5.4%
2013	635,694	668,268	9,227,430	9,248,134	6.9%	7.2%
	15%	27%	15%	13%	-0.5%	12.4%

Source: ITC calculations based on UN COMTRADE statistics.

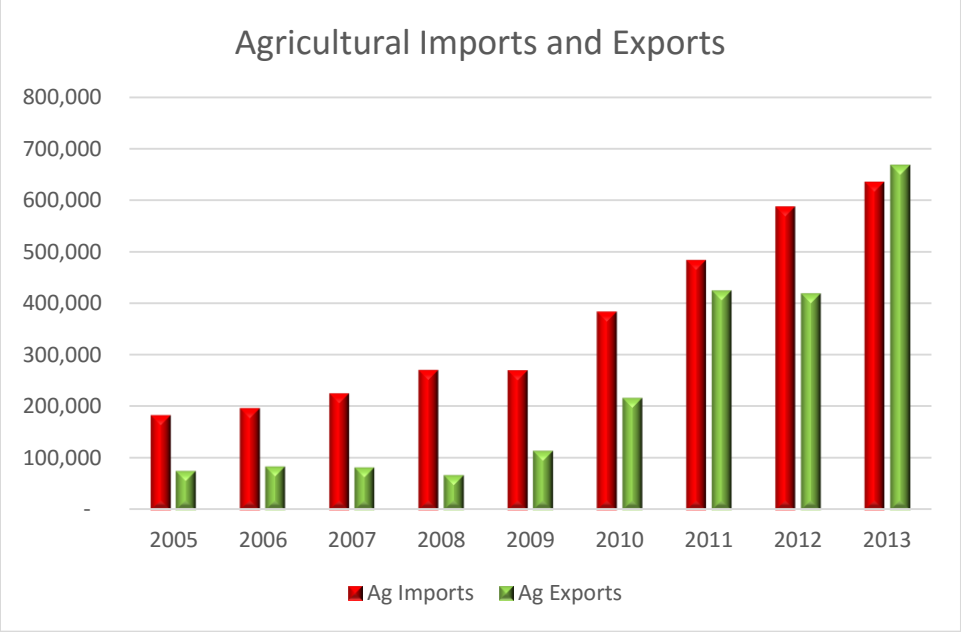


Figure 2 Growth of Agricultural Imports and Exports from Cambodia (in USD 000)

Source: ITC calculations based on UN COMTRADE statistics.

30. Four subsectors contribute to almost 80% of total agricultural exports in 2014 (see Table 11):

- Edible vegetables and certain roots and tubers (includes cassava)
- Cereals (includes rice and maize)
- Rubber and articles thereof
- Wood and articles of wood, wood charcoal

Table 11 Main Agricultural Export Subsectors in 2014

HS Code	Product	Value of Exports in 2014 (USD '000)	% of Total Exports
'07	Edible vegetables and certain roots and tubers	100,423	12.1%
'10	Cereals	287,064	34.6%
'40	Rubber and articles thereof	92,330	11.1%
'44	Wood and articles of wood, wood charcoal	176,608	21.3%
	Total of Four Categories	656,425	79.1%
	TOTAL EXPORTS	**830,015**	100.0%

31. The figures obtained from Trademap point to a value of agricultural export of over $800 million in 2014. In addition to the official or recorded data, there is a lot of informal trade between Cambodia and neighboring countries that is unrecorded and its size could be considerable. For example, paddy rice informal exports are believed to be anywhere between 2 and 3 million tons, for a total value of $500 to $800 million. Raw cashew nuts volumes between 100,000 and 280,000 tons are exported to Vietnam for a total value of between $100 and $300 million. If these already ongoing exports are taken into account, it might well be that agricultural exports are over $1.5 billion. Their potential for growth is still largely untapped.

2.5 Crop Productivity Trends[3]

32. Production of most crops has increased tremendously over the past 10 years (2004-2014). For major crops, the production has more than doubled during this period and average annual production growth rates have been consistently high in most crops (above 7%).

33. The contribution of area and yield to the growth of production varies from crop to crop. In the case of rice, overall yield has increased faster than cultivated areas, mostly because of the increase in wet season paddy yields (5% over the period).

34. In the case of maize, cassava, and sugarcane, most production growth has been the result of area expansion, even though yields have also increased.

[3] All the conclusions in this section are based on production statistics obtained from GDA. As indicated below, the statistics point to robust growth in most crops. However, there is the need of some caution, given that the agricultural statistics system in Cambodia still requires improvement. Both levels of production and year to year variations have sometimes been found at odds with other sources of data like the CSES or field data reported by various studies. This points to the need of improving the agricultural statistics system as a critical measure to make evidence-based policy decisions.

Table 12. Production, Area, and Yield of Rice Crops between 2004 and 2014

Crop		Unit	2004	2,014	Growth
Rice Total	Cultivated	ha	2,109,050	3,028,836	3.7%
	Yield	T/ha	1.977	3.079	4.5%
	Production	T	4,170,284	9,324,416	8.4%
Rice Wet	Cultivated	ha	1,815,619	2,537,976	3.4%
	Yield	T/ha	1.725	2.815	5.0%
	Production	T	3,132,581	7,143,521	8.6%
Rice Dry	Cultivated	ha	293,431	490,860	5.3%
	Yield	T/ha	3.536	4.443	2.3%
	Production	T	1,037,703	2,180,896	7.7%

Table 13. Production, Area, and Yield of Subsidiary Crops between 2004 and 2014

Maize	Cultivated	ha	91,203	135,995	4.1%
	Yield	T/ha	2.814	4.041	3.7%
	Production	T	256,665	549,607	7.9%
Cassava	Cultivated	ha	22,749	515,293	36.6%
	Yield	T/ha	15.915	23.178	3.8%
	Production	T	362,050	11,943,204	41.9%
Sweet potato	Cultivated	ha	7,316	5,908	-2.1%
	Yield	T/ha	4.803	9.184	6.7%
	Production	T	35,138	54,259	4.4%
Vegetable	Cultivated	ha	35,780	51,338	3.7%
	Yield	T/ha	5.004	8.088	4.9%
	Production	T	179,050	415,239	8.8%
Mungbean	Cultivated	ha	39,089	52,858	3.1%
	Yield	T/ha	1.158	1.147	-0.1%
	Production	T	45,253	60,652	3.0%
Total Subsidiary Crops	Cultivated	ha	196,137	761,392	14.5%
	Yield	T/ha	4.477	17.104	14.3%
	Production	T	878,156	13,022,961	31.0%

Table 14. Production, Area, and Yield of Industrial Crops between 2004 and 2014

Peanut	Cultivated	ha	19,213	17,633	-0.9%
	Yield	T/ha	1.121	1.574	3.5%
	Production	T	21,543	27,760	2.6%
Soybean	Cultivated	ha	84,886	72,218	-1.6%
	Yield	T/ha	1.299	1.443	1.1%
	Production	T	110,305	104,180	-0.6%
Sesame	Cultivated	ha	64,470	28,019	-8.0%
	Yield	T/ha	0.852	0.616	-3.2%
	Production	T	54,954	17,260	-10.9%
Sugar cane	Cultivated	ha	6,788	47,365	21.4%
	Yield	T/ha	19.205	32.534	5.4%
	Production	T	130,363	1,540,996	28.0%

Tobacco	Cultivated	ha	1,708	10,702	20.1%
	Yield	T/ha	1.451	1.302	-1.1%
	Production	T	2,479	13,939	18.8%
Jute	Cultivated	ha	633	192	-11.2%
	Yield	T/ha	1.390	0.870	-4.6%
	Production	T	880	167	-15.3%
Total Industrial Crops	Cultivated	ha	184,167	176,129	-0.4%
	Yield	T/ha	1.740	9.676	18.7%
	Production	T	320,524	1,704,302	18.2%

Source: Authors' calculations based on data from MAFF

35. The rubber sector has also witnessed a remarkable growth in the last ten years. Planted areas have increased by 21% annually and as soon as these areas go into production, the rubber output will likely triple over the next 10 years. The yields however, have hardly changed over the past decade.

Table 15. Production, Area, and Yield of Rubber between 2002 and 2011

Year	Total Cultivated (ha)	Tapping (ha)	Production (Ton)	Yield (kg/ha)
2004	54,209	31,590	33,770	1,069
2005	60,406	30,402	29,464	969
2006	69,994	32,390	32,077	990
2007	82,059	30,491	32,975	1,081
2008	107,901	34,313	37,050	1,080
2009	127,723	34,135	37,380	1,095
2010	181,433	38,406	42,250	1,100
2011	213,104	45,163	51,339	1,137
2012	280,355	55,361	64,525	1,166
2013	328,771	78,493	85,244	1,086
2014	357,809	90,545	97,054	1,072
Average Growth	20.8%	11.1%	11.1%	0.0%

Source: Authors based on data from MAFF

36. Over the last 5 years, the area cultivated for the production of fruit crops, such as banana, coconut, longan, mango, sapodilla, durian, jack fruit, custard apple, orange, rambutan, guava, pineapple and permanent crops (cashew, oil palm, pepper…etc.) increased by 5% to 183 thousand hectares in 2013.

2.6 Access to Technology

37. Farmers' connectivity to markets, information, and finance has improved. Expansion of transport infrastructure has opened up new areas to integrate production with markets; trade with neighboring countries has accelerated; farmers know more about prices through use of mobile phones; and a number of microfinance organizations and commercial banks have become accessible to the small farmers (see ACI 2014b).

38. This enhanced access to markets, information, and finance has facilitated the adoption of "modern" inputs such as improved seeds, chemical fertilizers, agricultural machinery, pesticides, herbicides, and irrigation equipment. However, the quality of these inputs is often a problem. Surveillance and inspection systems to assure quality and safety of agricultural inputs are very weak.

39. Moreover, adoption of "modern" inputs and yield-enhancing technologies is not guarantee of higher profitability. Higher profitability depends not only on the inputs used, but also on their quality, market prices, and assets (land, finance, human resources, and water) available to the farmer. A wise combination of different factors of production taking into account the assets and the market can increase profitability of small farmers, but this of course requires enhanced skills and knowledge.

40. One way to enhance skills and knowledge is through access to effective agricultural extension services. Over the past decade, there has been a remarkable growth of extension service providers from the public, private, and NGO sector. Most farmers had access to one or more of these technology agents.

41. However, the effectiveness of the agricultural extension services is limited; in the view of farmers, private sector extension has fared less well than the public sector and the NGO sector (see ACI 2014). Farmers indicate that extension services provided by the private sector are excessively linked to commercial considerations by private companies whose primary interest is to sell their product rather than providing objective, useful and relevant knowledge to farmers. The NGOs and the public sector have fared slightly better in the view of the respondents.

42. There is more work to be done in order to ensure that technical agents (from public, private, and NGO sector) gain a better understanding of farm characteristics. Many farmers also do not fully realize the important impact that technical advice can have on their agricultural profitability. It seems that extension services need a serious boost in providing effective on-farm demonstrations particularly for smallholder farmers.

43. To be successful in this undertaking, effective farmer organizations would be needed. Unfortunately, even though the last decade has seen a proliferation of farmer groups, farmers do not seem yet too convinced about the usefulness of farmer organizations. A common perception among farmers and experts is that most of existing farmer groups are not sustainable. The government has promoted cooperatives, but it is too early to know whether this initiative is actually contributing to positive change in agriculture.

44. Farmers are highly aware of the importance of improved and quality seeds. They think that seeds are keys to high impact on productivity. Farmer-to-farmer communication has been the main source for adoption of new and improved seeds; farmer-to-farmer communication has been more important than technical agents from the extension system.

45. Farmers are positive about the continuous improvement in seeds. This is not only because of the effort of institutions such as the research and extension organizations in Cambodia, NGOs, and private companies. A key role in improved seeds dissemination and

adoption is played by contacts with farmers and traders in neighboring countries. In practice, many of the improved seeds in Cambodia are originated by the research and development systems of Vietnam and Thailand. While the access to this R&D effort is a positive externality for Cambodia, the seed trade remains largely uncontrolled and issues of intellectual property rights are not addressed.

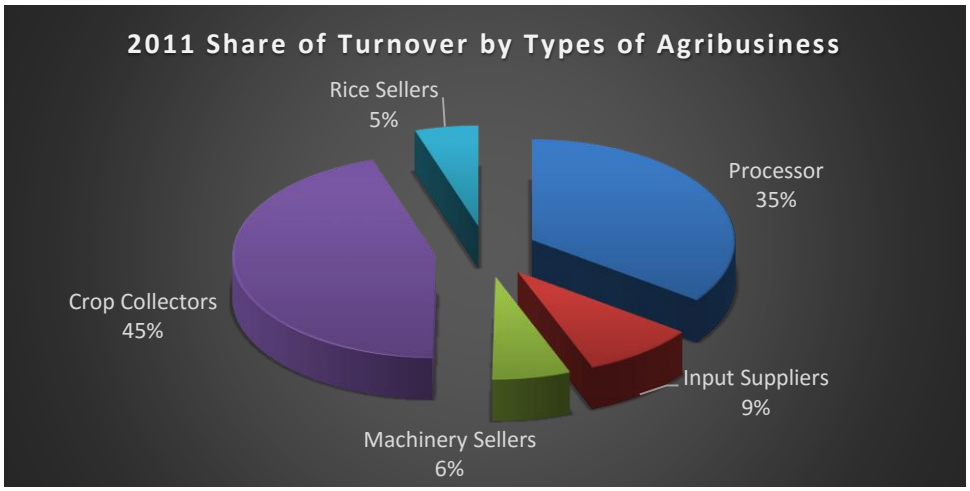
46. Chemical inputs (fertilizers, pesticides, herbicides) are increasingly used in Cambodia; however, Cambodian farmers use much less chemical inputs than neighboring countries. This lag in adoption of chemical inputs might have some positive effects in terms of reducing environmental impact and chemical residues on food. However, the lower use of chemicals in Cambodia appears to be less the result of a conscious choice inspired by environmental or food safety concerns than the outcome of a poorly functioning input distribution system characterized by high prices of inputs and often by inputs of dubious quality. In some cases, most notably cassava, the very low use of fertilizer (whether chemical or organic) has serious negative impact on soil fertility, results in soil degradation, and endangers sustainability of the sector.

47. The increased cost of labor and the migration of youth and women out of the agricultural sector has accelerated the transition towards agricultural mechanization. Migration of youth towards non-farm rural sector and urban sector is continuing unabated. The subsequent lack of labor in the rural areas put a pressure on rural wages which had negative impact on cost of production; at the same time it accelerates the process of mechanization.

48. The practice of contract farming is still limited. Farmers recognize that contract farming might provide a stable outlet for their production, but they are wary of engaging in contractual relationships. Reneging on contractual obligations is common and is a major concern both of farmers and agroenterprises.

2.7 Agribusiness

49. In spite of an impressive growth in agricultural GDP, the agricultural sector is still heavily dependent on primary production. The postharvest system is relatively underdeveloped. Agroindustry is basic and most commodities (paddy, cassava, maize, cashews, cattle, soy bean) are exported in raw form. A modern agroindustry is emerging in the case of rice, but this is a very recent phenomenon, stimulated by government policy in 2010 and favorable world rice trends. Crop production is mostly rainfed and irrigation covers 24% of cultivated area. In the case of rice, dry season cultivated area represents only 17% of total rice cultivated area. The agribusiness sector consists mostly of small traders and informal agroenterprises. Even though the modern sector is emerging (processors, input suppliers, machinery suppliers) less than half of the agroenteprises have some degree of formality (registration, accounting systems).



Source: ACI (2013) Study on Agribusiness Finance, prepared for the World Bank

Figure 3. Contribution to Turnover of different Types of Agribusinesses

2.8 Comparative Advantage and Competitiveness

50. Previous analysis has indicated that Cambodia farmers have a comparative advantage in the production of a number of crops such as paddy, cassava, maize, cashew nuts, and others. The comparative advantage is assessed by computing the opportunity cost of producing the selected products domestically and comparing it to the cost of importing the product (the so called Domestic Resource Cost ratio or DRC). If DRC is less than 1, then the country has a comparative advantage in economic terms since the cost of producing domestically is lower than the cost of importing. This is the situation for most crops in Cambodia. And that is also the reason why traders buy from farmers in Cambodia to supply processors in neighboring country. By doing so, the value added to Cambodian agricultural products is captured by other countries and the agroindustry and agribusiness sector in Cambodia remains small and underdeveloped.

51. Competitiveness refers to the capacity of gaining market share in the global or regional economy. To do so, it is crucial to move away from the current situation of Cambodia being a supplier of raw agricultural commodities and instead focusing on agricultural products with value added:

Raw Agricultural Commodities ➔ High Value Added Products

52. Competitiveness goes beyond comparative advantage. For example, fragrant paddy production in Cambodia can have a comparative advantage relatively to Thailand. However, milled jasmine rice from Thailand is more competitive than jasmine rice from Cambodia. The issue for Cambodia in milled rice as in several other value-added products is to move from comparative advantage to competitiveness:

Comparative Advantage ➔ Competitiveness

53. Competitiveness is founded on a competent, hard-working and efficient work force; a clear understanding of what makes Cambodia unique in the global market place; and, the determination and entrepreneurship to maximize productivity and innovate with new products and processes based on the country's natural endowments. To achieve competitiveness, the energy and inventiveness of the private sector is essential. Its promotion is facilitated by

- Improved market infrastructure and logistics. Market infrastructure developed through the combination of public investment, PPP and community participation, focused on the development of prioritized value chains and the reduction of logistics cost.
- Growth of innovative small and medium agribusiness enterprises. Growth of innovative small and medium agribusiness enterprises through the combination of tax incentives, innovation matching grant funds, and agribusiness incubators.
- Growth of food and agricultural product exports. Growth of food and agricultural products export through stronger marketing capacity and branding.
- Enhanced food safety and quality. Enhanced food safety and quality standards, effective regulations and institutions, institutional capacity to apply and comply with SPS.

2.9 Profitability of Smallholder Farmers

54. Even though the increase in production in many crops has been impressive, from the point of view of the commercial smallholder farmer, the key issue is profitability of crop production, namely the return on investment in land and labor.

55. Differently from production data, information on profitability is not readily available. Information on profitability of different crops depends on surveying farmers and getting information to build farm budgets for each crop under different conditions. An example of this work was conducted in the study on "*Cambodia Agriculture in Transition: Opportunities and Risks*" (see ACI 2014a and 2014b). We summarize the main findings in the following paragraphs.

56. The study conducted an assessment of changes in agriculture in Cambodia over the period 2005 to 2013. It noted that in spite of adoption of modern inputs, the unit costs of production have increased more than unit revenues (measured either in terms of unit of land or unit of production). In some cases (eg maize) this has led to a decline in unit margins. When considering the changes in real terms, the unit margins have increased for some crops (eg cassava and vegetables), declined for other crops (eg maize and rice) but overall the unit margins per ha in crop agriculture have been relatively stagnant (growing only an average of 2.2% in real terms over the period). Similar situation occurs when the margins per unit of products are considered (Table 17).

Table 16. Profitability of Crop Production between 2005 and 2013

	2005			2013		
	Unit Margins ($/ha)	**Cultivated Land (ha)**	**Total Margins ($ million)**	**Unit Margins ($/ha)**	**Cultivated Land (ha)**	**Total Margins ($ million)**
Wet season rice	159	2,121,591	337	245	2,484,832	610
Dry season rice	195	321,939	63	296	495,465	146
Cassava	198	30,032	6	506	337,800	171
Maize	577	90,732	52	304	215,442	65
vegetables	284	35,762	10	1,394	54,155	75
Total	**180**	**2,600,056**	**468**	**298**	**3,587,694**	**1,068**

Source: ACI 2014

Table 17. Nominal and Real Changes in Margins between 2005 and 2013

	Change in Unit Margins between 2005 and 2013 (%)	**Change in Cultivated Land between 2005 and 2013 (%)**	**Change in Total Margins between 2005 and 2013 (%)**	**Change in Unit Margins deflated by CPI (%)**	**Change in Total Margins deflated by CPI (%)**
Wet season rice	55%	17%	81%	-4.9%	12%
Dry season rice	51%	54%	133%	-6.3%	43%
Cassava	156%	1025%	2777%	57.8%	1659%
Maize	-47%	137%	25%	-67.5%	-23%
Vegetables	391%	51%	643%	203.0%	363%
Total	65%	38%	128%	2.2%	41%

Source: ACI 2014

57. Agricultural growth in Cambodia over the past was the result of more cultivated land and more inputs responding to higher prices of agricultural products. However, the overall profitability of agriculture has not increased for the majority of farmers, at least in real terms. In real terms, profitability for most farmers (eg those engaged in rice) might have been stagnant or declining, in spite of the noted changes in output prices and use of modern technology. In the case of cassava, the increase in output prices was higher than the increase in unit cost of production; the problem however was that the land expansion in cassava is itself unsustainable, since it is carried out through forest clearing and exploitation of soils.

2.10 SWOT Analysis for Crop Agriculture in Cambodia

Strengths	Weaknesses
• Abundant land and water resources • Comparative advantage in the production of a number of crops • Surplus in the production of a number of crops (paddy, cashews, cassava, maize, sesame, fruit, pepper, …) • Established research organization working on rice seed • Established seed company working mostly on rice seed • Supportive policy for rice sector • Rapidly improving infrastructure (roads, electricity, irrigation, water) • Access to roads, electricity, markets, and finance improving • Relative open trade regime • Geographic indications (Kampot pepper, Kampong Speu palm sugar) • Cambodia fragrant rice has acquired a reputation as "best rice in the world" in recent Rice Forums	• Weakly organized supply chains for most crops • Limited statistical database for crop agriculture (production, farm budget, exports, land size distribution) • Lack of research organizations working on crops other than rice • Lack of coordination in extension activities of public, private, and NGO sector • Limited public sector investment in agriculture • Limited private sector investment in the crop sector • Weak farmer organizations in the crop sector • Limited success of contract farming and integration of smallholders with modern value chains • Weak enforcement of legislation and regulations on seed and agrochemicals • Lack of systematic approach to good agricultural practices (GAP) in green agriculture and climate smart agriculture • Weak institutional capacity, lack of policies and regulations, and weak enforcement of existing regulations for compliance with SPS requirements and food safety
Opportunities	**Threats**
• Filling the gaps between actual and potential crop yields • Cambodia is one of the main exporters of fragrant rice in the world • World leader in exports of organic cashews • A self-sufficient producer of safe vegetables • A reliable supplier of high quality fresh and processed fruit such as mango and durian for the global market • A reliable supplier of feed for the Asian Economic Community (AEC) • A sustainable supplier of cassava starch in Asia • The home of geographic indications (GI) for crops that are recognized globally (eg Kampot pepper, Kampong Speu palm sugar, Kampot durian) • Modernization of agriculture based on profitable commercial smallholder farmers well integrated with global value chains.	• Natural disasters in the presence of a weak preparedness and climate resilience capacity • Continued unchecked unsustainable use of natural resources leading to soil degradation, losses of watershed basin, and loss of fish resources • Weak or arbitrary enforcement of regulations related to SPS and food safety, agrochemicals, seed, organic certification, contract farming, and economic land concessions

2.11 Main Conclusions

- Over the past decade, agricultural sector in Cambodia has grown rapidly in terms of GDP, production, and exports.
- The crop subsector has done particularly well, with high growth in production in rice, maize, cassava, vegetables, pepper, and cashewnuts.
- Farmers are getting better access to road infrastructure, markets, information, and finance.
- Access to technology is also improving, but quality of inputs (eg seeds and agrochemicals) need improvement.
- Labor is becoming scarce, leading to higher agricultural wages and mechanization.
- Most products are exported in raw form and an organized agroindustry (except in the case of rice milling) has not yet emerged. As a consequence the value added to agricultural products is low.
- Cambodia has a comparative advantage in a number of crops but because of weak infrastructure, underdeveloped agribusiness, and low compliance with SPS and food safety requirements, the comparative advantage has not yet translated into competitive advantage.
- In spite of high production and productivity growth, profitability of smallholder farmers has remained relatively low.

3 POLICY FRAMEWORK AND CHALLENGES

3.1 Policy Framework

58. The Royal Government of Cambodia has developed several policies and strategies to support agricultural growth and development. The overall national strategies include the *Rectangular Strategy* (RS) that provides a framework for the country's long-term development vision since 2004 and is now reaching phase III (2014-2018) and the *National Strategic Development Plan* 2014-2018 (NSDP).

59. One of the main implications of these strategies for the crop subsector is the emphasis they put on promoting agricultural productivity and diversification through intensification, rather than through expansion of cultivated land. The two strategies also recognize rice as key crop for food security, employment, and exports. While rice is considered a priority crop, the strategy also indicate the need of diversification both in crop production ad in rural income.

60. In addition to the RS and NSDP, another key document is the *Strategic Framework for Food Security, Nutrition, and Social Protection* formulated under the leadership of the Council for Agriculture and Rural Development (CARD).

61. Key Ministries and Agencies involved in agricultural development include Ministry of Agriculture, Forestry, and Fisheries (MAFF), Ministry of Water Resources and Meteorology (MOWRAM), Ministry of Environment (MOE), Ministry of Rural Development (MRD), Ministry of Women Affairs (MOWA), the Council for Agriculture and Rural Development (CARD), Cambodia Agricultural Research Development Institute (CARDI), and Royal University of Agriculture (RUA).

62. The review of the key policies and strategies for agriculture presented in ANNEX 1 can be summarized as following:

i. The overall policy framework in Cambodia recognizes the central role of agriculture in achieving a number of priorities such as food security, poverty reduction, employment, economic growth, and environmental sustainability.
ii. The general policy framework is also largely favorable to open trade and market economics.
iii. Cambodia tries to pursue integration with the regional and global economy.
iv. Policy recognizes the important role of the private sector and farmer associations in agriculture.
v. Given its limited resources, the Government has focused on delivering functions that are largely public good in character such as providing a conducive environment for investment, formulating policies and regulations, enforcing regulations, funding research, organizing an agricultural statistics system, and investing in infrastructure.
vi. Many of the policies have a weak regulatory and enforcement system.
vii. Most agricultural investment is funded by donors and little by government budget.
viii. Policies are often general in content and lack specific implementation mechanisms and monitoring systems.

ix. Apart from rice and rubber, there is little guidance related to other crops strategies and policies.

3.2 Challenges

63. The main challenges for the formulation of a Crop Master Plan up to 2030 can be summarized as follows:

3.2.1 Vision

64. While there are various statements of a vision for Cambodia and Agricultural sectors in documents such as the NSDS and ASDP, these statements are not specific enough for the crop subsector. Moreover, the visions statements are not based on wide consultation process and as a consequence they might not be broadly shared among the agricultural sector stakeholders including government agencies at the central and local level, farmers, and agroenteprises. The challenge is to identify a vision statement that is shared, specific to the crop sector, exciting, and linked to overall policy framework of RGC.

3.2.2 Value Chain Prioritization

65. Cambodia policy makers are well aware that agriculture is in transition from a traditional system to a modern system characterized by organized systems of linkages involving input suppliers, farmers, processors, logistics agents, distributors, traders, and retailers. Crop production is one key element of value chains the purpose of which is to ensure sustainable creation of value to the consumer. Currently, agricultural value chains in Cambodia are weakly developed. The challenge is how to identify and prioritize a number of strategic crop-based value chains for the CMP.

3.2.3 Technology Access and Transfer

66. Modernization of the crop sector and its diversification towards high value added is based on a substantial contribution of technology. This requires considerable investments in research, extension, and education. The resources of the private sector, international agencies, and international research and academic organizations should be mobilized in order to complement and expand the limited resources available to MAFF and RGC. The challenge is how to ensure that farmers and agroenteprises can access and adopt technology to improve value added in the crop production.

3.2.4 Land Distribution and Efficient Middle Farms

67. Even though agricultural land is changing, over the next 15-20 years, the vast majority of farmers in Cambodia will continue to be smallholders with an average size of landholdings less than 5 ha. Yet, survey data indicated a process of land consolidation where the shares of medium and large farms is increasing. Medium and large farms, if run efficiently, will enhance the capacity of farmers to benefit from higher income and also provide incentives for investment and adoption of technology that could increase the returns on land and labor. The

key challenge is how to facilitate the process of transformation towards efficient larger-size farms while addressing the needs of the rural households who might be negatively affected.

3.2.5 Inclusion and Growth

68. Agricultural growth has proved to be the most effective way to raise rural households out of poverty. This happens through various channels: directly by raising the productivity and income of farmers and indirectly through expanded opportunities for productive employment in the farm sector (as agricultural workers) and in the rural non-farm sector (as workers in agroprocessing, agricultural trade and services related). Moreover as agriculture is linked to other sectors (industry and services), the growth in agriculture will have multiplier effects on other sector as well which result in expanded opportunities for rural households, particularly the landless and marginal farmers, in the urban sector and in the non-farm based industrial (eg garments, construction) and service sector (eg trade, transportation, tourism). The challenge is how to ensure that different types of smallholders and marginal/landless farmers can benefit from growth. Elements of a strategy for inclusive growth in agriculture include: (i) Ensure that smallholder commercial farmers are integrated with value chains and directly benefit from profits derived by higher volumes and higher quality of their produce; (ii) Substantially raise the productivity of the marginal/subsistence farmers; (iii) Expand employment opportunities for the landless; and (iv) Promote emergence and development of agroenterprises, particularly youth and women agro-entrepreneurs

3.2.6 Sustainable Practices and Climate Resilience

69. Sustainable practices in crop agriculture are sometimes in conflict with short-term gains from diversification and commercialization of crops, lack of capacity to prepare and respond to climate change, and inefficient use of inputs of low quality and sometime unsafe. The challenge is how to ensure that farmers adopt sustainable practices. This requires a considerable effort in capacity building, demonstrations, and awareness of the costs and benefits of alternative practices. Capacity building can be strengthened by an effective monitoring and inspection system.

3.2.7 Pest Management

70. Farmer's knowledge and skill to control pest at the field are limited. The improvement of pest management is a critical action to address high priority issues related to pests and their management using Pest Control Method approaches. Comprehensive Pest Control Method approaches that are economically viable and environmentally sound will help to protect human health. The outcomes of pest management are effective, affordable, and environmentally sound pest control method practices and strategies supporting more vital communities.

3.2.8 Food Safety

71. While food security has relatively improved in Cambodia, food safety challenges are just now starting to be understood. The importance of food safety in agriculture will increase over time. As Cambodia is a country with a potential for export of crop-based products and is

also relatively open to imports from the GMS countries and the rest of the world, SPS measures to improve handling of trade will be paramount to the success of trade-oriented Cambodia agriculture. The costs of lacking food safety in terms of health, nutrition, and foregone income from trade are huge in Cambodia and deserve to be highlighted in the CMP up to 2030. The challenge is how to ensure that food safety will be receiving adequate emphasis on investment and policy formulation of Cambodia agriculture. The policies, regulations, institutions, and mechanisms to promote, monitor, assure food safety practices in crop agriculture in Cambodia are just recently emerging and there is a considerable work ahead in order to reducing contamination, chemical residues in agricultural products, and ensure adherence to SPS regulations in trade. More however needs to be done to ensure that good agricultural practices in crop production are adopted to ensure soil fertility, appropriate application of fertilizers and pesticides to crops, analysis of chemical residues in crops, and traceability.

3.2.9 Role of Public, Private, and CBO in Agriculture

72. Even though the RGC and agricultural policies are in principle favorable to the development of the private sector cooperative and community sector, the public sector is still involved in a number of functions some of which have public good nature (eg policies, regulations, enforcement, statistics, research on OPV, inspections, border controls, SPS compliance, pests and disease surveillance and identification) and some are of a service delivery nature (eg extension, laboratory testing, fumigation, seed multiplication) that could conceivably be delegated or simply carried out by some other sector (private, cooperative, community).

73. The private sector in agriculture and agribusiness is just emerging. In the case of production, the private sector has a mixed record in Economic Land Concessions. In the case of NGO sector, there is a wealth of experiences in Cambodia in agricultural extension and food security area. However, it is less clear how the NGO sector does contribute to the overall economic growth and sustainability of agriculture.

74. Over the next 15 years, it is highly likely that the current roles of public sector in agriculture will evolve and change toward a focus only on the public good nature of its functions. It is important to clarify the expectation for the private and NGO sector and coordinate their activities for a cohesive and mutually reinforcing growth and inclusiveness strategy. The challenge for the CMP is how to facilitate the move towards a greater focus of public sector on public goods in agriculture and facilitate a more active role of the private sector and NGO sector in agriculture?

75. The movement of the public sector to a greater focus on public goods and less on non-public goods depends on developing a vibrant private, cooperative, and community sector. The private sector in agriculture is still limited and mostly consisting of small and not-well organized agroenteprises. In some sectors, like rice, the situation is changing, but generally this is not the case in other crop subsectors. The cooperative sector is also limited in coverage and its capacity is generally weak. MAFF has made a commitment to the development of cooperatives and sees the development of cooperatives as a solution to the improvement of smallholder farmers' conditions, through better access to inputs and output markets, and

enhanced access to technology, training, and finance. While both private sector and cooperative sector could be valid answers and approaches to agricultural growth, it is doubtful that only one approach should be pursued. There are in Cambodia and there will continue to be smallholder farmers for whom the cooperative model is not appropriate; there are companies, including processing companies, that will remain small and do not aim at upscaling, upgrading, and expand their operations. In a competitive agrarian structure, these possibilities can coexist all at the same time. The government should allow sufficient competition and protection so that alternative models of doing business and farming prosper in Cambodia.

76. Public sector, especially GDA, private sectors, and NGOs in relation to agricultural inputs (seeds, fertilizers, materials, and equipment) have an important role to: (a) raise the awareness of and improve the efficiency of use of improved technologies and high inputs among poor farmers, thereby creating a high demand for these inputs; (b) lower the transaction costs of supplying rural areas with high quality of agricultural inputs; (c) improve the linkages between importers, government (for quality control) and retailers by removing input adulteration and marketing inefficiencies; and (d) improve the economies of scale in marketing of high quality inputs at the wholesale and retail levels.

3.2.10 Productivity, Profitability, and Competitiveness.

77. Cambodia agriculture needs to increase productivity, profitability, and competitiveness. To a certain extent these terms are used interchangeably. However, a deeper look at the terms would indicates that the approaches and strategies to pursue each of these might be different. In the context of crop agriculture in Cambodia, productivity is often identified with yield increase; usually, this is mentioned in contrast with cultivate area increase. The basic idea is that land expansion is constrained and so future increase of production in Cambodia will have to come through increase in yields. Increases in yield are the outcome of the combination of various inputs and technological know-how. Unless inputs or technological know-how change, yields will not change (apart from climatic events). For any combination of inputs and outputs, there is a profitability outcome, the gross and net income the farmer will be able to make from his farm operations. Profitability depends not only on inputs and outputs, but also on the prices. Even if productivity increases, it is possible that profitability does not increase or even declines when productivity is increased. Looking at farm profitability means looking at farm budgets and therefore at farming as a business, a business that of course deals with natural resources for which sustainability has to be assured and a business that is the primary source of food security and poverty reduction for the country. Yet, while there is a relatively well organized system of data collection for production indicators such as cultivated areas, yields, and production, there is hardly any updated, comprehensive, and accessible database of information about farm profitability (like benchmark farm budgets).

78. Competitiveness refers to maintaining or increasing market shares in export markets. To achieve competitive status, Cambodia will certainly need to improve both productivity and profitability, but that is not sufficient. Productivity and profitability have to be such that the products that ultimately are supplied by Cambodia to international market can be either cheaper, or more in demand than other similar products from the rest of the world. To

monitor competitiveness, Cambodia should look not only at the value and volume of its exports, but also its trade position relatively to other countries. For example, if exports of milled rice from Cambodia are 500,000 mt, what is its share (in value and volumes) of global exports of milled rice?

79. The challenge is how to ensure that the CMP can drive increases in productivity, profitability, and competitiveness over the next 15 years. This can be done through results-based approach and indicators that are regularly monitored.

4 DRIVERS OF FUTURE GROWTH AND IMPLICATIONS FOR THE CROP SECTOR

80. The formulation of the Crop Master Plan requires a clear vision, a realistic strategy, and a well-designed plan of action. A good vision, strategy, and plan is based on an understanding of past trends, current situation, and drivers of future growth that affect Cambodia in a regional and global context.

81. **BOX 1** summarizes the driving forces representing the expected developments and their effects on the agricultural sector of Cambodia. The combined impact of these changes will be the agricultural transformation discussed in section 4.6.

BOX 1 DRIVING FORCES UNDERPINNING AGRICULTURAL TRANSFORMATION IN CAMBODIA

1. **Economic growth in Cambodia**
   a. Stimulate more demand for food
   b. Pull labor out of agriculture
   c. Increase labor costs
   d. Lower cost of capital and increase farm demand for mechanization
   e. Create a larger fiscal space for public investments in agriculture
2. **Urbanization in Cambodia**
   a. Put pressure on land available to agriculture, converting land to urban purposes
   b. Lead to declining per capita rice consumption
   c. Create higher demand for more diversified (change of diet) and processed foods
   d. Require more attention to food safety and quality
   e. Create challenges to integrate small farms into value chains
   f. Increase demand for farm labor force
3. **Rising ASEAN and global demand for food**
   a. Lead to declining per capita rice consumption of low-quality rice
   b. Create more demand for higher-value, better processed and marketed rice
   c. Raise demand for higher-value, processed foodstuff
   d. Require high attention to safety and quality to comply with the rules of buyers and avoid non-tariff barriers
4. **Climate change**
   a. Increase pressure for sustainable management of natural resources (land, water, forests)
   b. Bring more attention and urgency to reduce land degradation
   c. Call for building institutions and clear rules for NRM
5. **Fiscal discipline**
   a. In spite of a larger fiscal space due to the continued economic growth, more budget resources would be required for various purposes to underpin growth and inequality reduction. Public in

general would also require better transparency and accountability on the use of funds. This would lead to stronger fiscal discipline.

b. Define the role of government and key public investments to support agricultural transformation under fiscal constraints

4.1 Economic Growth

82. GDP is expected to grow strongly driven by a dynamic urban sector, light industry, tourism, and a strong agricultural sector. In order to attain the level of middle income status by 2030 Cambodia growth will have to continue to be at the high levels of the past decade, namely over 9% per year. Even if a more conservative growth of 7.2% is assumed over the period to 2030 (as in the NSDP), combined with an assumption of 1.1% population (declining from 1.4% in the past decade), by the end of 2030 Cambodia GDP per capita is expected to be almost three times the level at the baseline year 2012, namely growing from $956/capita to $2,745/capita (in current $).

83. This higher income will have an immediate impact on higher demand for food. The high growth of the economy will imply that different sectors (industry, services, and agriculture) will all have to growth, but the industry and services sectors are expected to grow faster than agriculture, partly because of their higher productivity and partly because of the higher elasticity of demand for industry products and services. That would imply an increasing demand of labor in industry and services which will result in pulling labor out of agriculture.

84. Agricultural labor force is likely to decline, under the pushing factors of an increasingly mechanized agriculture and the pulling of higher income in the non-farm sector. This in turn will result in agricultural labor productivity increasing more than the growth of agricultural GDP and even more than labor productivity in general. As a consequence the gap between labor productivity in agriculture and the rest of the economy is going to narrow. For example, the gap between labor productivity in the rest of the economy and agriculture could narrow from the current level of about 5 (that is labor productivity in the rest of the economy is 5 times higher than in agriculture) to about 2.5. This implies a more balanced development which ultimately will contribute to a more rapid and sustainable growth.

85. In common with other countries, Cambodia's rural youth are increasingly choosing employment in sectors other than agriculture. Labor shortage provides incentives for increased mechanization. Outmigration from agriculture to other sector might also accelerate the process of increasing farm size. As the agricultural sector transforms to a more commercial and competitive industry, it will attract more investment and support more semi-skilled and higher-paid employment.

86. Agricultural GDP is expected to continue its robust growth, albeit driven by different factors than in the past: from a growth of productivity based on expansion of modern inputs to a total factor productivity growth based on technology, innovation, and efficiency. Agricultural GDP growth at 5% (as in the objectives of the ASDP) will still be less than in other sectors of the economy (ie industry ad services) which implies a declining share of agricultural GDP in overall GDP.

4.2 Urbanization

87. While total population will rise from 14.8 million in 2012 to 18 million in 2030 and assuming an urban population growth of 5.1% (consistent with past decade growth), urban population will more than double from 3.3 million to 8 million over the same period, implying a rapid urbanization of Cambodia from a rate of 22% to a rate of 44%.

88. There are a number of implications of rapid population growth for the agrifood system of Cambodia. An increasing urban population needs to be fed by a relatively smaller rural population. While in 2012, Cambodia on average needed one agricultural labor to feed 2.8 persons in Cambodia, in 2030, each agricultural worker will need to be able to feed 4.5 persons. For the urban population, food consumption will be richer in proteins and micronutrients and will require more stringent quality standards, and food that is more convenient to prepare and consume. An increasing urbanization also implies more pressure on agricultural land in peri-urban areas, which often is the most fertile land. Food distribution systems appropriate for urban areas need improved marketing and distribution infrastructure. An increasing amount of food will be distributed via modern outlets and supermarkets, will be more processed, and sold in a variety of packaged forms. Agroindustry will need to develop, in order to provide enhanced features such as storability, convenience, improved packaging, and diversified products.

89. Due to increasing income and urbanization, diets will be more diversified, richer in protein and micronutrients. More animal products and more processed foods will be consumed. Also, more people will be aware of health issues (cholesterol, diabetes, allergies, chemical residues, antibiotics in animal feeding, etc.) related to food and food safety. Rice consumption per capita will likely to remain high but lower than its current level, implying an increasing available of rice for exports. Rice quality will increase not only for the export markets but for the domestic and urban markets as well.

4.3 Rising ASEAN and Global Demand for Food

90. Increase in cross-border trade will require Cambodia to have an adequate capacity and institutions to comply with trading agreements often requiring more stringent measures for food safety and quality standards, phytosanitary and quarantine controls, double tax agreements, transit regulations, and harmonized trade and commerce legislation (e.g. anti-dumping, labeling, trade mark protection). It will also require Cambodia's agri-food industries to become competitive with neighboring countries. An adequate physical and institutional infrastructure will be needed to achieve such competitiveness including more stable and cheaper access to energy, improved transportation network and logistics systems, highly effective information and communication systems, and the financial institutions supporting trade and investment.

91. Demand for high quality rice will likely increase more than demand for low quality rice and Cambodia is in the fortunate position to be able to respond to this increasing demand. Regional and global demand for higher-value products, including both fresh and processed products will increase, providing a great opportunity for Cambodia to diversify and move towards a higher value added agricultural system. Agroindustry development and the general

compliance with good agricultural practices (GAP), good manufacturing practices, and other certifications (HACCP, Globalgap, Organic, etc) will be key factors to gain competitiveness in international markets. The agricultural system in Cambodia and the crop subsector in particular need to be prepare to face these challenges and benefit from the resulting opportunities.

92. In the regional and global context, agricultural quality and safety systems are based on standards of best practice operating procedures, internal control systems and product traceability. They require strong government regulatory systems with sufficient capacity for monitoring, regulation and enforcement, supported by non-government industry-based institutions to provide training, certification, auditing and analytical laboratory services. The regulatory capacity must encompass the whole food chain, from rigorous assessment and registration of agricultural inputs (such as pesticides, veterinary medicines and biotechnology products) and livestock feeds, through to food processing additives. The tragic 2008 "melamine in milk" episode shocked Asia. The fact that melamine was not previously monitored as it was not considered a potential agricultural input highlighted the need for dynamic and rigorous food safety system. The most frequent food safety events are due to bacterial contamination such as the deaths in the USA caused by from *E. coli* in tomatoes in 2007 and bean sprouts in Germany in 2011. In all cases, a system to trace the source of contaminated products was essential to rapid and effective response.

93. Markets are increasingly open and will be increasingly homogenized toward international tastes and new requirements for quality, packaging, safety, and even process attributes such as socially or environmentally friendly methods. New distribution channels, dominated by wholesale chains and larger firms including supermarket retailers, will impose high performance demands on value chain stakeholders. Food production, distribution and marketing chains are changing with improving infrastructure, communications, vertical business structures, integration into the world market, and the rapid rise of supermarkets. With over 80% of the consumer price of food formed in the post-farm value chain, agricultural policy will move beyond the exclusive and narrow focus on farm productivity.

4.4 Climate Change and Sustainable Management of Natural Resources

94. Climate change, input and output market price fluctuations, trans-boundary disease and natural disasters have major local and regional impacts on agriculture. India, for example, has developed agricultural insurance and disaster response mechanisms for primary (crop failures) and to some extent secondary (livestock deaths) consequences of climate variability. Risks in commercial agriculture may be mitigated by response mechanisms that include catastrophe protection insurance and the protection of farmers under bankruptcy legislation.

95. There will be global pressure for countries to implement green technologies (e.g. solar power) and reduce carbon emissions. At the 2012 'Rio+20' UN Conference of Sustainable Development, Cambodia and other member nations agreed to establish Sustainable Development Goals based on green economy principles. To facilitate this, new multilateral financing mechanisms are emerging such as the Climate Change Fund, and increased provision for the Global Environment Fund, as well as carbon trading on international stock

markets in response to voluntary and government-mandated emissions certification schemes.

96. Rising costs of energy will drive up costs of fertilizers, irrigation, mechanization and thus food. In this context, profitable farming systems and their genetic materials need to be highly efficient, not necessarily relying on high-fertilizer and water input systems such as hybrid wet rice. Aerobic rice systems are emerging as more efficient and provide better yield in marginal conditions and under climate change. Increasing urbanization and agro-industry development results in large-scale concentrated waste that continues to be costly and polluting, and in response many countries are using this waste to manufacture bio-fertilizer.

97. Unless checked, cultivated land expansion might come at the detriment of either forestland or other natural resources (soil and water) thus compromising the sustainability of crop agriculture. Degradation of renewable resources including agricultural land and water presents another set of challenges. Improving the land tenure system, markets for water rights, land use zoning, and regulatory capacity to ensure sustainable land and water resource use management are some of the policy and institutional mechanisms that have proven effective.

4.5 Fiscal Discipline

98. Pressure for increased integrity of the tax system, including the administration of the taxation of agriculture will be an increasingly feature of more modern agricultural systems. Strong income growth of the economy will make possible a larger tax basis that will provide the resources for public sector investment that ultimately benefit the overall economy. Nevertheless in the short to medium term, it is likely that the agricultural sector will continue to be underfunded by the public sectors. That requires an even greater effort in increasing efficiency of the expenditures, prioritizing the investments, reducing wastes, and reaching out to attract private and community investment.

4.6 Agricultural Transformation

99. Over the 15-year period 2015-2030, one likely scenario is for GDP/capita of Cambodia to continue to increase substantially and Cambodia become a middle income country. This scenario is consistent with the potential of the country and an improvement in policies and institutions that will result in accelerated growth. During this movement towards middle income country status, Cambodia will go through the process of agricultural transformation, a process whereby the economic structure of a society changes from one based on agriculture to one based on industry and services.

100. During the process of agricultural transformation, agriculture importance in the economy, as measure by share in labor and GDP, declines (see **Box 2**). At the same time, agriculture becomes more productive: returns to agricultural labor and land increase and overall agricultural GDP grows.

Box 2. Indicators of Agricultural Transformation

1. **Agriculture becomes less "important" in the economy**
   - Declining share of agriculture in labor
   - Declining share of agriculture in GDP

2. **Agriculture becomes more productive**
   - Increasing agricultural labor income
   - Increasing agricultural GDP per unit of labor and land

101. Four lessons from the process of agricultural transformation are relevant to the formulation of Cambodia's vision and the Crop Master Plan. The lessons can be summarized as follows.

a) Total Factor Productivity (TFP) growth is the main source of future agricultural growth. TFP is the growth in outputs that cannot be explained by increased of inputs such as land, labor and capital, fertilizer, etc. TFP implies improved efficiency and effectiveness in using inputs. TFP growth contributed between 40% and 70% of agricultural output growth in Asia over the last 50 years[4].
b) At early stage of development, agricultural growth is the main engine of poverty reduction because most of the poor are in rural areas. Lower inequality enhances the impact of growth on poverty reduction.
c) Increasing urbanization presents challenges that traditional food systems are not well prepared for. Integration of smallholder farmers with modern value chains is a feasible response to these urbanization challenges.
d) As the economy moves closer to middle income status, the development of the rural non-farm sector (including agri-food manufacturing, services, marketing and logistics), becomes increasingly important in closing the gap between rural and urban areas.

4.7 Conclusions

102. Cambodia Agriculture is transforming rapidly under the driving forces of economic growth, urbanization, global demand for food, climate change, and fiscal discipline. This transformation presents numerous challenges and opportunities for the current system of production and distribution. The Crop Master Plan will address the challenges and identify strategies, policies, investments, and mechanisms to realize the opportunities of modernization.

[4] Keith O. Fuglie, 2010, Total Factor Productivity in the Global Agricultural Economy: Evidence from FAO Data.

5 STRATEGIC APPROACH TO THE CROP MASTER PLAN

103. The approach to the Crop Master Plan is based on some key elements that are discussed below. These key elements will inform all the detailed program, subprograms, and activities formulate in the following paragraph. The approach can be described as follows.

104. **Take Stock of Past Trends and Current Situation**. The impressive growth of the agricultural sector over the past decade has consolidated the position of Cambodia as a potential source of a number of agricultural products at the regional and even global level. The considerable food surplus of Cambodia assures sufficient food availability to meet the basic requirement for food security, even though more efforts need to be done to improve access to safe and nutritious food. However, the growth of the past cannot be sustained in the future for a number of reasons related to sustainable use of land, increasing wages, low profitability, low total factor productivity growth, and the weak capacity to generate value added in agriculture, through a well-developed postharvest system, agroindustry, and value chains well integrated with urban and global markets.

105. **Focus on smallholders and the transformation towards mid-size farms**. For the conceivably future (next 15 years), the structure of landholdings is going to be dominated by smallholders. It is however possible to facilitate the emergence of mid-size farms (say 3 to 10 ha) through consolidation, leasing, or cooperative farming. The mid-size farms offer the opportunity to smallholder farmers to become commercialized and diversify towards higher value products.

106. **Identify the crops based on a value chain approach**. The value chain approach looks not only at production but also at other stages of the chain from input providers to final consumers. The selection of crops and the investment and policies to support their development requires looking at postharvest systems, processing, logistics, trade and marketing. The value chain approach is supported by the drivers of future growth including urbanization, globalization, food safety requirements, competitiveness, structural transformation, labor migration and mechanization.

107. **Ensure that smallholder farmers are integrate into value chains that are connected to rapidly growing urban and global markets**. The integration can take different forms of horizontal and vertical coordination including contract farming. The key point is that through integration into value chain, smallholder farmers and agroenteprises can gain in competitiveness, increase value added, and reduce risk.

108. **Prioritize less than 10 crops.** This is key to success. Cambodia can achieve comparative and competitive advantage in a number of crops, raise productivity and competitiveness and generate employment, particularly non-farm employment through the emergence of agroindustry, agribusiness, logistics services, and a number of professional services to agriculture. This is possible but requires clear vision and focus. The prioritization should be based on evidence, but also requires consensus among the stakeholders in the sector.

109. **Preserve natural resources.** Embark on a crop development that does not rely on land expansion and abuse of water resources. Most of the crop production expansion could be

achieved through yield improvements. Most of the water used in rice could be reduced without any negative impact on yields. Most of the soil fertility could be maintained or even enhanced through a number of conservation agriculture practices.

110. **Formulate a vision and targets that are clear and exciting**. The vision should guide the CMP towards the achievement of goals are realistic and exciting at the same time.

111. **Formulate programs, subprograms, and activities** and ensure that the responsibilities of different levels of the MAFF system are clearly indicated.

112. **Estimate a budget** and possible sources of finance.

6 VALUE CHAIN PRIORITIZATION

113. The formulation of the Crop Master Plan (CMP) is based on a prioritization of crops. Rather than considering crop production only, the CMP considers the value chain in its entirety and is focused on the elements that contribute to value and development goals.

114. Based on the initial list of crops identified in the Inception Report and listed in Table 18, the prioritization of value chains takes into account a number of criteria as explained in the following section.

Table 18 Crops List to be considered for Prioritization in the CMP

Cereals: 1. Rice (All, Fragrant, Non-fragrant) 2. Maize Roots and tubers: 3. Cassava 4. Sweet potato Vegetables: 5. Tomato 6. Cabbage 7. Lettuce 8. Rockets 9. Carrot 10. Cucumber Fruit: 11. Banana 12. Mango 13. Durian 14. Papaya 15. Avocado 16. Jackfruit	Spices: 17. Chili 18. Pepper Leguminous and oilseeds: 19. Mungbean 20. Peanut 21. Soybean 22. Sesame Other: 23. Sugarcane 24. Cashew Nuts 25. Coconut 26. Sugar Palm

6.1 Criteria for Prioritization

115. There are four groups of criteria illustrated in Table 19: (i) contribution to GDP and employment; (ii) growth; (iii) difficulty of investment; and (iv) other criteria.

Table 19 Criteria for Prioritization of Value Chains

Criteria Group/Individual Criteria	*Weight of Criteria Group*	Weight of Individual Criteria
Contribution to the Economy	***20***	
GDP contribution		10
Contribution to Employment		10
Growth	***45***	
Growth Potential		25
Export Potential		20

Criteria Group/Individual Criteria	*Weight of Criteria Group*	Weight of Individual Criteria
Easiness of Investment	**10**	
Short lags in return to investment		5
Low risk		5
Other Criteria	**25**	
Government Priority		10
Impact on Environment		10
Geographic Spread		5
TOTAL	100	100

116. **Contribution to the Economy.** The two criteria (contribution to GDP and to employment) highlight the importance of the value chain to the overall economy and employment. A value chain with a small impact on GDP or employment might still make sense from a business point of view; however, it might not make sense for investment of public resources, unless other criteria (eg growth or social) justify that public investment. The link with employment is particularly important given the impact on poverty. The rural poor can benefit from expansion of employment opportunities both in the production sector and in the post-production sector (as the value chain will cover both).

117. **Growth**. This is the most important criterion (with the highest weight). The criterion tries to assess the potential for future growth of value generated by the value chain (both in production and post-production) and potential for exports. Assessment of growth is partly based on technical and supply factors (like technology, availability of land and water, etc) and partly on demand factors (for example growth of demand for safe food, high value products, health product, processed products).

118. **Investment**. Choice of value chains is also affected by the nature of the investment. The investment lag affect the time to see a return; from this point of view investments in perennial crops have longer lags than annual crops so they might be more difficult to pursue. Risk is another major factor to consider. Some value chains are inherently more risky than other, so they might receive a lower score during prioritization. The less risk and the lower lags, the more attractive is the investment.

119. **Other criteria.** Under this category, criteria such as government priorities, environmental impact, and geographic spread are included.

6.2 Weights and Scoring

120. Criteria have different weights. The weights are normalize to sum up to 100. The prioritization of value chains is then based on scoring each value chain according to the criteria. For each criteria a score of between 1 and 5 can be given, where 1 is the minimum unweighted score (namely the value chain contributes very little to the criteria) and 5 is the maximum unweighted score (namely the value chain contribute very much to the criteria). This scoring is partly based on objective assessments (example the value of production) and

partly on subjective assessment related to the perceived contribution of each value chain to the criteria. The use of subjective assessment is acceptable provided that these assessment are transparent and discussed publicly so that they are the outcome of some consensus building process.

121. After assessing the unweighted score for each criterion, the scores are weighted with the weights of each criteria and the overall score (sum of weighted scores) is computed.

6.3 Results

122. The scoring method explained in the previous sections has led a groups of experts to the following scoring of the crops listed at the beginning of this chapter.

Table 20 Prioritized Value Chains Scoring

SNo.	*Ranking*	Rank	Score
1.	Rice Fragrant	01	460
2.	Rice Total	02	415
3.	Non-Fragrant Rice	03	415
4.	Maize	04	410
5.	Cassava	05	410
6.	Mungbean	06	395
7.	Mango	07	390
8.	Cashew Nuts	08	390
9.	Pepper	09	375
10.	Banana	10	370
11.	Tomato	11	320
12.	Soybean	12	310
13.	Cabbage	13	295
14.	Cucumber	14	295
15.	Papaya	15	290
16.	Peanut	16	290
17.	Sesame	17	275
18.	Sugar Palm	18	275
19.	Lettuce	19	260
20.	Rockets	20	260
21.	Carrot	21	260
22.	Avocado	22	260
23.	Chili	23	260
24.	Sugarcane	24	255
25.	Coconut	25	250
26.	Durian	26	230
27.	Jackfruit	27	220
28.	Sweet potato	28	205

123. The prioritization of the first 10 crops include cereals (rice and maize), tubers (cassava), fruit trees (mango, banana, cashew nut), spices (pepper), and pulses (mungbean). Individual vegetables (eg tomato, cucumber, lettuce) are not among the first 10 crops, mainly

because of their small value as percentage of GDP and low potential for export. However, if all vegetables were taken as a composite value chain, their importance in the scoring would certainly be bigger, and they would be part of the first ten most important crops.

124. Therefore, the prioritized value chains include the following:

Table 21 First 8 Prioritized Value Chains

SNo.	Prioritized Value Chain
1.	Rice
2.	Maize
3.	Cassava
4.	Mungbean
5.	Mango
6.	Cashew Nuts
7.	Pepper
8.	Vegetables

125. The inclusion of rice is not surprising, as rice is the most important crop in terms of area, production, value, employment, and agroindustry. It has also considerable export potential that remains largely to be exploited.

126. Apart from rice, the other crops included in the list are the major contributors to the value of production as highlighted in the following table.

Table 22 Value of Production of Selected Crops

No.	Crop	Value of Production (USD)
1	Rice	2,564,214,400
2	Cassava	1,194,320,400
3	Mango	261,004,000
4	Vegetable	166,095,600
5	Maize	109,921,400
6	Pepper	90,620,500
7	Mungbean	75,815,000
8	Cashew Nuts	74,547,000
9	Sugar cane	53,934,860
10	Soybean	49,485,500
11	Peanut	48,580,000
12	Sweet potato	21,703,600
13	Sesame	21,575,000
14	Chili	5,264,000

7 VISION

127. The vision for crop agriculture is part of the overall vision of agriculture in Cambodia as a sector that is contributing to food security and poverty reduction, and moving towards commercialization and diversification.

128. Based on the discussion of past trends (Chapter 2) and drivers of future growth (Chapter 4), the vision for crop agriculture can be refined further as follows:

VISION FOR CROP AGRICULTURE 2030
Cambodia crop agriculture is a reliable source of high quality, safe, and competitive crops in the global economy while ensuring sufficient volumes of safe food to meet food and nutrition security of its own citizens in a sustainable and climate resilient way.

129. Given the prioritization of value chains in Chapter 6, the vision for crop agriculture 2030 is translated into specific statements for the prioritized value chains, as follows:

Table 23 Vision for the Prioritized Value Chains in the Crop Master Plan to 2030

Rice	**Cambodia is one of the three main exporters of fragrant rice in the world**
Maize	**Cambodia is a reliable supplier of feedgrains (maize and pulses) to the Asian Economic Community (AEC)**
Cassava	**Cambodia is a sustainable and major supplier of cassava starch and cassava chips to Asia**
Mungbeans	**Mungbean is an important source of improved soil fertility and crop rotation in addition to fulfil market demand**
Mango	**Cambodia is one of the five major exporters of quality fresh mango in the world**
Cashew	**Cambodia is the world leader in organic cashews**
Pepper	**Cambodia is a leading exporter of quality pepper including the globally recognized Kampot pepper**
Vegetables	**Cambodia is a largely self-sufficient producer of safe vegetables**

130. The vision for CMP is based on the crops indicated in Table 25.

The overall features of this vision include:

- Meeting the need for adequate, safe, and nutritious needs of its population
- Export orientation
- Reputation for quality and safety
- Orientation towards high value added
- Linkages with agroindustry/agribusiness

- Requires well-coordinated policy and investment involving private, public, and community sector

Table 24 Contribution of Prioritized Crops to Key Elements of the CMP Strategy

Crops	Food and Nutrition Security	Food Safety	Export	High value	Agroindustry
Rice	✓	✓	✓		✓
Maize		✓	✓		✓
Cassava		✓	✓		✓
Mungbeans					
Mango		✓	✓	✓	✓
Cashew		✓	✓	✓	✓
Pepper		✓	✓	✓	
Vegetables	✓	✓		✓	

Table 25 Vision for Crop Agriculture 2015-2030.

	Distinctive Features		Production ('000 tons)		Area ('000 ha)		Value of Production (USD million)		Value Added (USD million)		Exports Value (USD million)		Imports Value (USD million)		Farm Employment ('000)	
Crops	2015	2030	2015	2030	2015	2030	2015	2030	2015	2030	2015	2030	2015	2030	2015	2030
Rice	Among top 10 fragrant rice exporters	Among top 3 fragrant rice exporters	9,255	13,742	3,047	3,124	2,314	3,435	820	3,125	350	3,243			609	625
Maize	Among top 10 exporters of maize in ASEAN	Top exporter of maize in ASEAN	550	2,485	144	360	110	497	8	66	20	362			17	43
Cassava	Among top 10 exporters of cassava starch in Asia	Second largest exporter of cassava starch in Asia	11,943	21,582	515	692	709	1,488	60	1,242	770	2,730	-	-	82	111
Mungbean	Used as nitrogen fixation after main rice crop	Use both as N fixation and for export and feed	61	121	53	72	76	151			13	88			18	24
Mango	Informal exports to Vietnamese traders. No SPS compliance.	GI established and Recognized Global Supplier of Safe and Quality Mango.	1,305	3,156	65	101	326	1,640	8	159	15	220			22	34
Cashews	Ten largest exporter of cashew nuts	Top exporter of organic cashew seeds	100	372	143	222	110	512	-	377	-	837			29	44
Pepper	Geographic Indication (GI) in place	Global Brand and increased market share	10	29	5	9	91	436	4	14	86	436			5	9

	Distinctive Features		Production ('000 tons)		Area ('000 ha)		Value of Production (USD million)		Value Added (USD million)		Exports Value (USD million)		Imports Value (USD million)		Farm Employment ('000)	
Crops	2015	2030	2015	2030	2015	2030	2015	2030	2015	2030	2015	2030	2015	2030	2015	2030
Vegetables	High dependence on imports. No safety assurance.	Greatly reduced dependence on imports. Greatly enhanced safety assurance.	415	1,108	52	77	166	597	33	186			158	95	87	129
Total Selected Value Chain			23,638	42,595	4,024	4,658	3,902	8,756	934	5,168	1,253	7,916	158	95	868	1,019
Growth Rate (average compounded over 15 years)				4.0%		1.0%		5.5%		12.1%		13.1%		-3.3%		1.1%

8 VALUE CHAIN PROGRAMS

8.1 Introduction

131. Based on the prioritization presented in Chapter 6, this chapter presents the formulation of programs for the 8 prioritized value chains. For each value chain, the chapter will provide the following:

- Overall description
- SWOT Analysis
- Key Issues
- Opportunities
- Vision
- Sub-Programs and Activities

132. The value chains programs refer to the following crops:

i. Rice
ii. Maize
iii. Cassava
iv. Mungbean
v. Mango
vi. Cashew Nuts
vii. Pepper
viii. Vegetables

8.2 RICE PROGRAM

8.2.1 Overall Description of the Rice Value Chain

133. Rice is the main crop of Cambodia in terms of cultivated area, employment, and value of production. It is not the main crops in terms of volume of production anymore. Cassava with a production of over 11 million tons exceeds the 9 million tons of paddy production. Over the past decade rice has grown quite a bit both in terms of cultivated areas and yield. However, future growth of rice sector is likely to derive from improvement in yields and increase in the postharvest chain where value added can be created.

134. Rice production can amply meet the rice requirements of the population. In fact Cambodia has a considerable paddy surplus that is exported either formally (as milled rice) or informally as paddy to neighboring countries. The main policy of RGC since 2010 has been to promote the milling of this paddy surplus so that Cambodia could become a major rice exporter. Currently, Cambodia is exporting about 0.5 million of milled rice, even though the paddy surplus is about 4 million tons.

135. Even though there is still considerably yield improvement in rice farming in Cambodia, Cambodian farmers have a comparative advantage in producing rice, even relatively to neighboring countries. The comparative advantage in production is however lost in the postharvest chain where the high logistis and transportation costs, and the high processing cost make rice from Cambodia not yet competitive.

136. In Cambodia, there are around 1.8 million rice producing households with average 5 members per households. Most of these farmers are subsistence rice farmers with the average farm size (source from Cambodia Agricultural Census, 2013) being less than one hectare. Farm size is not only small but is also decreasing over time due to increasing population pressure and the limited exit of labor from rural areas to larger cities.

137. Most rice farms are not viable as economic units. Their small size and limited income per ha combine to push rural households into non-farm activities including seasonal labor, migration to urban arear or other countries. An average rice farm, with size of one ha could yield income of about $300/ha, which is clearly insufficient to keep an household above poverty level. As a result there is an increasing outflow of rural labor outside of farming. This scarcity of agriculture labor is beyond the latest years movement towards increasing mechanization. At the same time, there is a tendency towards larger operational holding farm size.

138. In the conceivable future, and most probably over the next 15 years, smallholder farmers will continue to remain the majority of rice farmers. Smallholder farmers can, however, reap the benefit of scale in production and marketing by being organized in institutions that reduce transaction costs and increase overall efficiency. Such institutions include group farming, contract farming, community organizations and farmer cooperatives.

139. The rice value chains across Cambodia can be broadly characterized as “traditional” and “modern export chains”. Both categories of chains operate in parallel in practically all provinces of Cambodia. Traditional value chains are characterized by a low level of vertical integration and coordination. The adoption of mechanized operations such as harvesting, threshing and drying in these chains has been relatively slow, resulting in inefficiencies in the post-harvest system and poor-quality outputs. In the case of modern value chains, organizational innovations including improved coordination and vertical integration have increased efficiencies, promoted mechanization and resulted in high-quality outputs.

140. The efficiency and quality of post-harvest handling operations strongly affect the quality of rice and the amounts of loss across the post-harvest system. The main post-harvest operations for rice are threshing, drying, storing and milling. There is a great diversity in the way these operations are carried out depending on the market and transportation conditions across Cambodia. Accordingly, the amounts of qualitative and quantitative post-harvest losses vary depending on the practices used. Reliable quantitative estimates of post-harvest losses in diverse conditions in Cambodia currently vary between 10 to 30%. It is also important to consider the way rice is grown as this can affect post-harvest losses. For example, farmers often use “mixed” seeds containing several varieties from the previous harvest and post-harvest losses associated

with such mixed harvested grain also tend to be high. Such losses can be avoided by using uniform standardized seeds or changing seeds every two years.

Figure 4 SWOT Analysis of the Rice Sector in Cambodia

8.2.2 Key Issues in the Rice Value Chain

141. **At the production level**, the main issues include the following:

- Limited access to quality seed
- Dependence on rainfed agriculture

- Limited knowledge of crop practices to increase productivity, improve climate resilience, respond to pests and diseases, and conserve natural resources (soil fertility, water)
- Access to mechanization services to lower dependence of increasingly scarce agricultural labor
- Lack of mutually beneficial linkages with other value chain actors such as millers
- Small farm size not providing sufficient income for economic viability
- Still relatively weak organizational capacity of farmer groups and farmer cooperatives in consolidating and planning joint efforts to benefit large numbers of smallholder farmers.
- Lack of risk reduction mechanisms available to farmers (eg crop insurance, early warning systems)

142. **At the postharvest level**, the main issues include:

- Lack of a warehouse receipt system allowing farmers to collaterize their stock and benefit from access to finance and seasonal price variability
- Lack of access to providers of drying and storage services at the village level
- Underutilization of milling capacity
- High cost of electricity

143. At the **trade and marketing level**, the main issues include:

- Logistics cost
- Access to affordable multi-modal transportation (containers, truck, railways, vessel)
- Quality assurance
- Branding
- Agricultural statistics and market information

8.2.3 Opportunities for the Rice Value Chain

144. The opportunities for the rice sector in Cambodia are many, but require wise strategic choices. They also need to take into account some major changes affecting the overall economy and the agricultural transformation into a modern agricultural system.

145. Among the context variables that need to be taken into account are:

- the expected improvement in power generation that will impact on the access and cost of electricity for either production (water pumping) or processing (milling energy bills)
- improvements in road, railway, and port infrastructure both within Cambodia and the GMS corridors; this will impact the access to transportation means and lower the cost of transportation
- logistics improvement in terms of access to warehouses, containers, multi-modal transportation
- facilitation in trade exchange through e-trade operations and modalities

146. Cambodia could be a leading exporter of high quality fragrant rice. This will require strict quality assurance systems of the value chain of rice from input (seed primarily) to packaging.

147. Well integrated value chain with input suppliers, farmers, processors, and exporters being part of effective value chains able to provide rice to domestic consumers and meet the demand of world rice markets.

148. More sustainable rice production, using soils more effectively and restoring their fertility, using water more wisely in an effort at conservation, experimenting with reduced tillage and alternative wetting and drying system, crop rotation, and avoiding field burning after the harvest.

149. Land levelling and experimenting with precision agriculture in fertilization, pest controls, and weed controls.

150. Reduced postharvest losses leading to higher value of final product.

151. Higher income per ha and per unit of agricultural labor

8.2.4 Vision and Targets for the Rice Value Chain

152. The vision for the rice sector is for Cambodia to be a leading exporter of fragrant quality rice in the world. The commitment to high quality rice will be the trade mark and brand of Cambodia in the global rice industry. So far only few other countries have achieved this status: Thailand (with Jasmine), India and Pakistan (with basmati rice), and Italy (with Arborio rice).

153. In order to achieve this vision, Cambodia rice value chain has to improve at various levels, from input use, to production techniques, supply chain management, postharvest technologies, processing, logistics, and marketing.

154. This vision will allow to achieve an increase of the value of production from current USD 3.1 billion to USD 6.6 billion, while keeping the total rice land relatively constant, but improving productivity, reducing postharvest losses, revolutionizing supply chain management, and benefiting from general improvement in access to affordable electricity, better roads, improved logistics, and more efficient marketing.

155. The key actors in this transformation will be farmer organizations, millers and exporter organizations, and government agencies involved in the rice sector.

156. Some of the key targets of this vision include: exports value increasing from USD 350 million to USD 3,243 million; over 70% of paddy processed in Cambodia (from the current level of 43%); value added in the industry over USD 3.1 billion; and farm income per ha growing by 45% (from USD 380/ha to USD 550/ha).

Table 26 Indicators and Targets for Rice Value Chain

Indicator	Unit	2015	2020	2025	2030
Area	'000 ha	3,047	3,124	3,124	3,124
Yield	kg/ha	3,037	3,436	3,888	4,398
Production	000 ton	9,255	10,735	12,146	13,742
Farmgate price	$/kg	0.250	0.25	0.25	0.25
Value of Production	$ million	2,314	2,684	3,036	3,435
Volume for domestic consumption	000 ton	3,231	3,532	3,824	4,099
Volume for feed, seed, and waste	1 ton	1,203	1,180.86	1,214.57	1,236.76
Volume rice exported	000 ton	500	1,144	2,301	3,705
Production Processed in Cambodia	%	43%	49%	61%	71%
Production Processed outside Cambodia	000 ton	5,255	5,443	4,782	3,942
Price of rice domestically	$/kg	0.7	0.75	0.81	0.88
Export Price of rice	$/kg	0.7	0.75	0.81	0.88
Value of Exports	$ million	350	863	1,869	3,243
Value Added in processing and exports	$ million	820	1,271	2,047	3,125
Total Value (production, processing, marketing)	$ million	3,134	3,955	5,084	6,560
Total Value/ha	$/ha	1028	1266	1627	2100
Labor in production	no.	609	625	625	625
Labor in postproduction	no.	40	53	74	98
Return to labor in production	$/day	8	9	10	11
Return to labor in postproduction	$/day	16.40	19.21	22.24	25.51
Farmer income/ha	$/ha	380	430	486	550

8.2.5 Subprogram and Activities for the Rice Value Chain

157. The improvement of the value chain should start with **seed**. There is a major work to be done to ensure that farmers get access to good seed that result in high yield and production of paddy required by miller for meeting the demand of the domestic population and exports. This work requires appreciable increase in investment in research (breeding of export fragrant varieties and climate resilient varieties), improved capacity of research stations to supply adequate volumes of foundation and registered seeds, and various policy and regulatory activities to promote a well-functioning seed system.

158. Another set of activities aim to reduce the transaction costs for small farmers in relation to access to technology, information and markets, and improve the efficiency of farm operations. These activities include:

- **Improvements in the legal/institutional framework of contracts**: Contract farming provides an opportunity to smallholders to benefit through participation in the modern value chain and market assurances. Improving the legal and institutional framework of contracts by reducing transaction costs will enable smallholders to enter into such formal arrangements. In addition, such a framework will provide protection to smallholders from unscrupulous contractors.

- **Promotion of custom-hiring services for agricultural machinery**: Custom hiring is an important way through which most smallholders are able to access services of agricultural machinery. Except for very small agricultural tools, large machinery such as tractors, harvesters and threshers is mostly used by smallholders on a custom-hiring basis. Such services are efficiently provided by the private sector and their own associations – hence, a suitable regulatory framework and support policies to attract private sector investment for providing such custom services are needed.

- **Promotion of farmer organizations/cooperatives**: Farmers' groups and cooperatives could be empowered through local development and community-driven approaches and through support for capacity building in various aspects of farm and agri-business management, provision of preferential access to institutional credit and institutional reforms to recognize such entities as key agencies in agriculture. These kinds of promotions will empower smallholders in bargaining powers and fulfillment of contracting challenges. Whenever economically feasible, consider the establishment of market infrastructure to improve linkages between agricultural cooperatives and markets.

- **Provision of production and market information** to smallholders through modern information and communication technologies.

159. A third set of activities is related to **extension activities for new approaches to production** including conservation agriculture, land levelling, and alternative wetting and drying systems for improved water use management.

160. The strategy should promote the development of systems to reduce risk and prepare to disaster including **weather indexed crop insurance** and **early warning system**.

161. On the **postharvest system**, the main programs are related to the establishment of a **warehouse receipt system** to allow farmer access to finance and benefit (rather than being penalized) from seasonal price variations. **Service providers for harvesting, threshing, drying and storage facilities** should also be promoted to reduce postharvest losses and improve the quality of paddy.

162. Harvesting and threshing: The traditional practice of manual harvesting and threshing is being largely replaced by mechanization in intensive rice bowls of Asia. Mechanization of one or both of these operations provides opportunities to decrease losses and improve quality through increasing efficiency in post-harvest operations and through suitable management and operation of these mechanical devices.

163. Drying: Mechanical dryers of different types are now available. These range from small-scale farm-level dryers to flat-bed dryers and advanced continuous-flow dryers for handling large quantities.

164. Storage: Hermetic storage, use of commercial silos or standard local build storage.

165. The final set of activities is related to **trade and marketing**. In this case, promotion of exporter association, market information, and branding of Cambodian rice will be essential to transform the rice sector into a modern industry.

Table 27 List of Sub-programs and Activities – Rice

Program	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
1. Seed	1.1 Breeding program to develop new varieties that are (i) more suitable to the branded strategy of Cambodia and (ii) improve climate resilience (eg drought resistant, salinity resistant)	CARDI has already developed 40 varieties	Develop 4 new varieties	Develop 4 new varieties	Develop 4 new varieties	CARDI
	1.2 Establish and promote seed standards and seed certification system	Drafting Law	10% seed companies certified	50% seed companies certified	100% seed companies certified	GDA/ Dept. of Rice Crop
	1.3 Improve research stations capacity to produce affordable foundation seeds to meet market demand		Volume of foundation and registered seed			GDA/ Dept. of Rice Crop CARDI
	1.4 Promote adoption of certified seed through demonstration and information campaigns	40 rice varieties released by CARDI	40% of producers using good quality seeds	60% of producers using good quality seeds	80% of producers using good quality seeds	GDA/Department of Extension and Dept. of Rice Crop
2. Production	2.1 Improvements in the legal / institutional framework of contracts	NA	Linkage between private sector (traders, millers, and wholesalers) to producers and 20% of producers will be contract farming base	40% producers have contracted with traders, millers, or wholesalers	Ongoing collaboration programs and 50% contracted base farming	PDAs and GDA

Program	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
	2.2 Support emergence of supply chain management information systems					
	2.3 Promotion of custom-hiring services for agricultural machinery	NA	20% of smallholders are able to access services of agricultural machineries	40% of smallholders are able to access services of agricultural machineries	60% of smallholders are able to access services of agricultural machineries	Department of Agricultural Engineering/GDA and PDAs
	2.4 Promotion of farmer organizations/ cooperatives	NA	Conduct capacity gap assessment of existing farmers organization and cooperative	Additional 20% farmer organization and cooperative established and capacity strengthened	40% of farmer organization and cooperative established	GDA/Department of Farmer Cooperative
	2.5 Development, promotion and provision of rice production and market information	NA	30% of technology package for rice production are available to smallholders farmers and market information available through mobile phone established.	50% of technology package for rice production are available to smallholders farmers and 20% of market information available through mobile phone established.	70% of technology package for rice production are available to smallholders farmers and 50% of market information available through mobile phone established.	GDA/Department of Agricultural Extension, Dept. of Rice Crop, CARDI,

Program	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
	2.6 Conservation agriculture demonstration and extension program	Limited demonstrations by projects	Regular demonstrations by GDA and PDA	Regular demonstrations by GDA and PDA	Regular demonstrations by GDA and PDA	GDA/PDA
	2.7 Land levelling demonstration and promotion activities	Limited demonstrations by projects	Regular demonstrations by GDA and PDA	Regular demonstrations by GDA and PDA	Regular demonstrations by GDA and PDA	GDA/PDA
	2.8 Alternative wetting and drying rice system demonstration and promotion of efficient water use management	Limited demonstrations by projects	Regular demonstrations by GDA and PDA	Regular demonstrations by GDA and PDA	Regular demonstrations by GDA and PDA	GDA/PDA
	2.9 Weather indexed crop insurance and early warning system	Rice-SDP starting pilot	10% of farmers covered by insurance	50% of farmers covered by insurance	80% of farmers covered by insurance	GDA MEF
	2.10 Soil mapping and improved soil fertility management	Pilot in nitrogen efficiency	10% soil mapped and 10% of farmers adopt soil fertility management practices	50% soil mapped and 50% of farmers adopt soil fertility management practices	100% soil mapped and 100% of farmers adopt soil fertility management practices	Dept. of Soil Resources Management
	2.11 Identify prevalent pests and diseases and methods to fight them	Pilots on training of pests and disease control	List of pests and diseases and training of farmers	50% of farmers adopting improved methods of pest and diseases control	100% of farmers adopting improved methods of pest and diseases control	GDP/Department of Plant Protection
	2.12 Improved in-farm water management extension work	NA	Demonstrations by GDA and adoption by 10% of farmers	Demonstrations by GDA and adoption by 50% of farmers	Demonstrations by GDA and adoption by 100% of farmers	GDA/Dept. of Agricultural Engineering, and Dept. of Rice Crop

Program	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
3. Postharvest	3.1 Reduction of post-harvest losses through demonstration and extension programs	25% post-harvest loss and fewer quality milling machines	15% post-harvest loss	10% post-harvest loss	5% post-harvest loss	GDA/Dept. of Agricultural Engineering, and Dept. of Rice Crop
	3.2 Support development of drying service providers	NA	5% of drying through service providers	10% of drying through service providers	30% of drying through service providers	GDA/Dept. of Agricultural Engineering, and Dept. of Rice Crop
	3.3 Develop warehouse receipt system	NA	10% of rice warehouse and stock	30% rice warehouse and stock	50% of rice warehouse and stock available	GDA/Department of Agricultural Engineering
4. Marketing and Trade	4.1 Improve rice export associations	NA	Provincial associations established	National associations and federation established	National federation active in promoting sector and advocating policies	GDA/Department of Cooperatives
	4.2 Promote brand of Cambodia rice	NA	Cambodia brand rice representing 20% of trade in international market	Cambodia brand rice representing 30% of trade	Cambodia brand rice representing 500% of trade in international market	GDA/Department of Industrial Crops

Program	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
	4.3 Promote market information technologies	NA	Establish mobile information sharing on technology, market demand, and price	30% adopt and use of the information technology, market demand, and price	80% adopt and use of the information technology, market demand, and price	Department of Agricultural Extension and Dept. of Rice Crop
	4.4 Promote establishment of market infrastructure to strengthen linkages of farmers to markets.	NA	Feasibility studies for investment in market infrastructure for agricultural cooperatives. 30% of cooperatives have improved access to market infrastructure.	90% of cooperatives have improved access to market infrastructure.	100% of cooperatives have improved access to market infrastructure.	Department of Agricultural Cooperatives

8.3 MAIZE PROGRAM

8.3.1 Overall Description of the Maize Value Chain

166. Maize is produced throughout Cambodia and North-West provinces and Kampong Cham province are the largest producers. Worldwide production was over 880 million metric tons (mmt) surpassing both wheat (729 mmt) and rice (738 mmt). While maize is grown primarily as livestock and animal feed in much of the world, 60 percent of maize produced in Cambodia is grown for feed, 20% for human consumption, 15% for industrial products, and 5% for farmer seeds.

167. Maize is the third largest crop produced in Cambodia after rice and cassava. The maize industry is important to the economy both as an employer and earner of foreign currency because of its multiplier effects. This is because maize also serves as a raw material for manufactured products such as ethanol, paper, paint, textiles, medicine and food.

168. The maize industry is also an important earner of foreign exchange for producers through the export of maize and maize products. The industry exports mostly to Thailand, Vietnam and China. The international maize market, especially the Chinese market, has a dominant influence on the local exports.

169. Maize producers makes limited use of modern inputs. Including modern seed and fertilizer. Subsistence farmers make up 90%-95% of the maize farmers nationally and contribute over 80% of the total marketed volume. They cultivate maize on landholdings of minimum less than one hectare and use traditional methods of farming. The subsistence farmers are usually scattered and mainly carry out maize production for home consumption with little surplus available for sale. The marketing of the maize output is done individually due to mistrust amongst farmers, lack of a central collection place and poor storage facilities. As a result, the subsistence farmers end up selling the maize surpluses at the farm gate, immediately after harvest to the rural traders and agents, who often set the prices. The subsistence farmers usually have no wide choice of buyers.

170. Commercial farmers currently make up about 5%-10% of the maize farmers nationally and contribute about 20% of the marketed maize volume. The commercial farmers often devote more than 2 ha to maize production and are increasingly adopting modem farming methods and crop husbandry practices. They produce maize specifically for sale and often market it during the off peak season to urban traders both within and outside their respective provinces. The commercial farmers sell in bulk and improve on maize quality to obtain better prices.

171. Integrated farming systems, including maize, are generally poorly developed, though in some areas maize is often grown in rotation or intercropped with beans or other upland crops.

172. Most maize producers are small scale farmers typically cash-constrained which often force sales immediately after harvest, when prices are at their lowest level. Limited on farm

storage capacity is a major constraint and prevent effective marketing options for farmers. Also from harvest to marketing time, around one-third of maize production is lost at the village level. Generally, farmers sell their production in local markets or directly to small-scale traders. At times, they sell to secondary markets through local traders. This kind of trading can cause many difficulties such as: (1) prices could be much lower (but maybe not enough to compensate for transport costs);(2) Traders may not have sufficient cash; and (3) farmers may wait for a long time to get paid.

173. Most trade is on an informal basis (i.e. no written contracts, lack of access to information services and poor infrastructures). Most traders collect maize at the village gate and sell to wholesalers who operate in main and secondary markets. Working in primary markets, traders are paid commissions by wholesalers and borrow trucks from them. They operate with cash and bags and receive instructions for pricing, quantities, quality, coordination of purchases and transportation.

174. Wholesalers store maize for five to six months before selling them at much higher prices to retailers. Large-scale trade also takes place at the regional level (Vietnam, Thailand, and China), and at the national level with some trans-border trade. They own the necessary capital to finance large trade operations, and they possess terminals and warehouses in key terminal and retail markets.

175. In Cambodia, retailers only sell a few tons a month or less and have small liquid funds for purchases. Their marketing outlets mostly concern terminal and urban consumers, and they sell maize as well as some rice, beans, sesame, and other crop grains. Most retailers are supplied by wholesalers despite the fact that they can purchase at the farm gate. A few farmers also work as occasional retailers, according to their family and kinship ties, as do small-scale rural traders.

176. Various nodes of a given marketing channel are composed of marketing networks led generally by the wholesalers and semi-wholesalers operating in wholesale markets. These networks have ramifications through collecting markets (grouping) and rural producers' markets, as well as through export regional markets. They are in general composed by stakeholders, whose business relationships are based on trust, kinship or parental relationships. In Cambodia, maize production is becoming more of a commercial activity, and more contracting arises exclusively among the stakeholders of the marketing channels.

177. Since maize market liberalization, farmers and other stakeholders have faced increased market and production risks in Cambodia. First, farmers have to choose their marketing channel, then they must decide when and how much to sell and when and how to store. The absence of insurance markets is often explained by high transaction costs, geographical remoteness and risk covariance at the local level. Although the development of such markets requires a strong financial framework, enhancing access to information through new technologies and communication could help spread these schemes.

178. The maize sector continues to be hampered by multiple market and institutional failures. Institutional obstacles include the lack of an effective legal system and weak

commercial and market transactions, all of which limit the growth potential for the agro-processing sector.

179. Infrastructural constraints (particularly transport and communications) are a major cause of the low long-run supply response of farmers to price incentives. Cost-effective ways to provide infrastructure may involve user communities in maintaining existing infrastructures with their own-managed funds. Productivity benefits could be achieved by improving off-road transport and intermediate means of transport with capital-savings techniques for road construction, using labor based techniques to overcome usual problems related to equipment use and availability in the region.

8.3.2 Key Issues in the Maize Value Chain

180. **Production:**

- Few farmers use fertilizer or purchase improved seeds.
- Uncertainty about rainfall (which affects returns) and lack of credit are constraining factors.
- Many farmers are poorly educated, and the limited reach of extension and business development services further reduces their access to new technologies, innovations, and financial services
- Maize yield depends on good rainfall, with little use of irrigation or water harvesting:
    - Rainfall varies from year to year and this unpredictably adds to farmers' uncertainty.
    - Because of dietary preferences, some farmers plant maize in areas unsuitable for the crop.

181. **Lack of storage:**

- Sharp seasonal fluctuations in maize prices (particularly in remote areas) suggest insufficient storage by farmers and traders.
- Storage is limited by liquidity constraints, capacity, and high storage losses (storage losses are higher for maize than for other crops).

182. **Lack of grades.** Maize is often not fully dried at the farm nor is it fumigated, resulting in the need for further drying and sometimes fumigation by traders. The absence of standardized grades requires the quality of produce to be manually checked. As a result of both of these factors, maize is repeatedly packed and unpacked during marketing, creating inefficiencies in the market chain. Poor drying at initial stages in the marketing chain can result in high levels of aflatoxins which are unobserved throughout the rest of the marketing chain.

183. **Fragmented sales by small numbers of farmers**:

- Less than one-quarter of maize farmers sell any maize.
- Farmers are predominantly selling small amounts of maize in the village to traders.
- Aggregation is time consuming and costly, contributing to low farm prices.
- Farmers lack information about prices in nearby markets and also lack cost-effective means of transporting maize individually. However low levels of trust between farmers limit collective sales or transportation.

184. **Market imperfections and market incompleteness**

- Deficiencies in extension services also explain the lack of viable input credit schemes and the possibility to scale them up with more thoroughly managed arrangements.
- Access to credit is also problematic when considering the few risk-mitigation strategies of rural entrepreneurs. Farmers' cash supplies run low at critical points in the year. Since farmers have limited or no access to loans, this leads to difficulties in covering critical expenses:
    - This creates a vicious cycle with farmers' inability to afford improved inputs resulting in poor crop yields, low incomes and inability to afford inputs for the following harvest — in short, a repeating cycle of hardship.
    - This in turn leads to farmers selling crops immediately after harvest, when prices are lowest, in order to have cash to cover expenses.

- Inadequate credit support is among the major constraints to the development of an efficient and self-propelling maize supply chain. Notably, commercial banks or MFIs normally require physical assets as collateral before availing credit to the beneficiaries rather than usage of maize stock inventories.
- Most maize farmers have no direct access to markets or means of transporting large quantities of maize to market. They also have limited (or no) access to market information:
    - Farmers are consequently subjected to the low prices offered at the farm gate by local traders.
    - Traders capture a disproportionate amount of profit compared with farmers.
- Widely varying prices for maize from year-to-year:
    - Creates significant additional uncertainty.

185. **Failure to develop contractual arrangements amongst the maize supply chain.**

- The reliance on-spot cash-based market transaction raises transaction costs and hinders private sector institutional development. The failure to develop contractual arrangements between participants of value chains has led to parasitic behavior and on and off seasonal participants within the maize supply chain, which increases uncertainties.
- Weak farmers' organizations, lack of business skills and traditional attitudes to markets, leads to the disaggregation of supply and a limited ability to meet the quality and quantity of maize required for commercial contracts.

186. **Inaccessibility to information by producers and traders.** The poor information flow between the various participants constrains development of a competitive and efficient maize supply chain. In reality, access to information by individual participants is used to one's advantage at the expense of other participants within the maize supply chain.

Figure 5 SWOT Analysis of the Maize Sub-Sector in Cambodia

8.3.3 Opportunities for the Maize Value Chain

187. Becoming a major supplier to the regional feed industry
Development of processing industry for food and non food uses

8.3.4 Vision and Targets for the Maize Value Chain

188. Supported by a clear program for maize development, the value chain can reach a value of half a billion USD by 2030, while developing agroprocessing and improving returns to land.

Table 28 Indicators and Targets for the Maize Value Chain

Indicator	Unit	2015	2020	2025	2030
Area	ha	143,517	201,290	282,320	360,319
Yield	kg/ha	3.8	4.7	5.7	6.9
Production	000 ton	550	938	1,600	2,485
Farmgate price	$/kg	0.200	0.20	0.20	0.20
Value of Production	$ million	110	188	320	497
Volume for domestic consumption	000 ton	450	737	1,196	1,671
Volume exported without processing	000 ton	100	201	405	814
Volume processed in Cambodia	000 ton	135	271	546	1,098
Volume exported with processing	000 ton	-	136	327	768.28
Price of processed product	$/kg	0.26	0.26	0.26	0.26
Export Value (fresh and processed)	$ million	20	75	166	362
Value of Processed products	$ million	-	35	85	200
Value Added in processing	$ million	8	16	33	66
Total Value (production, processing, marketing)	$ million	118	204	353	563
Total Value/ha	$/ha	822	1013	1250	1562
Labor in production	no.	17,222	24,155	33,878	43,238
Labor in postproduction	no.	674	1356	2728	5488
Return to labor in production	$/day	13	16	19	23
Return to labor in postproduction	$/day	9.60	9.60	9.60	9.60
Farmer income/ha	$/ha	383	466	567	690

8.3.5 Subprogram and Activities for the Maize Value Chain

189. The maize value chain strategy requires implementing by the Department of Industrial Crop in collaboration with Department of Agricultural extension and CARDI under GDA. The Department in the support by GDA and MAFF should carry out the following tasks:

- Develop a unique, acknowledged National Maize Development Strategy that is based on up- to-date sub-sector information and revised policies. The strategy should be prepared jointly by the public and private sector, and respond to concerns and aspirations of all involved. It must have a strong market focus, looking at the costs, benefit and incentives for different actors' participation. It would be based on

existing capacity, and the reality and economics of doing business in Cambodia as a whole. It should also cover green agriculture opportunities, environmental impact, as well as the economic, political and social implications of the anticipated growth in Cambodia's maize sub-sector.

- Strengthen existing maize value chains by priority interventions in more productive Agro-Ecological Zones, especially looking at improved market linkages. To focus on:
  - Opportunities to continue to improve the capacity, professional management and market understanding of farmers' groups;
  - Opportunities to help large and medium-scale traders and processor reach out to organized small-scale farmers' groups and develop contacts and contracts;
  - Opportunities to increase business formalization, and improve professional standards of small and medium-scale millers.
- Develop green agricultural approaches for the maize sub-sector. This includes better farming systems to improve soil fertility (with, for example, great potential for increased use nitrogen fixation intercropping such as mungbean and soybean), on-farm water management systems to improve available soil moisture, and improved tillage systems such as conservation agriculture).
- Develop new markets, including:
  - Opportunities to introduce yellow maize production and processing;
  - Opportunities to develop export markets to neighboring countries.

Table 29 Subprograms and Activities of Maize Value Chain

Subprogram	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
1. Value Chain Assessment	1.1 Assess current actors involving in maize production and marketing	NA	Statistical data of maize value chain available for public sector, traders, and producers	Follow up study	Follow up study	GDA/Department of Industrial Crops
	1.2 Establish a national statistical system for data collection and sharing	NA	Statistical data system established in at least 10 key agricultural production provinces	Statistical data system established and expanded to in at least 20 key agricultural production provinces	Statistical data system established in all 25 agricultural production provinces	Department of Planning
2. Production	2.1 Research program on maize	NA	Select xx OPV varieties and test different hybrids available from private sector	Select xx OPV varieties and test different hybrids available from private sector	Select xx OPV varieties and test different hybrids available from private sector	GDA/Department of Industrial Crops CARDI
	2.2 Improve seed certification and nursery system	NA	30% Improved maize seeds, fertilizers, and agricultural inputs	60% Improved maize seeds, fertilizers, and agricultural inputs	90% Improved maize seeds, fertilizers, and agricultural inputs	GDA/Department of Industrial Crops, and

Subprogram	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
	2.3 Promote technical and service supported to maize production for subsistent farmers and commercial farmers	NA	Extension material and services available to producers and 30% adopted by producers	Extension material and services available to producers and 70% adopted by producers	Extension material and services available to producers and 100% adopted by producers	GDA/Department of Industrial Crops CARDI
	2.4 Develop green agricultural approaches for the maize	N/A	20% of green agriculture package (better use of alternating crops, water management, soil management, etc.) introduced and adopted.	30% of green agriculture package introduced and adopted.	50% of green agriculture package introduced and adopted.	GDA/Department of Industrial Crops
	2.5 Establish ICT center for providing information of technology and pricing	NA	Introducing ICT to maize producers and traders and 20% adopted.	Introducing ICT to maize producers and traders and 40% adopted.	Introducing ICT to maize producers and traders and 60% adopted.	GDA/Department of Extension and Crop Industry
	2.6 Identify prevalent pests and diseases and methods to fight them	Pilots on training of pests and disease control	List of pests and diseases and training of farmers	50% of farmers adopting improved methods of pest and diseases control	100% of farmers adopting improved methods of pest and diseases control	GDP/Department of Plant Protection
	2.7 Improved in-farm water management extension work	NA	Demonstrations by GDA and adoption by 10% of farmers	Demonstrations by GDA and adoption by 50% of farmers	Demonstrations by GDA and adoption by	GDA/Dept. of Agricultural Engineering, and

Subprogram	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
					100% of farmers	Dept. of Industrial Crops
3. Postharvest	3.1 Develop knowledge of storage facility and warehouse	NA	Technical of post-harvest technology and storage introduced and 30% adopted.	Technical of post-harvest technology and storage introduced and 50% adopted.	Technical of post-harvest technology and storage introduced and 70% adopted.	GDA/Department of Agricultural Engineering DA/Department of Agroindustry
	3.2 Promote establishment maize processing plants	NA	At least 2 processing plants per maize key production provinces established	At least 4 processing plants per maize key production provinces established	At least 6 processing plants per maize key production provinces established	GDA/Department of Agricultural Engineering DA/Department of Agroindustry
	3.3 Develop processing knowledge and skill for smallholders SME	NA	30% of SME adapt the skill and knowledge introduced	50% of SME adapt the skill and knowledge introduced	70% of SME adapt the skill and knowledge introduced	GDA/Department of Agricultural Engineering DA/Department of Agroindustry
4. Marketing and Trade	4.1 Promote market linkages and development for exports	NA	40% of Cambodian maize traders link to import-export international markets	60% of Cambodian maize traders link to import-export international markets	80% of Cambodian maize traders link to import-export international markets	GDA/Department of Industrial Crops Department of Plant Protection, and Phyto-Sanitation

Subprogram	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
	4.2 Promote contract farming practices between producers, agricultural cooperatives and traders and processors	N/A	30% of producers and agricultural cooperatives established contract arrangement with processors and traders	50% of producers and agricultural cooperatives established contract arrangement with processors and traders	70% of producers and agricultural cooperatives established contract arrangement with processors and traders	GDA/Dept. of Industrial Crops, Dept. of Agro-industry, Dept. of Extension, Dept of Agricultural Cooperatives, and PDAs

8.4 CASSAVA PROGRAM

8.4.1 Overall Description of the Cassava Value Chain

190. Cambodia cassava production has grown tremendously over the last 10 years. In 2004, the volume of production of cassava was 10% of the rice production volume, and in 2014, it was 2 million tons more than rice. This rapid growth has often come at the cost of depletion of soil fertility.

191. Most of the production is exported (informally) fresh or dry to neighboring Vietnam and Thailand. Formal exports go mostly to China. Processing technologies are poor, and often damaging to the environment because of limited capacity to manage agricultural waste.

192. The cassava agroindustry is not very organized. Small companies lack in technology and market access. Larger companies are still in the learning process of how to procure large supplies.

193. Cassava is a crop very versatile in its uses. The main uses of the crop include: food, feed, starch and ingredients, energy (bio-ethanol), and alcohol. Starch and ingredients have a number of uses in food industry (eg noodles), glucose, dextrose, lysine, MSG, glue, paper industry, pharmaceutical industry (coating), etc. Cambodia uses of cassava for food is marginal (less than 1% of total). Use of cassava for energy has not been very successful in the past due to both supply chain management issues and declining fossil fuel prices.

194. Uses for feed and starch are very limited in Cambodia. Most of the production is exported (informally) as fresh cassava to neighboring countries.

8.4.2 Key Issues of the Cassava Value Chain

195. The extremely rapid expansion in cultivation and production of cassava over the past 10 years is likely to reduce. On the supply side, the constraints will be from the increasing limitations on the use of forest land or degraded forest, declining soil fertility (which will accelerate unless plant and soil nutrient management is improved), and scarcity of labor (which could be partly remedied with increasing mechanization). On the demand side, the growth for different uses of cassava might reduce as the result of substitutes. However, even a reduction of growth to single digit level, would provide a great opportunity for Cambodia value chain to redefine itself as a sustainable and competitive industry.

196. The key issue is to ensure the sustainability of the sector, both at the production and processing levels.

197. On the production side, good agricultural practices need to be introduced, implying the use of better planting materials, improved weeds management, sustainable plant protection measures, adequate plant and soil nutrition, and appropriate harvesting. The sector needs a system of well-functioning nurseries capable of producing good planting material; this system can benefit from the use of improved germplasm from neighboring countries (Vietnam and Thailand) promoted, with the support of CIAT. Management of pests and diseases also requires considerable improvement as cassava is a plant subject to a number of such attacks. A program of agricultural extension and certification of good practices should be established to ensure the sustainability of the value chain.

198. At the same time, management of agricultural wastes in processing is essential to assure that effluents are not discharged untreated into water bodies or soils, solid wastes are also used and dispersed in an environmentally sound manner, and air pollution and smells are reduced within acceptable levels.

199. The competition from Thailand and Vietnam is particularly strong as both countries have a more advanced value chain and the agroindustrial structure (particularly in Thailand) to process cassava is very sophisticated. While Cambodia might have a comparative advantage in production, Thailand and Vietnam have more a comparative advantage in processing and logistics, and marketing. Over the next 15 years this could be rebalanced, provided that Cambodia has a clearly articulated strategy and plan to catch up with its two neighbors in the cassava industry.

8.4.3 Opportunities for the Cassava Value Chain

200. Cassava has a tremendous opportunity in Cambodia as a crop that could lead to considerable employment generation and, particularly, high value added in a number of agroindustrial activities related to the production of feed, starch and ingredients, and also alcohol. These opportunities could be seized by farmers, SMEs, and medium and large enterprises, and rural labor (hired both as agricultural workers and agroindustrial workers).

Figure 6 SWOT Analysis of the Cassava Sector in Cambodia

8.4.4 Vision and Targets for the Cassava Value Chain

201. The vision for the cassava value chain is for Cambodia to be the leader of cassava production and processing in Southeast Asia together with Thailand. Cambodia is already among the 10 largest producers in the world, and, if the current growth continues, it is likely to be among the largest 5 producers in the world and perhaps **the largest producer in Asia.**

202. This large production capability can be sustained only if value added is produced in the country. Value added in the cassava industry is considerable and can reach almost twice the value of production. The return to labor and land from this dramatic shift could be substantial as well and contribute to overall welfare improvement through expansion of productive employment.

203. From its current estimate value of USD 770 million, by 2030, the industry could be worth $2,720 million per year, representing an increase of almost USD 2 billion. Return to labor in production increases from $14/day to $22/day and in postproduction from #12.85/day to $26/day. Farm income per ha increase from $551/ha to $860/ha.

8.4.5 Subprogram and Activities for the Cassava Value Chain

204. The Strategy will combine measures at the production level with measures in the postproduction chain. At the production level, it is imperative for Cambodia to establish linkages with CIAT (international center within CGIAR) and related research organizations in Thailand, China, and Vietnam to promote exchange of germplasm and adoption of improved varieties (with higher yield, amylose content, and more resistant to pests and diseases). GDA could also establish an extension program for sustainable cassava production, ensuring the soil fertility is maintained and no infringement in forest land occurs. Integrated nutrient management (INM) is recommended.

205. In the postprodution side, one of the most important issues to deal with is the agricultural waste management. Demonstration and capacity building in environmentally sound methods of processing will be promoted. At the same time, the private sector needs to be attracted to establish a number of value added activities including feed, starch, ingredients. SPS compliance should be ensured through inspection, laboratory analysis, and risk assessment.

Table 30 Indicators and Targets for Cassava Value Chain

Indicator	Unit	2015	2020	2025	2030
Area	ha	515,293	626,933	692,184	692,184
Yield	ton/ha	23.2	27	30	31
Production	ton	11,943,204	16,845,103	20,534,087	21,581,531
Farmgate price	$/ton	59.40	62.43	65.61	68.96
Value of Production (fresh roots)	$ million	709	1,052	1,347	1,488
Production Processed in Cambodia	%	0	10%	50%	100%
Percentage of production processed as chips/pellets	%	10%	20%	30%	50%
Percentage of production processed as starch	%	2%	10%	25%	45%
Export Price of chips/pellets	$/ton	220	237.00	255.32	275.05
Export Price of starch	$/ton	430	463	499	538
Volume of Chips/pellets	ton	543,416	1,532,904	2,802,903	4,909,798
Volume of Starch	ton	59,716	421,128	1,283,380	2,427,922
Export Surplus / Exports Fresh Cassava	ton	10,510,020	11,791,572	9,240,339	1,079,077
Export Surplus Processed Chips/pellets	ton	543,416	1,532,904	2,802,903	4,909,798
Exports Surplus / Exports Starch	ton	59,716	421,128	1,283,380	2,427,922
Value of Export Surplus / Exports	$ million	770	1,295	1,962	2,730
Value Added in processing and exports	$ million	60	243	615	1,242
Total Value (production, processing, marketing)	$ million	770	1,295	1,962	2,730
Total Value/ha	$/ha	1493	2065	2835	3944
Labor in production	no.	82,447	100,309	110,750	110,750
Labor in postproduction	no.	3742	11062	21253	37588
Return to labor in production	$/day	14	17	19	22
Return to labor in postproduction	$/day	12.85	17.57	23	26
Farmer income/ha	$/ha	551	671	779	860

Table 31 List of Subprograms and Activities – Cassava

Program	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
1. Value Chain Assessment	1.1 Detailed assessment of the value chain, including production and marketing completed by 2016.	CEDEP II Study	Follow up Study	Follow up Study	Follow up Study	GDA/Department of Industrial Crops
	1.2 Statistics System Established	Weak system of statistics	Organized system of statistics on production, exports, and domestics prices	Organized system of statistics on production, processing, exports, and domestic and international prices	Organized system of statistics on production, processing, exports, and domestic and international prices	Department of Planning
2. Production	2.1 Establish relations with Cassava Research Organizations internationally (eg CIAT) and regionally (eg Thailand Vietnam).	NA	Ongoing collaboration programs	Ongoing collaboration programs	Ongoing collaboration programs	GDA/Department of Industrial Crops CARDI
	2.2 Carry out a selection program of most promising varieties.	NA	Classification of varieties used in Cambodia	Purifying 2-3 varieties from Cambodia	Developed 2-3 Cambodia varieties	GDA/Department of Industrial Crops CARDI
	2.3 Promote system of nurseries certification	NA	Survey of all nurseries and list of certified nurseries	All nurseries are certified		GDA/Department of Industrial Crops

Program	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
	2.4 Establish GAP for sustainable cassava production	NA	GAP established and certification program in place	20% of production area is certified	50% of production area is certified	GDA/Department of Industrial Crops
	2.5 Establish an extension program for dissemination of GAP	NA	GAP adopted by 50% of farmers	GAP adopted by 80% of farmers	GAP adopted by 100% of farmers	GDA/Department of Extension Department of Plant Protection, and Phyto-Sanitation
	2.6 Identify prevalent pests and diseases and methods to fight them	NA	List of pests and diseases and training	50% of farmers adopting improved practices	100% of farmers adopting improved practices	GDP/Department of Plant Protection
	2.7 Soil mapping and improved soil fertility management	NA	10% soil mapped and 10% of farmers adopt soil fertility management practices	50% soil mapped and 50% of farmers adopt soil fertility management practices	100% soil mapped and 100% of farmers adopt soil fertility management practices	Dept. of Soil Resources Management
	2.8 Improved in-farm water management extension work	NA	Demonstrations by GDA and adoption by 10% of farmers	Demonstrations by GDA and adoption by 50% of farmers	Demonstrations by GDA and adoption by 100% of farmers	GDA/Dept. of Agricultural Engineering, and Dept. of Indutrial Crops
3. Processing	3.1 Establish a demonstration site for small and medium processing enterprises.	NA	Technologies for cassava processing well known in Cambodia.			GDA/Department of Agricultural Engineering GDP/Department of Agroindustry

Program	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
	3.2 Investment fund for SME startup	NA	SME processing 10% of total production	SME processing 20% of total production	SME processing 30%	GDA/Department of Agricultural Engineering GDP/Departent of Agroindustry
	3.3 Program for agricultural waste management	NA	20% of waste treated	60% of waste treated	100% of waste treated	GDA/Department of Agricultural Engineering GDP/Departent of Agroindustry
	3.4 Promotion of large processing enterprises	NA	Large enterprises processing 10% of total production	SME processing 50% of total production	SME processing 70%	GDA/Department of Agricultural Engineering GDP/Departent of Agroindustry
4. Marketing and Trade	4.1 Promote associations of producers and exporters	NA	Provincial associations established	National associations and federation established	National federation active in promoting sector and advocating policies	GDA/Department of Cooperatives

8.5 MUNGBEAN PROGRAM

8.5.1 Overall Description of the Mungbean Value Chain

206. Mungbean production is mainly (90%) situated in Asia: India is the largest producer with more than 50% of world production but consumes almost its entire production. China produces large amounts of mungbeans, which represents 19% of its legume production. Thailand is the main exporter and its production increased by 22% per year between 1980 and 2000.

207. World mungbean prices are largely determined by both the volume of production and quality of the crops in China and Burma, and as a result are constantly responding to supply issues in these exporting countries.

208. Price trends usually become obvious in December when harvest of the Chinese crop nears completion, and both the volume and quantity of production in that country is more apparent.

209. Mungbeans are classified into four grades for marketing purposes:

- sprouting-grade beans
- cooking-grade beans
- number 1 processing-grade beans
- processing-grade beans
- manufacturing

210. Less than 5% of the total mungbean crop goes into the sprouting market. Processing grade is a broad classification for lower quality beans. Prices can vary by as much as $150 per tonne at any time of the year for beans within this broad processing grade classification depending on appearance and quality i.e. whether good or poor quality processing grade.

211. Mungbean can be used as a cover crop before or after cereal crops. It makes good green manure. The mungbean is an N-fixing legume that can provide large amounts of biomass (7.16 t biomass/ha) and N to the soil (ranging from 30 to 251 kg/ha). Green manure should be ploughed in when the plant is in full flower.

212. Mungbeans are rich in protein (20-30% DM) and starch (over 45% DM) with a low lipid content (less than 2% DM), and variable but generally low amounts of fiber (crude fiber 6.5% DM on average). The amino acid profile of mungbeans is similar to that of soybean. The by-product of mungbean vermicelli processing contains 11-23% crude protein, 0.4-1.8% ether extract, 13-36% crude fiber, 0.30-0.68% calcium and 0.17-0.39% phosphorus depending on the mungbean material.

213. In Cambodia, mungbean is cultivated nationwide especially in lowland area and along the rivers. It is usually cultivated at the same land as the second crop after main crop such as rice. Apart from giving a production, mungbean can improve soil fertilizer.

214. MAFF reported that 53,294 hectare cultivated in 2014, worth 74 million USD. The export volume increased dramatically from 9.100 tonnes in 2014 to 10,300 tonnes in 2015.

215. Mungbean in Cambodia is mostly processed as dessert, beverage and animal fed.

8.5.2 Key Issues of the Mungbean Value Chain

- Limited access to high yielding varieties
- Limited technologies for cleaning, grading, and packaging
- Hardly any processing
- Limited knowledge of international market
- Low quality beans due to no quality standard and lack of extension technologies
- Insufficient bean supply due to disorganized supply chain
- Lack of mungbean industry organization, quality assurance programs, technology, relationship in the chain

8.5.3 Opportunities for the Mungbean Value Chain

216. Growing demand in international markets outside traditional markets of India and China. Use as a healthy "grain".

8.5.4 Vision and Targets for the Mungbean Value Chain

217. Engage in a new crop that is suitable for exports and provide crop rotation advantages for soil fertility and additional income after the main rice season.

8.5.5 Subprogram and Activities for the Mungbean Value Chain

218. A number of measures to ensure that productivity increases are realized by farmers and mungbean become part of the research and extension work of MAFF.

Pure seed of the improved variety must be available at a reasonable price in sufficient quantities in time for farmers to plant. The management technologies associated with the improved variety in specific locations need to be defined and made available as a package to farmers. The national policies and government institutions must be committed to extend the technology to farmers.

Increasing Productivity and Area Planted - If the total mungbean production is to increase rapidly, both the yield must be improved and the area planted with mungbean must be increased. This will require:

- Improved access to all inputs (ranging from improved seed varietals, inoculant, herbicide, fertilizer, etc.) for smallholder farmers across the country
- Improved practices, including better land preparation, planting, cultivation and harvesting and application of inputs (including through soil testing)
- Increased irrigation to reduce variability in yields
- Increased use of mechanization by smallholders to increase the land that can be cultivated
- Improving market efficiency as production rises, it will be crucial to ensure that the increased mungbean volumes reach the market and that the producers receive a fair price. This will require:
  - The market must be made more efficient to ensure that all farmers have access to price information and reduce the margin extracted by traders and brokers

        - Mungbean produced by smallholders must be aggregated more efficiently to make working with smallholders more attractive to processors and international traders
        - The risks associated with mungbean production (yield variability, price variability) must be reduced by creating risk mitigating products (e.g., insurance products, contract farming, futures contracts)
    - Improving storage:
        - The quality of storage facilities across the productive provinces must be established and improved to increase the volume that reaches market, ensures a stable supply for processors and allows farmers to get the best price for their produce
    - Access to Finance
        - Access to finance must be improved to allow farmers to invest in small-scale irrigation systems, increase the area under cultivation, and enable smallholders to purchase better inputs
    - Processing
        - Food safety must be improved to ensure that market requirements for mungbean by products and food products are met.

Figure 7 SWOT Analysis of the Mungbean Sector in Cambodia

Table 32 Indicators and Targets for Mungben Value Chain

Indicator	Unit	2015	2020	2025	2030
Area	ha	53,294	58,841	64,965	71,727
Yield	ton/ha	1.14	1.32	1.53	1.69
Production	ton	60,652	77,630	99,362	121,121
Farmgate price	$/kg	1.25	1.25	1.25	1.25
Value of Production	$ million	76	97	124	151
Exports as Percent of total Production	%	16.5%	35%	49%	58%
Export Price	$/kg	1.25	1.25	1.25	1.25
Exports Volume	ton	10,000	26,978	48,710	70,469
Value of Exports	$ million	12.50	33.72	60.89	88.09
Total Value/ha	$/ha	1,423	1,649	1,912	2,111
Labor in production	no.	17,765	19,614	21,655	23,909
Return to labor in production	$/day	12	14	16	18
Farmer income/ha	$/ha	996	1,154	1,338	1,478

Table 33 List of Sub-programs and Activities – Mungbean

Program	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
1. Value Chain Assessment	1.1 Detailed assessment of the value chain, including production and marketing completed	NA	Based on initial study of 2016, follow up study	Follow up Study	Follow up Study	- GDA/Department of Industrial Crops CARDI - CARDI
	1.2 Statistics System Established	Weak system of statistics	Organized system of statistics on production, local use, exports, and domestics prices	Organized system of statistics on production, processing, exports, and domestic and international prices	Organized system of statistics on production, processing, exports, and domestic and international prices	- GDA/Department of Administration, Planning, Accounting and International Cooperation - Department of Planning
2. Research Capacity	2.1 Improve ability of crop station	Limited resource and infrastructure	Ongoing development program	Ongoing development program	Ongoing development program	- GDA/Department of industrial crops
	2.2 Establish research collaboration with organization in India, China, Australia, and Thailand	NA	Ongoing collaboration	Ongoing collaboration	Ongoing collaboration	CARDI 'GDA/Department of industrial crops

Program	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
3. Production	3.1 Variety selection program	Few local varieties are being tested but no any comprehensive reports were made.	- Classification of varieties used in Cambodia and the most popular for export - Purifying and identifying 2-3 local varieties giving high yield, tolerant to insect infestation and climate change	- Developed 5-6 Cambodia varieties		- GDA/Department of Industrial Crops and Department of Plant Protection, Sanitary and Phyto-Sanitary CARDI
	3.2 Hybrid Varieties Piloting	NA	- Few hybrid varieties will be tested and identified	- 10% of total mungbean production will be from hybrid variety	- 30% of total mungbean production will be from hybrid variety	- GDA/Department of Industrial Crops and Department of Plant Protection, Sanitary and Phyto-Sanitary CARDI
	3.3 Registration of variety	NA	Few most popular local varieties will be registered as Cambodian mungbean varieties			- GDA/ Department of industrial crops CARDI GDP/National Agricultultural Laboratory Ministry of Commerce Ministry of Industry and Handicrafts

Program	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
	3.4 Standard Development	NA	National Mungbean standard will be in place and recognized as ASEAN Standard	National Mungbean standard will be in place and recognized as Global Standard		- GDA/ Department of industrial crops GDA/Department of Plant Protection, and SPS Ministry of Commerce Ministry of Industry and Handicrafts
	3.5 Establish an extension program for dissemination identified varieties	Limited	Technical booklets, posters and crop calendar will be in place	Ongoing Extension	Ongoing Extension	- GDA/Department of Extension and Department of Agricultural Cooperative Promotion
	3.6 Identify prevalent pests and diseases and methods to fight them	Pilots on training of pests and disease control	List of pests and diseases and training of farmers	50% of farmers adopting improved methods of pest and diseases control	100% of farmers adopting improved methods of pest and diseases control	GDP/Department of Plant Protection
	3.7 Improved in-farm water management extension work	NA	Demonstrations by GDA and adoption by 10% of farmers	Demonstrations by GDA and adoption by 50% of farmers	Demonstrations by GDA and adoption by 100% of farmers	GDA/Dept. of Agricultural Engineering, and Dept. of Industrial Crops
4. Processing	4.1 Establish a demonstration site for small and medium processing enterprises.	There are some enterprises using mungbean to make many kinds of food	Technologies for mungbean processing well known in Cambodia.	New 2-3 kinds of food made from mungbean introduced		- GDA/Department of Agricultural Engineering Department of Agroindustry RUA/Faculty of Agroindustry Ministry of Industry and Handicraft CAMCONTROL

Program	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
	4.2 Investment fund for SME startup	NA	2 SME will be established and 10% of production is used	3 SME will be established and 20% of production is used	5 SME will be established and 40% of production is used	- GDA/Department of Agricultural Engineering Department of Agroindustry RUA/Faculty of Agroindustry Ministry of Industry and Handicraft
	4.3 Animal Feed Factories promotion	NA	5% of total produce is used to make animal feed	10% of total produce is used to make animal feed	30% of total produce is used to make animal feed	- GDA/Department of Agricultural Engineering Department of Agroindustry
5. Marketing and Trade	5.1 Promote formation of Mungbean Association	NA	Associations covering all producing regions	Federation formed		
	5.2 Contract farming system introduced in the value chain	NA	Contracts with processors and traders established	30% of production under contract		

8.6 MANGO PROGRAM

8.6.1 Overall Description of Mango Value Chain

219. World production and trade of fresh tropical fruit is expected to expand over the next decade. Developing countries account for about 98 percent of total production, while developed countries account for 80 percent of world import trade. The major tropical fruits account for approximately 75 percent of global fresh tropical fruit production. Mango is the dominant tropical fruit variety produced worldwide, followed by pineapples, papaya and avocado.

220. Global production of mangoes was about 30.7 million tonnes in 2010, accounting for nearly 50 percent of world tropical fruit production, of which 2.7 million tonnes from Africa, 3.3 million tonnes from Latin America and Caribbean, 12.3 million tonnes from India, 6.3 million tonnes from China, 1.1 million tonnes from Pakistan, 1.2 million tonnes from Philippines and 1.8 million tonnes from Thailand and so on. Slightly more than 77 percent of world mango output was produced in Asia and the Pacific, 13 percent in Latin America and the Caribbean and 9 percent in Africa. India remains the world's largest mango producing nation, accounting for 40 percent of total global output, with was about 12.3 million tonnes.

221. The most significant increase in mango production for the Asia and the Pacific region was China; with nearly 8 percent compound growth and increased from 2.8 million tonnes in 2000 to nearly 6.3 million in 2010. Production in Mexico, the largest mango producing nation in Latin America and the Caribbean increased from 1.5 million tonnes in 2000 to 1.9 million tonnes in 2010. Asia and the Pacific should continue to be the most significant region for world mango production, supported by strong forecast growth in China, Thailand, the Philippines and India.

222. Mango is a common fruit tree in Cambodia and is originally from India and there are many varieties like Keo Romeath, Keo Chin, Phomsen, Kbal Damrey, Irwin which is a new variety imported from Taiwan by Mong Reththy Group.

223. The main producing season for all kinds of mango is between April and May. Over the last 10 years, Keo Romeath has become the most popular one both for local use and Cambodian export. This variety is able to provide two additional crops per year in the off-season during the period September to February, with the first off-season harvest occurring from September to November and the second off-season harvest from late January to February.

224. According to MAFF/GDA statistics, mango tree is grown in all 25 provinces in Cambodia and its cultivated area has reached 65,251 ha in 2014 compared with 23,980 ha in 2010. Mango tree cultivation in Kampong Speu Province is over 39,500 ha accounting for 60.5% of total mango planted area in 2014, followed by Kampot, Siem Reap, Battambang and Kratie. The total production is around 1,305,020 tons[5] with worth around USD$326million and an average yield of around 20 tons per hectare per season.

225. Cambodian mangoes are typically exported to Vietnam and Thailand informally by individual traders. Afterwards, they are packaged and then exported to China and other countries. Formal trade of mango from Cambodia is negligible. GDA/MAFF statistics indicate that export volume of mango was 600 ton in 2013, decreased to 30 tons in 2014 and rapidly increased to 9,117 tons in 2015. However,

[5] Most of this production is unutilized. The domestic consumption is about 15% of production.

informal export to Thailand and Vietnam is estimated to be more than 20.000 tons per year. ACI recent value chain studies suggests that exports might be closer to 30,000 tons per year.

226. There are few companies producing mango or part of their business is mango such as PRL Co, Ltd, Kirirom Food Production (K.F.P) Co, Ltd, Khmer Mango, Narith Cambodian Fresh Mangoes, Khmer Natural Fruit Plantation, NIJIRINJIN Co., Ltd, Fruit Nirvana, Path Chamnan, L.K.S Cambodia Ltd, Karona Natural Fruits, Yeung Shi Group Co.,Ltd, and Royal Trust Trading Co.,Ltd.

8.6.2 Key Issues for Mango Value Chain

227. Over the last 10 years, Keo Romeath has become the most popular mango variety both for local use and Cambodian export. Cambodian farmers are able to harvest three crops of Keo Romeath mango per year. The traditional "in-season" harvest is during April to May. The two off-seasons are during the period September to February, with the first off-season harvest occurring from September to November and the second off-season harvest from late January to February. However, off-season technology based on application of plant hormones is still new for most mango growers. Most farmers do not know how to apply plant hormones and as a consequence most of them do not have off-season harvest. Moreover, farmers tend to apply excessive doses of chemicals to mango tree, raising food safety and labor health concerns.

228. According to farmers Keo Romeath is a Cambodian variety, but there has not been any research or effort at registering this variety as Cambodian variety. There is hardly any extension work on mango with a few exceptions in Siem Riep. The most advanced mango farmers in Cambodia are located in Kandal and they have learned mango technologies from Vietnamese traders. However, in spite of Kandal being the most productive mango area in the country, the sustainability of mango production in the province is at risk, given the increasing value of land in the province due to the vicinity of Phnom Penh real estate market.

229. Marketing of mango for domestic use is poorly organized, without any major player providing quality assurance. Postharvest technologies in mango are rudimentary. The informal trade to Vietnam is better organized with farmers selling to traders who sell directly to Vietnam buyers. The traders negotiate the prices before harvest and usually take care of the harvesting of the mango trees. Most of the value added activities for further formal exporting are done in Vietnam.

230. There are few small companies involved in mango processing including dried mango, green mango salads, fermented mango, and mango juice. However, these products are mostly for domestic use and there are not yet brands of Cambodian companies.

8.6.3 Opportunities for Mango Value Chain

231. An increasing number of farmers and investors have become interested in mango cultivation over the past 5 years, encouraged by increasing prices and the opportunity of producing in the off-season. Large areas in Kampong Speu and other provinces are now covered with mango trees and the production is expected to increase substantially in the years to come.

232. The adoption of new technologies in production can increase yield considerably and also increase production during the off-season when prices are higher.

233. Some companies are also investing in more professional mango orchard and establishing trade linkages with high-value destination markets such as Korea and Singapore. Those markets require

more stringent SPS compliance and therefore imply investment in postharvest technologies by exporting companies.

234. The Keo Romeath variety should be tested and analyzed to understand if it is a Cambodian variety that could registered.

GAP for mango could be introduced to improve the quality and efficiency of mango cultivation.

Figure 8 SWOT Analysis of the Mango Sector in Cambodia

8.6.4 Vision for Mango Value Chain

235. The vision for mango is for Cambodia to become a major exporter of quality and safe mango, both in its fresh and processed form. Currently the value of production of mango is estimated to be already at $326 million. The value could increase to reach $1.6 billion by 2030 with export value reaching $220 million. Both returns to labor and land could be impressive; for return to labor increasing from $42/day to $136/day, and for return to land increasing from $4,000/ha to almost $13,000/ha.

Table 34 Indicators and Targets for Mango Value Chain

Indicator	Unit	2015	2020	2025	2030
Area	ha	65,251	83,279	96,543	101,467
Yield	ton/ha	20	26	30	31
Production	ton	1,305,020	2,125,740	2,856,817	3,155,703
Farmgate price	$/kg	0.25	0.32	0.41	0.52
Value of Production	$ million	326	678	1,163	1,640
Production Processed in Cambodia	%	0.0%	0.5%	1.0%	1.5%
Exports as Percent of total Production	%	2.3%	2.8%	3.2%	3.7%
Export Price of fresh product	$/kg	0.50	0.64	0.81	1.04
Export Price of processed product	$/kg	1.00	1.28	1.63	2.08
Exports Volume of fresh mango	ton	30,000	59,521	91,418	116,761
Export Volume of processed mango	ton	-	10,629	28,568	47,336
Value of Exports of Fresh Mango	$ million	15.00	37.98	74.46	121.37
Value of Exports of Processed Mango	$ million	-	13.57	46.53	98.41
Value of Exports	$ million	15.00	51.55	120.99	219.78
Value Added in processing and exports	$ million	8	33	84	159
Total Value (production, processing, marketing)	$ million	334	711	1,247	1,799
Total Value/ha	$/ha	5115	8535	12918	17732
Labor in production	no.	21,750	27,760	32,181	33,822
Labor in postproduction	no.		1488	2285	2919
Return to labor in production	$/day	42	68	101	136
Return to labor in postproduction	$/day	0	17.50	29	44
Farmer income/ha	$/ha	4,000	6,516	9,640	12,931

8.6.5 Subprograms and Activities for Mango Value Chain

236. The program include institutional capacity building to ensure a core group of technicians for mango are available, including both production experts and postproduction experts. The system of agricultural statistics on production, marketing, and trade needs to be establish to ensure reliability of data.

237. Variety registration and development need to be started and it is recommend to have an agricultural station and a demonstration site for both production of mango and postharvest/processing technologies for mango. On the marketing side, the brand recognition of Cambodian mango (keo romeath) should be pursued. Associations of producers and agroenterprises will be promoted.

238. It is also important to have GAP and standards for mango to ensure quality and safety of mango production. SPS compliance should be strictly enforced.

Table 35 List of Subprograms and Activities – Mango

Program	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
1. Value Chain Assessment	1.1 Conduct periodic assessments of the value chain	Report by MoC	Follow up Study	Follow up Study	Follow up Study	- GDA/Department of horticulture and subsidiary crop
	1.2 Establish a reliable system of agricultural statistics for mango	Production estimates are not based on sound methods. No information about informal trade. No price monitoring.	Reliable system of statistics on production	Reliable system of statistics on production, marketing, and trade	Reliable system of statistics on production, marketing, and trade	- MAFF/ Department of Planning
2. Institutional Strengthening	2.1 Strengthen organization and build up human resource for mango value chain	NA	Ongoing capacity building program	Ongoing capacity building program	Ongoing capacity building program	- GDA CARDI

	2.2 Establish mango station at agricultural stations	NA	Ongoing research program	Ongoing research program	Ongoing research program	- GDA/Department of horticulture and subsidiary crop - GDA/ Department Plant Protection Sanitary and Phyto-sanitary
3. Production	3.1 Establish relations with mango Research Organizations in Thailand, India, and China.	NA	Ongoing collaboration programs	Ongoing collaboration programs	Ongoing collaboration programs	- GDA/Department of horticulture and subsidiary crop CARDI
	3.2 Variety selection program	NA	Classification of varieties used in Cambodia and the most popular for export	Purifying 2-3 varieties from Cambodia	Developed 2-3 Cambodia varieties	- GDA/ Department of horticulture and subsidiary crop GDA/National Agricultural Laboratory CARDI
	3.3 Registration of variety	NA	Few most popular mango varieties will be registered as Cambodian mango varieties			- GDA/ Department of horticulture and subsidiary crop GDA/National Agricultural Laboratory CARDIent of horticulture and subsidiary crop Ministry of Commerce Ministry of Indutry and Handicrafts

	3.4 Soil identification for mango cultivation	NA	Soil survey and identify for mango cultivation will have been conducted	Soil mapping for mango developed		- GDA/ Department of Agricultural Land Management and National Agricultural Laboratory CARDI
	3.5 Promote system of nurseries certification	NA	Survey of all nurseries and list of certified nurseries	All nurseries are certified		- GDA/ Department of horticulture and subsidiary crop
	3.6 Establish GAP for mango and certification system	NA	GAP established and certification program in place	20% of production area is certified	50% of production area is certified	- GDA/ Department of horticulture and subsidiary crop - GDA/ Department Plant Protection Sanitary and Phyto-sanitary
	3.7 Standard Development	NA	Mango standard will be in place and recognized globally			- GDA/ Department of horticulture and subsidiary crop GDA/National Agricultural Laboratory CARDIent of horticulture and subsidiary crop Ministry of Commerce Ministry of Indutry and Handicrafts

	3.8 Establish an extension program for dissemination of GAP	NA	GAP adopted by 50% of farmers	GAP adopted by 80% of farmers	GAP adopted by 100% of farmers	- GDA/Department of Extension Department of Plant Protection, and Phyto-Sanitation
	3.9 PPP Network Establishment	NA	Coordination system to share information developed			- GDA CARDI Private sector Model farmers
	3.10 Identify prevalent pests and diseases and methods to fight them	Pilots on training of pests and disease control	List of pests and diseases and training of farmers	50% of farmers adopting improved methods of pest and diseases control	100% of farmers adopting improved methods of pest and diseases control	GDP/Department of Plant Protection
	3.11 Improved in-farm water management extension work	NA	Demonstrations by GDA and adoption by 10% of farmers	Demonstrations by GDA and adoption by 50% of farmers	Demonstrations by GDA and adoption by 100% of farmers	GDA/Dept. of Agricultural Engineering, and Dept. of Horticulture
4. Processing	4.1 Establish a demonstration site for small and medium processing enterprises.	Small scale was in place	Technologies for mango processing well known in Cambodia.			- GDA/Department of Agricultural Engineering - GDA/Department of Agroindustry
	4.2 Investment fund for SME startup	NA	SME processing 10% of total production	SME processing 20% of total production	SME processing 30%	- GDA/Department of Agricultural Engineering - GDA/Department of Agroindustry
	4.3 Promotion of large processing enterprises	NA	Large enterprises processing 10% of total production	SME processing 50% of total production	SME processing 70%	- GDA/Department of Agricultural Engineering - GDA/Department of Agroindustry

5. Marketing and Trade	5.1 Promote associations of producers and exporters	Provincial associations established		National associations and federation established	National federation active in promoting sector and advocating policies	GDA/Department of Agricultural Cooperative Promotion
	5.2 Promote brand of Cambodia GAP Mango	NA	Cambodia GAP Mango representing 10% of trade	Cambodia GAP mango representing 20% of trade	Cambodia GAP mango representing 30% of trade	GDA/Department of horticulture and subsidiary crop Department of Plant Protection, and Phyto-Sanitation

8.7 CASHEWS PROGRAM

8.7.1 Overall Description of the Cashew Value Chain

239. World consumption of cashew kernels is over 600,000 tons and growing at 8% annually. Overall trade in cashews is about 350,000 tons per annum of cashew kernel out of a total global production of 600,000 tons of kernel, making cashews among the world's most traded agriculture commodities. By the time the average cashew kernel is consumed it will have likely traveled around the world at least once. However, in recent years with the introduction of low cost, high quality processing technology, this situation has started to change. Increasing processing is occurring in cashew producing countries. The major importers are US and Europe with 31% and 30% of the total imports. The imports are growing at over 30% over the past 4 years with a total value of US$2.7 billion. Organic cashews represent about 5% of the total trade and they are growing at 20% per year in the US and EU.

240. Data on cashew sector in Cambodia are scanty and poorly organized. Production data obtained by the GDA indicate about 76,000 ha of cashew nut productive area with a total production of about 55,000 tons and an average yield of 720 kg/ha. However, a recent visit field visit conducted by researchers of Agrifood Consulting International (ACI) in March 2015 indicate a much larger production volume. Based on data collected from major buyers of cashew nuts in Cambodia, the ACI team estimates the current production in Cambodia at over 100,000 tons.

241. There is a considerable dynamism in the sector, particularly in those areas such as Kampong Cham and Kampong Thom where farmers have found a renewed interest in cashew partly stimulated by the poor prospects in the rubber sector. Farmers have started to cultivate new cashew nut varieties, such as M23, that produce a larger size kernel much appreciated by international buyers. The variety M23 is not only producing bigger cashews, but its outturn is terms of kernels per kg of cashew nuts is also higher and its overall yield in the farmer field make it more attractive even relatively to competing crops such as rubber. Nurseries are currently very active in producing saplings to sell to farmers who are cutting down old cashew nut trees and planting new cashew nut varieties.

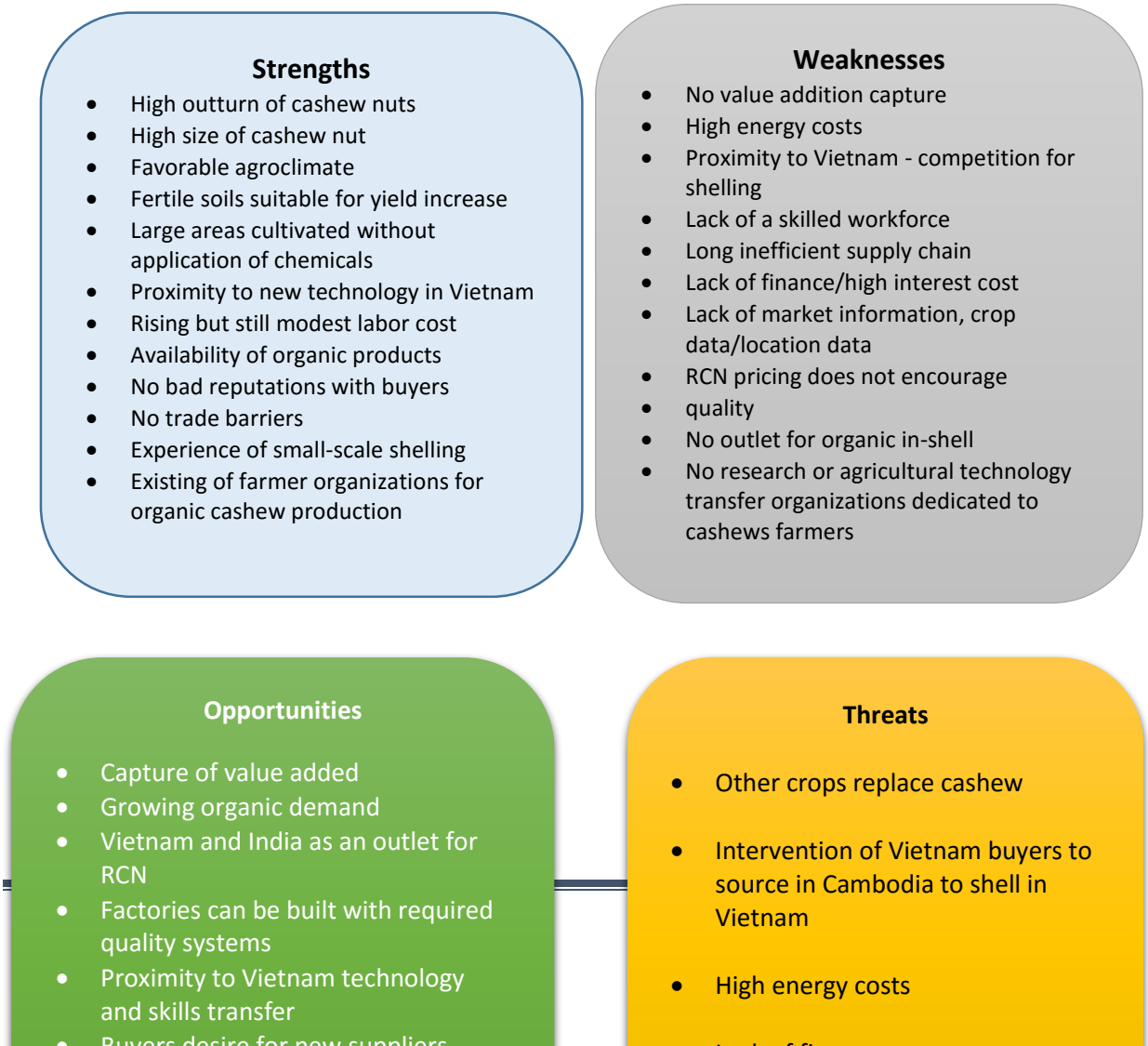
Large cashew nut from variety M23 and traditional cash nuts (the small ones). Source: ACI Field Visit March 2015

242. Even though production of raw cashew nuts (RCN) is considerable, no commercial-scale processing exists in the country. Local traders procure nearly 100% of Cambodia's RCN output for processing in Vietnam, India, and Thailand.

243. For the most part, in Cambodia cashew nuts are cultivated by smallholder farmers, who own only a few hectares of cashew orchards. They lack horticultural skills, and generally use little or no purchased inputs such as pesticides and fertilizers. The lack of chemical input provides an opportunity to develop a high-value organic cashew supply chain. Good practices in plant husbandry, harvesting, and postharvest technologies are limited, as the result of lack of dedicated organizations to technology transfer in the sector.

244. The supply chain for cashew nuts in Cambodia lacks organization. Currently almost the entire production is exported in-shells to Vietnam and India. There is no commercial processing of cashew nuts. Producers typically cultivate 1-2 ha of land to cashew trees with a production of 0.7 ton being the average for most farmers. Production of cashew nuts is sold to small traders who in turn sell to larger traders who are in contact with foreign buyers. Quality control and traceability is non-existent.

Figure 9 SWOT Analysis of the Cashew Sector in Cambodia



8.7.2 Key Issues in the Cashew Value Chain

245. Overall the cashew sector is Cambodia is poorly organized. Farmers produce and sell to traders who in turn export primarily to factories in Vietnam. In spite of considerable production potential in Cambodia, there is not yet any processing factory and therefore all value added in the sector is captured in other countries. There has not been any research effort or any consistent extension program to support the sector. IFC and GIZ have supported pilot projects in organic certifications during 2008-2011 in Kampong Thom, but the effort has ended without clear follow up. A large plantation has been established in Skun over the past 10 years and has been responsible for identifying M23 and other varieties, but the plantation is not integrated with a processing plant. Nurseries are emerging as the effort of individual farmers who have limited technical expertise in nursery management.

8.7.3 Opportunities for the Cashew Value Chain

246. There are suitable soils and agrecological conditions for a considerable expansion of cultivated land to cashew. The emergence of new varieties with large kernels combined with improved crop husbandry offer the opportunity for farmers to reap larger benefits from their land. Return to land and labor could be considerable. There is a large opportunity for investors in processing plants and organic certification. Cambodia could become a leader producer and exporter of cashew and the leader in the export of organic cashews. Improved seeds and crop husbandry, investment in processing, and organic certification will require the support of an active research and extension system. Incentives for agroprocessing are already in place and the energy costs might also be declining in the future as part of the overall energy strategy of RGC. There are however not yet sufficient technical and management skills to ensure a successful implementation of medium to large scale processing operation.

8.7.4 Vision and Targets for the Cashew Value Chain

247. Based on current estimates, the cashew sector is already producing (and exporting in raw form) about $110 million of RCN. This is achieved without any support from government, and with no organization of the value chain. The vision for the cashew sector in Cambodia is one in which Cambodia becomes one of the major world producers of RCN and exporters of cashew kernels of high quality. In particular, Cambodia could become the leading exporter of certified organic cashew kernels in the worlds.

248. This would imply to increase cultivated areas and yield of cashew nut trees, resulting in overall value of the sector at $888 million with exports of $837 million. Farmers income per ha would triple from $616/ha to $1842/ha. The employment in the sector would also increase from 28,000 to 44,000 (full time equivalent workers) with return to labor growing both in production and postproduction. Return to labor in production would increase from $12/day to $37/day.

8.7.5 Subprograms and Activities for the Cashew Value Chain

249. The strategy to achieve the vision and the targets is based on the leading role taken by the Department of Industrial Crops. The Department will act as a champion for the promotion of the value chain and will coordinate with other departments and the private sector. A small task force for the promotion of the value chain (comprising representatives of MAFF/GDA, private sector, and farmers) will be in charge of value chain assessment and establish the basis for a reliable crop statistics and marketing information system. The task force will establish linkages with the leading research organizations on cashews operating in Thailand, India, and Vietnam. A few demonstration farms for crop husbandry and variety selection will be established and the department of extension will coordinate the technology dissemination to farmers. At the same time, a nursery program will be established. With the help of the Department of Agricultural Engineering and Department of Agroindustry, pilot processing demonstration sites will allow small medium enterprises (SMEs) to familiarize with the processing technology. A matching fund to provide incentives to SMEs to invest in the processing sector will be established. The Department of Cooperatives will support the formation of producers associations and the Department of Agroindustry will support the emergence of processors and exporters associations. GAP for cashews will be established and a certification of organic cashew production will be promoted.

Table 36 Indicators and Targets for Cashew Nut Value Chain

Indicator	Unit	2015	2020	2025	2030
Area	ha	142,857	182,326	211,366	222,148
Yield	kg/ha	700	1,029	1,376	1,675
Production	ton	100,000	187,528	290,925	372,010
Farmgate price	$/kg	1.10	1.19	1.28	1.38
Value of Production	$ million	110	222	371	512
Production Processed in Cambodia	%	0	10%	50%	100%
Export Price of processed product	$/kg	8	8.62	9.28	10.00
Exports as Percent of total Production	%	0	10%	50%	90%
Exports Volume of cashew nuts	ton	0	4,688	36,366	83,702
Value of Exports	$ million	0	40	338	837
Value Added in processing and exports	$ million		18	152	377
Total Value	$ million	110	240	523	888
Total Value/ha	$/ha	770	1319	2476	3999
Labor in production	no.	28,571	36,465	42,273	44,430
Labor in postproduction	no.	0	234	1818	4185
Return to labor in production	$/day	12	20	28	37
Return to labor in postproduction	$/day	0	62.05	67	72
Farmer income/ha	$/ha	616	975	1406	1842

Table 37 List of Subprograms and Activities – Cashew nuts

Program	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
1. Value Chain Assessment	1.1 Detailed assessment of the value chain, including production and marketing completed by 2016.	Outdated IFC Study Available with production detail	Follow up Study	Follow up Study	Follow up Study	GDA/Department of Industrial Crops
	1.2 Statistics System Established	Weak system of statistics	Organized system of statistics on production, exports, and domestics prices	Organized system of statistics on production, processing, exports, and domestic and international prices	Organized system of statistics on production, processing, exports, and domestic and international prices	Department of Planning
2. Production	2.1 Establish relations with Cashew Research Organizations in Thailand, India, and Vietnam.	NA	Ongoing collaboration programs	Ongoing collaboration programs	Ongoing collaboration programs	GDA/Department of Industrial Crops

Program	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
	2.2 Carry out a selection program of most promising varieties.	NA	Classification of varieties used in Cambodia	Purifying 2-3 varieties from Cambodia	Developed 2-3 Cambodia varieties	GDA/Department of Industrial Crops
	2.3 Promote system of nurseries certification	NA	Survey of all nurseries and list of certified nurseries	All nurseries are certified		GDA/Department of Industrial Crops
	2.4 Establish GAP for cashew nut and certification system	NA	GAP established and certification program in place	20% of production area is certified	50% of production area is certified	Department of Plant Protection, and Phyto-Sanitation GDA/Department of Industrial Crops
	2.5 Establish an extension program for dissemination of GAP	NA	GAP adopted by 50% of farmers	GAP adopted by 80% of farmers	GAP adopted by 100% of farmers	GDA/Department of Extension Department of Plant Protection, and Phyto-Sanitation
	2.6 Identify prevalent pests and diseases and methods to fight them	Pilots on training of pests and disease control	List of pests and diseases and training of farmers	50% of farmers adopting improved methods of pest and diseases control	100% of farmers adopting improved methods of pest and diseases control	GDP/Department of Plant Protection

Program	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
	2.7 Soil mapping and improved soil fertility management	NA	10% soil mapped and 10% of farmers adopt soil fertility management practices	50% soil mapped and 50% of farmers adopt soil fertility management practices	100% soil mapped and 100% of farmers adopt soil fertility management practices	Dept. of Soil Resources Management
	2.8 Improved in-farm water management extension work	NA	Demonstrations by GDA and adoption by 10% of farmers	Demonstrations by GDA and adoption by 50% of farmers	Demonstrations by GDA and adoption by 100% of farmers	GDA/Dept. of Agricultural Engineering, and Dept. of Industrial Crops
3. Processing	3.1 Establish a demonstration site for small and medium processing enterprises.	NA	Technologies for cashew nut processing well known in Cambodia.			GDA/Department of Agricultural Engineering GDA/Department of Agroindustry
	3.2 Investment fund for SME startup	NA	SME processing 10% of total production	SME processing 20% of total production	SME processing 30%	GDA/Department of Agricultural Engineering GDA/Department of Agroindustry
	3.3 Promotion of large processing enterprises	NA	Large enterprises processing 10% of total production	SME processing 50% of total production	SME processing 70%	GDA/Department of Agricultural Engineering GDA/Department of Agroindustry

Program	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
4. Marketing and Trade	4.1 Promote associations of producers and exporters	NA	Provincial associations established	National associations and federation established	National federation active in promoting sector and advocating policies	GDA/Department of Cooperatives
	4.2 Promote brand of Cambodia Organic Cashews	NA	Cambodia Organic Cashew representing 10% of trade	Cambodia Organic Cashew representing 20% of trade	Cambodia Organic Cashew representing 30% of trade	GDA/Department of Industrial Crops

8.8 PEPPER PROGRAM

8.8.1 Overall Description of the Pepper Value Chain

250. Black pepper (Piper nigrum) is native to Southeast Asia and can be purchased today largely preserved in four different ways: black pepper; white pepper; green pepper, and red pepper. All these forms come from the same plant and are just different stages in the fruit maturity and using different processing techniques. It should be noted that with water-weight lost in the drying process, 50 kg of fruit produce 16 kg of black pepper and 6 kg of white pepper.

251. The USA imports 66,000 tons (24 percent of all world pepper imports) valued at US$114 million; the EU imports 80 000 tons valued at US$180 million.. Green and white pepper have the largest market in Western European markets. Vietnam is the world's largest producer and exporter of pepper, producing 34 percent of the world pepper production. Other major producers include Indonesia (9%), India (19%), Brazil (13%), Malaysia (8%), Sri Lanka (6%), Thailand (4%), and China (6%).

Pepper in Cambodia has a long tradition which was disrupted during the war year. Only in the 1990s the production of pepper started again. Over the past 5 years cultivated areas have tripled and there has been a heightened interested of farmers in this high value products. The interest of farmers has been partly triggered by the successful experience of the Geographic Indication (GI) of “Kampot Pepper”, an initiative of the Ministry of Commerce that has been supported by various donor agencies and NGOs and resulted in high benefits of Kampot pepper farmers and a branding of Caobmodia pepper internationally.

252. The main producing area for pepper however is not in Kampot but in Kampong Cham (Memot district), Ratanakiri, Mondulkiri, and Kratie.

Black Pepper	Red Pepper	White Pepper	Green Pepper
			
Black pepper is the sun-dried product of Green Pepper. The unripe berries are picked when just starting to turn from green	**Red Pepper** is the sun-dried product of the fully ripened berry; the berries are left to turn red on the vine before harvesting. The berries must be picked at the right moment before they spoil, are blanched and	**White Pepper** comes from fully ripened berries. The berries are left to ripen on the vine, and once fully matured to a bright red color are picked and placed in hot water until the skin falls away. The off	**Green pepper** is the unripe berry of the pepper plant. It is harvested before maturity and must be consumed

to yellow, blanched and left to dry in the sun on bamboo mats for three to four days. Black Pepper, when stored correctly, can last many years.	dried in the sun for three to four days. The red peppercorns are then individually sorted by hand. Red Pepper is a much rarer and premium pepper with a unique flavor which is sweeter, more full and rounded, but with less heat than Black Pepper.	white core of the peppercorn is then sun-dried for three to four days. White pepper has a very different characteristic to Black or Red Pepper as elements of flavor are removed with the outer skin.	within three days of picking. It has a very fresh citrus flavor and is less spicy than the dried variety.

8.8.2 Key Issues for the Pepper Value Chain

253. High investment cost to establish a plantation are often beyond the financial capacity of smallholder farmers. In spite of increasing demand, the supply response is limited.

254. One issue is the control of counterfeit, particularly in the case of Kampot pepper.

255. There is a fast expansion of individual big private enterprises that might challenge the sustainability of smallholder producers.

256. Technology is still a major constraint for most farmers and there is still considerable work to be done to establish a core group of expert technicians and trainers.

257. Vietnam and Thailand together absorb about 95% of pepper from Cambodia. There is small amount of direct export from Cambodia to consumer countries.

258. Most farmers have limited knowledge about best practices in cultivation and lack knowledge about market information and quality requirements. Farmers have poor knowledge to do grading pepper, or processing high quality for market demands.

8.8.3 Opportunities for the Pepper Value Chain

259. The rapid growth in cultivated areas is likely to continue as the potential for growth is high and the quality of pepper is very good. Investors are interested and the GI in Kampot has played in important role not only in improving farmers' income but in creating some type of brand for pepper from Cambodia.

260. As more farmers and enterprises invest in pepper, the knowledge about the sector will increase and that might result in exporters being directly located in Cambodia rather than going through Vietnam or Thailand.

261. Possibility of cultivating organic pepper or at least low chemical intensity pepper

262. Increasing number of companies able to clean, grade, and process, and export directly.

8.8.4 Vision and Targets for the Pepper Value Chain

263. Cambodia being one of the 5 largest exporters of pepper in the world. Among the major exporters, Cambodia distinguishing for high quality of its products, market by some GI such as Kampot pepper.

Figure 10 SWOT Analysis of the Pepper Sector in Cambodia

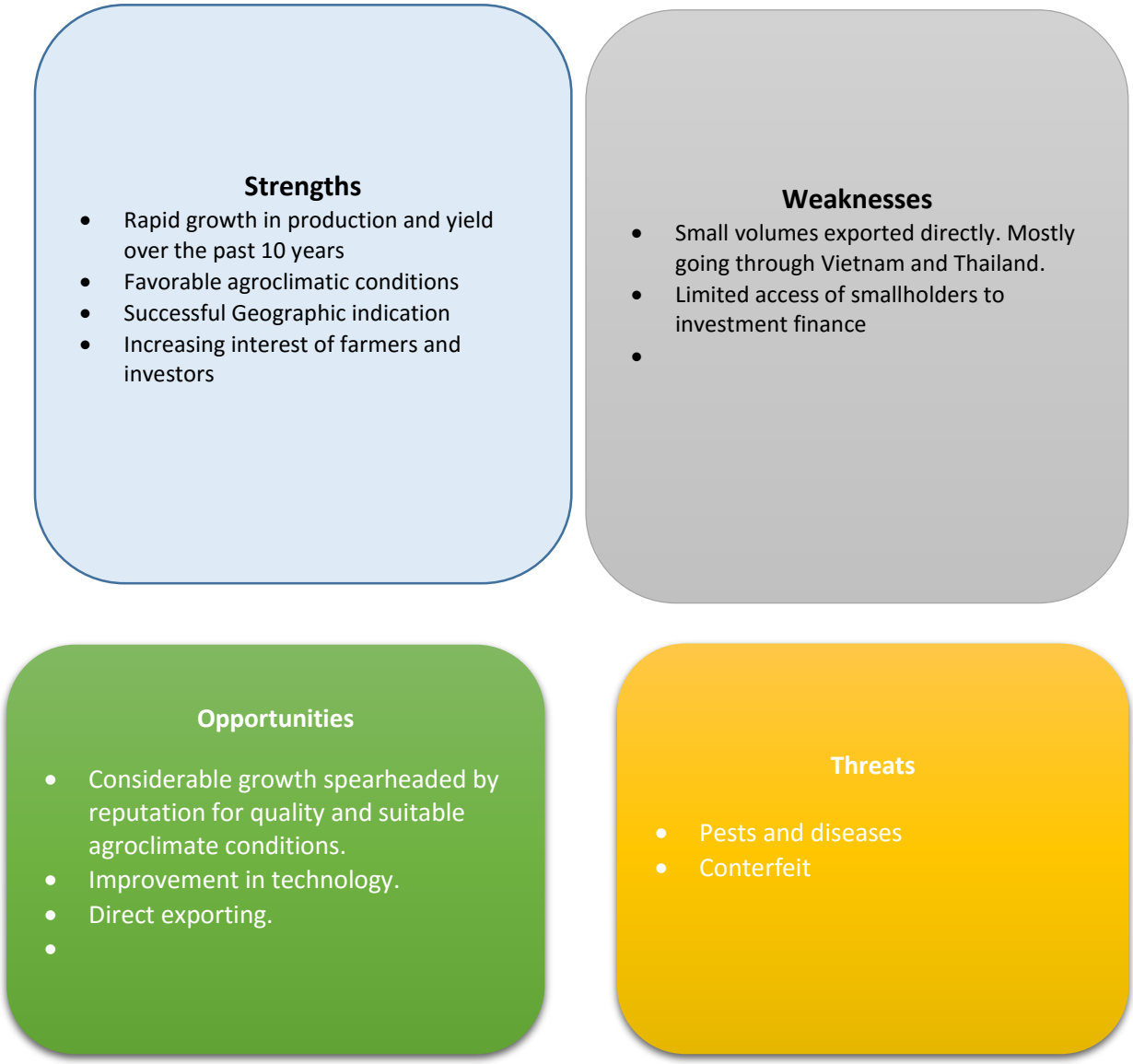


Table 38 Indicators and Targets for Pepper Value Chain

Indicator	Unit	2015	2020	2025	2030
Area	ha	4,523	5,773	7,367	9,403
Yield	ton/ha	2.11	2.44	2.83	3.13
Production	ton	9,539	14,114	20,882	29,425
Farmgate price	$/kg	9.50	11.01	12.77	14.80
Value of Production	$ million	91	155	267	436
Exports as Percent of total Production	%	90.0%	93%	95%	97%
Export Price	$/kg	10.00	11.51	13.27	15.30
Exports Volume	ton	8,585	13,160	19,928	28,471
Value of Exports	$ million	85.85	151.51	264.39	435.63
Total Value/ha	$/ha	20,035	26,926	36,186	46,316
Labor in production	no.	4,523	5,773	7,367	9,403
Labor in postproduction	no.	95	141	209	294
Return to labor in production	$/day	56	75	101	130
Farmer income/ha	$/ha	14,025	18,848	25,330	32,421

8.8.5 Subprogram and Activities for the Pepper Value Chain

264. Building on the success of the past, the pepper value chain is ready for the next growth spur through which Cambodia will be able to assert itself in international markets as an independent exporter of quality pepper, rather than through other exporters. To achieve this objective, the research and extension system capacity in pepper needs to be strengthened and considerable work to improve cultivation techniques and postharvest systems, including marketing and trade have to be established.

Table 39 List of Subprograms and Activities – Pepper

Program	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
1. Value Chain Assessment	1.1 Conduct periodic assessments of the value chain	NA	Follow up Study	Follow up Study	Follow up Study	- GDA/Department of horticulture and subsidiary crop
	1.2 Establish a reliable system of agricultural statistics for pepper	Production estimates are not based on sound methods. No information about informal trade. No price monitoring.	Reliable system of statistics on production	Reliable system of statistics on production, marketing, and trade	Reliable system of statistics on production, marketing, and trade	- MAFF/ Department of Planning
2. Institutional Strengthening	2.1 Strengthen organization and build up human resource for pepper value chain	NA	Ongoing capacity building program	Ongoing capacity building program	Ongoing capacity building program	GDA CARDI

Program	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
	2.2 Establish pepper station at agricultural stations	NA	Ongoing research program	Ongoing research program	Ongoing research program	GDA/Department of horticulture and subsidiary crop GDA/ Department Plant Protection Sanitary and Phyto-sanitary
3. Production	3.1 Establish relations with pepper Research Organizations in Thailand, India, and Vietnam and the International Pepper Community (IPC)	NA	Ongoing collaboration programs	Ongoing collaboration programs	Ongoing collaboration programs	GDA/Department of horticulture and subsidiary crop CARDI
	3.2 Variety selection program	NA	Classification of varieties used in Cambodia and the most popular for export	Purifying 2-3 varieties from Cambodia	Developed 2-3 Cambodia varieties	GDA/ Department of horticulture and subsidiary crop GDA/National Agricultural Laboratory CARDI

Program	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
	3.3 Registration of variety	NA	Few most popular pepper varieties will be registered as Cambodian pepper varieties			GDA/ Department of horticulture and subsidiary crop GDA/National Agricultural Laboratory CARDI Ministry of Commerce Ministry of Industry and Handicrafts
	3.4 Soil identification for pepper cultivation	NA	Soil survey and identify for pepper cultivation will have been conducted	Soil mapping for mango developed		GDA/ Department of Agricultural Land Management and National Agricultural Laboratory CARDI
	3.5 Promote system of nurseries certification	NA	Survey of all nurseries and list of certified nurseries	All nurseries are certified		- GDA/ Department of horticulture and subsidiary crop
	3.6 Establish GAP for pepper and certification system	NA	GAP established and certification program in place	20% of production area is certified	50% of production area is certified	- GDA/ Department of horticulture and subsidiary crop - GDA/ Department Plant Protection Sanitary and Phyto-sanitary

Program	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
	3.7 Standard Development	NA	Pepper standard will be in place and recognized globally			GDA/ Department of horticulture and subsidiary crop GDA/National Agricultural Laboratory CARDI Ministry of Commerce Ministry of Industry and Handicrafts
	3.8 Establish an extension program for dissemination of GAP	NA	GAP adopted by 50% of farmers	GAP adopted by 80% of farmers	GAP adopted by 100% of farmers	- GDA/Department of Extension Department of Plant Protection, and Phyto-Sanitation
	3.9 PPP Network Establishment	NA	Coordination system to share information developed			GDA CARDI Private Sector Model Farmers
	3.10 Identify prevalent pests and diseases and methods to fight them	Pilots on training of pests and disease control	List of pests and diseases and training of farmers	50% of farmers adopting improved methods of pest and diseases control	100% of farmers adopting improved methods of pest and diseases control	GDP/Department of Plant Protection
	3.11 Improved in-farm water management extension work	NA	Demonstrations by GDA and adoption by 10% of farmers	Demonstrations by GDA and adoption by 50% of farmers	Demonstrations by GDA and adoption by 100% of farmers	GDA/Dept. of Agricultural Engineering, and Dept. of Industrial Crops

Program	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
4. Processing	4.1 Establish a demonstration site for small and medium processing enterprises.	Small scale was in place	Technologies for mango processing well known in Cambodia.			GDA/Department of Agricultural Engineering - GDA/Department of Agroindustry
	4.2 Investment fund for SME startup	NA	SME processing 10% of total production	SME processing 20% of total production	SME processing 30%	GDA/Department of Agricultural Engineering - GDA/Department of Agroindustry
	4.3 Promotion of large processing enterprises	NA	Large enterprises processing 10% of total production	SME processing 50% of total production	SME processing 70%	GDA/Department of Agricultural Engineering - GDA/Department of Agroindustry
5. Marketing and Trade	5.1 Promote associations of producers and exporters	Provincial associations established		National associations and federation established	National federation active in promoting sector and advocating policies	GDA/Department of Agricultural Cooperative Promotion
	5.2 Promote brand of Cambodia pepper	NA	Cambodia branded pepper representing 10% of trade	Cambodia branded pepper 20% of trade	Cambodia branded pepper representing 30% of trade	GDA/Department of horticulture and subsidiary crop
	5.3 Boost GI of Kampot Pepper internationally	GI Kampot already recognized within Cambodia	Internationally recognition of Kampot Pepper at major spice conference	Internationally recognition of Kampot Pepper at major spice conference	Internationally recognition of Kampot Pepper at major spice conference	GDA/Department of horticulture and subsidiary crop Ministry of Commerce

8.9 VEGETABLES PROGRAM

8.9.1 Overall Description of the Vegetables Value Chain

265. Vegetable production still remains on the threshold of subsistence due to the fact that a large number of rural households' farm plots are too small to support commercial production under present productive systems and agro-processing remains underdeveloped. However, there is a potential to move vegetable production and marketing from a largely subsistence to a modernized, nationally-integrated and knowledge-intensive sector with more emphasis on diversification, processing, productivity-enhancement, and capacity development.

266. Cambodia's vegetable industry is erratic and characterized by seasonal gluts. Frequent supply shortages are compensated for with cheap products from neighboring countries, predominantly Vietnam. Demand for vegetable products tends to grow very rapidly with urbanization and increased income. The import from neighboring countries such as Vietnam (60%) and Thailand (20%) are still significantly high more than 80%. Only 20% of the crop is grown during the wet season from May to November, mainly due to the difficulties with pests, diseases and floods. Prices of some vegetables can double during this period. Vegetable production is highly labor intensive. On average, about 424 labor days are needed to cultivate and market vegetable crop production from one hectare, compared to only 78 days per hectare for cereal crops such as rice and maize.

267. Diversity of vegetables (fruit and leafy) are demanded by consumers, such growth provides major opportunities for farmers to diversify their production and increase their incomes. Such opportunities may be especially valuable for women, who are the primary producers and marketers of vegetable produce throughout Cambodia. Finally, from the farming through retailing, vegetable production employs about twice as much labor as cereals per hectare of production; small farmers, rural laborers, and the urban poor stand to gain extremely from these employment opportunities. Vegetable production plays important role in poverty alleviation through employment generation, improving the feeding behavior of the people, and creating new opportunities for poor farmers.

268. **Production** - in Cambodia, two main seasons can be distinguished: the dry season from November to May and the rainy season from May to October. In the early dry season, vegetables are easy to grow and give high yield because of favorable cropping conditions: the good climate, wet soil, lack of pests, and easy access to water sources. But at the end of the dry season, when water is no more available, the yields decrease, especially for temperate vegetables like tomato, cabbage and Chinese cabbage which require a lot a water. In the rainy season, vegetables are difficult to grow and give low yield, the climate is warmer, the ponds and lakes suffer from water shortage and some areas are flooded. During the rainy season, some vegetables such as tomato, cabbage and Chinese cabbage, cannot grow to meet the market needs. At this time (as well as in the late dry season), the imported vegetable quantity increases and comes in addition to local production.

Phnom Penh and Siem Reap are the highest consumption of vegetable in Cambodia. Among the 25 provinces of Cambodia, there are 6 provinces which supply vegetables to Phnom Penh: Kandal, Phnom Penh, Kampong Speu, Takao, Kampong Cham and Kampong Chhnang. Kandal province is located at the periphery of Phnom Penh and includes three rivers (Mekong, Bassac and Tonle Sap). The population located along these rivers is growing vegetables since ancient time, especially the population of Saang district. Vegetables also originate from the suburban area of Phnom Penh, where they are grown in the area situated along Mekong River and near the lakes.

269. The vegetable cropping systems can be roughly divided into two types:
- Vegetable production in the *home gardening* or near the houses, on non-flooded land, that can take place both in rainy and in dry season.
- Vegetable production *in the lowland*, taking place in the beginning of the dry season (rice being cultivated in the lowland in the rainy season).

270. In Cambodia, there is a clear differentiation of the sources of vegetables according to the type of vegetables, some vegetables are nearly entirely imported (tomato, cabbage, onion, Chinese cabbage) while some other are entirely local (including leafy-vegetables such as lettuce, spinach, cucumber, yard long bean).

271. There are two categories of producers:

(a) Producers bringing their personal vegetables only and selling them wholesale to collectors, wholesalers, retailers at the market (they represent 15% of producers present in the market); and

(b) Producers bringing their personal vegetables and buying vegetables from other farmers to the market, in this case they act as collectors: they represent 85% of producers selling in the market.

272. **Vegetable marketing** - significant amounts (around 70%) of vegetables are currently imported into Cambodia from Vietnam and Thailand. This has resulted in the substitution of imports by local production being identified as a possible growth opportunity for the vegetable sector.

Imported vegetables

273. Most vegetables (around 70%) sold in Cambodia (e.g. tomato, cabbage, Chinese cabbage, carrot, onion, etc.) are mainly coming from Vietnam, the rest originating from almost all provinces in Cambodia, but on a small scale only around 20% and it is classified as a local vegetable.

274. Four main types of traders: producers, collectors, wholesalers and retailers.

275. Collectors - include two categories of actors:
1) Collectors, moving from the village to village, can be named as mobile collectors to sell at the market. Mobile collectors buy vegetables from producers (Cambodian or Vietnamese);

2) Collectors based in the market (called fixed collectors), buying from producers and mobile collectors in the market and reselling to the different types of traders in the market. Fixed collectors are less numerous than mobile collectors (they represent about 20% of the total number of collectors). Fixed and mobile collectors, resell to traders in the larger cities and town in Cambodia and also to traders based in the provinces (mostly collectors, wholesalers and retailers). Mobile collectors can be local collectors or overseas collectors.

276. Wholesale Market - wholesalers buy vegetables from producers or collectors and resell them to retailers. Retailers are located in the market; they buy vegetables from wholesalers, collectors, or producers and sell to consumers

277. Market chain - producers and collectors sell to retailers, final consumers, restaurant/hotel and wholesalers. Wholesalers sell to retailers, restaurant or hotel owners. Producers, collectors and wholesalers usually sell vegetables wholesale, but they also sell some vegetables retail (to final consumers) when they have a little vegetables left, or, in the case of producers, when they produce and sell small quantities (this is the case of farmers in Phnom Penh districts).

278. Collectors are supplied by producers mostly and by other collectors; wholesalers are supplied by mobile collectors mostly and by producers; retailers are supplied by wholesalers mostly, and also by fixed collectors and producers

279. Around 70% (in Siem Reap 2015) of wholesalers sell only imported vegetables from Vietnam and around 20% from Thailand, and 10% of local vegetables. For local products, the orders are made by direct contacts; phone calls are rare because collectors bring products directly to their customers (wholesalers or retailers).

280. The relation between Cambodian wholesalers and Vietnamese suppliers is made through orders, directly through Vietnamese collectors present in the market or by orders by phone call and goods are transported in two days

281. Bok Choy, lettuce, tomato and yard long bean have their peak prices in September and October (in the middle of rainy season): the difference between the October price and the average price is 40% for Bok Choy and lettuce, 30% for tomato, 20% for yard long bean. October is also the time of the lowest quantities available in the market, except for lettuce. The most stable prices are observed for cucumber, cabbage and Chinese cabbage, which are the vegetables which are traded in the biggest quantities.

282. Cambodian vegetable products have estimated that at least 25 to 40 per cent of vegetables are damaged in Cambodia due to poor post-harvesting techniques, while in the US and Australia is around 10% lost acceptable. Educating farmers on better postharvest techniques to extend shelf life is important and supporting improved vegetable varieties are the integral part of developing a better vegetable industry.

283. Tomato is an important food and it is a staple part of everyone's diet in Cambodia and is filled with nutrients. Many Khmers believe it is good for their skin. In addition to tomato, chilli and leafy vegetables are also important in the Cambodian diet and household income.

284. Yard long bean is a popular vegetable in the market in Cambodia. It can be grown year-round but lower yields are common in the hot season based on the reliance of irrigated water. Yard long bean can be grown commercially in large plots sized more than 200 square meters. There are problems related to yard long bean production, especially in the hot season such as pests and disease (aphids, leaf miners, thrips, and fungus). To overcome these challenges and to boost more income for farmers, improved proper growing techniques are required. The price at farm gate for collectors ranges from $0.38/kg in wet season (seasonal) and 0.88$/kg in dry season (off-season). Collectors and wholesalers set the price at farm gates depending on whether there are more or less yard long beans in the market

285. Lettuce is grown as a hardy annual, lettuce is easily cultivated. The lettuce plant can vary greatly in size, shape, and leaf type but generally, the leaves of the plant form a dense head or loose rosette. The price at farm gate is over $1.25/kg compared to a production cost of less than $0.05/kg. The crop is highly perishable, so ready access to markets is necessary to make it a profitable crop.

286. Wax gourd belongs to the gourd family (*Cucurbitaceae*) and is native to tropical Asia. It is grown in many warm countries for its edible fruits. The price at farm gate in Cambodia is about $0.5/kg compared to a production cost of less than $0.05/kg.

8.9.2 Key Issues in the Vegetables Value Chain

- Low productivity – growth in vegetable outputs has been due entirely to increased land planted areas – either new land released by irrigation or switching from other crops rather than increase in efficiency. There is in needs by doing better or effectively, not doing more. In particular location, low productivity is recognized to be core competitiveness problem underpinning in the whole sector. Addressing this is a key development challenge and the task to which CMP committed itself.

- Inadequate inputs and vegetable varieties
  - Prevailing varieties are old and not suitable for demanding markets. Varieties of vegetables such as tomatoes, cabbages and other vegetable seeds should be produce locally adjusted to the market's needs.
  - Agricultural inputs, we identified the problems of seed prices and quality, but problems with availability and supply assortment are also not negligible. In addition to seeds, farmers find problems in sourcing fertilizers, seedlings and protection products.
  - Problems with plant protection related to effectiveness, i.e. the quality of plant protection products and the availability and price of and level of knowledge about these products

- Inadequate growing techniques

  - Improving competitiveness in vegetable exports requires changes in the production system, including the implementation of new techniques and machinery, irrespective of the types applied. Other necessary elements here are the extension of the vegetable season not only by using new cultivars, but also by means of various techniques of implementation (hotbeds, greenhouse and plastic mulches, etc.

- High costs of on-farm investments and the credit needed - Examples of widely needed investments may include irrigation systems, mulch foil, rotating tills, insect, pest and disease protection, calibrators, packaging machines and cold storage units. The loan arrangements offered by financial institutions feature high interest rates and unfavorable conditions.

- The structure of different value chains – linking farmers to ultimate consumer market limited farmers' access to appropriate information and concentrates power in key traders and other intermediaries.
  - Physical infrastructure is highly variable in its quality. Together with weak transportation and high wastage rates for perishables this acts as a disincentive to improve practice.
  - Some market structures (such as seed supply industry) are anti-competitive.
  - Unreliable and low levels of seeds quality undermine farmer confidence.
  - Financial services are often unfavorable for vegetable investment.
  - Low levels of co-operation between small-scale farmers acts as a barrier to planning and investment.
- Weak private sector capacity and weak knowledge and information –
  - The importance of knowledge and information in enhancing productivity prompted question related to market system providing a solution to weak knowledge and information; knowledge and information services not addressing the wider productivity problem in the vegetable sector. Addressing this issues require understanding of:
  - Underlying systematic constraints impinging on the supply and demand for information.
  - Sources of information were commonly being used by farmers, their perceptions of these and the wider experience of development agencies in engaging farmers

Farmers – farmers like to go to other farmers for information as their preferred source and certainly within every farming community, respected "lead" farmers exist who are available, local and perceived to be practical. Advice offered here is in the context of wider social relationships and structures. However, progressive and influential farmers still need to be able to access new information (e.g. on approach, product, etc.), raising the question of where this can be sources?

Retailers – along with farmers, the main most regularly used source of information is retailers. They are independent owner-managed small business, located in simple

shop premises in rural villages and towns. Retailers as sources of knowledge and information have a number of characteristics:

a. Their closeness to and frequent interaction with farmers offers a real opportunity to influence. 70% of farmers going to a retailer in search of a solution to a farming problem rather than to buy a specific product
b. Reliance on input supplies for information

Input supply companies – input suppliers do undertake product demonstrations with farmers directly on an occasional basis.

Government extension officers – DAE is to advise farmers directly and organize fairs to bring different actors, knowledge, and information to farmers. Although most farmers are aware of the government extension service and respect block supervisors' technical knowledge, few are regular users of their services

- Lack of cool warehouses and storage
  - An extension of the production season is also constrained by a shortage of adequate storage opportunities. Because of the lack of proper storage, some locally grown and traditionally produced vegetables must still be imported out of season as fresh goods.
  - With proper storage, products such as cabbage lettuce, onions, and many others can be kept and sold with insignificant quality changes throughout the year. Also, storage inadequacy and the lack of storage space represent major constraints which would preferably be solved by additional and adequate storage capacities, although in these cases, financial shortcomings arise.

Figure 11 SWOT Analysis of the Vegetable Value Chain

8.9.3 Opportunities in the Vegetables Value Chain

287. Vegetables can be used at the household level for a more varied diet and improved nutrition, but they can also be sold, for example to neighbors, to a local market and to visiting traders and can also be processed, for example, fresh cabbage can be processed into pickled.

288. Markets can be final consumers markets such as local village markets, or markets can be business or institutional markets, where vegetables are bought for further use or for re-sale, for example selling tomatoes to a processor, who makes ketchup, selling tomatoes to a school, selling onions to a retailer, who then in turn sells them to final consumers, etc.

8.9.4 Vision and Targets for the Vegetables Value Chain

289. There remains considerable potential for Cambodian vegetable to realize productivity gains at the high value structure of production. It is relatively more land abundant, although there are big problems related to access to irrigation and water availability. Whatever the constraints, vegetable production must be vigorously pursued in Cambodia for at least in the next 15 years to alleviate poverty through employment creation and income generation in rural areas. The vision is to ensure that the largest part of vegetable consumption could be provided safely from domestic consumption rather than from imports.

Table 40 Indicators and Targets for Vegetables Value Chain

Indicator	Unit	2015	2020	2025	2030
Area	ha	51,637	62,824	72,831	76,546
Yield	ton/ha	8.0	10.3	12.5	14.5
Production	ton	415,239	644,780	909,419	1,108,044
Farmgate price	$/kg	0.40	0.44	0.49	0.54
Value of Production	$ million	166	285	443	597
Volume of Consumption	ton	830,478	962,752	1,116,093	1,293,858
Volume of Imports	ton	415,239	317,972	206,674	185,813
Share of Imports in total Consumptin	%	50%	33%	19%	14%
Import Price	$/kg	0.38	0.42	0.46	0.51
Value of Imports	$ million	158	133	96	95
Percentage of Value of Production in Marketing and Processing	%	20%	0.23	0.27	0.31
Value Added in Processing and marketing	$ million	33.22	66.02	119.19	185.87
Total Value (production, processing, marketing)	$ million	199	351	563	782
Total Value/ha	$/ha	3860	5583	7725	10221
Labor in production	no.	86,750	105,545	122,355	128,597
Labor in postproduction	no.	8305	12896	18188	22161
Return to labor in production	$/day	6	9	12	15
Return to labor in postproduction	$/day	16.00	20.48	26.21	33.55
Farmer income/ha	$/ha	1608	2266	3044	3896

8.9.5 Subprograms and Activities for the Vegetables Value Chain

290. The vegetable value chain strategy requires implementing by the Department of Horticulture Under GDA. The Department in the support by GDA and MAFF should carry out the following tasks:

- Improve vegetable productivity – growth in vegetable outputs by increasing in efficiency. There is in needs by doing better or effectively, not doing more. In particular location.
- Improve input, supply and develop improved vegetable varieties
  - Varieties of vegetables such as tomatoes, cabbages and other vegetable seeds should be produce locally adjusted to the market's needs.
  - Agricultural inputs such as seeds, fertilizers, and pesticide should reduce cost to fit into the ability Cambodian producers that can afford to purchase. In addition to seeds, farmers find problems in sourcing fertilizers, seedlings and protection products.
  - Develop plant protection related to effectiveness, i.e. the quality of plant protection to control safe products

- Develop and improve growing techniques
  - Improving competitiveness in vegetable exports requires changes in the production system, including the implementation of new techniques and machinery, irrespective of the types applied. Other necessary elements here are the extension of the availability of vegetable production to the off-season not only by using new cultivars, but also by means of various techniques of implementation (hotbeds, greenhouse and plastic mulches, etc.)

- Improve costs of on-farm investments and available credit needed - Examples of widely needed investments may include irrigation systems, mulch foil, rotating tills, insect, pest and disease protection, calibrators, packaging machines and cold storage units. The loan arrangements offered by financial institutions feature high interest rates and unfavorable conditions.

- The structure of different value chains – linking farmers to ultimate consumer market and access to appropriate information of key traders and other intermediaries.
  - Physical infrastructure is highly variable in its quality. Together with weak transportation and high wastage rates for perishables this acts as a disincentive to improve practice.
  - Some market structures (such as seed supply industry) are anti-competitive required for improvement.
  - Develop reliable and low levels of seeds quality undermine farmer confidence.
  - Link farmers to appropriate financial services for vegetable investment.
  - Support small-scale farmers to improve the ability to planning and investment.
- Improve private sector capacity and develop knowledge and information system –

- Providing a solution to improve knowledge and information; addressing knowledge and information services to wider productivity problem in the vegetable sector. Addressing this issues require understanding of:
  - Underlying systematic constraints impinging on the supply and demand for information.
  - Encourage producer to apply and use available technical and marketing information to improve their productivities and income generation.

291. These strategies can be done through:

- Support focal point farmers – farmers like to go to other farmers for information as their preferred source and certainly within every farming community, respected "lead" farmers exist who are available, local and perceived to be practical. Advice offered here is in the context of wider social relationships and structures. However, progressive and influential farmers still need to be able to access new information (e.g. on approach, product, etc.), raising the question of where this can be sources?
- Build the capacity of retailers – Along with farmers, the main most regularly used source of information is retailers. They are independent owner-managed small business, located in simple shop premises in rural villages and towns. Retailers as sources of knowledge and information have a number of characteristics:
  i. Their closeness to and frequent interaction with farmers offers a real opportunity to influence. 70% of farmers going to a retailer in search of a solution to a farming problem rather than to buy a specific product
  ii. on input supplies for information
- Support and work with input supply companies to build the capacity – input suppliers do undertake product demonstrations with farmers directly on an occasional basis.
- Government extension officers – DAE is to advise farmers directly and organize fairs to bring different actors, knowledge, and information to farmers. Although most farmers are aware of the government extension service and respect block supervisors' technical knowledge, few are regular users of their services

292. Develop and build cool warehouses and storage

- An extension of the production season is also constrained by a shortage of adequate storage opportunities. Because of the lack of proper storage, some locally grown and traditionally produced vegetables must still be imported out of season as fresh goods.
- With proper storage, products such as cabbage lettuce, onions, and many others can be kept and sold with insignificant quality changes throughout the year. Also, storage inadequacy and the lack of storage space represent major constraints which would preferably be solved by additional and adequate storage capacities, although in these cases, financial shortcomings arise.

Table 41 List of Subprograms and Activities for the Vegetables Value Chain

Program	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
1. Value Chain Assessment	1.1 Value chain assessment on value chain actors (traders, retailers, and producers), production capacity, and markets	NA	2017 completion of value chain assessment and follow up study	Follow up study	Follow up study	GDA/Department of Horticulture Department of Plant Protection, and Phyto-Sanitation
	1.2 Establish a reliable system of agricultural statistics for vegetables	Production estimates are not based on sound methods. No information about informal trade. No price monitoring.	Reliable system of statistics on production	Reliable system of statistics on production, marketing, and trade	Reliable system of statistics on production, marketing, and trade	- MAFF/ Department of Planning
2. Production	2.1 Establish extension program to improve productivity and increasing efficiency and effectiveness of vegetable production.	Uncoordinated projects on vegetables production	% of yield increase per units of production land	% of yield increase per units of production land	% of yield increase per units of production land	GDA/Department of Horticulture, PDA

Program	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
	2.2 Establish quality assurance system for inputs to vegetables production	NA	# of good quality of high yielding vegetable seeds, fertilizer, and agrochemicals	Increase # of good quality of high yielding vegetable seeds, fertilizer, and agrochemicals	Increase # of good quality of high yielding vegetable seeds, fertilizer, and agrochemicals	CARDI GDA/Department of Horticulture Department of Plant Protection, and Phyto-Sanitation
	2.3 Strengthen research and development to improve growing techniques	NA	Improve research and extension system, and 40% of cultivation technology package introduced and adopted by producers and traders.	50% of producers and traders assessed to research and extension system and 60% of cultivation technology package introduced and adopted by producers and traders.	80% of producers and traders assessed to research and extension system and 90% of cultivation technology package introduced and adopted by producers and traders.	GDA/Department of Horticulture

Program	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
	2.4 Promote innovations of on-farm investments - investments may include irrigation systems, mulch foil, rotating tills, insect, pest and disease protection, calibrators, packaging machines and cold storage units.	NA	40% of farm investment increased, accessed, and adopted by producers and traders	60% of farm investment increased, accessed, and adopted by producers and traders	80% of farm investment increased, accessed, and adopted by producers and traders	GDA/Department of Horticulture Department of Plant Protection, and Phyto-Sanitation
	2.5 Demonstrations and extension on cool warehouses and storage	NA	30% of skill development of warehouse and product storage adopted by producers and traders	60% of skill development of warehouse and product storage adopted by producers and traders	80% of skill development of warehouse and product storage adopted by producers and traders	GDA/Dept of Agricultural Engineering
	2.6 Soil mapping and improved soil fertility management	NA	10% soil mapped and 10% of farmers adopt soil fertility management practices	50% soil mapped and 50% of farmers adopt soil fertility management practices	100% soil mapped and 100% of farmers adopt soil fertility management practices	

Program	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
	2.7 Improved in-farm water management extension work	NA	Demonstrations by GDA and adoption by 10% of farmers	Demonstrations by GDA and adoption by 50% of farmers	Demonstrations by GDA and adoption by 100% of farmers	GDA/Dept. of Agricultural Engineering, and Dept. of Horticulture
3. Processing	3.1. Promote vegetable small scale agro-processing	NA	Strategy document for agro-processing strategy and technical package of small scale agro-processing developed	Follow-up implementation of vegetable small scale strategy implementation and small scale agro-processing	50% of vegetable processing products introduced into national markets.	GDA/Department of Agricultural Engineering GDA/Department of Agroindustry
	3.2 Promotion of large scale of vegetable processing	NA	# of large scale agro-processing emerged in business and absorbed 10% of the vegetable product for processing	# of large scale agro-processing emerged in business and absorbed 20% of the vegetable product for processing	# of large scale agro-processing emerged in business and absorbed 40% of the vegetable product for processing	GDA/Department of Agricultural Engineering GDA/Department of Agroindustry
	3.3 Establish business enabling fund to support vegetable processing	NA	10% of producers and traders using fund for processing of vegetable	30% of producers and traders using fund for processing of vegetable	50% of producers and traders using fund for processing of vegetable	GDA/Department of Agricultural Engineering GDA/Department of Agroindustry

Program	Activities	Baseline 2015	Target 2020	Target 2025	Target 2030	Responsibilities
4 Marketing and Trade	4.1 Promote vegetable producing association	NA	# of vegetable association established and linked to markets	# of vegetable association established and linked to markets	# of vegetable association established and linked to markets	GDA/Department of Cooperatives
	4.2 Promote market linkage	NA	40% of vegetable production link to markets (wholesale and retail markets)	60% of vegetable production link to markets (wholesale and retail markets)	80% of vegetable production link to markets (wholesale and retail markets)	GDA/Department of Horticulture Department of Plant Protection, and Phyto-Sanitation
	4.3 Strengthen market information centers	NA	40% of vegetable producers and traders accessed and used market information	60% of vegetable producers and traders accessed and used market information	80% of vegetable producers and traders accessed and used market information	Department of planning and statistics and Dept. of Horticulture, and PDAs
	4.4 Promote establishment of market infrastructure to strengthen linkages of farmers to markets.	Pilots in Harvest project	30% of famers have improved access to market infrastructure.	50% of farmers have improved access to market infrastructure.	70% of cooperatives have improved access to market infrastructure.	Department of Agricultural Cooperative

9 POLICIES TO SUPPORT CROP MASTER PLAN

293. The implementation of the Crop Master Plan requires the combination of investments described in the value chain programs (Chapter 8) and Policies, Strategies, and Regulations (in short "policies") described briefly in this chapter.

294. The policies to support the Crop Master Plan can be divided into two groups: (i) policies related to each specific value chain targeted; and (ii) policies that are cross-cutting, that is are important for all crops in general, not specific to one crop in particular.

9.1 Policies related to Targeted Value Chains

295. For each of the value chains of Chapter 8, it will be necessary to develop an overall policy and strategy consistent with the Crop Master Plan.

296. Each of these policy and strategy documents will be issued by MAFF and will be formulated in coordination with other relevant ministries.

297. The objectives of these policies and strategies will be to help directing and moving towards the vision identified in the Crop Master Plan. The policies and strategies will elaborate the approaches, subprograms, and activities related to production, processing, marketing and trade, research and extension, value chain linkages, information and statistics.

298. One important element of these policies would be to translate the proposed vision into policy statement and to establish a platform for coordination of different value chain stakeholders.

299. Key to the success of the value chain approach proposed in the Crop Master Plan is the participation and active involvement of the private sector. Any platform or coordination/committee proposed under the policy should include the private sector.

300. These policies and strategies should be completed by 2016.

301. Recently, MAFF has stressed the importance of in-farm water management and of agricultural irrigation. While several subprograms to improve water use management, in-farm use, and green water management are already included in the investment subprograms of the 8 value chain programs, there is also the need of establishing policies to promoted these farm-water issues and clarify the demarcations between MAFF and MOWRAM in water use management.

Table 42 Policies related to Targeted Value Chains

No.	Policy Document	Start Formulation	End Formulation	Cost (USD '000)
P01	Value Chain Policy and Strategy for Rice	Jul-16	Dec-16	500
P02	Value Chain Policy and Strategy for Maize	Jul-16	Dec-16	300
P03	Value Chain Policy and Strategy for Cassava	Jul-16	Dec-16	400
P04	Value Chain Policy and Strategy for Mungbean	Jul-16	Dec-16	200
P05	Value Chain Policy and Strategy for Mango	Jul-16	Dec-16	200
P06	Value Chain Policy and Strategy for Cashews	Jul-16	Dec-16	200
P07	Value Chain Policy and Strategy for Pepper	Jul-16	Dec-16	200
P08	Value Chain Policy and Strategy for Vegetables	Jul-16	Dec-16	400
	Subtotal for period 2016-2020			**2400**

9.2 Policies cutting across different Crops

302. The cross cutting policies include the following:

Table 43 Cross cutting policies to support Implementation of the Crop Master Plan

No.	Policy Document	Start Formulation	End Formulation	Cost (USD '000)
P09	Seed Policy	Jan-16	Jul-16	100
P10	Seed Certification	Jan-16	Jul-16	100
P11	Seed Standards	Jan-16	Jul-16	100
P12	DUS Testing	Jan-16	Jul-16	100
P13	Crop Insurance	Jul-16	Jul-19	1000
P14	Law on Food Safety	Jan-16	Dec-17	200
P15	Law on Plant Protection and SPS	Jan-16	Dec-16	100
P16	Law on Warehouse Receipts	Jan-17	Dec-17	500
P17	Policy on Conservation Agriculture	Jan-17	Dec-18	1000
P18	Action Plan on Land Degradation	Jan-16	Dec-16	200
P19	Law on Agricultural Land Management	Jan-16	Dec-16	400
P20	Guidelines on Agricultural Land Zones	Jan-16	Dec-16	100
P21	Policy on Soil Fertility	Jan-16	Dec-17	200
P22	Policy on Green Water (in farm water use management)	Jan-17	Dec-18	1000
P23	Policy on Agricultural Cooperative	Jan-17	Dec-18	1000
	Subtotal for period 2016-2020			**6100**

303. Over the period 2015-2030, other policies will need to be formulated and issued, which will become evident over the implementation of the CMP.

10 MONITORING SYSTEM

304. The key indicators and targets in the vision and in the results to be achieved in different value chain programs are the basis for a Monitoring and Evaluation system.

305. The formulation of the monitoring system requires the clarification of the following:

- What needs to be monitored
- How to monitor (methods of monitoring and frequency)
- Who will monitor
- How information will be made available and to whom

The monitoring framework will be based on a logframe to be developed.

Logical frameworks for the CMP, 2030

Objectives	Performance Indicators	Measurement approach/data sources	Risks and Assumption	Institution(s) Responsible	Timeframe	Resources needed
Goal						
Strategic Objective						
Immediate results						
Outputs						
Activities						

306. This chapter will be developed after feedback on vision and programs.

11 BUDGET

307. The budget for the Crop Master Plan include the budget for three sets of activities: (i) the value chain programs budget; (ii) the budget for the policies and monitoring system to support the crop master plan; and (iii) the budget for institutional capacity building. The detailed budget for each value chain program is presented in **ANNEX 2**.

11.1 Budget for the Value Chain Program

308. The overall budget for value chain programs over the period 2016-2030 is USD 272.3 million, with rice absorbing about 51%, followed by cassava with about 12.4% of total budget and vegetables with 10.0%.

Table 44 Value Chain Program Budget

Crop	Program Budget (USD million)	Percentage of Total Budget
Rice	138.7	50.9%
Maize	15.9	5.8%
Cassava	33.8	12.4%
Mungbean	12.8	4.7%
Mango	18.4	6.7%
Cashews	17.5	6.4%
Pepper	8.2	3.0%
Vegetables	27.2	10.0%
Total	272.3	100.0%

309. This amount will be focused on programs for crop master plan over the15-year period 2016-2030. It is approximately USD 18.1 million per year. The budget does not include capital expenditures, and it is limited to the 8 value chains prioritized in the CMP.

310. The budget does not take into account the time of expenditures and the increase in level of prices. This exercise could be carried out once the main ideas of the CMP are agreed.

311. To put this investment in a different perspective, the investment in each crop is compared to the value of production of the crop and the growth in the value of production between 2015 and 2030. When compared to the overall value of production in 2015, the budget is only 5.6% and becomes 3% when compared to the growth of value. This is a rough indication of the Benefit Cost Ratio of the investment in value chain program.

Table 45 Value Chain Program Investment compared to Value of Production and Growth of Value

Crop	Program Budget (USD million)	Program Budget as % of Value 2015	Program Budget as % of Difference between Value 2030 and Value 2015	Value of Production 2015 (USD million)	Value of Production 2030 (USD million)	Growth in Value of Production
Rice	138.7	4.4%	4.0%	3,134	6,560	109%
Maize	15.9	13.5%	3.6%	118	563	377%
Cassava	33.8	4.4%	1.7%	770	2,730	255%
Mungbean	12.8	16.8%	16.9%	76	151	100%
Mango	18.4	5.5%	1.3%	334	1,799	439%
Cashews	17.5	15.9%	2.2%	110	888	708%
Pepper	8.2	8.6%	2.3%	95	450	374%
Vegetables	27.2	13.6%	4.7%	199	782	293%
Total	272.3	5.6%	3.0%	4,835.2	13,924.0	188.0%

11.2 Budget for the Policy Program and Monitoring System to Support the CMP

Table 46 Budget for Policy Formulation

No.	Policy	Cost (USD '000)
P01	Value Chain Policy and Strategy for Rice	500
P02	Value Chain Policy and Strategy for Maize	300
P03	Value Chain Policy and Strategy for Cassava	400
P04	Value Chain Policy and Strategy for Mungbean	200
P05	Value Chain Policy and Strategy for Mango	200
P06	Value Chain Policy and Strategy for Cashews	200
P07	Value Chain Policy and Strategy for Pepper	200
P08	Value Chain Policy and Strategy for Vegetables	400
P09	Seed Policy	100
P10	Seed Certification	100
P11	Seed Standards	100
P12	DUS Testing	100
P13	Crop Insurance	1000
P14	Law on Food Safety	200
P15	Law on Plant Protection and SPS	100
P16	Law on Warehouse Receipts	500
P17	Policy on Conservation Agriculture	1000
P18	Action Plan on Land Degradation	200
P19	Law on Agricultural Land Management	400

P20	Guidelines on Agricultural Land Zones	100
P21	Policy on Soil Fertility	200
P22	Policy on Green Water (in farm water use management)	1000
P23	Policy on Agricultural Cooperatives	1000
	Total for period 2016-2020	**8500**

Table 47 Budget for Monitoring

	Unit	No of Years	Unit Price (USD)	No. of Units	Amount (USD)
Monitoring Officer	staff	15	12,000	2	360,000
Monitoring Assistants	staff	15	6,000	4	360,000
Monitoring Visits	visits	15	600	12	108,000
Reports	reports	15	100	12	18,000
Dissemination Workshops	workshop	15	3,000	6	270,000
Subtotal Monitoring					1,116,000

11.3 Budget for Institutional Capacity Building

312. Capacity building to upgrade capacity of GDA, CARD, and MAFF staff includes both long-term training aimed at achieving specific degress such as MSc and PhD and short term training. Additional, one key capacity building will be to support the National Laboratory to conduct a number of food safety tests and input testing (eg fertilizers, pesticides).

Table 48 Budget for Capacity Building of MAFF/GDA Staff over 2016-2030

No.	Item	Unit	Unit Quantities	Unit Price (USD)	Amount (USD)
1	Research staff long term training (PhD)	PhD degree	16	240,000	3,840,000
2	Research staff long term training (MSc)	MSc degree	32	120,000	3,840,000
3	Research staff short term training	Training courses	250	1000	250,000
4	Departments staff long term training (PhD)	PhD degree	24	240,000	5,760,000
5	Departments staff short term training (MSc)	MSc degree	48	120,000	5,760,000
6	Departments staff short term training	Training courses	1250	1000	1,250,000
7	Support to National Laboratory	Equipment	1	10,000,000	10,000,000
	Subtotal				**30,700,000**

11.4 Total Budget

Table 49 total Budget to support CMP 2016-2030

No	Item	Amount (USD million)
1	Value Chain Programs	272.3
2	Policy	8.5
3	Monitoring	1.1
4	Capacity Building	30.7
	Total	**312.6**
	Average per year	20.8

12 NEXT STEPS

313. After submission of the Final Report:

i. Revisions and Preparation of Draft by MAFF for internal discussion
ii. External consultations
iii. Revision by MAFF
iv. Approval
v. Launching of Plan
vi. Dissemination central and local level
vii. Budgetary release
viii. M&E system establishment

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ANNEX 1 POLICIES AFFECTING THE AGRICULTURAL SECTOR

Rectangular Strategy Phase IIII

314. The new Rectangular Strategy Phase III (2013-2018) has been presented by the government as the policy framework for the Fifth Legislature. By maintaining the central themes of growth, employment, equity, and efficiency, the strategy shows a strong commitment by the Royal Government of Cambodia to promote employment and agriculture as central part of their medium-term development strategy and institute a policy framework to ensure botht productive employment generation and economic development.

315. With respect to agriculture, the strategy seeks to (i) improve productivity and diversification (including animal husbandry, food security and nutrition, and rural development); (ii) land reform and de-mining; (iii) fisheries reform; and (iv) forestry reform (including environment protection and conservation).

316. The RS promotes agriculture by a number of measures such as 1) Agriculture Support and Development Programs; 2) zero tariff on importing agriculture materials such as seeds, fertilizers, pesticide and agricultural equipment, etc.; 3) streamlining procedures and 3 years tax holiday for agricultural investment projects; 4) further incentives for investment in processing facilities, rice milling for exports and investment in irrigation; 5) streamlined procedures to promote rice exports; and 6) promoting farmer organization by setting up associations and cooperatives.

317. RS strategy for agriculture includes diversification. However, diversification requires several investments including effective and efficient irrigation systems; in fact maintaining and operating the existing irrigation systems remains challenging. Development of high quality and capable human resources to meet the immediate and long-term needs of agricultural development is another challenge for RGC in general and MAFF in particular. Adequate human resources in the public, private and NGO sector are needed for effective extension program aimed at increasing productivity and quality of agricultural products and improving the technical skills of farmers. Similar challenges affect the development and management of land and water resources as well as the management of ecological system that facilitate improvement in crop productivity and promote agricultural diversification. Finally, adverse impacts of climate change on Cambodia crop subsector require effective preparedness and response systems that could be adopted by smallholder farmers.

318. Cambodia aspires to reach the status of an upper-middle income country by 2030 and a high-income country by 2050. The Royal Government will formulate “Cambodia Vision 2030” and “Industrial Development Policy” as well as other policy and strategy documents that will guide Cambodia’s transformation, in terms of both quantitative and qualitative aspects. To meet this aspiration, the MAFF/GDA will formulate Crop Master Plan Vision 2030 that will guide and address the current issues and challenge of the current practices of crop sub-sector transformation into an effective policy instrument to support this Vision.

NSDP for 2014-2018

319. The National Strategic Development Plan (NSDP) has set forth other policy measures to promote agriculture, such as a land reform and clearance of land mines. These measures include strengthening land management, distribution and use; securing land ownership; curbing illegal landholding; and preventing concentration of unused land. Moreover, marginal farmers have been provided with social land concessions (SLC) in order to foster their production and diversification.

320. Due to lack of transparency in the way ELCs are granted, it is difficult to assess exactly how many ELCs have been approved, which are active, and how much state revenue has been raised. As of 2012 the MAFF's statistical data of ELCs contained details of more than 80 concessions, but some concessions known to exist are not listed, and there may also be concessions listed that have since been cancelled due to inactivity. The MAFF website states that between 1996 and June 2012 MAFF signed ELC contracts with 117 companies covering a total land area of 1,181,522 hectares. The size of ELC has varied from 600ha to more than 10,000ha per concession and cultivated from seasonal cash crops to perennial crops and fruits tree crops and trees. However, some NGO reports have claimed the figure is closer to 2 million hectares. The reason for this discrepancy is not clear, although it is known that other authorities have approved land concessions for agricultural purposes. For example, the Ministry of Environment has approved concessions in some protected areas. Little information is available regarding these concessions.

National Sustainable Development Strategy (NSDS) – Vision 2030

321. The vision 2030 of NSDS is to achieve a cohesive, educationally advanced, and culturally vibrant Cambodia without poverty, illiteracy and ill health; an increasingly higher standard of living; and a society which ensures the long term sustainability of the natural resources and the environment.

322. This strategy is a long-term strategy that gives direction to all sectors. It has a close relation with the Rectangular Strategy (RS) and the National Strategic Development Plan (NSDP) as well as with Cambodia's MDGs. Based on NSDS medium and long terms, the government will commit itself to fully integrate NSDS concepts and actions into national planning and budgeting process. Under the NSDS, all government ministries, departments, etc. should draw up management policies or sustainable sector policies to manage and utilize natural, environmental, and social resources for economic growth and development in 2008-2030. The proposed indicators reflect the objectives and targets in the NSDS and are divided in four sections: 1) Indicators for People's Wellbeing and Social Development; 2) Indicators for Sustainability of Natural Resources and the Environment; 3) Indicators for Sustainable Economic Sectors and Infrastructure; and 4) Indicators for Good Governance and Implementation of Sustainable Development. The indicators need to be integrated within the existing system in order to get one coherent system of monitoring and evaluation of sustainable development in the country.

323. One major implication of NSDS for the CMP is to integrate the principles of NSDS sustainable growth and development into the CMP programs and projects and to reverse the loss of environmental resources.

Strategic Framework for Food Security and Nutrition in Cambodia 2008-2012 (SSFSN)

324. The vision of SFFSN is "All Cambodians have physical and economic access to sufficient, safe, and nutritious food, at all times, to meet their dietary needs and food preferences for an active and healthy life". This Food security framework is addressed in the Government's Rectangular Strategy and the National Strategic Development Plan. It is also a priority recognized in a broad range of sector policies, from agriculture and water resources to economic development and health and education sectors.

325. The national strategies that are relevant to Food Security and Nutrition Strategic Framework are: 1) the Strategy for Agriculture and Water (SAW); 2) the National Nutrition Strategy (NNS); 3) National Strategy for Social Protection for the Poor and Vulnerable (NSPS); and 4) Policy Paper on Promotion of Paddy Rice Production and Export of Milled Rice.

326. The key constraints related to food insecurity in terms of affordability, availability, accessibility, and utilization were 1) Low productivity in agriculture, forestry and fisheries; 2) lack of land tenure and landholding; 3) poverty and lack of household income; 3) maternal health, mother-child caring practices, access to quality health services, and access to domestic clean water and sanitation; 4) instability in food supply due to shocks such as flood, drought; and 5) socioeconomic vulnerability.

327. Although, overall poverty rate went further down from 30.1 (in 2007) to estimated 25.8% in 2010, and 19.8% in 2013, the lesson learnt from the implementation of Strategic Framework for Food Security and Nutrition in Cambodia 2008-2012 seems that the share of the poorest quintile in national consumption (as a measure of consumption inequality) were slightly improving due to low income and lack of access to food. The poor food utilization was resulting in chronic malnutrition, morbidity and mortality, particularly among women and children in rural communities.

328. The capacities of food insecure households to cope with risks and shocks and increase the stability of their food supply were limited. In 2011, the capacities of water supply for irrigation were about 34% of the cultivated land (according to MoWRAM). The institutional and policy environment for improved food security and nutrition were not sufficiently operationalized.

329. The implication for the CMP is to ensure that its impacts do contribute to the achievement of the targets of the SFFSN.

Agriculture Sector Strategic Development Plan (ASSDP) 2009-2013

330. ASSDP is a policy related to agriculture, forestry, and fisheries that capture relevant elements from RS and NSDP. It has five strategic objectives including (i) food security, productivity, and diversification; (ii) market access for agricultural products; (iii) institutional and legislative development framework; (iv) fisheries reform; and (v) forestry reform. MAFF has translated the strategic objectives into three policy objectives: a) to increase productivity and diversification to ensure an annual increase of 10% of all important crops, 3% in livestock

production, b) to ensure the proper demarcation of the fishing lots for community fisheries; and c) to ensure the coverage of forest on 60% of total land by 2015.

331. Corresponding to the objectives, there are five key program areas: 1) to increase productivity and diversification; 2) to promote market access for agricultural products; 3) to strengthen institutional and legislative development framework; 4) to manage fisheries and aquatic resource in a sustainable manner; and 5) to manage forestry and wildlife resources in a sustainable manner (MAFF 2013). GDA has the mandate to support the implementation of program 1 through research, development and transfer of technologies related to a) the management of agricultural land, b) development of all types of crops, c) crop protection and SPS, d) agricultural machinery, e) agricultural extension and f) quality control of agri-products.

332. The key achievement of the implementation of the ASSDP was to support the Policy Paper on Promotion of Paddy Production and Rice Export and the endorsement of ten best rice varieties. Other achievement was the implementation of eight programs/projects in 2012 supported by a number of donors such as ABD, IFAD, AFD, EU, FAO, and JICA on activities related to smallholder livelihood development, food emergency assistance, agriculture productivity improvement, rice research, agriculture diversification and poverty reduction (MAFF 2013). Challenges during the implementation of program 1 included:

- Small budget allocated for research and extension
- Private investment in agriculture is small
- Dependence on import of vegetables
- Limited resources at national and provincial levels for technology transfer
- Migration of labor
- Low level of education of smallholders as an obstacle to extension work

Draft Agricultural Sector Strategic Development Plan (ASDP) 2014-2018

333. The Agricultural Sector Strategic Development Plan (ASDP), 2014-2018 is a medium-term plan that specifies the policy goals and objectives, indicates development outcomes, expected outputs and activities of MAFF for a 5 year period, from 2014 to 2018 with a vision "*To contribute poverty reduction, ensure enough & safe food availability for all people, through modernization of agricultural sector based on a new approach and with changed scope and pace for accelerating agricultural economic growth, and sustainable natural resource management & conservation"*. The overall goal is *"Increase agricultural growth to around 5% per annum through enhancement of the agricultural productivity, diversification and commercialization and livestock and aquaculture farming by taking into account the consideration of sustainable forestry and fisheries resource management"*.

334. The ASDP 2014-2018 will be implement based on four pillars as follows:

a. Pillar-1: Enhancement of the agricultural productivity, diversification and commercialization;
b. Pillar-2: Promotion of livestock and aquaculture;
c. Pillar-3: Sustainable Fisheries and Forestry Resources Management;
d. Pillar-4: Strengthening the institutional capacity and increasing efficient supporting services and human resource development

335. In order to achieve the main policy goals and these four pillars, the Ministry of Agriculture, Forestry and Fisheries formulated five priority programs which incorporate the Public Financial Reform Program of the RGC under Programme-5. The programs will be financed through a budget that combines domestic financial resources with the contributions of development partners. The 5 priority programs are as follows:

336. **Program 1. Enhancement of Agricultural Productivity, Diversification and Commercialization.** The program objective is "*to increase the growth of all kinds of crop production by 10% per annum through enhancing agricultural research and extension aiming to increase crop yield, improve the product quality, strengthening capacity of agricultural cooperatives in connection with contract farming system and improving sustainable agricultural land management and utilization*". MAFF will continue the increase in productivity of rice and other commercial crops. Research and development (R&D) will continue to improve crop productivity and resilience to climate change through improving quality of seed for which there is a market demand. Agricultural diversification will be promoted through the creation of an enabling environment to increase the involvement of private sector, construction of local infrastructure to improve farm access to markets, conduct local trials of seed for commercial crops, provide extension activities to introduce cash crops to small farmers, oversee trading relations between farmers on the one hand and traders and integrated, agricultural supply and marketing firms on the other. Rice value chains will also be strengthened through improving the availability and quality of commercial rice seed; improving rice extension services; capacity building of mill operators; and facilitating access to credit for farmers, traders and millers, etc. The indicators have been developed to measure the achievement.

Table 50 Indicators under the program 1 of ASDP

No.	Indicator	Unit	2013 (Achieved)	2014	2015	2016	2017	2018
1	Area under all crops	Million ha	4.50	4.81	5.02	5.23	5.44	5.65
2	Rice Yield	Ton/ha	3.16	3.17	3.18	3.21	3.23	3.25
3	Paddy surplus	Million Ton	4.82	5.24	5.41	5.60	5.79	6

337. Interestingly, the targets for the expansion of crop land over 5 years imply an average growth rate of 4.6%, whereas the increase in rice yield is only an average of 0.6% per year. Combining the rice yield assumption with the paddy surplus targets (assuming to grow at an average of 4.5% per year) suggest that the emphasis on expansion of cultivated area is still more than the expansion of yields.

338. **Program 2. Promote Animal Production and Animal Health**. This program related to livestock farming through the introduction of a policy framework based on value chain principles that will reduce barriers to the development of this sector, taking into account issues of food safety standards and market regulation, especially sanitary and phyto-sanitary standards.

339. **Program 3**. **Sustainable Fisheries Resources Management.** Fisheries reform aimed at livelihood improvement, addressing the food security and nutrition needs of the population and preserving fishery resources through organizing fishery communities, conservation of flooded forests, combating illegal fishing, and promotion of aquaculture for contributing to national economic growth and poverty reduction.

340. **Program 4**. **Sustainable Forestry & Wildlife Resource Management**. This program is to strengthen the sustainable management of forestry and wildlife through law enforcement, promoting reforestation of at least 25,000 ha per year; create the protected forest and wildlife conservation with 50,000 ha/year; and establish 32 forestry communities per year.

341. **Program 5. Strengthening Institutional Capacity, enhancing efficiency of supporting services and Human Resource Development**. The objective of the program is to increase the effectiveness of institutional management, service delivery, and strengthen the capacity for agricultural education and training for sustainable agricultural development.

342. MAFF has proposed a budget plan for implementing these five programs under ASDP 2014-2018 with the total amount of US$336.49 million, in which the amount of US$280.41 million for recurrent costs and US$56.08 million for investment costs. The total budget of US$77,430,760 allocated for enhancement of agricultural productivities, diversification and commercialization, the amount of US$46,701,130 allocated for promotion of livestock production and health, the amount of US$63,331,130 allocated for sustainable fisheries resource management, the amount of US$49,714,240 allocated for sustainable forestry and wildlife management, and the amount of US$43,236,310 allocated for strengthening institutional capacity, increasing the efficiency of supporting services and human resource development in agriculture sector. The main financial resources would be obtained from the national budget and external assistances.

Lessons from the past ASSDP 2009-2013

343. The draft of ASDP 2014-2018 is based on lessons learnt and the achievements in ASSDP 2009-2013, which has indicated that the gross value added of agricultural production reached over 9,000 billion Riels in 2013, up from 8,000 billion Riels in 2009 (constant 2000 prices). Key constraints and challenges during the implementation of ASSDP 2009 – 2013 are set out below:

344. **Producers and extension services**. Between 2009 and 2013, the extension service workers are expected to provide training, particularly through the 556 agricultural co-operative organizations, in best practice techniques for land management, soil fertility and crop selection and support in organization management, marketing, access to finance and agri-business development. The RGC has recognized the requirement to extend the outreach of the supporting services structure to local levels. Farmers have trouble finding the market to sell their products and difficulties in increasing their market competing ability in the context of free market economy.

345. **Sanitary and phyto-sanitary (SPS) standard and export and trade facilitation.** The laws and regulations to further promote production and distribution of improved quality

seed; strengthen agricultural land management including control on the use of inputs; strengthen farmers' organizations and promote contract farming; and facilitate domestic trading and export of milled rice need to be implemented and effectively enforced. SPS legislation needs updating because there are gaps, poor compliance with WTO principles and insufficient implementation. MAFF has prepared laws and procedures on the import and export of agricultural products subject to SPS inspection. Management of plant and animal quarantine needs to be improved. The EU markets require high SPS standards for agricultural products and no use of GMOs. Cambodia will have to demonstrate it is implementing and enforcing these controls. The capacity of the testing laboratories is limited.

346. **Enhancement of productivity and diversification.** There is still a large need for both technical and financial support, as well as the participation of all concerned stakeholders in order to promote and increase the access to agricultural extension services, irrigation systems, climate-resilient seeds and cultivation techniques and appropriate uses of agricultural input supplies and credit supports. The encouragement of participation from the private sector in agricultural development is needed in order to increase investments in the sector. Despite progress in land registration and titling, challenges still remain in access to land which impact agricultural production, more farmers need title to their land and faster updating of land information. MAFF has prepared laws on agricultural land use and management. Among other things, this will incorporate agro-ecosystem analyses (AEA) into land-use planning.

347. Contract Farming included 121 agro-industry contracts granted in 18 provinces. The total land area under these contracts was around 1.3 million ha. 0.81 Million ha of this can be cultivated, but only 0.28 million ha has actually been cultivated, mostly with rubber, oil palm, sugar cane, cashew, cassava and tree plantations. Issues still remaining:

- *Enhancing rice productivity* - The extension program for the production and distribution of these 10 rice seed varieties has started but has not yet been extended comprehensively to famers. The quantity produced of those seeds was not sufficient to supply all the farmers interested in growing them.
- *Paddy Rice Collection and Processing* – The links between farmers and processors are weak. Farmers, individually, still sell their paddy to traders. The contract farming is not yet being widely used so in future MAFF will focus on developing the contract farming system. Despite Government support for the Rice Millers' Association, finance will be needed both for the purchase and storage of paddy rice during the harvesting period and for the installation of further, international standard milling capacity. The improvement of post-harvest management is still limited despite recent investment.
- *Export facilitation* - Increased export needs more investment which depends on confidence that international milling, quality and SPS standards supported by effective trade facilitation and competitive export arrangements.
- *Subsidiary and Industrial Crops* - The production of subsidiary and industrial crops such as maize, cassava, mung bean and soya beans fluctuated according to the growing conditions, prices, and market demand for each crop. Over the last 5 years, the area cultivated for the production of fruit crops, such as banana, coconut, longan, mango, sapodilla, durian, jack fruit, custard apple, orange, rambutan, guava, pineapple and permanent crops (cashew, oil palm, pepper…etc.) increased by 5% to 183 thousand hectares in 2013.

348. **Supporting Services**. ASSDP 2014 - 2018 is developing in line with the concept of a free market economy. The role and responsibilities of each technical line department must be improved to enable and facilitate the functioning of the sector. A clear management structure, and strong human resources capacity is needed in all the units under MAFF. Monitoring actions to the contract implementation must be strongly enforced. Training and support of the agricultural extension workers is required. Human resource development, vocational, and professional training need to be accelerated, especially the improvement and development of local agricultural technical capacity for the grass-root level in order to provide agricultural extension services to farmers in rural areas.

Strategy for Agriculture and Water 2010-2013

349. SAW vision – "*to ensure enough, safe and accessible food and water for all people, reduce poverty, and contribute to economic growth (GDP per capita), while ensuring the sustainability of natural resources"* and the overall goal of the SAW is to contribute to poverty reduction, food security and economic growth through enhancing agricultural productivity and diversification and improving water resources development and management. The SAW has five programs: 1) institutional capacity building and management for agriculture and water; 2) food security; 3) agriculture and agri-business; 4) water resources, irrigation management and land; and 5) agricultural and water resource research, education and extension. The Programs is identified to be instrumental for contributing to achieving the overall development goal of the NSDP, with its particular focus on improving the institutional and management capacity of MAFF and MOWRAM. At the same time, the Programs will also benefit farmers and the agricultural sector by providing an effective means of improving the success rates of agricultural and water sector programs, promoting greater diversity in agricultural production, and improving the competitiveness of the agricultural sector.

350. The review of SAW 2006-2010 led to have four key findings of challenge and limitation of each programs as summarizing the following:

- Institutional capacity building and management for agriculture and water
  - No framework to link the decentralized planning process with MAFF and MOWRAM policy and planning at the national level.
  - Inadequate remuneration levels encouraging most qualified staff leave temporarily or permanently for private sector, donor or NGO opportunities.
  - Gaps between the mandates of MOWRAM and MAFF are i) farmers' knowledge of field water control and ii) methods of irrigated agriculture.
- Food security.
  - These projects have been implemented in rather fragmented way.
  - Limited capacity for systematic planning and programming for FS as integral part of agriculture and rural development.
- Agriculture and agri-business.
  - Lack of skills and experience in facilitating and brokering contract farming arrangements.
  - The capital required by the rice millers is US$720 million for 1 million rice export.

  - High processing and logistics costs make Cambodia less competitive in the international market of rice.
  - The government policies and regulations are promulgated but lack of enforcement.
- Agricultural and water resource research, education and extension.
  - Fragmented research activities.
  - Lack of coordination institution for agriculture research.
  - Government budget allocated for agriculture research is small and still largely depends on external funding.

Gender Mainstreaming Policy and Strategy in Agriculture

351. Cambodia has an active agricultural population of 5,869,633 or 62 percent within the age group 15-64 years old of the overall agricultural population. In agricultural activities, boys and girls with the age of 10-14 years old are helping in the household's own farm/agricultural activities. The total number of agricultural and fishery workers in Cambodia is 3,715,696 of which 1,755,581 (47.3%) are females and 1,960,115 (52.8%) are males.

352. In order to ensure gender mainstreaming for the whole sector of agriculture and rural development, the Ministry of Agriculture, Forestry and Fisheries (MAFF) established a Gender Unit (GU) as the over-arching body to oversee the implementation of the Policy and Strategy for Gender Mainstreaming. This strategy has the vision of "Enhancement of gender equality in the agriculture sector through active cooperation of both women and men for the opportunity to contribute and benefit equally from the activities of all sub-sectors in the agriculture sector". There have 4 objectives:

- enhanced awareness of gender issues in agriculture sector
- gender analysis and sex disaggregated targets, data, etc. in program / project cycle
- enhanced capacity of MAFF to integrate gender issues
- increased rural women's access to and control of agricultural resources in order to improve agricultural productivity and household incomes

353. The MAFF National Medium Term Priority Framework (NMTPF) focuses on "improved consumer protection and market access to agricultural and related products" by providing support to agro-business, the solutions selected in relation to improving livelihoods of poor women in 'off-farm' communities.

354. Key findings from the gender mainstreaming strategic plan review have identified challenges and limitation of gender mainstreaming in agriculture and can be summary below. These key findings can be used as points to include in gender mainstreaming in the CMP vision 2030:

- Low understanding of the process of managing the revolving fund of district project staff, planning officers, gender and gender focus point on gender analysis and sex disaggregated targets and data collection.
- Gender Mainstreaming Policy and Strategy in Agriculture developed in 2006 and no new version to match with ASSDP 2009-2013 was not available
- Lack of gender training of targeting entrepreneurial skills, business development

services, current market information on jobs, and access to credit.
- Limited income-generation opportunities for women in poor rural households in the community.
- Woman-headed households have limited access to credit/capital to start and expand their income-generation activities

Policy Paper on Promotion of Paddy Production and Rice Export

355. The government developed a policy on "Paddy Rice Production and Promotion of Milled Rice Export" in 2010, aiming to achieve a paddy rice production surplus of 4 million tons and milled rice exports of at least 1 million tons by 2015 by investing in irrigation facilities, encouraging private sector investment in paddy rice processing and export, and improving procedures for export and transport facilitation. The policy resulted in increased investment in the rice milling sector and exports of milled rice.

356. However, it is unlikely the target of 1 million on exports of milled rice will be reached in 2015. In 2014, less than 400,000 tons of milled rice were exported.

357. There are limitations and challenges of the implementation of the policy and requires exploring and addressing in the MAFF's ASDP and CMP in the future. These key limitation and challenges can be summarized as follows:
- Price of Cambodian rice is still less competitive due to production and processing costs including fuel and logistics.
- Lack of capital for buying paddy rice and investment on upgrading mills. High interest rates of loan.
- Lack of investment on research on rice varieties that meet the demand at the international market.

Land Law

358. The Land Law was enacted in 2001 to regulate land administration, management and distribution. In developing its policies for land reform, the government identified three main pillars: land administration, land management and land distribution. The first pillar, Land Administration, is concerned with land registration and dispute resolution. According to the law, MAFF is responsible for granting Economic Land Concessions while the Ministry of Environment is responsible for the protected areas and national parks and the MLMUPC is the Government entity that issues land titles. There are several other laws and regulations which are linked with the land law such as the Forestry Law in 2002, the Law on Protected Areas in 2008, a Royal Decree on the creation of the Law on Environmental Protection and Natural Resource Management, 1996, Environmental Impact Assessment or EIA (1999), procedure for granting right to tree planting on state forest land (2008) and community forestry (2003).

359. Secure land tenure for smallholder farmers and commercial enterprises is an important component of the agricultural development strategy and master plan. Cambodia is currently pursuing a dual track approach regarding land use and land tenure that employs a systematic land-titling program for smallholder farmers, while granting economic land

concessions to private investors to support plantation style approaches to agribusiness development. Economic land concessions are allocated to private users for specific purposes with the rationale of promoting investment in agricultural production and generating rural off-farm employment, leading to poverty reduction in rural areas. Conversely, social land concessions provide a mechanism for enabling landless farmers to gain access to land for residential and subsistence farming purposes.

360. The challenges and limitations of implementation of land policy can be land holding and land titling for smallholder farmers and to overcome the issues MAFF and ASDP should use the coordination mechanism of TWG. These issues are:

- slow progress in granting land titles might not reach target of 43% in 2015
- Protected areas, community protected areas and forests are under severe pressure and encroachment. This issues cause by the lack of forest demarcation on the ground.
- Lack of financial resources for management of protected areas and protection forests.
- Many governmental agencies involved in forest management.

Economic Land Concessions

361. The government offers three types of land concessions, in which State land is leased to domestic and foreign investors, 1) Social Concessions; 2) Economic Land Concessions; and 3) Use, Development or Exploitation Concessions. In the case of Social Concessions, beneficiaries can build residential constructions and cultivate State land for subsistence. Use, Development or Exploitation Concessions include mining concessions, port concessions, airport concessions, industrial development concessions, and fishing concessions. Economic Land Concessions (ELCs) permit beneficiaries to clear land for industrial or agricultural exploitation.

362. The legal framework governing ELCs consists primarily of the 2001 Land Law, which distinguishes between state public and state private land, and Sub-Decree (RGC) No. 146 ANK/BK on Economic Land Concessions (SD-ELC), which sets out the criteria, procedures, mechanisms and institutional arrangements for initiating, granting, monitoring and reviewing ELCs. ELCs can be granted by the Ministry of Agriculture, Forestry and Fisheries for a maximum of 10,000 hectares, and no more than 99 years.

363. Based on MAFF report up to June 2012, the ELC has been granted to 117 private companies with the total land areas of 1,181,522 ha. There is no new data have been found after June 2012.

Climate Change

364. The Royal Government of Cambodia officially launched the Cambodia Climate Change Strategic Plan (CCCSP) 2014-2023 in November 2013. The CCCSP captures the main strategic objectives and directions for a climate-smart development of Cambodia in the next 10 years. It builds synergies with existing government policies to ensure a strategic cohesion to address

a wide range of climate change issues linked to adaptation, GHG mitigation, and low-carbon development.

365. The goals of the CCCSP are:

- reducing vulnerability to climate change impacts of people, in particular the most vulnerable, and critical systems;
- Shifting towards a green development path by promoting low-carbon development and technologies;
- Promoting public awareness and participation in climate change response actions.

366. The CCCSP 2014 – 2023 has set out on 1) putting in place institutional and financial arrangements for the implementation of the CCCSP, development of national monitoring and evaluation (M&E) frameworks and indicators, and development of climate change action plans (2014 – 2018) by line ministries; 2) implanting the Adaptation Fund and Green Climate Fund, research and knowledge management, capacity, development, mainstreaming of climate change across sectors at different levels, operation of M&E and data management systems; and 3) scale up success cases and mainstreaming climate change into national and sub-national programs.

367. Although progress made in recent year related to climate change, Cambodia has still suffered from dramatic changes in seasonal weather pattern. The government plan of climate change adaptation is not well integrated into the subnational level and cause of poor prepared for climate change mitigation and adaptation because of lack of information and resources. The local communities are aware of possible coping and adaptation activities such as rehabilitating irrigation and water storage scheme, building water control structure, using appropriate technology such as tolerance seeds to drought and short duration rice after flooding. However, the lack of resources such as financial resources prevented government at national and central from carrying out activities effective and efficient way. The future policy with appropriate mitigation and adaptation mechanism to preparing rural communities to cope with climate change is a key to improve food security, income generation, and poverty alleviation.

Agricultural Extension Policy

368. The Agricultural Extension Policy was endorsed by the Minister of MAFF on 01 April 2015 and is a guiding map in expanding effective agricultural extension services to improve the livelihood and well-being of the Cambodian people through increased agricultural productivity, diversification and commercialization, sustainable natural resources management and responsiveness to the context of integration and technological and market competition in the region and the world.

369. The Agricultural Extension Policy in Cambodia has a vision to increase effectiveness of agricultural extension service delivery for improved livelihood and wellbeing of the Cambodian people. The main goal of the strategy is to allow all Cambodian farmers and farming communities will access and adopt better agricultural knowledge, information, and technologies to enhance agricultural productivity, diversification, commercialization, and

sustainable natural resources management. To be able to achieve this goal, there are five objectives adopted as follows:

- to improve effectiveness of agricultural extension institutions and systems at all levels for effective operation, cooperation, and coordination, and strengthened linkages among all the stakeholders;
- to improve human resource capacity and capability in delivering extension services in response to local needs and market demand;
- to research and develop appropriate technologies and make them available, accessible, and applicable to farmers;
- to develop extension materials and promote effective access to and use of agricultural knowledge, information, and technologies;
- and to effectively deliver extension services to improve decision-making among farmers and farming communities for increasing agricultural productivity, diversification, commercialization, and income generation.

370. The implementation of this policy requires participation by all stakeholders from government institutions, development partners, private sector, NGOs, CBOs, lead farmers, and extension service providers, collaborating, supporting and implementing to provide effective and efficient extension services to farmers and farming communities as well as providing services and techniques that meet demand, are accessible and adaptable to farmers and farming communities.

Law on Agricultural Cooperatives

371. The law on Agricultural Cooperatives (endorsed by Royal Decree in 2013) is intended to enhance volunteer participation of major incomes that includes farming system production, agro-industry, agri-business or services related to agricultural production and have agreed to establish and develop Agricultural Cooperatives to improve economic, social, and culture of its members including involvement in national economic development. This law aims to determine the establishment, operation, and management mechanism to support agricultural cooperatives, agricultural cooperatives unions, and agricultural cooperatives federations. MAFF is responsible for registering the establishment, operations, and development of agricultural cooperatives, and should provide capacity building and extension services to strengthen the agricultural cooperatives. Also, MAFF should establish a Department of Agricultural Cooperative Development under GDA to be held responsible for agricultural cooperatives. Each cooperative should consist of at least 15 members and these members should have a major job in farming system production, agro-industry, agri-business or services related to agricultural production. Each member should be at least 18 years old during the application for membership and has at least been employed once in the agricultural production sector.

372. The Law of Agricultural Cooperatives will provide a good environment for implementation of the CMP because the law would allow farmers to organize themselves in legally recognized cooperatives, which could improve their market position and allow access to financial and technical support. It is important for small farmers to get organized in order to get access to the market and additional resources and it would be vital for farmers to choose good leaders for their cooperatives.

Law on Plant Seed Management and Plant Breeder Rights promulgated on13 May 2008.

373. The Law is intended to manage and control breeding release, modification, listing, distributing, trading crop seeds and protecting new varieties in the Kingdom of Cambodia. Ministry of Industry, Mines, and Energy is responsible for registering and protection of new varieties by providing the protection right of breeder of new varieties, transferring ownerships, declaring annulment or termination, accepting forms of registering, changing, or deleting the names of new varieties, issues of order and recording of contract. The model form, documents, or varieties shall be set by the declaration of the Ministry of Industry, Mines, and Energy.

374. The business owners of new varieties that have obtained the right of protection should use the name of varieties registered. MAFF and MEF will issue a certificate and service charge for quality and will join set declaration.

375. varieties are considered different as long as they have the absolute difference from the other varieties which are generally recognized by the date applying for the right or the priority right. varieties are considered stable as long as their necessary nature does not vary in all the stages of growth cycle and each generation. Any person who has bred or discovered and developed new varieties and has the intention to protect the copyright of new varieties shall submit a proposal to the Ministry of Industry, Mines, and Energy. MAFF shall study it and evaluate the technical outcomes in compliance with the provision of this law. An application for the protection of the new varieties shall be a Khmer citizen or foreign citizen who has residency in Cambodia or have a permanent on the Protection of New Varieties or in any state with the memorandum of understanding with the Kingdom of Cambodia.

> The owner of a protected variety shall lose the right of protection, if the owner or person authorized by the breeder sells or circulates them in the market in the Kingdom of Cambodia. The right shall not be lost if the protected variety is used for further propagation or for an export of materials of the variety, which enables the propagation of the variety in a country which does not protect varieties of the plant genus or species to which the variety belongs, unless the exported materials is exclusively for final consumption purposes.

376. Seed trade shall have a license from the MAFF. Ownership transfer made to another person with a license for seeds trade shall have an agreement from the MAFF.

377. This law provides a favor condition and right to the registered varieties and owner to protect the varieties. This is good for protecting the investment of seed production business in Cambodia.

Contract Farming

378. The Sub-decree defines the implementation framework of Contract-based Agricultural Production with the intention to strengthen, take responsibilities, build trust, and fairness between producing and purchasing party ensuring prices, purchases, and supply of agricultural crops both on quantity and quality, increasing processing and exporting of

agricultural crops to contribute to national economic development and poverty reduction of the people parallel to the policies and strategies of the RGC. This Sub-decree's scope applies to all types of Agricultural Production Business and Contract-based Agricultural Production. The Ministry of Agriculture, Forestry and Fisheries shall be the lead agency in communicating, coordinating, providing services under its competency, involving in all activities, providing enabling environment to the development of Contract-based Agricultural Production, monitoring and evaluating and making reports to the RGC. The State shall have the following roles:

- Bridge communication between investors and farmers, producers, processors in the framework of Contract based Agricultural Production
- Promote and encourage the formation of associations, agricultural communities, or agricultural organizations as the bases to develop contact-based agriculture
- Addressing conflicts and problems pertaining to the implementation of Contract-based Agricultural Production on the basis of existing laws and interests of parties of the contract, etc.

379. Therefore, contract farming system enables farmers to access credit, inputs, technical advice and marketing information directly from processors or market intermediaries thereby reducing risk and increasing profits. It will also provide a good environment for implementation of CMP. However, the disadvantages of contract farming are including loss of bargaining power, potential reductions in margins, and increased emphasis on improving quality (and associated penalties for noncompliance). The choice to enter into or leave a contract arrangement is there for the farmer to make. Farmers involved in contract farming are able to capture higher returns than those without contracts. Higher returns are achievable due to higher productivity from better management (assisted by targeted extension and the provision of credit and inputs), as well as higher prices from producing a crop to the required specifications of the processor.

Food Safety

380. Plant health management system and food safety in Cambodia are under-developed. The use of a multi-pronged approach or strategy commonly referred to as an Integrated Pest Management or an Integrated Plant Health Management approach or Sanitation and Phyto-sanitation (SPS) are not well managed. In practices, the Integrated Plant Health Management programs rely on the use of several integrated approaches enhancing the chances of growing healthy plants for consumption and export-import. These integrated approaches include genetic host resistance, cultural practices, chemical applications, biological control, and regulatory measures.

381. The Prakas on Food Safety is important for drafting the CMP to ensure that food safety and biosafety guidelines are incorporated. The prakas aims to 1) improve the implementation of food safety system for the protection of consumer health and to enhance Cambodian food export competitiveness; and 2) set up institutional mechanisms for facilitating and coordinating activities from different ministries and competent authorities related to food safety. This Prakas covers only food for commercial purpose and related activities at all stages of the food chain from primary production at farm to final consumer consumption. This excludes food for family or use for recreational purposes, animal feed and living modified

organisms. It also clarifies accountability and effective roles and responsibilities of ministries and competent authorities in policy development, legal framework, standards and technical regulation development, etc.

382. Food shall be deemed to be unsafe if it is considered to be 1) injurious to health and 2) unfit for human consumption. The Ministry and Competent Authority have the mandate to i) educate and advise consumers and food business operators on food safety, ii) monitor, inspect, investigate, undertake required corrective measures, apply recalls and provide systems as necessary to enhance food safety, iii) in special circumstances and where unavoidable undertake the appropriate legal action including corrective administrative measures and sanctions.

383. The food business operators have the mandate to i) provide safe food and to address safety issues as they arise, ii) implement Food Safety Management Systems (FSMS), iii) ensure compliance with food requirements and standards, iv) alert the Ministry and Competent Authority on food safety issues and collaborate closely with the Ministry and Competent Authority in implementing measures to avoid or reduce risks caused by its products, v) respond quickly to food safety concerns as they arise and vi) recall the food product.

384. Consumers shall contribute to the improvement of food safety by i) understanding about food safety issues and consume only food that meet food requirements and standards and ii) taking food safety problems to suppliers, report to the Ministry or Competent Authority.

385. Food business operators shall record information of its supplier and shall make it available to the Ministry and Competent Authority on demand. Food business operators shall ensure that food is adequately labeled.

386. In implementing this work MAFF should ensure that information on licensing and registration of the food businesses is available to other ministries and competent authorities on demand. MAFF is the sole responsible agency and lead coordination to promote effective and efficient implementation of tasks related to food and food business at primary production and processing. MAFF should facilitate the activities of other authorities and ministries to perform the certification. Other ministries and competent authorities should inform MAFF on the progress and revision of any legal framework under their competency which is related to food business at primary production and primary processing.

387. All registration and/or permission to establish and operate food business at secondary processing shall be carried out by the Competent Authority of the Ministry of Industry, Mines and Energy (MIME). MIME should ensure that information on licensing and registration of the food factory and handicraft is available to other ministries and competent authorities on demand.

388. All registration and/or permission to establish and operate food business at the tourist canteens and restaurants and inspection of compliance to the tourist standards and norms shall be carried out by the Competent Authority of the Ministry of Tourism.

389. Ministry of Health (MOH) should be the sole responsible agency in leading effective and efficient coordination in the implementation of the tasks related to food safety at the consumer sector.

390. The General Department of Customs and Excise of Cambodia (GDCE) should be the sole responsible agency in leading effective and efficient coordination in food safety inspection at the international checkpoint

Rice Strategy/Rice Policy

391. Despite the important of rice in agriculture and society in Cambodia, there is no long-term strategy or policy to guide the sector. The policy in promotion of rice export is intended to apply up to 2015 and is not clear the follow up of that policy. The Department of Rice Crop Production has not yed drafted a strategic plan to guide policy, programs, and projects in this crucial crop.

Draft Horticultural Strategy

392. The Department of Horticulture and Subsidiary Crops has drafted the master plan for this subsector. Based on the preliminary draft of the Master Plan, it will 1) contribute directly to increasing horticultural production of fruits and vegetables through improved food security and livelihood improvement as well as indirectly through the prospect of achieving surplus production that can be marketed; and 2) open up the opportunity to increase household income that can be used to meet other basic needs beyond the provisions possible through subsistence farming.

393. The draft master plan has focused on eight themes: 1) Research and development (R&D); 2) Production and Productivity improvement; 3) Post harvest management;4) Marketing and export; 5) Processing and Value addition; 6) Human Resource Development (HRD); 7) Organize farmer producer and consumer groups; and 8) Collaboration/networking with international F&V institutions.

394. In general, vegetable production in Cambodia is highly seasonal with a discontinuity of supply at various periods throughout the year. During these periods, local firms or producers find it difficult to compete with the imported products. The draft strategy was mainly focused on vegetable and limited information related to fruit and subsidiary crops.

Mechanization Strategy

395. The vision of the strategy is to commit toward contributing to poverty reduction, ensuring food security, and adapting to climate change with the goal to apply mechanization as one of the major inputs in agriculture and thereby serve as a catalyst for rural development. Cambodian farming systems are largely subsistence oriented and are dependent on rainfed conditions, thereby excessively exposing producers to production uncertainties. Farmers have started to use more and more agricultural machineries since 2009. This is partly due to 1) migration of young people from rural areas to urban areas for work in garment and shoe factories, construction, or to work abroad; 2) climate change; and 3) increasing demand for

food as population growth. Chan et al. (2014) indicated that around 9,467 tractors and 151,700 power tillers were used in 2013. Large tractors are largely used in the northwestern provinces of Battambang and Banteay Meanchey, and Kampong Thom province, where there are large areas of land holding size. Power tillers are commonly used for smaller farm size and they are suitable for farm size of paddy rice in most provinces.

396. The transformation from subsistence agriculture to commercialized agriculture requires integration of mechanization into the production process. Increased mechanization also requires capacity building to operate machinery such as power tillers, tractors, post-harvest handling machinery, storage, agro-processing equipment, etc.

ANNEX 2 DETAILS OF THE VALUE CHAIN PROGRAM BUDGET

Table 51 Budget for Value Chain Program on Rice

Program ID	Program	Sub program ID	Sub program	Activity ID	Activities	Budget (US$'000)
1	Rice	1.1	Seed	1.1.1	Breeding	25,000
1	Rice	1.1	Seed	1.1.2	Seed Certification	900
1	Rice	1.1	Seed	1.1.3	Foundation Seeds	20,000
1	Rice	1.1	Seed	1.1.4	Adoption of Seed	6,000
1	Rice	1.2	Production	1.2.1	Contracts	3,000
1	Rice	1.2	Production	1.2.2	Supply chain MIS	1,500
1	Rice	1.2	Production	1.2.3	Machinery	300
1	Rice	1.2	Production	1.2.4	Farmer Organizations	4,500
1	Rice	1.2	Production	1.2.5	Market Information	1,200
1	Rice	1.2	Production	1.2.6	Extension	12,000
1	Rice	1.2	Production	1.2.7	Land levelling	3,000
1	Rice	1.2	Production	1.2.8	Alternative Wetting and Drying	3,000
1	Rice	1.2	Production	1.2.9	Weather Indexed Crop Insurance	6,000
1	Rice	1.2	Production	1.2.10	Soil fertility	4,800
1	Rice	1.2	Production	1.2.11	Pests and diseases	4,500
1	Rice	1.2	Production	1.2.12	In-farm water management	15,000
1	Rice	1.3	Postharvest	1.3.1	Postharvest losses	3,000
1	Rice	1.3	Postharvest	1.3.2	Drying	1,500
1	Rice	1.3	Postharvest	1.3.3	WRS	9,000
1	Rice	1.4	Marketing and Trade	1.4.1	Associations	1,500
1	Rice	1.4	Marketing and Trade	1.4.2	Brand	1,500
1	Rice	1.4	Marketing and Trade	1.4.3	Market Information	1,500
1	Rice	1.4	Marketing and Trade	1.4.4	Market infrastructure	10,000
					Subtotal Rice	138,700

Table 52 Budget for Value Chain Program on Maize

ID Program	Program	ID Sub program	Sub program	ID Activity	Activities	Budget (US$'000)
2	Maize	2.1	Value Chain Assessment	2.1.1	Value Chain Study	150
2	Maize	2.1	Value Chain Assessment	2.1.2	Statistics	300
2	Maize	2.2	Production	2.2.1	Research	1800
2	Maize	2.2	Production	2.2.2	Inputs	600
2	Maize	2.2.	Production	2.2.3	Extension	1500
2	Maize	2.2	Production	2.2.4	Green Technology	600
2	Maize	2.2	Production	2.2.5	ICT	600
2	Maize	2.2	Production	2.2.6	Pests and Diseases	3000
2	Maize	2.2	Production	2.2.7	In-farm water management	4500
2	Maize	2.3	Postharvest	2.3.1	Storage	300
2	Maize	2.3	Postharvest	2.3.2	Processing	900
2	Maize	2.3	Postharvest	2.3.3	Training Processing	600
2	Maize	2.4	Marketing and trade	2.4.1	Linkage	450
2	Maize	2.4	Marketing and trade	2.4.2	Contracts	600
					Subtotal Maize	**15900**

Table 53 Budget for Value Chain Program on Cassava

ID Program	Program	ID Sub program	Sub program	ID Activity	Activities	Budget (US$'000)
3	Cassava	3.1	Value Chain Assessment	3.1.1	Study	450
3	Cassava	3.1	Value Chain Assessment	3.1.2	Statistics	300
3	Cassava	3.2	Production	3.2.1	Research collaboration	600
3	Cassava	3.2	Production	3.2.2	Selection program	3000
3	Cassava	3.2	Production	3.2.3	Nurseries	1500
3	Cassava	3.2	Production	3.2.4	Sustainable production	400
3	Cassava	3.2	Production	3.2.5	Extension program	6000
3	Cassava	3.2	Production	3.2.6	Pests and diseases	900
3	Cassava	3.2	Production	3.2.7	Soil Fertility	1500
3	Cassava	3.2	Production	3.2.8	In-farm water management	3000
3	Cassava	3.3	Processing	3.3.1	Demonstration	900
3	Cassava	3.3	Processing	3.3.2	Investment Fund	8000
3	Cassava	3.3	Processing	3.3.3	Waste Management	6000
3	Cassava	3.3	Processing	3.3.4	Promotion large enterprises	600
3	Cassava	3.4	Marketing and Trade	3.4.1	Associations	600
					Subtotal Cassava	**33750**

Table 54 Budget for Value Chain Program on Mungbean

ID Program	Program	ID Sub program	Sub program	ID Activity	Activities	Budget (US$'000)
4	Mungbean	4.1	Value Chain Assessment	4.1.1	Study	150
4	Mungbean	4.1	Value Chain Assessment	4.1.2	Statistics	150
4	Mungbean	4.2	Research capacity	4.2.1	Stations	900
4	Mungbean	4.2	Research capacity	4.2.2	Collaboration	450
4	Mungbean	4.3	Production	4.3.1	Variety Selection	1500
4	Mungbean	4.3	Production	4.3.2	Hybrids	600
4	Mungbean	4.3	Production	4.3.3	Registration	200
4	Mungbean	4.3	Production	4.3.4	Standards	200
4	Mungbean	4.3	Production	4.3.5	Extension	3000
4	Mungbean	4.3	Production	4.3.6	Pests and Diseases	1500
4	Mungbean	4.3	Production	4.3.7	In-farm water management	1500
4	Mungbean	4.4	Processing	4.4.1	Processing technology	300
4	Mungbean	4.4	Processing	4.4.2	Innovations	1500
4	Mungbean	4.4	Processing	4.4.3	Feed	200
4	Mungbean	4.5	Marketing and Trade	4.5.1	Association	300
4	Mungbean	4.5	Marketing and Trade	4.5.2	Contracts	300
					Subtotal Mungbean	**12750**

Table 55 Budget for Value Chain Program on Mango

ID Program	Program	ID Sub program	Sub program	ID Activity	Activities	Budget (US$'000)
5	Mango	5.1	Value Chain Assessment	5.1.1	Study	300
5	Mango	5.1	Value Chain Assessment	5.1.2	Statistics	300
5	Mango	5.2	Institutional Strengthening	5.2.1	HR capacity building	800
5	Mango	5.2	Institutional Strengthening	5.2.2	Stations	1500
5	Mango	5.3	Production	5.3.1	Research collaboration	600
5	Mango	5.3	Production	5.3.2	Variety selection	4500
5	Mango	5.3	Production	5.3.3	Registration of variety	300
5	Mango	5.3	Production	5.3.4	Soil testing	450
5	Mango	5.3	Production	5.3.5	Nurseries	600
5	Mango	5.3	Production	5.3.6	GAP	300
5	Mango	5.3	Production	5.3.7	Standards	100
5	Mango	5.3	Production	5.3.8	Extension	1500
5	Mango	5.3	Production	5.3.9	PPP	100
5	Mango	5.3	Production	5.3.10	Pests and Diseases	3000
5	Mango	5.3	Production	5.3.11	In-farm water management	1500
5	Mango	5.4	Processing	5.4.1	Demonstration	400
5	Mango	5.4	Processing	5.4.2	Investment Fund	900
5	Mango	5.4	Processing	5.4.3	Large enterprises	300
5	Mango	5.5	Marketing and Trade	5.5.1	Associations	300
5	Mango	5.5	Marketing and Trade	5.5.2	Brand	600
5	Mango				**Subtotal Mango**	**18350**

Table 56 Budget for Value Chain Program on Cashews

ID Program	Program	ID Sub program	Sub program	ID Activity	Activities	Budget (US$'000)
6	Cashews	6.1	Value Chain Assessment	6.1.1	Studies	450
6	Cashews	6.1	Value Chain Assessment	6.1.2	Statistics	300
6	Cashews	6.2	Production	6.2.1	Research collaboration	600
6	Cashews	6.2	Production	6.2.2	Selection Program	1500
6	Cashews	6.2	Production	6.2.3	Nurseries	600
6	Cashews	6.2	Production	6.2.4	GAP	300
6	Cashews	6.2	Production	6.2.5	Extension	3000
6	Cashews	6.2	Production	6.2.6	Soil Fertility	3000
6	Cashews	6.2	Production	6.2.7	Pests and Diseases	1500
6	Cashews	6.2	Production	6.2.8	In-farm water management	1500
6	Cashews	6.3	Processing	6.3.1	Processing Technology	500
6	Cashews	6.3	Processing	6.3.2	Innovation Fund	3000
6	Cashews	6.3	Processing	6.3.3	Promotion large	300
6	Cashews	6.4	Marketing and Trade	6.4.1	Associations	300
6	Cashews	6.4	Marketing and Trade	6.4.2	Organic	600
					Subtotal Cashews	**17450**

Table 57 Budget for Value Chain Program on Pepper

ID Program	Program	ID Sub program	Sub program	ID Activity	Activities	Budget (US$'000)
7	Pepper	7.1	Value Chain Assessment	7.1.1	Studies	150
7	Pepper	7.1	Value Chain Assessment	7.1.2	Statistics	150
7	Pepper	7.2	Institutional Strengthening	7.2.1	Stations	300
7	Pepper	7.3	Production	7.3.1	Research collaboration	150
7	Pepper	7.3	Production	7.3.2	Variety Selection	300
7	Pepper	7.3	Production	7.3.3	Registration	100
7	Pepper	7.3	Production	7.3.4	Soil testing	100
7	Pepper	7.3	Production	7.3.5	Nurseries	200
7	Pepper	7.3	Production	7.3.6	GAP	300
7	Pepper	7.3	Production	7.3.7	Standards	100
7	Pepper	7.3	Production	7.3.8	Extension	1500
7	Pepper	7.3	Production	7.3.9	Information	100
7	Pepper	7.3	Production	7.3.10	Pests and Diseases	1500
7	Pepper	7.3	Production	7.3.11	In-farm water management	1500
7	Pepper	7.4	Processing	7.4.1	Processing Technology	200
7	Pepper	7.4	Processing	7.4.2	Innovation	500
7	Pepper	7.4	Processing	7.4.3	Promotion large	100
7	Pepper	7.5	Marketing and Trade	7.5.1	Association	200
7	Pepper	7.5	Marketing and Trade	7.5.2	Brand	200
7	Pepper	7.5	Marketing and Trade	7.5.3	GI	250
					Subtotal pepper	**7600**

Table 58 Budget for Value Chain Program on Vegetables

ID Program	Program	ID Sub program	Sub program	ID Activity	Activities	Budget (US$'000)
8	Vegetables	8.1	Value Chain Assessment	8.1.1	Studies	300
8	Vegetables	8.1	Value Chain Assessment	8.1.2	Statistics	300
8	Vegetables	8.2	Production	8.2.1	Extension	4500
8	Vegetables	8.2	Production	8.2.2	Input quality	1500
8	Vegetables	8.2	Production	8.2.3	Research	3000
8	Vegetables	8.2	Production	8.2.4	Innovations	4500
8	Vegetables	8.2	Production	8.2.5	Postharvest	1500
8	Vegetables	8.2	Production	8.2.6	Soil Fertility	3000
8	Vegetables	8.2	Production	8.2.7	In-farm water management	1500
8	Vegetables	8.3	Processing	8.3.1	Processing technology	900
8	Vegetables	8.3	Processing	8.3.2	Attract large companies	600
8	Vegetables	8.3	Processing	8.3.3	Innovation fund	3000
8	Vegetables	8.4	Marketing and trade	8.4.1	Associations	300
8	Vegetables	8.4	Marketing and trade	8.4.2	Market linkages	450
8	Vegetables	8.4	Marketing and trade	8.4.3	Market Information	300
8	Vegetables	8.4	Marketing and trade	8.4.4	Market infrastructure	1,500
					Subtotal Vegetables	**27,150**