

Market study for the production and sale of Natural Fertilizer in Siem Reap



By **Cambodian Institute for Research and Rural Development (CIRD)**

Mao Vannak
Rat Rotana

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1. Background and Objectives of the study

The overall objective is to carry out preliminary studies of the project of structuration the fecal sludge management sector of Siem Reap city. The purpose of these preliminary studies is to clearly establish the feasibility of a project and its deployment, thus enabling local authorities, technical and financial partners to position themselves for the implementation phase.

The topics covered in the studies are divided into three categories:

- The sectorial framework, to ultimately define the organization scheme relevant to the sector (relations between local authorities, treatment site management, sewage tanker driver companies and households).
- The financial operation, to define ultimately how to balance the costs of this sector.
- The treatment and recovery system, in order to ultimately define the type of treatment and its characteristics at the preliminary design stage and the prospects for the development of humus or composts.

This phase of studies also includes the involvement of local authorities in particular in the organizational, technical and land choices. It will conclude with the development of a proposal for the implementation of the project in the following years, in its institutional components, organization and optimization of stakeholders in the sector and implementation of a processing sewage sludge site.

Specific objectives of the market study for the production and sale of humus or compost in and around Siem Reap and its suburbs.

To measure the interest and quantify the needs of the agricultural sector of Siem Reap and its surroundings for the use of natural fertilizer resulting from the mummification of fecal sludge, in order to specify the uses of the organic matter produced (agricultural, ornamental ...) and possible recovery recipes for the sludge treatment activity (sale of humus and / or compost).

This study includes agronomic aspects (quantitative and qualitative requirements for cultivated species and different uses), economic aspects (quality, quantity and price of organic materials currently used, cost of organic matter and price of interest to users) and sociological aspects (possible blocking effects and reticence of users and/or end-users).

It also includes a geographic approach of sales opportunities in the area based on potential user production systems (agricultural and ornamental uses).

2. Methodology

2.1. Desk review

All relevant data about crop production area (rice, maize, vegetable, fruit and other cash crops), number of producers of each crop and the amount of organic fertilizer already exist in Cambodia, especially in Siem Reap were collected from previous study reports, internet sources and other related documents.

2. 2. Primary data collection and Field survey

2.2.1. Key informant interviews

Key informant interview is designed to get information about type of crops, total crop production area, total number of producers and potential production areas. Main market players and producer associations, key constraints and opportunities are also screened out from this method. Below are the key informants to be interviewed and expected data to be collected:

Target key informant	Number of respondents	Interview technique	Data/information collected
MAFF- Department of Agricultural Legislation representative	1	Unstructured questionnaire	<ul style="list-style-type: none"> - Amount of organic fertilizer being used in Cambodia both export and locally produced - Number of organic fertilizer firm
Siem Reap Provincial Department of Agriculture	1	Unstructured questionnaire	<ul style="list-style-type: none"> - Data of crop production in Seam Reap province (type of crop, area of production and number of producers). - Potential production area - Number of AC in Seam Reap and their business activities

2.2.2. Individual interview with producer

This method was designed to get information related to agronomic aspects (quantitative and qualitative requirements for cultivated species and different uses), economic aspects (quality, quantity and price of organic materials currently used, cost of organic matter and price of interest to users) and sociological aspects (possible blocking effects and reticence of users and/or end-users). During the study, 80 producers were interviewed, who were identified after interviewing relevant officers of the Provincial Department of Agriculture of Seam Reap province. The main selection criteria focused on geographical area, crops species and production size. Below are the producer samples selected for interview (number by different types of production systems):

Target key informant	Number of respondents	Interview technique	Data/information collected
Rice producer	41	Semi-structured questionnaire	<ul style="list-style-type: none"> - Total production area of each crop - Type, source and amount of fertilizer they used per year - Their interest of using organic fertilizer (quality, quantity, price, packaging, delivery ...etc) - Their preference and challenge of using organic fertilizer
Vegetable producer (commercial purpose)	20	Semi-structured questionnaire	
Cash crop producer (commercial purpose)	10	Semi-structured questionnaire	
Ornamental gardener	9	Semi-structured questionnaire	

2.2.3. Interview with key input suppliers/retailer/AC

This method was designed to get information about the type of fertilizer they sell, quantity of organic fertilizer they commercialize per year, their interest in locally-produced organic fertilizer business, main problem and challenges in implementing their business. Below are the names/number of input suppliers, retailer and ACs that were interviewed and the data/information to be collected:

Target input suppliers/retailers	Number of respondents	Interview technique	Data/information collected
<u>Input supplier firms:</u> - Bopha Organic Fertilizer - Wathanapich (organic fertilizer) - Cam Agriculture Import Export (fertilizer, pesticide, planting materials) - FERTIKAL (Organic Fertilizer)	4	Semi-structured questionnaire	- Percentage of farmers/area used company fertilizer. - Amount of fertilize import per year - Yield improvement made after investing the company inputs. - Key constraints of the companies - Suggestion to farmer/cooperative regarding to the investment of inputs
Retailer	6	Semi-structured questionnaire	- Type of fertilizer they sell - Amount of each type of fertilizer they sell per year, especially organic fertilizer - Their interest on organic fertilizer business - Key constrains
Agricultural Cooperative	5	Semi-structured questionnaire	- Their business activities - Number of AC member and their agricultural activities - Crop production area - Their interest on organic fertilizer business - Key constrains



2.3. Limitations of the study

The key limitation which was encountered during the course of fieldwork is that the numbers of samples of farmers/producers, and fertilizers market operators selected for interview were based on purposive sampling method rather than representative; due to limited timeframe and financial resources for conducting interview on a bigger sample size. Of particular concern, some of those direct actors interviewed, particularly market operators did not dare to answer all questions, especially in relation to specific business activities including trading network, specific trading volume, and business costs.

3. Findings

3.1. Country Context

Up to 2014 Cambodia was classified as a least-developed country (LDC) by the United Nations. Following more than two decades of strong economic growth, Cambodia has attained the lower middle-income status as of 2015, with gross national income (GNI) per capita reaching USD1,070. Driven by garment exports and tourism, Cambodia has sustained an average growth rate of 7.6% in 1994-2015, ranking sixth in the world (World Bank, 2017). The 2016-2018 GDP growth rate is at the same level of 7 percent per year, driven by the garment industry, construction, the service sector, in particular tourism, and agriculture as well as public sector investments in rural and urban infrastructure. Per capita income although rapidly increasing in the last decade, is low compared with most neighboring countries. Cambodia had a GDP of \$18.05 billion in 2015. GDP

per capita in Cambodia averaged 621.03 USD from 1993 until 2016, with a record low of 316.10 USD in 1993 and reaching an all-time high of 1078.40 USD in 2016. The economy of Cambodia at present follows an open market system and has seen rapid economic progress in the last decade.

According to World Development Indicators 2014, the proportion of the population living below the national poverty line fell from 50.2 percent in 2004 to 17.7 percent in 2012 (slightly less than 3 million out of a population of 15 million). This constitutes an impressive result and makes Cambodia an overachiever in terms of meeting and exceeding MDG1. The National Strategic Development Plan 2014-2018 targeted to decrease the poverty rate to 12.9% in 2018. In this regard, it is worth recalling that the poverty reduction was driven to a large degree by increases in rice prices which benefitted poor rural producers, and by expansion of the cropped area. While the production, productivity and export of rice remain a main national priority, rice prices are no longer rising and the markets for the rice surplus are limited. Rice cannot be counted upon as a vehicle for poverty reduction and it would be environmentally unsustainable to continue the conversion of land to agriculture. The growth rate in agriculture has fallen to below 2 percent per year in recent years. The sector is unlikely to resume its role as a driver of national poverty reduction but it will continue to be a crucial source of livelihood for a large majority of the population for many years to come (FAO's CPF 2016-2018).

The population of Cambodia is young with 50 percent of the population below the age of 22. Many in the young generations do not view agriculture as an attractive future and seek better prospects in other sectors, in the cities and in neighbouring countries, particularly Thailand. The pull of the cities and the push out of rural areas are unavoidable and a reduction of the number of people relying on subsistence agriculture will, in the longer run, improve the profitability of agriculture and thus its contribution to vulnerability reduction. In the short run, however, the rural migration is contributing to reducing the growth rate of the sector as the average age of farmers' increases and the availability of rural labour decreases. At the same time, it is of concern that the young people are largely unskilled and that the migration to the cities is creating a new set of challenges of un or underemployment and increasing urban poverty and vulnerabilities. Although the rural migration cannot be stopped, efforts are required, to slow it down by making agriculture and the related value-chains more profitable and creating off-farm employment opportunities in rural areas (FAO's CPF 2016-2018).

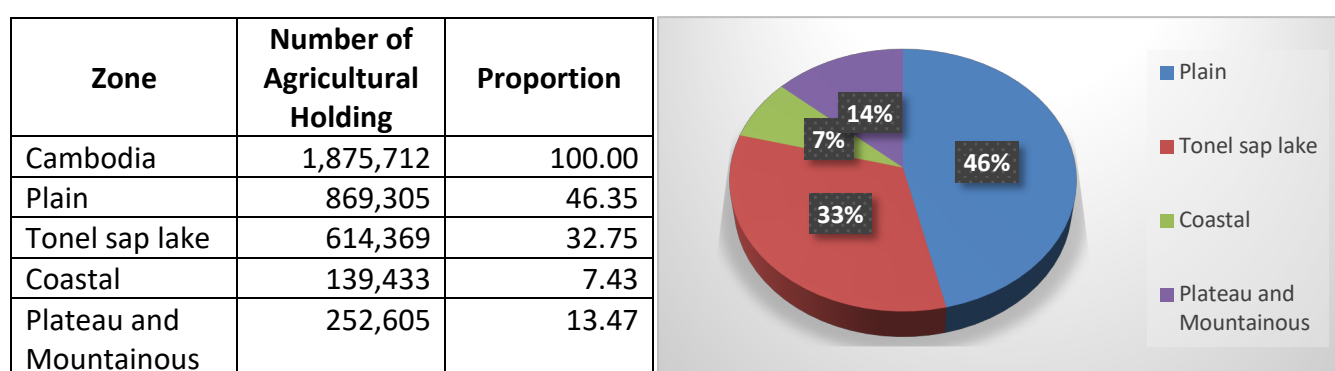
3.2. Overview of agriculture sector

Cambodia remains a predominately agricultural country. Economic life is dominated by crop cultivation, raising livestock and poultry, marine and riparian fishing, aquaculture, and the gathering of forest products. Agriculture is an important sector in supporting economic growth, ensuring equity and food security, and enhancing rural economic development. The sector employs nearly 64.6 percent of the country's labor force and contributes about 26.7 percent to the gross domestic product in 2016. According to Census of Agriculture of Cambodia (CAC, 2013), of the 1.88 million agricultural households with separate agricultural land, around 47 percent had plots of land measuring less than 1 ha in size. A further 45 percent comprised agricultural land measuring between 1 ha and 3.99 ha.

Base on country topography and agro-ecological based farming systems, agricultural production zones can be divided in to 4 different main zones as the following:

- Tonle Sap Lake Zone: covering eight provinces of Banteay Meanchey, Battambang, Pailin, Siem Reap, Oddar Meanchey, Kampong Thom, Kampong Chhnang and Pursat;
- Plains Zone: covering seven provinces of Kampong Cham, Kandal, Phnom Penh, Prey Veng, Svay Rieng, Takeo and Tbong Khmum;
- Plateau and Mountainous Zone: covering six provinces of Kampong Speu, Preah Vihear, Ratanak Kiri, Mondul Kiri, Kratie and Stung Treng;
- Coastal Zone: covering four provinces of Kampot, Koh Kong, Preah Sihanouk and Kep.

Table 1: Agricultural holdings by the 4 main agro-ecological zones



Source: Census of Agriculture in Cambodia 2013

The primary agricultural commodity is rice. Other major crops include cassava, maize, mung bean, and soy bean. According to CAC 2013, rice crops accounted for 82% of all temporary crops grown on land parcels. Including rice, the grain and cereal crops were totally planted on 2.45 million ha of land, amounting to some 86% of the total number of land parcels used for temporary crops. Irrigated parcels with cereals and grains accounted for just 22% of the total area of all land parcels under temporary crops. After rice, the other main crops production, are shown in the table below:

Table 2: Main crops production in Cambodia from 2013 to 2016

No	Agro-Product Name	Production by Year (MT)			
		2013	2014	2015	2016
1	Rice	3,090,452	3,013,783	5,191,833	9,335,284
2	Black Pepper	5,465	5,611	9,541	11,819
3	Cassava	7,632,997	13,298,108	12,496,175	13,298,108
4	Rubber	85,244	97,000	53,489	?
5	Maize	843,477	549,607	302,134	399,649
6	Sweet Potato	30,656	54,259	29,087	45,424
7	Mung Bean	53,044	60,652	42,066	59,220

8	Pea Nut	80,662	72,511	22,417	25,149
9	Soy Bean	131,062	104,180	95,895	96,942
10	Sesame	23,369	17,260	16,815	17,859
11	Sugarcane	730,088	1,540,996	606,351	709,175

Table 3: Agricultural production area by major crops by year

No	Crops	Area by Year (Ha)	
		2015	2016
1	Rice	2,561,957	3,025,630
2	Black Pepper	4,645	6,124
3	Cassava	512,732	573,624
4	Rubber	388,955	??
5	Maize	82,473	112,574
6	Sweet Potato	3,658	5,757
7	Mung Bean	42,973	57,172
8	Pea Nut	13,531	15,519
9	Soy Bean	66,087	66,824
10	Sesame	24,796	26,544
11	Sugarcane	15,666	19,514

As a matter of policy, the Cambodian government encourages investment in agriculture, diversification of agricultural products, and investment in improved irrigation and water control. The Cambodian government set a goal of exporting one million tons of milled rice by 2015, but actual exports totaled only at 538,396 tons (around 54% of the target set). Cambodian rice exports increased to about 635,679 metric tons in 2017, an increase of 17.3 percent from 542,144 MT in 2016. Besides, a huge amount of unmilled rice was exported informally without record to bordering countries, mainly to Vietnam and Thailand.

In terms of agricultural materials, equipment and inputs, most of the current demand for water pumps, well-drilling machines, tractors, tilling equipment, rice milling, drying, and packaging equipment, fertilizers, insecticides, and seed comes from private agribusiness investors and NGOs. However, still there is a big gap between demand and supply of higher quality seeds, fertilizers, and other agricultural inputs and new technology such as spraying machines, pest identification drones and other equipment and training that would greatly benefit the agriculture sector, which is only slowly transitioning from outdated and less productive. The presence of an increasing number of plantations also creates opportunities for the establishment of processing plants to add value to basic products for export and domestic consumption. As part of the

government's policy to support the agriculture industry, materials and equipment used in agricultural production are exempt from import duties. Relatively high operating costs, including electricity, limit opportunities to establish processing plants. There is significant potential to expand the production and processing of high yield varieties of rice, cassava, corn, and other crops. Several investment projects in cassava and sugarcane are underway.

The government of Cambodia's Industrial Development Policy, launched in 2015, included the goals of reducing logistic and electricity costs in food processing. In May 2016, fees for loading and unloading cargo were reduced by 10% and 5% in Sihanoukville and Phnom Penh ports, respectively.

In realizing the vision of agricultural sector development, the RGC has adopted a three-pronged strategy - productivity enhancement, diversification and agricultural commercialization through implementing a package of interrelated measures -- infrastructure building and enhancement (roads, irrigation, energy/electricity, and Information and Communication Technologies (ICTs); improvement in the provision of extension services; and improved agricultural inputs, land management reform, finance, marketing, farmer organization, and institutional building and coordination (MAFF, Agricultural Extension Policy in Cambodia 2015).

3.3. Fertilizers market at national level

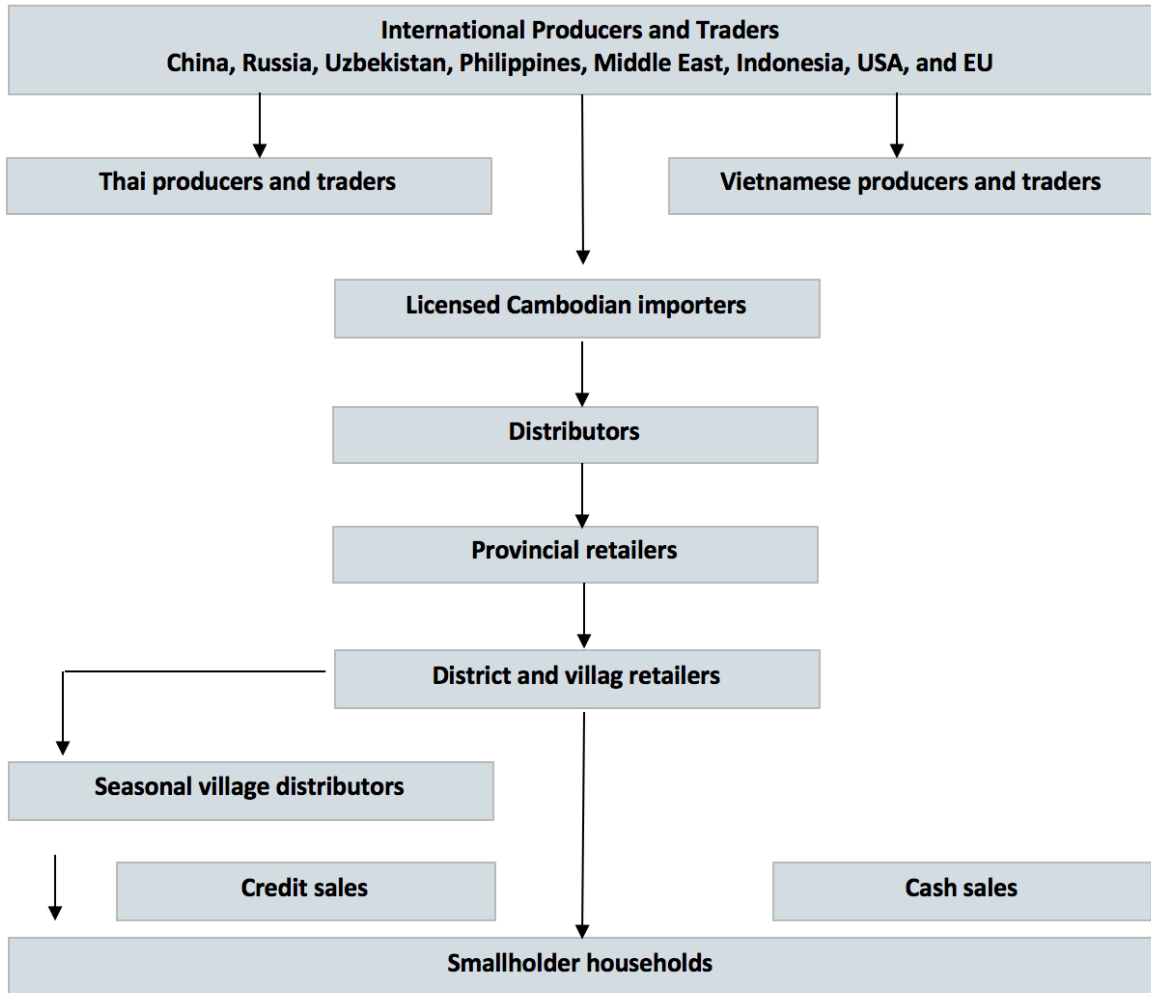
Currently in the whole country there are 95 private companies that have obtained license from the Department of Agricultural Legislation of MAFF as fertilizers import companies. They import fertilizers (mostly chemical fertilizers but also some organic fertilizers) from abroad for commercializing in Cambodia. Amongst these companies, there are 4 import companies known on the market as organic fertilizers importers. The total amount of both organic and chemical fertilizers imported to Cambodia in 2017, is estimated at 842,706 MT (Department of Agricultural Legislation, 2017). Among these, the total volume of fertilizer commercialised in Siem Reap in 2017, is estimated by provincial department of agriculture of Siem Reap at around 12,500 MT.

Table 4: Name of main organic fertilizer importing companies and estimated trading volume

No	Name of import Companies	Trade names of imported organic fertilizer	Countries of origin	Imported volume in 2017 (MT)	Sold out volume in 2017 (MT)	Sold out volume in 2017 in SR (MT)	Imported volume planned for 2018 (MT)
1	Bayon Heritage Co., Ltd	Japan Natural	Japan	50,000	45,000	3,000	60,000
2	Khy Thay Cooperation Co.,Ltd	Chicken	Belgium	4,500	3,500	100	4,500
3	EXM Cambodia Co.,Ltd	EXM Fertiplus	Belgium	1,000	850	100	1,200
4	Fertikal	Fertikal	Belgium	5,000	4,500	700	5,000
Total				60,500	53,850	3,900	70,700

3.4. Supply chain of fertilizer to Cambodia

Currently, the main source of supply of organic fertilizers are only Japan and Belgium while for chemical fertilizers, the sources of supply are from the following producing countries: China, Russia, Uzbekistan, Philippines, Middle East, Indonesia, USA, and EU. The trading channel from source of supply to end users is shown in the diagram below:

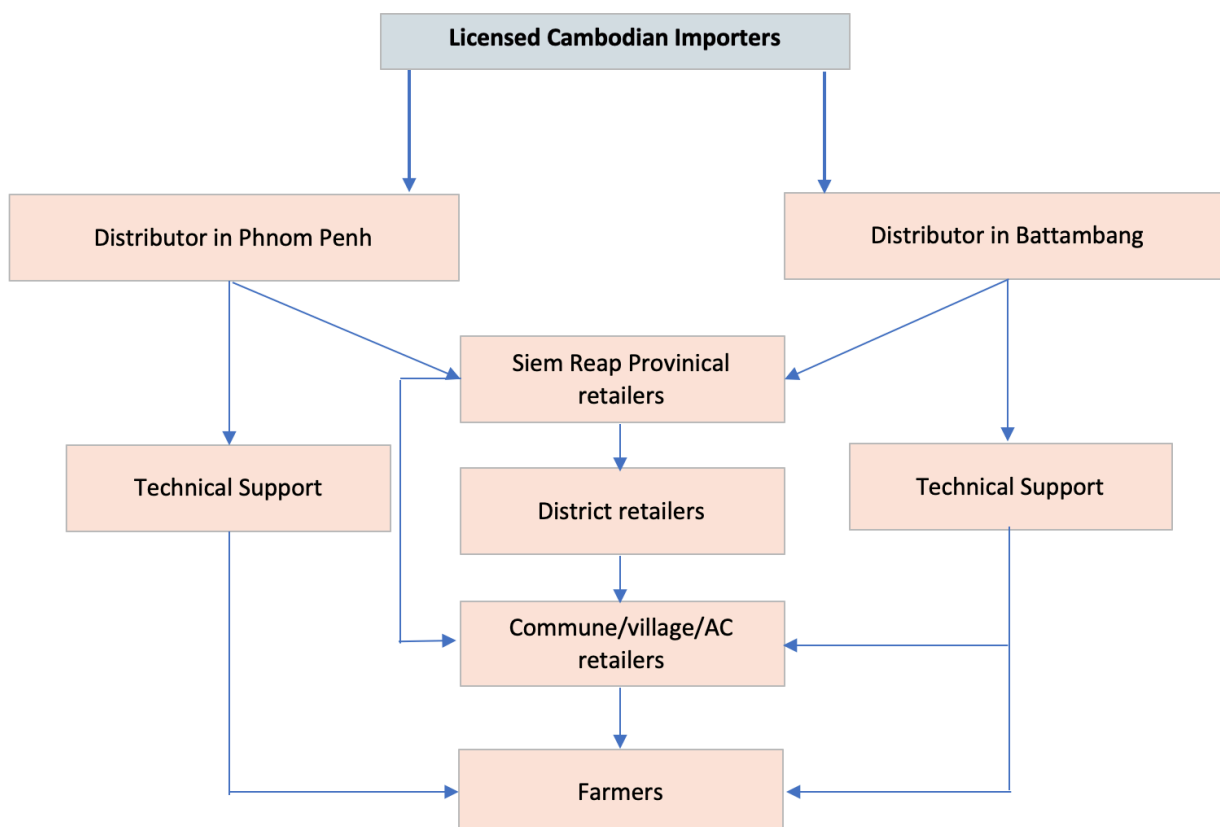


Source: IFDC, 2010



3.5. Supply chain of fertilizer to Siem Reap province

To supply the imported fertilizers (both chemical and organic fertilizers) to Siem Reap province, the Cambodian licensed import companies distribute fertilizers that they imported from abroad to the main distributors in Phnom Penh and main distributors in Battambang province first then these last distributors supply fertilizers directly to retailers in Siem Reap. The retailers at districts, communes and village levels as well as the Agricultural Cooperative get supply from district retailers. The trading channel from Cambodian licensed import companies to end users in Siem Reap is shown in the diagram below:



3.6. Crop production in Siem Reap

Siem Reap province comprises of 12 districts where agricultural production is the main economic activity. The major crops produced in Siem Reap province are rice, corn, cassava, sweet potato, vegetable mix, green bean and sugarcane. Among these crops, rice is the most important crops produced by the majority of farmers in the province.

- **Rice production:** Total rice production area in the whole province is 208,410 ha. The rainy season rice covers 186,765 ha of land and dry season rice covers 21,655 ha. Chi Kraeng and Pouk districts are the biggest rice production districts of the province.

Table 5: Rice production area (ha) by district in Siem Reap province

No	District	Rainy season rice production area (ha)						Dry season (ha)
		Short term	Medium term	Long term	Chamkar rice	Floating rice	Total	
1	Angkor Chum	1,270	14,640	2,280	0	0	18,190	0
2	Angkor Thom	1,320	1,475	510	820	0	4,125	0
3	Banteay Srei	985	3,575	1,090	1,095	0	6,745	80
4	Chi Kraeng	7,420	16,545	11,540	355	915	36,775	6,320
5	Kralanh	5,010	12,010	3,430	0	3,865	24,315	800
6	Puok	9,510	10,250	3,740	0	1,750	25,250	6,300
7	Prasat Bakong	745	8,725	3,575	0	20	13,065	1,770
8	Siem Reap	2,820	1,760	890	0	335	5,805	4,515
9	Soutr Nikom	5,340	11,330	4,270	60	255	21,255	1,870
10	Srei Snam	690	6,690	6,000	0	600	13,980	0
11	Svay Leu	1,500	3,210	2,060	2,035	0	8,805	0
12	Varin	1,440	4,085	2,730	200	0	8,455	0
	Total	38,050	94,295	42,115	4,565	7,740	186,765	21,655



- **Other main crops:** After rice, the following 6 crops are also widely grown in Siem Reap: Casava, mixed vegetable, green bean, corn, sugarcane and sweet potato. All these crops are grown on 23,385 ha of land. Among these crops, cassava shared the biggest part of growing area (13,038 ha) and follows by the mix vegetables (4,115 ha) and green bean (3,450 ha).

Table 6: Main crops production area (ha) by district in Siem Reap province

No	District	Corn		Cassava		Sweet Potato		Vegetable mix		Green Bean		Sugarcane	
		Rainy	Dry	Rainy	Dry	Rainy	Dry	Rainy	Dry	Rainy	Dry	Rainy	Dry
1	Angkor Chum	20	25	3,050	120	5	5	70	175	35	10	15	15
2	Angkor Thom	180	200	500	500	0	0	280	120	110	110	20	20
3	Banteay Srei	65	60	860	430	5	20	80	90	20	15	15	20
4	Chi Kraeng	30	25	60	40	0	0	210	130	20	0	35	20
5	Kralanh	100	40	1,775	40	115	50	205	140	80	0	180	45
6	Puok	30	55	20	20	15	20	230	415	15	25	5	5

No	District	Corn		Cassava		Sweet Potato		Vegetable mix		Green Bean		Sugarcane	
		Rainy	Dry	Rainy	Dry	Rainy	Dry	Rainy	Dry	Rainy	Dry	Rainy	Dry
7	Prasat Bakong	35	40	55	55	25	20	265	290	5	0	35	50
8	Siem Reap	25	35	5	5	5	10	165	260	0	0	10	20
9	Soutr Nikom	50	120	1,590	500	100	120	275	365	1,260	1,690	60	80
10	Srei Snam	65	60	1,740	455	0	0	75	65	0	0	55	0
11	Svay Leu	55	30	25	20	25	10	40	40	40	0	10	55
12	Varin	25	15	900	300	10	5	75	55	5	10	30	5
	Total	680	705	10,580	2,485	305	260	1,970	2,145	1,590	1,860	470	335

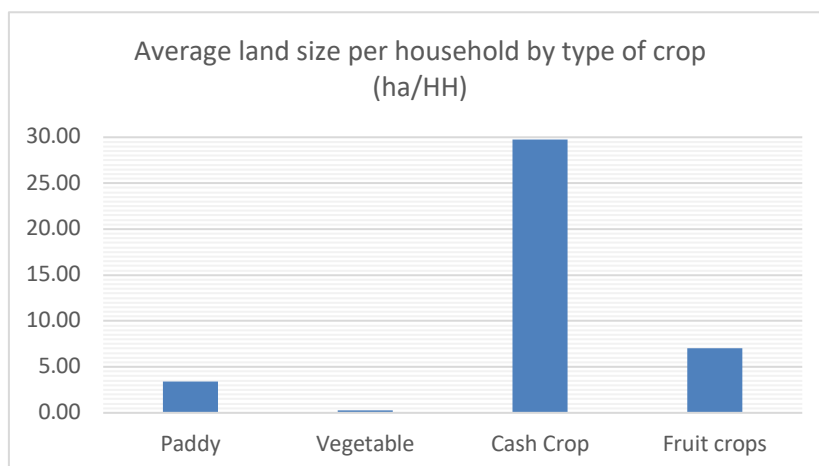


3.7. Average land size hold by the interviewed farmers

Amongst the interviewed farmers, the average land used for each of the 4 main crops focused by the study are shown in the table below:

Table 7: Average land size per household by type of crop

Types of farmers (by crops)	Cultivated area (ha/HH)	Remark
Paddy	3.43	Rainy season rice is 1.5 ha and dry season rice is 1.79 ha
Vegetable	0.28	Vegetable is part of rice-base farming system, a second crop after rice.
Cash crop	29.73	70% of the interviewed farmers rented land from other farmers
Fruit crop	7.06	Most of them are investors from Siem Reap city, they hire labor to work on their farms



3.8. Farmers' practices in fertilizer use

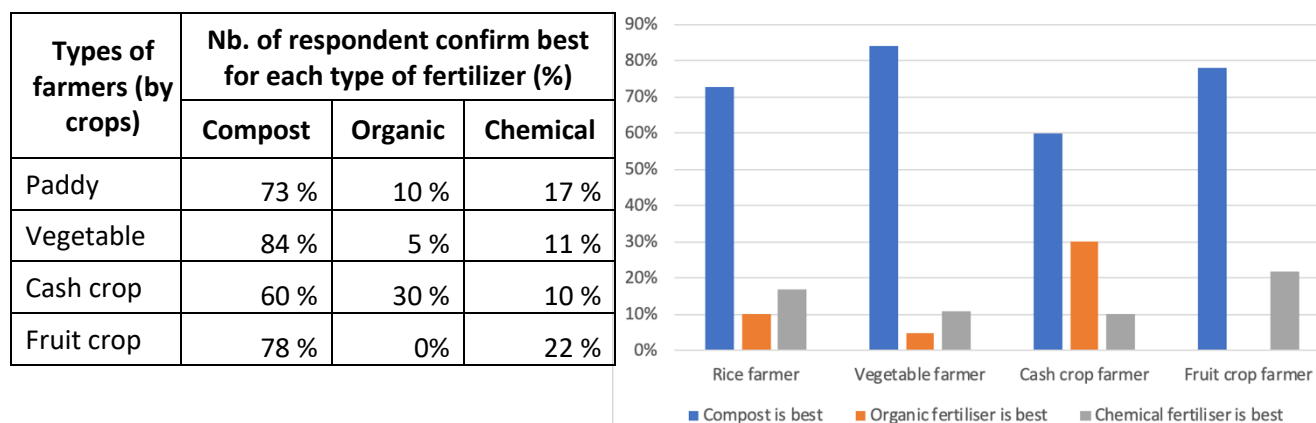
Based on individual farmer interview result, there are 3 types of fertilizer being used by farmers in Siem Reap. These 3 types of fertilizer are:

- 1). Compost: natural fertilizer or humus produced by farmers using organic matters that they can find locally such as cow dung, plant waste, ...
- 2). Organic fertilizers: refer to imported organic fertilizer that they buy from market (industrial production in general).
- 3). Chemical fertilizers: various types of chemical fertilizers imported from abroad (industrially produced).

Amongst these fertilizers, farmers prefer to use compost that they produce by themselves to grow their crops rather than purchasing organic and chemical fertilizers. More than 70% of the interviewed farmers use compost on almost all the crops that they grow.



Table 8: Farmers' preference on the 3 different types of fertilizers



In term of volume of fertilizer used by farmers per household, fruit crops farmers apply biggest volume of compost while cash crops farmers apply biggest amount of chemical fertilizer each year. The average annual application of fertilizer by farmers on the 4 crops focused by the study are shown in the table below:

Table 9: Average annual family use of fertilizers amongst interviewed farmers

Types of farmers (by crops)	Average cultivated area (ha/HH)	Types of fertilizers used (Kg/HH/Year)		
		Compost	Organic	Chemical
Paddy	3.43	647	170	387
Vegetable	0.28	3,236	30	111
Cash crop	29.73	25	220	3,185
Fruit crop	7.06	10,311	1,133	817

3.9. Farmers' view on locally produced organic fertilizer

Based on individual farmer interview result, over 80% of the interviewed farmers are interested in locally produced organic fertilizer though raw material is the organic matter from city waste. However, they said that they will buy if the quality is guaranteed by the factory certified by

competent agency. In general, they believe that when this raw material is processed by the factory, pathogen will be killed and the organic matter can be safe for use but there is a need to have quality guarantee system.

In term of production form and other related conditions, farmers suggest the following:

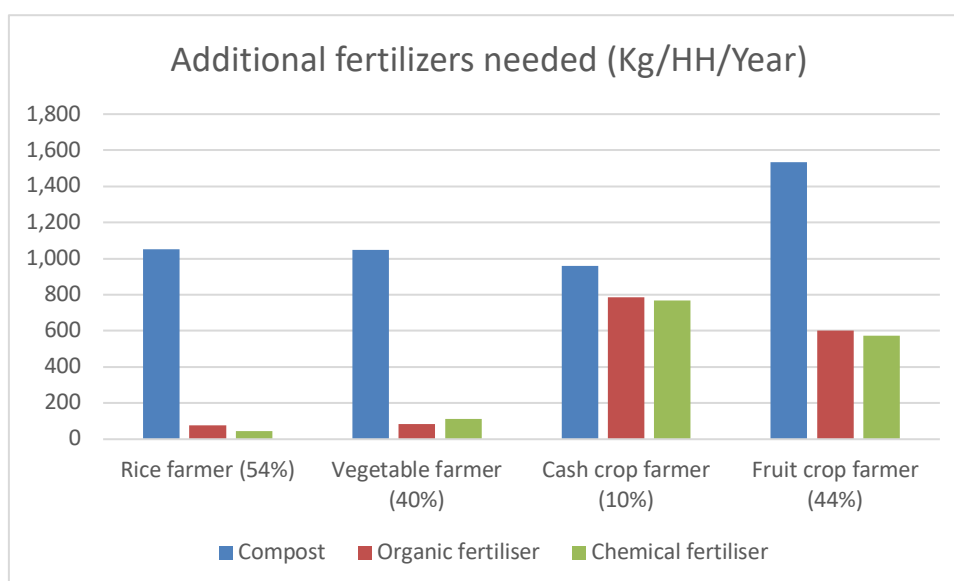
- All instruction on packaging have to be in Khmer language
- The quantity per bag should be 25 kg/bag and 50 kg/bag
- 2 layer pack (outside non-plastic and inside plastic to protect fertilizer from water)
- Price of 50 kg/bag should be from 60,000 - 75,000 riel
- Good quality (not lower than imported one) and purity insurance
- Well respond to plant needs for growth and development
- 100 % of paddy and fruit crop need fertilizer in the form of granular. There are 20% of vegetable farmer need fertilizer in the form of powder and 10% of cash crop need the fertilizer in the form of liquid.
- Need technical advisor to advise on method of fertilizer use
- Delivery at home in case of purchasing over 10 bags per time

3.10. Need of organic fertilizers

At family level, based on individual farmer interview result, in general farmers confirm their needs in using more organic fertilizer on their crops. The additional need of fertilizers for each type of fertilizer and by crops are shown in the table below:

Table 10: Estimation of need for additional fertilizers per year per family (Kg)

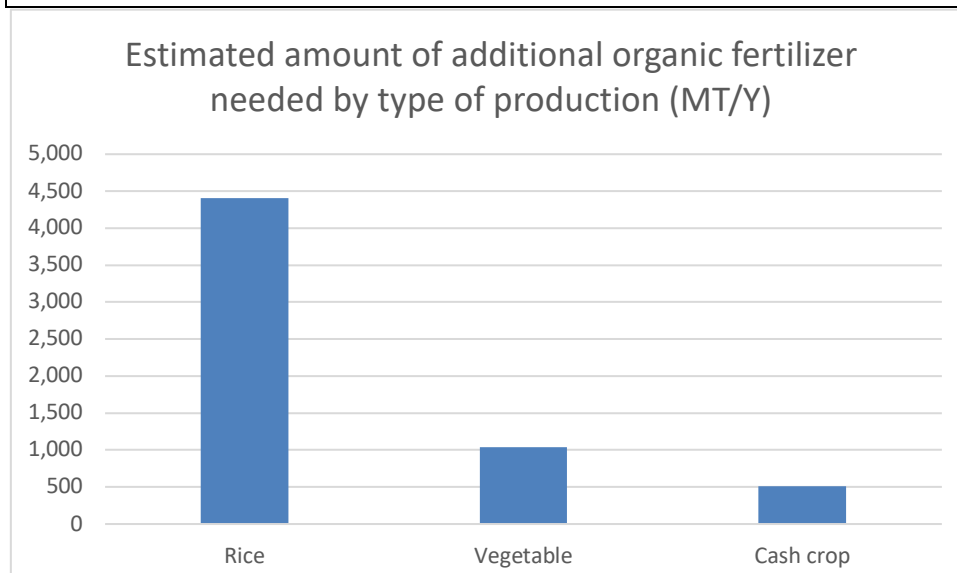
Crops	Nb. of farmers confirmed needs (%)	Quantity of additional fertilizers needed (Kg/HH/Year)			
		Rate	Compost	Organic	Chemical
Paddy	54	Max	10,000	1,600	400
		Ave	1,051	78	44
		Min	400	30	40
Vegetable	40	Max	2,520	150	300
		Ave	1,049	83	112
		Min	300	50	30
Cash Crop	10	Max	2,183	3,500	3,020
		Ave	960	785	770
		Min	200	100	25
Fruit crop	44	Max	8,500	1,000	1,000
		Ave	1,533	600	575
		Min	1,800	200	150



Based on the above confirmation on the need for additional organic fertilizer and the agricultural statistic of the province, we can estimate the need for additional organic fertilizer at provincial level as much as around 6 thousand metric tons per year. The detail calculation is shown as the following:

Table 11: Estimation of need for additional organic fertilizer per year in Siem Reap

Crops	Nb. of farmers confirmed to buy organic fertilizer locally produced (%)	Average need of fertilizer per HH per year (Kg)	Total nb. of producers in Siem Reap (HH)	Amount of organic fertilizer needed per year (MT)
Paddy	93%	78	60,763	4,407
Vegetable	85%	83	14,696	1,036
Cash crop	100%	785	648	508
Fruit crop	88%	600	N/A	N/A
Total				5,951



Based on the study, in Siem Reap there are 49 agricultural cooperatives (AC) with 3,800 members that are doing collective business on selling fertilizer. These AC sell fertilizer to both AC members and non-AC members in 2 different ways, pay immediately or in credit. If they buy in credit, they have to pay back to AC at the end of the year, but the price is about 5,000 – 10,000 Riel higher than the normally price per bag. The capacity of these ACs to sell fertilizer per year is about 1,500 MT.

Table 12: Name of interviewed AC and their capacity to sell fertilizer per year

No	District	AC Name	Nb. of member	Main business	# of fertilizer sellout/year (MT)	Potential capacity in selling fertilizer (MT)
1	Puok	Sovan Rikray Phum Trakaet Khmum Mouk Phen	69	Credit, sell fertilizer, and sell the rice seed.	75-80	100
2	Angkor Chum	Brochae Wattanak Angkor Chum	69	Credit and sell the chimerical fertilizer	15-20	100
3	Varin	Trotrong Sethakech Krousa Varin	72	Credit and sell the chimerical fertilizer	10-15	70
4	Prasat Bakong	Bakong Angkor	41	Credit, sell fertilizer, and sell the rice seed.	10-20	100
5	Chi Kraeng	Sang Voeuy Samakipheap	257	Credit and sell the chimerical fertilizer	10-15	120
Total					120 - 150	490

The retailer gets the fertilizer from wholesaler/distributers at the main markets nearby or at the provincial level market which depend on some condition, communication and capital they have. The payment is depending on the wholesaler/distributor, at the beginning of their business, the wholesalers require to pay 100% after getting the fertilizer, but later on they require to pay 50% at the time the retailer get fertilizer and 50% at the time second time they get the fertilizer. For the new fertilizer product, the wholesaler/distributor assigned the staff to help retailer in doing promotion and provide consultation to farmers on use of fertilizer and crop cultivation techniques. Recently, the competition in fertilizer business is very high, especially on price. If any seller could sell in a cheaper price, they will be able to attract farmer to buy their products. Some retailers sell the fertilizer to famer in credit and they collect the money back after harvesting. In this case fertilizer price is about 10,000-15,000 riel/bag higher than the normally price.

Table 13: Number of retailers and their selling capacity

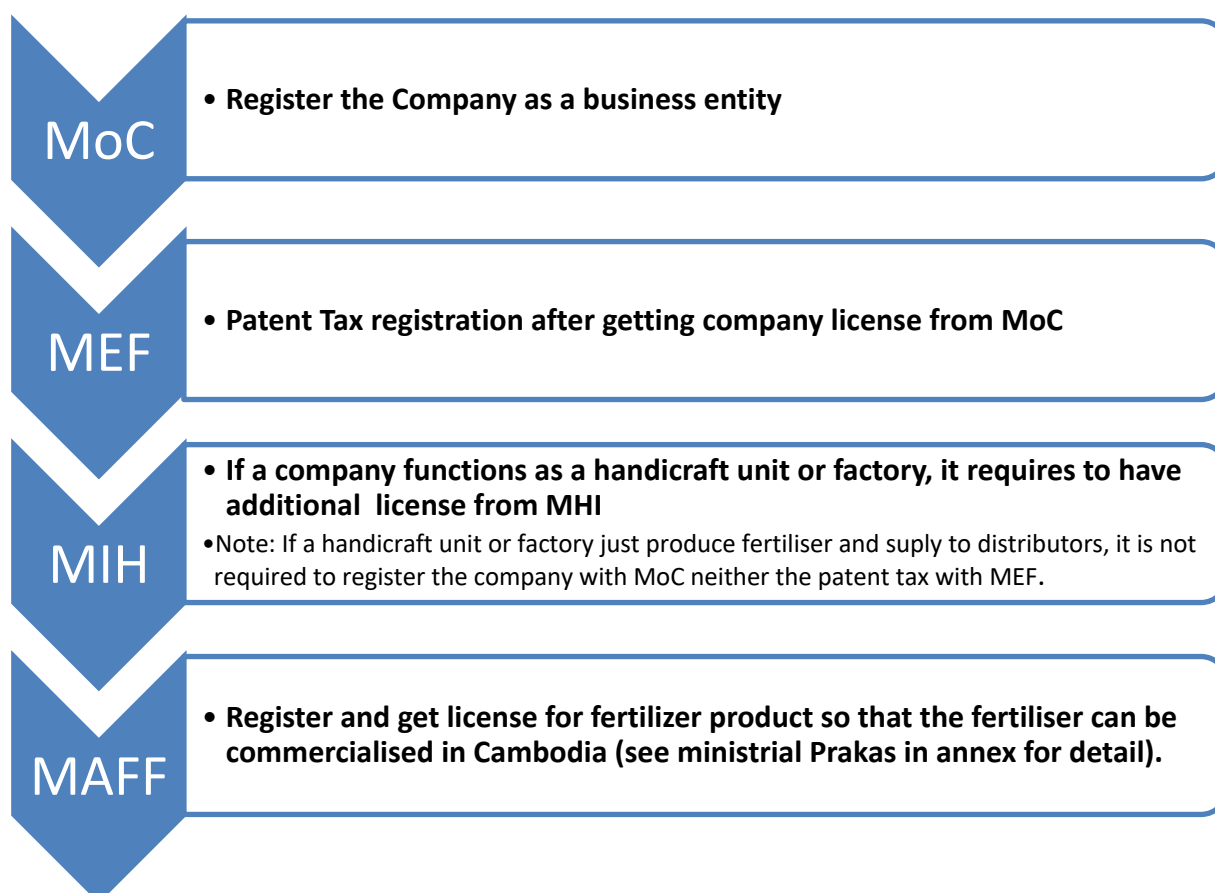
No	District	# of retailers	Amount of fertilizer sold in 2017 (MT)	Selling potentiality/capacity (MT)
1	Puok	2	100	150
2	Angkor Chum	1	70	100
3	Varin	1	120	140
4	Prasat Bakong	1	50	60
5	Chi Kraeng	1	100	120
Total		6	440	570

Based on interview result, 91% of the total interviewed farmers confirmed that they will not reject use of natural fertilizer resulting from the humification of fecal sludge while 9% confirmed that they will not use any natural fertilizer resulting from the humification of fecal sludge.

3.11. Legal procedure in setting-up natural fertilizer factory in Cambodia

To operate a natural fertilizer factory in Cambodia it requires to have a license from the ministry of Industry and Handicraft. Besides, before the factory can commercialize the natural fertilizers produced on market, it needs to have inspection and license from the ministry of Agriculture.

Procedure to follow for opening a fertilizer company and/or handicraft/factory in Cambodia



4. Conclusion

The demand of natural fertilizer (humus, compost, organic fertilizer) is high because in general farmer appreciate its quality that can improve both soil fertility and soil physical property as well as quality of agricultural products compared with the use of chemical fertilizer. However, family production of natural fertilizer is not enough to meet the demand of each house hold use for their agricultural production due to lack of raw material (organic matter for producing natural fertilizer). In Cambodia, yet there is no local industrial production of natural fertilizer while imported industrial organic fertilizer is expensive for local farmer. The future local industrial production of natural fertilizer resulting from the humification of fecal sludge will be able to substitute the import of organic fertilizer as well to respond to local market demand of natural fertilizer.

5. Recommendation

The future factory needs to have close collaboration with the ministry of agriculture, forestry and fisheries in order to ensure the quality of natural fertilizer resulting from the humification of fecal sludge. Trade name and brand need to be developed with assistance from professional brand designer. A strong promotional campaign should be organized in order to raise farmers awareness on this new product as well as to attract distributor to collaborate with the factory on commercialization of the new local industrial natural fertilizer. The factory should not play commercial role by itself, it should build business partnership with the current existing (or new one) fertilizer distributor. The factory should also collaborate with existing development project working on agricultural production and PDA in conducting on-farm trial and in developing demonstration farm when good result is obtained. These two tools can be efficiently served for market promotion purpose.