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# Joint Research for 2022 KAPEX with the Kingdom of Cambodia

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Rural Community Economic Development through  
Capacity Building and Integrated Farming Promotion

Korea Rural Economic Institute  
Ministry of Agriculture Forestry and Fisheries of Cambodia

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# 제 출 문

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# 1

## Introduction

### 1.1 Joint research Background and Purpose

Before becoming a low-middle-income country in 2015, Cambodia's economy grew annually by 7.6% on average from 1994 to 2015 and by 7.1% from 2016 to 2019. GDP grew annually but shrank by 3.1% in 2020 due to the negative impact of the COVID-19 pandemic.<sup>1)</sup> The agricultural sector is one of the major drivers of economic growth besides garment exports, tourism, construction and real estate. In 2018, it contributed approximately 23.5% of GDP, with a contribution of the agriculture sub-sector as 58.1% of crops, 11.1% of livestock and poultry, 24.1% of fisheries and 6.7% of forestry.<sup>2)</sup>

Despite the important role of the agriculture sector in supporting national economic growth, ensuring equity, securing food security, improving people's livelihood and job creation, and promoting the development of the rural economy,

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<sup>1)</sup> Asian Development Bank (ADB), July 2021. Cambodia Agriculture, Natural Resources, and Rural Development Sector Assessment, Strategy and Road Map.

<sup>2)</sup> Government of Cambodia, 2019. National Strategic Development Plan 2019–2023.

the total workforce in the agricultural sector has been gradually decreasing from 54.2% in 2010, 48.7% in 2013, 45.3% in 2014 to 37% in 2017<sup>3)</sup> but the increase in cross-border migration has been noticed. However, the growth has unevenly been experienced across the country and rural economies remain dependent on small-scale farming as the primary source of income. An estimated 67% of Cambodia's workforce in the agricultural sector is primarily engaged in agriculture cultivation and majorities are small landholders farming one or two hectares of land.

The Royal Government's vision is to modernize Cambodia's agriculture, promoting and improving agricultural productivity, diversification and agriculture commercialization. The government promotes farmer cooperatives,<sup>4)</sup> which will be supported by public extension services and relevant private sector assistance in taking advantage of economies of scale in production and marketing arrangements as part of the MAFF's effort to tackle the issue of the declining labor force. The number of agricultural cooperatives is growing, and as of 2019, the MAFF recorded around 1,200 registered cooperatives, with just under 122,000 members (some 60% of members being women); however, their capacity varies. Further strengthening of farmer cooperatives and different forms of farmer groups is required for sustainable agricultural sector development in the country,<sup>5)</sup> as well as the enhancement of local economic growth and household well-being. Moreover, modern farming mechanization gradually replaces the labor shortage, such as tractors, two-wheel tractors, harvesters and threshers, water pumps etc...

Many concerns in the agricultural sector in order to develop local farming and fulfill the government's vision of modernizing agriculture and increasing agricultural productivity. One of the concerns is the seasonal water scarcity, besides the high

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<sup>3)</sup> Ibid.

<sup>4)</sup> Government of Cambodia, MAFF. 2015. Agricultural Sector Strategic Development Plan, 2014–2018. Phnom Penh.

<sup>5)</sup> Asian Development Bank (ADB), July 2021. Cambodia Agriculture, Natural Resources, and Rural Development Sector Assessment, Strategy and Road Map.

range of rainfall, due to the lack of appropriate water storage and water resources management issues. Extreme flooding, flash floods, and droughts are common that can be seen in many areas throughout the rainy and dry seasons. Furthermore, other concerns draw attention to the crucial inputs for agriculture, such as vegetable seeds, fertilizers and pesticides, nearly all of which are imported and reduce the competitiveness of local agricultural products.

The Majority of seeds are imported from other countries; however, some farmers also produce their own seeds for cultivation but the sort is limited and quality can vary. Similar to seed issues, all chemical fertilizers are imported. Although organic fertilizers are also imported but there are many associations and communities that produce organic fertilizer across the countries, and recently, a few organic fertilizer factories have been established. Usually, farmers use their own animal or organic wastes to produce organic fertilizer (such as manure, mulch, and compost) but the amount is very little. FAO data shown that Cambodia used 134,053 tons of total fertilizer in 2018 compared to 38,693 tons in 2005. The amount of fertilizer used per hectare of cropland increased from 10kg in 2005 to 33kg in 2018<sup>6)</sup> and Cambodia increased imports of fertilizers from about 850,000 tons in 2016 to 1,149,615 tons in 2019.<sup>7)</sup> Pesticide use has also been increasing and according to MAFF's latest figures, 81,098 tons of pesticides were officially imported in 2019.<sup>8)</sup>

Another important part of agricultural activity carried out by agricultural households is the raising of livestock and poultry, which supports livelihoods and provides income in rural households. Of the total 1,726,338 household agricultural holdings in the country, 1,300,725 holdings, or 75 per cent of households, raised livestock and/or poultry.<sup>9)</sup> Remaining in agricultural households/smallholders

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<sup>6)</sup> Asian Development Bank (ADB), July 2021. Cambodia Agriculture, Natural Resources, and Rural Development Sector Assessment, Strategy and Road Map.

<sup>7)</sup> Government of Cambodia, MAFF. 2020. Annual Report for Agricultural Forestry and Fisheries 2019–2020 and Direction 2020–2021. Phnom Penh.

<sup>8)</sup> Ibid.

based, livestock production has risen 50 per cent since 2012 and grew by just over 3 per cent in the 2016-2017 period<sup>10</sup>). Sixty-three per cent of household agricultural holdings nationwide reported raising poultry, 43 per cent reported raising large livestock, and 8 per cent reported raising small livestock. Many households kept a mix of both livestock and poultry. In 2018, the cattle population was 2.9 million, with one to three animals typically kept in each household. Cattle are raised with poor feed quality, as rice straw, cut grass and rice bran mixed with banana stems or Cattle allow to freely graze in rice field after cultivation. Pig production decreased as the total population declined from 2.4 million in 2013 to 1.8 million in 2018 (one to five pigs in each household). Feed for pigs is comprised mainly of kitchen scraps, leftover meat, fish, and bones mixed with rice bran and vegetables. The poultry population has risen from 21.5 million birds in 2013 to 37.2 million in 2018. In 2016, the MAFF estimated a 21% increase in the number of commercial farms over the previous year, from 2,539 farms to 2,856 during 2014-2015.

This study aims to promote the agricultural sector through integrated farming by focusing on the combination of vegetable agriculture and livestock (cattle, pig and poultry farming) at the household level, which could serve as an engine to develop the economy, contribute to the poverty reduction from the family and cooperative level. The study will focus on:

1. Studying the current way of agricultural practices (integrated farming and non-integrated farming) at target sites,
2. Identifying critical factors and challenges of Cambodian agricultural practices, particularly the integrated farming system and,
3. Considering key elements for promoting integrated farming.

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<sup>9</sup>) MAFF, Cambodia Inter-Censal Agriculture Survey 2019 (CIAS19)

<sup>10</sup>) Asian Development Bank (ADB), July 2021. Cambodia Agriculture, Natural Resources, and Rural Development Sector Assessment, Strategy and Road Map.

## 1.2. Research Scope and Method

### 1.2.1. Research Scope

- Agricultural status of the project site
- Agricultural problem of the project site
- How to utilize farming and livestock circulation in Korea

### 1.2.2. Research method and data collection

The research was conducted to explore the agricultural trends of Cambodian farmers, the advantages of integrated farming over non-integrated farming practices and the significant challenges facing local agriculture. Utilizing both quantitative and qualitative methods, a structured questionnaire and social tools were used to collect the data. The research focused in six villages in two provinces, Kampong Chhnang Province (Ksaj Sor Village, Sambok Kriel Village and Khnar Tey Village) and Takeo Province (Russei Thmey Village, Punsaing Village and Champa Village), with a sample size of approximately 10 per cent of the households in each village.

Excel and Statistical Package for the Social Sciences (SPSS) were used to process, manage and analyze the data. The Excel program was used for data entry, while SPSS was applied for data analysis. Descriptive statistical analysis tools were performed in this report.

Household surveys among farmers were conducted using standardized questionnaire items among farmers in the target villages. Interviews were conducted with a total sample size of 150 farmers, 75 of whom experience integrated farming and the remaining do not.

Observation was made by investigating the behaviours of farmers, fertilizer sellers and agricultural product buyers for qualitative research. In addition, value chain and market issues are being studied to increase farmers' sales.

Key informants included relevant organizations, including government agencies, local authorities, local markets, agricultural products middlemen, funders/banks/credit companies, farmer organisations/groups/communities, NGOs, policymakers, and researchers. The interview is necessary to collect data regarding policy, legal framework and opportunities for farmers.

Consultative discussions are held with the technical group of Community Development Department of the Ministry of Rural Development after obtaining preliminary findings for validation, feedback and further inputs for writing and finalizing the manuscripts and reports, with participation from key important stakeholders among key informants. The consultation explored the implementation of policies and long term planning while presenting the preliminary findings and soliciting input.

**Table 1** Research Method and Data Collection

Method	Subject	Detail
Literature review	Primary and secondary literature data	<ul style="list-style-type: none"> <li>• Cambodia rural development and integrated agriculture-related policies, legislative and strategic frameworks, etc.</li> <li>• Analysis of reports and documents for overseas case investigation</li> </ul>
Data collection	Records and statistics	<ul style="list-style-type: none"> <li>• Current status of agriculture, forestry and fisheries, current status of water-energy-food resource use, etc.</li> <li>• Analysis of primary and secondary data such as integrated agricultural resource management</li> </ul>
Interview	Agricultural workers in Takeo and Kampong Chhnang, experts from government and related organizations, etc.	<ul style="list-style-type: none"> <li>• Current state of understanding and problems</li> <li>• Quality of discharged materials (fertilizer, leaves, equipment), extraction method, final arrival of working funds, etc.</li> <li>• Market and consumer analysis</li> </ul>

### 1.3. Composition of Joint Research Team

〈Table 2〉 Composition of Joint Research Team

Sort	Affiliation	Name
Cambodia Joint Investigation Team	Cambodia Asian Vision Institute	Ngo Sitthykun
	Ministry of Rural Development of Cambodia	Oeun Thearith
Korean Expert	Konkuk University	Duk Heo
Korea Rural Economic Institute	Center for International Agricultural Partnership	Jongsun Kim
		Kyeonghun Joo





# 2

## Cambodia Integrated Agricultural Status and Policy Analysis

### 2.1. Project Site Status

#### 2.1.1 Kampong Chhnang's agricultural types

Table 3 represents the activities in agriculture of respondents in the three target villages in Kampong Chhnang. Among all 75 respondents, 40 of them had knowledge of the definition of integrated farming, whereas 35 respondents reported that they had never heard of the term. According to the data collected, the numbers of respondents who practice integrated farming are lower than the non-integrated. 29% of farmers work just with livestock, while 27% do crop farming only. 44% of the total respondents practice integrated farming. As in the focus group discussion, there have not been any cases or study to classify integrated and non-integrated farming up to this point.

**〈Table 3〉** Types of Agriculture in Kampong Chhnang

Types	Frequency	Percent	Valid Percent	Cumulative Percent
Cultivation	22	29.3	29.3	29.3
Livestock	20	26.7	26.7	56.0
Both (Integrated Farming)	33	44.0	44.0	100.0
Total	75	100.0	100.0	

Source: Team analysis using field survey data.

The research team wanted to find out the proportion of households doing integrated and non-integrated farming. In addition, respondents were asked how they saw their community involve with integrated farming. Based on their opinions, the majority of the respondents' answers, 25N, is between 31~50% of the village practicing the both livestock and crop farming. On the other hand, while 0-15% and 75-100% are in the same numbers which are 12 responds.

### 2.1.2 Takeo's agricultural type

Out of all 65 respondents, 37 of them had knowledge of the term of integrated farming, whereas 28 respondents reported that they had never heard of it. The respondents' agricultural activities, which engage in integrated farming are significantly less than the non-integrated ones. Around 25% of the total respondents only practice integrated farming, compared to around 51% of farmers, who only practice crop farming and 17%, who work just with livestock.

**〈Table 4〉** Types of Agriculture in Takeo

Type	Frequency	Percent	Valid Percent	Cumulative Percent
Cultivation	33	50.76	50.76	50.76
Livestock	16	24.62	24.62	75.38
Both (Integrated Farming)	16	24.62	24.62	100.0
Total	65	100.0	100.0	

Source: Team analysis using field survey data.

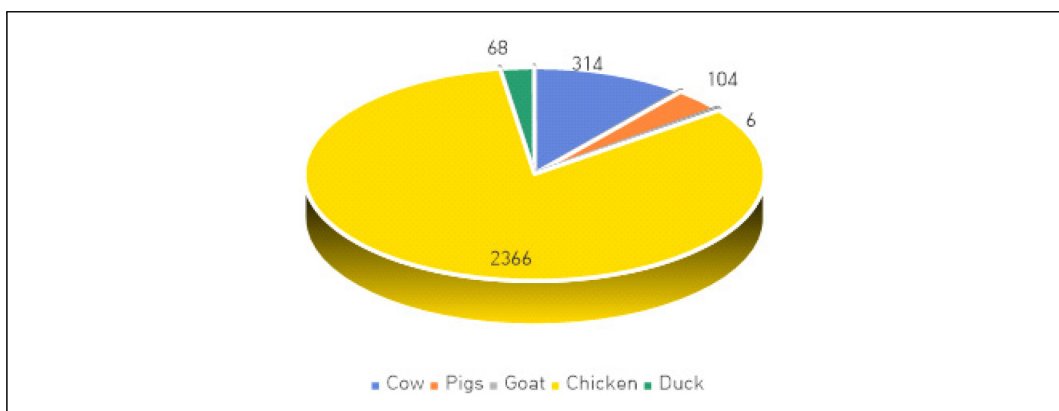
The research also seek for the perception of respondents on the percentage of families doing integrated and non-integrated farming in their areas. Respondents were asked to provide theirs though on how many percentages of integrated farming are practiced in their areas. According to their responses, 21 participants think that there should have 50% to 75% of farmers are on the integrated farming.

## 2.2. Current Status of Livestock Breeding in the Project Site

### 2.2.1 Livestock raising in Kampong Chhnang

A total of 65 (20 households are doing only livestock) of the 75 respondents from the three villages of Kampong Chhnang, are doing livestock. The farmers keeps chickens (2366), Ducks (68), Cows (314), Pigs (104), and goats (6). Among those households doing livestock, 31 claimed that they produce feed from their own input or bought inputs from other farmers or market. The majority of households raised few type livestock at the same time, the common one is the combination of cattle, chickens and pigs.

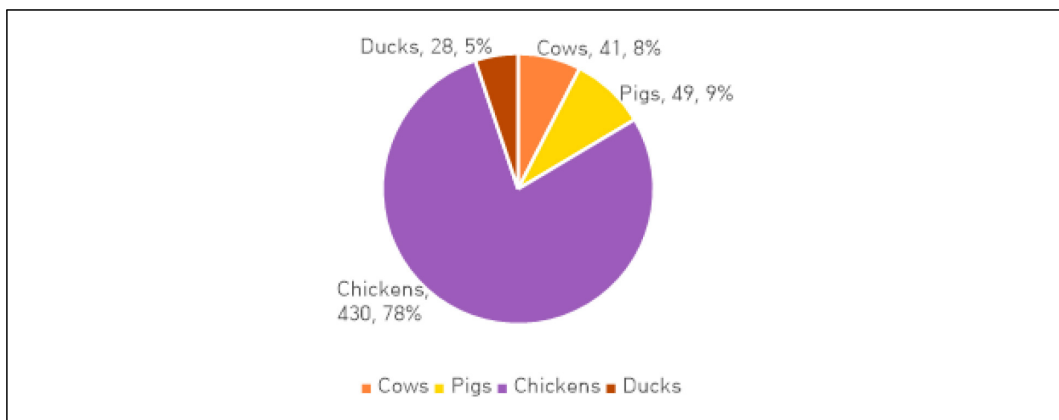
⟨Figure 1⟩ Total Amount of Animals Raised by Interviewee



Source: Team analysis using field survey data.

Out of the 65 households, who do the livestock, 62 respondents participated in the question asking how many animals they often sell to market. Among all types, chicken is the animal that is sold to market with the greatest frequency (78%), followed by pigs (9%), cattle (8%) and ducks (5%). According to the data collection, 430 chicken are sold by 31 household in a period of 3-4 month, 49 pigs are sold by 4 households in a period of 4-6 months, 41 cows are sold by 25 households in a period of 12 to 18 months, and 28 ducks are sold by one household in a time of 6 months.

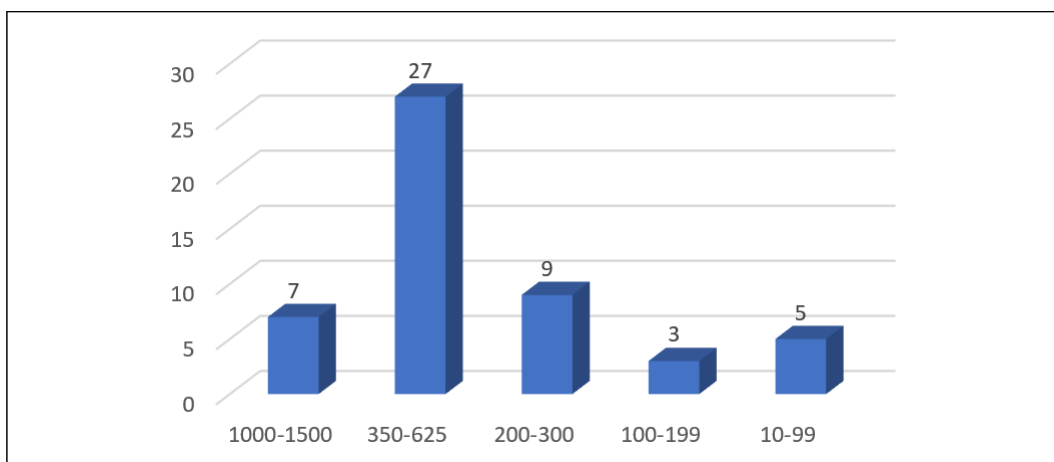
〈Figure 2〉 Headcount of Animal Sold by Households



Source: Team analysis using field survey data.

Among 51 livestock farmers participated in the survey, the majority, 27 respondents, reported that they could earn between \$350 to \$625 per year, or on average \$29 to \$52 per month. 7 household reported their annual income from 1000-1500 per year, or an average \$83-\$125.

**Figure 3** Income from Livestock by Household



Source: Team analysis using field survey data.

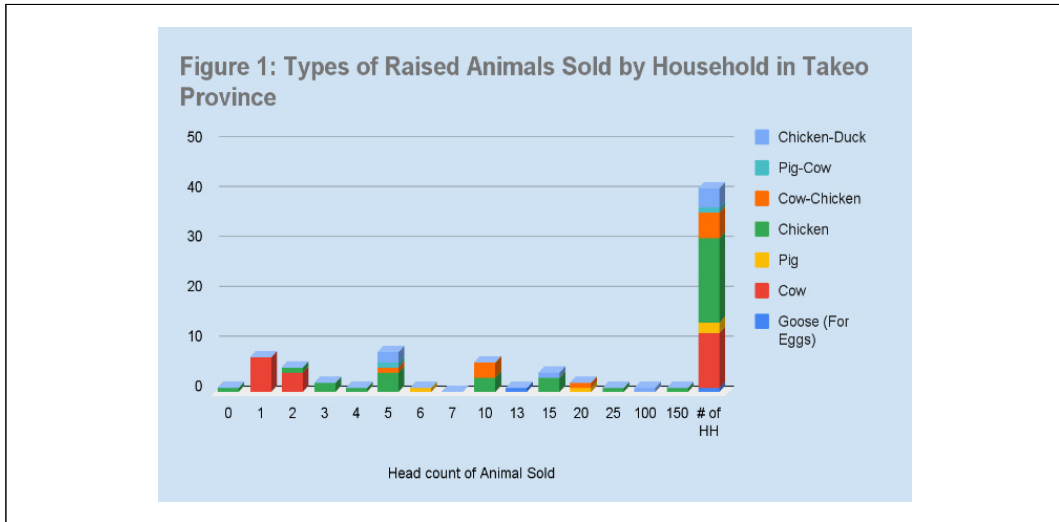
## 2.2.2 Livestock raising in Takeo

Main animals that are raised by farmers are cows and chickens. There are vets but most likely they are informal or uncertified. Main buyers/traders are middle traders who are villagers. Most farmers are family business, small size farmers. They grow crops that are easy to grow, grow fast and in high demand. However, livestock raising is declining because of infections and competition with imported meat. So the crops cultivation is relatively increasing in contrast to livestock raising.

Out of 65 households in Takeo interviewed, the study noted that there are 32 farmers are raising livestock, in which 16 of whom farm only livestock. The total animal in this three target villages are chickens (764), ducks (243), geese (31), cows (85), pigs (42), buffalo (1) and fish (2100). Among 16 households only one family raises some fish, about 300 fish. Their main source of water is from wells and lakes. In terms of labor, only 1 or zero person per household works on raising livestock. According to Figure 3, the indication from study data finds that cows and chickens are more commonly sold than other animals like pigs, geese, and ducks. Moreover,

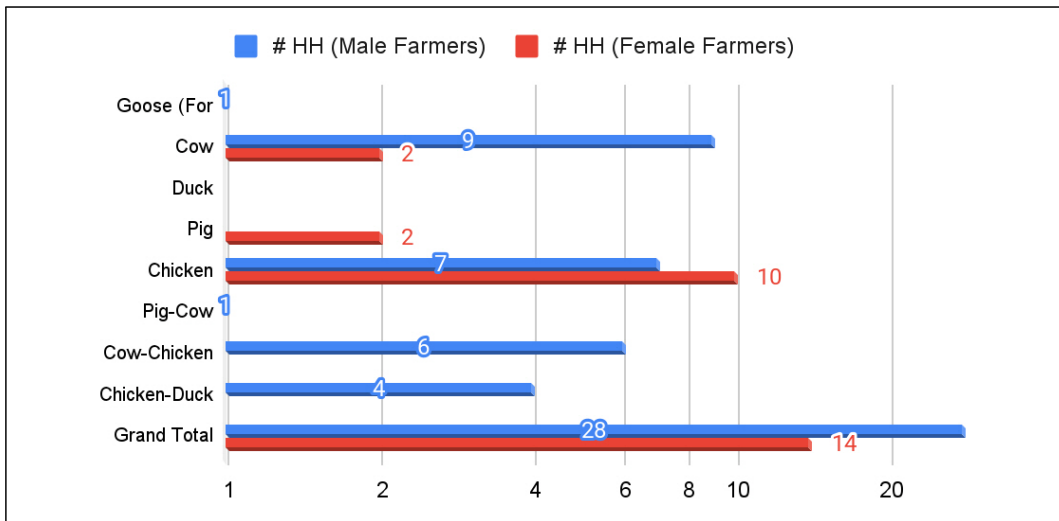
there are more small size farmers than wholesale farmers. As indicated in Figure 4, it shows that most farmers sold between 1 to 5 units of chickens-cows-ducks. About 14% of the households who could sell 15-20 units and 7% who could sell 100-150 units (mostly chickens-ducks).

**Figure 4** Types of Raised Animals Sold by Household in Takeo Province



Source: Team analysis using field survey data.

**Figure 5** Headcount of Animals Sold by Gender



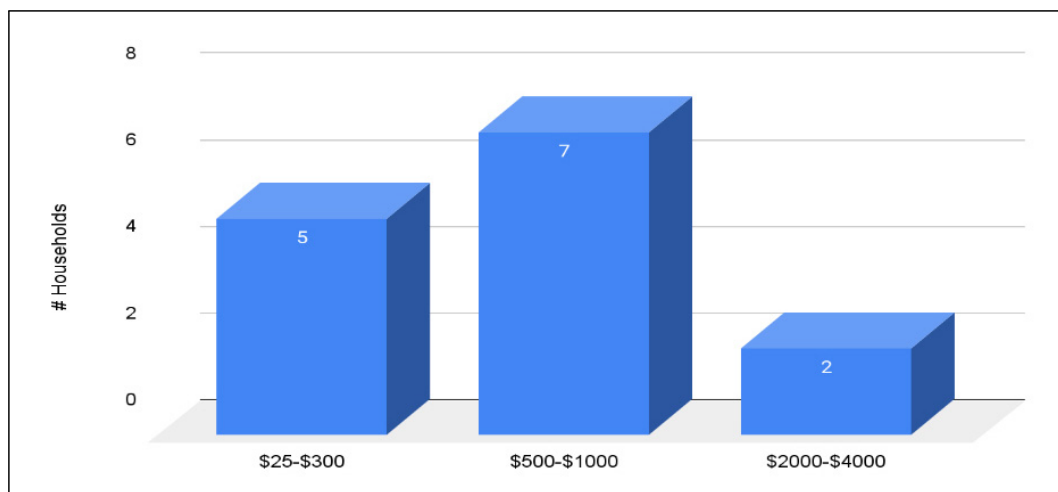
Source: Team analysis using field survey data.

In overall, men could sell more animals than women as per Figure 5. However, women could sell chicken far more than men and men could sell cows far more than women. This could be because men raise cows more than women and women raise chicken more cows than men do.

Livestock households need to feed their animals from 2 to 100 kilograms of feed per day. Out of 16 households, it is observed that there are 10 households who produce feed on their own. They do not buy or need additional feed for their animals. However, there are 6 households who do not make any feed or buy feed from outside. On average they buy from 2 to 6 kilograms per day and it costs them from 700 to 4000 Riels per kilogram. Their main buyers/clients are domestics, middle agents and local traders and the purchase mostly at the home gate.

Among livestock farmers, 7 of them reported that they could earn between \$500 to \$1000 per year, or on average \$38-\$83 per month. Five of them earn even less, about \$25 to \$300 per year or \$2-\$25 per month. Two of them could earn between \$2000-\$4000 per year or \$167-\$333 per month from raising livestock.

**Figure 6** Income from Livestock by Household in Takeo



Source: Team analysis using field survey data.

In addition, according to group discussion with local authorities and suppliers, it is important to note that in Takeo, the main source of income of farmers is from business/trading, which is about 40 per cent. Other 20% comes from elementary jobs (micro business). This means agriculture is not the main source of income. Most interviewed farmers spend more time in other economic activities so that they could earn more income, such as rubber plantation, casual work for other farmers.

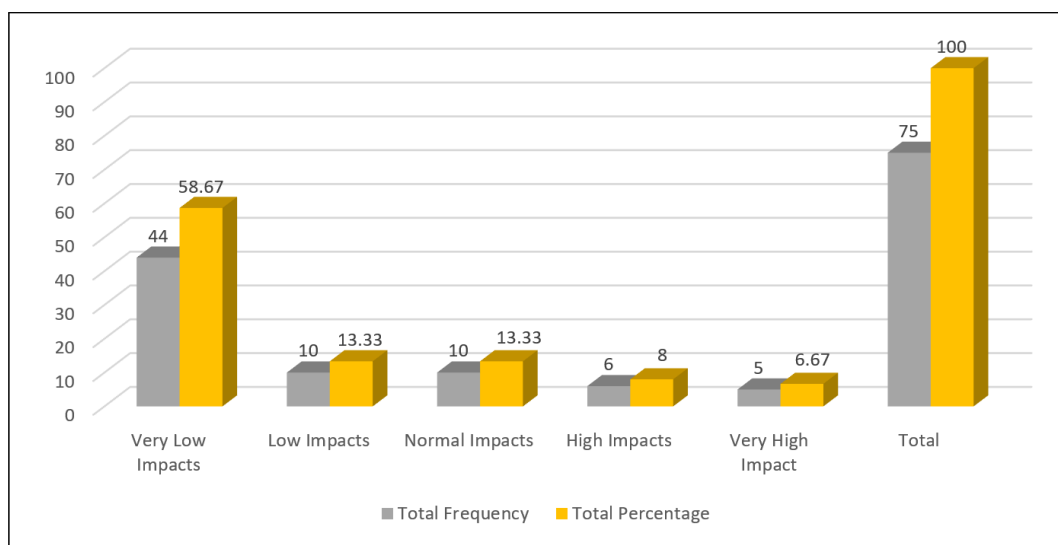
## **2.3. Analysis of Project Site Problems**

### **2.3.1 Perception of farmers on common challenges in Kampong Chhnang**

Farmers stated that they have enough knowledge on the cultivation and raising livestock. 58% of them suggest that is not very necessary to get more new skill in farming. However, 7% of the respondents expressed the opposite opinion and raised their concern on impact of low technical skill in productivity. They considered learning from the experts are important to understanding and get improved in capability. Most of them answered that they would find the experts (agricultural experts from NGOs or governmental authority and so on) to understand the new way of farming and get more important new approaches of increasing productivity.



**〈Figure 7〉** Awareness of the Impact of the Lack of Technological Skills of Kampong Chhang Farmers on Agriculture



Source: Team analysis using field survey data.

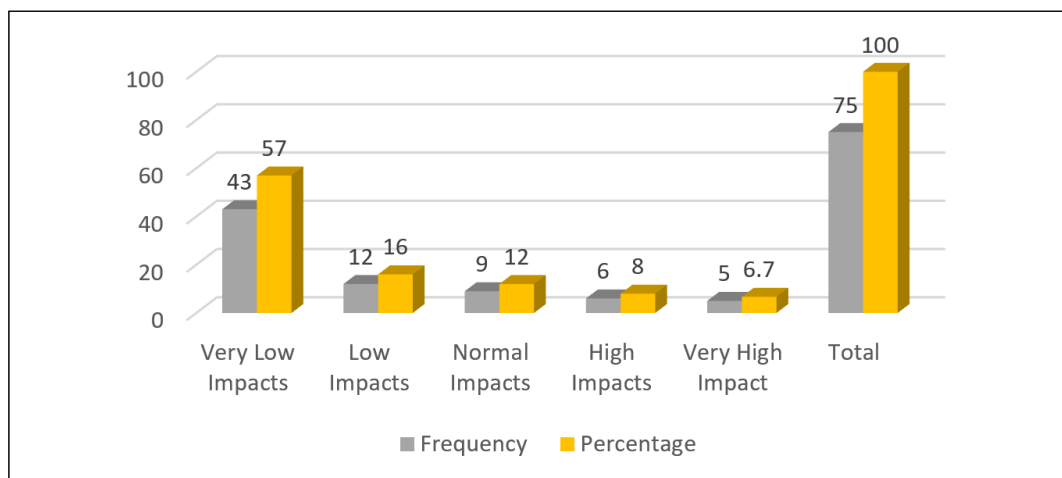
In livestock section, the situation is not a big different, Farmers in target villages in Kampong Chhang raise animal in a traditional way. When they were questioned on breeding and technical skill as challenges of raising livestock (Figure 6 and 7), the majority of responses (about 75% of them) answered that breeding is not a big deal and 62.5% of them rated lack of technical skills the lowest areas of concern. It is interesting to note that the result in Figure 6 and 7 is contrasting with the opinion of experts and open the huge chance in improving the livestock productivity. However, there is a small proportion of farmer who consider these two factors as a key factor for improving. According in FDG, animal diseases are also the big problem for farmers, there are not too many qualified vet, and majority of farmers depend on their own experience or an opinion of the animal feed shop owner, in which animal medicines are also provided.

The water resource for production is a critical in agriculture which result a big impact on agricultural productivity and diversity. The research study found out that the majority of them hasn't much been affected from the lack of water resource.

Most of them pay low worries on water shortage which accounted for around 47%. Additionally, 22.7% respondents have a highly difficult in access to water resource for their agricultural production. Around 17% claimed that lack of water resource is a normal problem they have faced. Famer still depend on raining water for their cultivation and for the adaptive responds, notably, they rely on buying water from water seller, transported from the nearby canal, lake or water reservoir. Well are the most important source of water for agricultural in these area, not every household has their own well and further some well cannot pump water in the dry season. In observation, water storage has also been dug but the quantity is very low.

Climate change has posed several natural disastrous problems to farmers such as drought, flood and intensive rain. However, the respondents perceived that the natural disaster has very low impacts on their process of cultivation and livestock, 57%. While only around 6.7% experienced severe impact from the natural disasters. To be resilient with that, some of them stopped doing agriculture or cut down on production until it become better. While some of them use chemical fertilizer to make their crop firm and strong. On the other hand, the majority of the respondents still have no any solution.

**<Figure 8> Awareness of Impacts of Natural Disasters on Agriculture**



Source: Team analysis using field survey data.

The respondents, most of them have no problem with the labour as they do it with the capacity of their family member. Around 64% of them have very low impacts while only around 5% are in shortage of human force. Some of respondents said they will hire people (seasonal labor force) to help in their farm if they lack of it. While most of them they follow their available human force resource.

The majority of respondents expressed low concern on transportation and claimed that it does not affect them severely. Only 9% of respondents considered the extremely high impact of lack of transportation while 69% assumed very low impacts from the lack of transportation. Some respondents solve the difficulties by hiring transportation to deliver the product, and some others deliver by themselves. Farmers also confirmed cases where middlemen come to collect and buy from the farmers at their places. However, most respondents don't have any approaches for tackling with the problem.

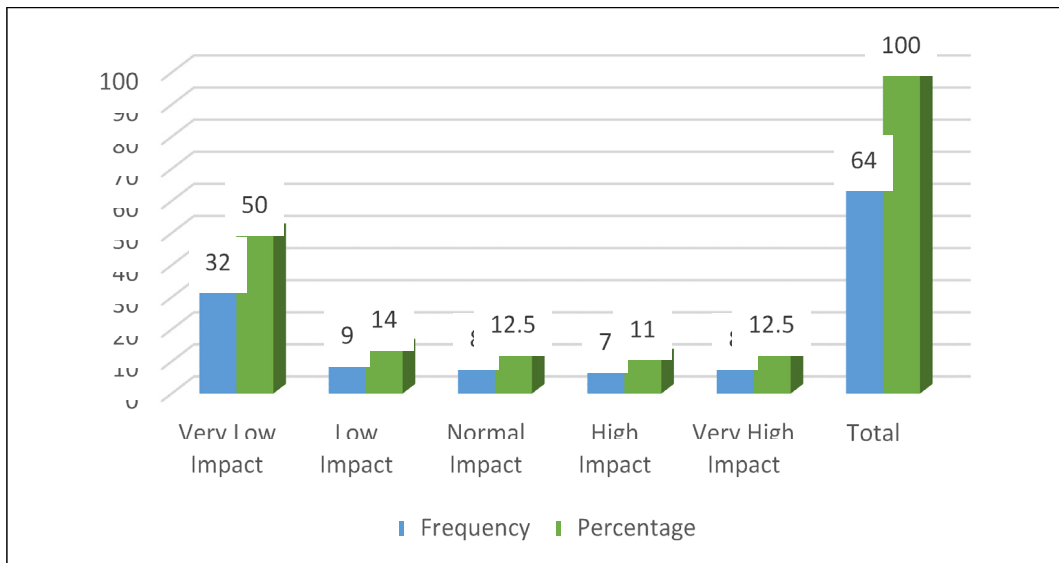
The majority of respondents experienced very low impacts from the technical shortage such as the skill in packaging, and food processing which account for 72% of them as they have the middlemen come to buy the fresh product either it is livestock, vegetable or other agricultural product. While the normal impacts responded by 15% of farmers. The respondents who get highly impacted is only 4%. They said they package by hand and do it traditionally.

Farmer face significant hurdles as a result of market issues. Around 31% have extremely worse experience in locating the new or high price market for their agricultural products. Around 45% of respondents rarely get really affected by a lack of market, instead, they have to deal with a low market or a monopoly price, that is manipulated by middlemen. Some farmers move their product and sell in the community or bring them to the market by themselves for higher price.

### 2.3.2 Perception of farmers on common challenges in Takeo

Farmers from the target villages in Takeo express their belief in traditional way farming and raising livestock. Figure 8 shows that 50% of respondent does not make any importance on the lack of technical skill of doing agriculture. In contrast, around 13% of interviewed stress on gaining new skill to raise the productivity and diversity of the agricultural products.

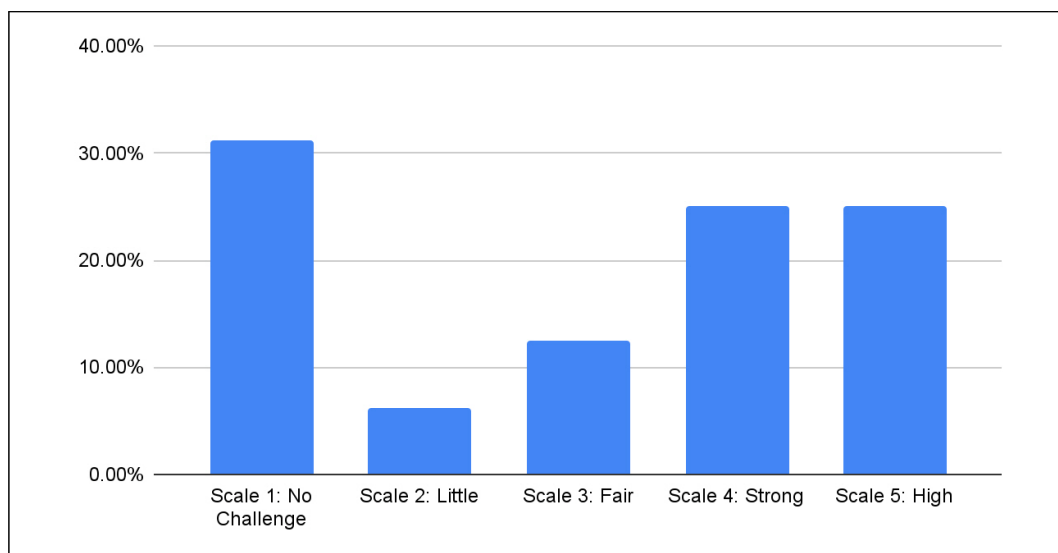
〈Figure 9〉 Challenge in Lack of Technical Skill of the Takeo Farmers



Source: Team analysis using field survey data.

〈Figure 9〉 and 〈Figure 10〉 illustrate the majority of responses from respondents from Takeo on livestock issue, with 62.5% of them rated lack of technical skills and 75% rated breeding the least concerning issues. This situation also applies to animal diseases, about which less than one third of farmers are very worried. Among the 16 households that only raise livestock, one group of about 5 farmers do not find any challenge in animal diseases while other two groups (4 farmers each) have experience significant difficulties, 〈Figure 10〉.

**Figure 10** Farmers' Awareness of Livestock Diseases



Source: Team analysis using field survey data.

According to the survey, the majority of respondent have not been significantly impact by the lack of water resource. Most of them, 76%, expressed minimal concern about water shortage and only 1.6% of respondents have a highly difficulty in access to water resource for their agricultural activities.

Climate change and natural disaster have a low impact on their cultural activities, as 57% of respondents confirmed. However, 15.63% has another opinion and 3% consider that natural disasters have a huge impact on their crops and livestock.

Most of the respondents does not feel any impact of labor force as are farming according to their capacity of family labor. The figure shows around 64% of them confirmed minor effect of lack labor force while 1.6% express the opposite way for their agricultural activities

The majority of respondents with 89% expressed low concern on transportation, and said it did not significantly impact of their agricultural activities. No one points out the transportation problem as a high impact indicator or very serious issue in the target villages in Takeo. Although 6% of respondent concern that it has a typical impact on farming and livestock.

As respondents in Takeo have middlemen come to acquire the fresh product, or buyer in the community does not require in high quality packaging, whether it is meat, vegetables, or other agricultural products, the majority of respondents reported relatively little impact from the technical food processing skill shortage in areas, which account for 73.8% of them. Only around 5% of them consider this issue as a high challenge that needed to be improved.

# 3

## Current Status of Policy Promotion Related to Livestock Manure Circulation

### 3.1. Policies and Systems Related to the Livestock Manure Circulation in Korea

The UN officially announced the Sustainable Development Goals (SDGs) agenda at the UN Summit in 2015. The 12th Sustainable Development Goal (SDGs) is ‘responsible production and consumption’, and for this, a transition from a linear economic model<sup>11)</sup> to a circular economy has been proposed. Korea enacted the Framework Act on Resource Circulation in 2016 to respond to SDGs, and has been in effect since January 2018. The Ministry of Environment established the Basic Plan for Resource Circulation (2018-2027) based on the applicable law, and this plan contains a mid- to long-term strategy to realize a circular economy.

The Ministry of Agriculture, Food and Rural Affairs has been promoting a policy of turning livestock manure into resources and putting it into farmland. However, there was no comprehensive and comprehensive policy at the government level in relation

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<sup>11)</sup> It refers to an economic model that leads to mining–production–consumption–disposal.

to circulatory farming. Even if farming and livestock circulation was mentioned in the policy, it was focused on the limited field of livestock manure treatment. (Special Committee on Agriculture, Fisheries and Rural Community 2019).

In 2004, the Ministry of Agriculture and Forestry and the Ministry of Environment jointly established the 'Livestock Manure Management and Utilization Promotion Planning Team' and announced comprehensive livestock manure management measures. (Hyuntae Park et al. 2008). As part of circular agriculture, the government has implemented 'wide-area eco-friendly agricultural complex development project' in 2005, 'mid-to-long-term vision for promoting a resource-circulating society and basic plan for national resource circulation', and 'measures to promote natural circulation agriculture using livestock manure' in 2006. Recently, after the pilot project from 2014 to 2016, the 'Mountain Ecological Livestock Farm Creation Project' has been implemented since 2017.

Looking at the measures to promote natural circulation agriculture in 2006, 73 livestock cooperatives and 318 agricultural cooperatives signed agreements as of 2012.

and the promotion system for natural circulation agriculture was presented. However, it was not activated anymore, and now, the joint resource center that promotes natural circulation agriculture provides loans for natural circulation agriculture.

## **3.2. Status of Related Laws**

### **3.2.1. Livestock Manure Act**

Acts related to the management, use, and treatment of livestock manure include the 「Act on the Management and Use of Livestock Manure」 (hereinafter referred to as



the 「Livestock Manure Act」, 「Odor Prevention Act」, 「Fertilizer Management Act」, 「New Energy and Renewable Energy」 Development·Use·Dissemination Promotion Act」, etc. Among these laws, most matters related to livestock manure are stipulated in the Livestock Manure Act (Kim Hyun-joong et al. 2018).

At this time, notifications from the Ministry of Agriculture, Food and Rural Affairs, the Ministry of Environment, and the Rural Development Administration and ordinances by local governments are enacted and implemented based on the 「Livestock Manure Act」. The Fertilizer Management Act is related in that it presents standards for livestock manure compost and livestock manure fermented liquid (liquid manure), which are equivalent to ripened organic fertilizers.

The 「Livestock Manure Act」 aims to contribute to the development of a sustainable livestock industry in harmony with the environment and the improvement of public health by preventing environmental pollution by utilizing livestock manure as resources or properly treating it. ·Manage treatment facilities, spread compost and liquid manure, promote the use of livestock manure, and deal with regulations related to public treatment and related business.

Livestock manure was recognized as a waste, not a resource, prior to the enactment of the Act in 2006, and the related law was also named the 「Sewage Manure and Livestock Wastewater Treatment Act」. However, in 2006, the Livestock Manure Act was enacted to preserve the environment and realize a sustainable livestock industry through the promotion and systematic management of livestock manure as resources. Through this, instead of the purification-oriented legislation that focuses on the prevention of water pollution and discharges livestock manure into rivers after purification, legislation was established to recognize livestock manure as a resource and utilize it.

When the law was enacted in 2006, the Ministry of Agriculture, Food and Rural Affairs and the Ministry of Environment jointly prepared a comprehensive management plan for livestock manure to strengthen policy connectivity for

livestock manure recycling, treatment, and use among ministries (Kang Gi-cheol et al. 2018). As the law was changed to the 「Livestock Manure Act」, the concept of recycling livestock manure into compost and liquid manure was introduced, and support for livestock manure recycling facilities for proper treatment of livestock manure was institutionalized.

Since its enactment, the 「Livestock Manure Act」 has been continuously revised, and regulations such as management and supervision have been strengthened, and livestock manure recycling has been promoted through facility expansion (Kim Hyun-joong et al. 2018). Following the enactment of the Livestock Excreta Act in 2006 and the entry into force of the “International Convention on the Prevention of Marine Pollution by Discharge of Wastes (London Protocol)”, in July 2007, in preparation for a complete ban on marine dumping of livestock manure, livestock manure was discharged into the sea. Reduction measures have been established.

In 2013, unlicensed barn management was strengthened, livestock manure composting and liquefaction standards were newly established, and a livestock manure electronic handover system was introduced. In 2015, a three-year administrative disposition grace period was set aside for the legalization of unlicensed barns, and contents such as installation of resource-oriented public treatment facilities, introduction of livestock excreta survey, expansion of livestock breeding restricted areas, establishment and operation of the Livestock Environment Management Center, etc. The Livestock Manure Act was amended, including

In 2016, 'measures for creating a clean livestock farm' were prepared for the stable development of the livestock industry and the vitalization of natural circulation agriculture to promote livestock manure resource utilization. Comprehensive measures to improve the livestock environment were prepared, including strengthening support and support, reviewing the introduction of nutrient management system charges, and reducing ammonia.

### 3.1.2. Fertilizer Management

「The purpose of the Fertilizer Management Act is to preserve the quality of fertilizer, maintain and promote agricultural productivity through smooth supply and demand and price stability, and to protect the agricultural environment. It also deals with regulations related to the definition of fertilizer, establishment of process specifications, registration of fertilizer producers, warranty indication and sales management, quality control and management obligations, and restrictions on registration and reporting.

According to the Fertilizer Management Act, livestock manure and livestock manure fermented liquid (liquid manure) are among the by-product fertilizers, and are considered as organic fertilizers. In order to become fertilizer according to the Fertilizer Management Act, process standards must be followed. Process standards refer to 'the minimum amount of the main ingredient, the maximum amount of harmful ingredients that can be contained in the fertilizer, the content of additional ingredients necessary for maintaining the efficacy of the main ingredient, and the expiration date, etc. Standards determined and announced by the Minister for Food, Agriculture, Food and Rural Affairs.

### 3.1.3. Waste Disposal Act

Except for agricultural by-products, food processing by-products, and livestock manure, which are organic waste resources from agricultural and livestock production, they are subject to management under the 「Waste Management Act」 (Seo Dae-seok et al. 2017). According to the definition of organic waste resources, the scope can be defined as agricultural by-products, livestock manure, forest residues, etc, and rice hulls and rice bran generated in the process of

commercializing agricultural products, and non-edible by-products generated in the process of slaughtering livestock also fall under this category.

Among organic waste resources, food processing by-products are business wastes generated from business sites and are subject to the 「Waste Management Act」 managed by the Ministry of Environment, and include rice hulls and rice bran from rice processing plants, as well as citrus peels and onion peels from food and beverage businesses.

Among agricultural by-products, rice straw is managed according to the livestock forage supply activation policy of the Ministry of Agriculture, Food and Rural Affairs, and there is no clear management system for other items. Most of these agricultural by-products are not statistically tallied in the amount generated and processed, and it is found that they are returned to farmland or self-incinerated (Youngman Yoon et al. 2017).

Currently, in accordance with the 「Waste Management Act」, incinerating agricultural by-products, waste vinyl, household waste, etc. in rural areas in the open air or using them as fuel for furnaces is subject to punishment as illegal waste incineration. The Rural Development Administration is requesting refrain from incinerating customary agricultural by-products to reduce fine dust and prevent forest fires, and agricultural by-products (rice straw, barley stalks, red pepper stalks, sesame seeds, pruned branches of fruit trees, etc) are resources that can increase soil organic matter content. It is recommended to crush and use as compost during soil plowing (rotary) work (Rural Development Administration press release 2020. 1. 21.).

As of 2018, as a result of the crackdown on illegal burning, 16,686 cases were caught nationwide, and a fine of 927 million won was imposed. In response, the Rural Development Administration cooperated with the Si/Gun Agricultural Technology Center to support the shredding of agricultural by-products at the Si/Gun/Village level using a power shredder for lease at the farm machinery rental office.

### 3.3. Farming and Livestock Manure Circulation Organic Farming Policy-Related Systems

#### 3.3.1. The Concept and Conditions of Organic Farming<sup>12)</sup>

##### 1) Concept of Organic Farming

In promoting eco-friendly agriculture, which is a concept that includes organic farming, first, chemical fertilizers are given only insufficient ingredients according to the results of soil testing, and a lot of compost is used. In addition, the use of pesticides is reduced to a minimum when necessary, pesticides with low toxicity are used as much as possible, and natural enemies are used. In paddy fields, it is recommended to introduce and practice eco-friendly farming methods such as duck farming and snail farming, which can reduce the use of herbicides, pesticides, and chemical fertilizers. In addition, efforts are being made to plant rye and milkweed in paddy fields and fields in winter to use them as feed and compost resources, and to create beautiful rural landscapes with green fields in early spring.

Also, what is important is to practice circular farming by returning livestock manure and agricultural by-products to farmland. In addition, waste vinyl and empty pesticide bottles are being collected and disposed of immediately after use.

Simply put, organic farming is farming without the use of pesticides and fertilizers. Organic agriculture is agriculture that does not use any chemical substances, such as herbicides, insecticides, fungicides, synthetic pesticides, chemical fertilizers, and hormones, and is the highest level of agriculture among environmental agriculture.

It is recognized as the beginning of organic farming when 3 years have elapsed after the use of chemical agents was stopped and no chemical components are

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<sup>12)</sup> This part was prepared by referring to the Sejong Special Self-Governing City Agricultural Technology Center website (<https://www.sejong.go.kr/adtc.do>).

detected in the soil, and 3 years is considered a transition period. Farming without using pesticides and fertilizers is never an easy task. Just because there is no use of chemical pesticides and chemical fertilizers does not mean that organic farming takes place. First of all, it is necessary to increase intellect, which is the basis of agricultural production. In addition, cropping systems such as crop rotation and mixed cropping should be used rather than the existing mass production of small species, and the production structure itself should move toward an organic system that is circulated within the farm or region as much as possible rather than relying on inputs from the market and the outside.

The organic system referred to in organic agriculture is not limited to the production sector. In the disconnected system between urban and rural areas, it is not possible to continue organic farming in the first place. Organic farming in its true meaning can be realized when rural areas and cities, producers and consumers communicate, share and circulate as much as possible, and restore organic relationships. Organic farming is only possible when it enters into the larger circulation system of organic relationship between urban and rural areas.

## **2) Environment-Friendly Agricultural and Livestock Products**

### **Certification System**

Eco-friendly agricultural and livestock products are organic synthetic pesticides, chemical fertilizers, feed additives, It refers to agricultural and livestock products produced in a healthy environment without the use of chemical materials such as antibiotics and antibacterial agents at all or using only minimal amounts. To promote eco-friendly agriculture, a certification system is needed. This is an eco-friendly agricultural and livestock product certification system.

The eco-friendly agricultural and livestock products certification system is a professional certification body that selects eco-friendly agricultural and livestock

products that are safer for consumers based on strict standards. It is a system that inspects and certifies the safety of the government.

In order to manage eco-friendly agricultural and livestock products, strict quality inspections are required to ensure that certification standards are complied with in the production and shipment stages, such as growth and harvest, as well as soil and water. We do thorough aftercare.

〈Table 5〉 shows the types and standards of eco-friendly agricultural and livestock products. There are two types of eco-friendly livestock product certification: organic livestock products and antibiotic-free livestock products.

**〈Table 5〉 Eco-Friendly Agricultural Product Certification Types (2 Types)**

– Organic Agricultural Products, Pesticide-Free Agricultural Products

Products	Standard
Organic products / Organic livestock products	Organic products are cultivated without the use of organic synthetic pesticides and chemical fertilizers at all (conversion period: 3 years before the first harvest for perennial crops, 2 years before sowing for other crops) Organic livestock products are livestock products produced in compliance with certification standards while feeding [organic feed] produced in accordance with the cultivation and production standards of organic products.
Pesticide-free agricultural products / Antibiotic-free livestock products	Pesticide-free agricultural products do not use organic synthetic pesticides at all, and chemical fertilizers are used within 1/3 of the recommended application amount. Non-antibiotic livestock products are livestock products produced by observing certification standards while feeding [general feed] to which antibiotics, synthetic antibacterial agents, and hormones are not added.









Organic produce has the condition that it must be grown without using organic synthetic pesticides and chemical fertilizers at all. That is, the conversion period requires 3 years before the first harvest for perennial crops and 2 years before planting for other crops.

Organic livestock products are livestock products produced by observing certification standards while feeding organic feed produced in accordance with the cultivation and production standards of organic products.

In contrast, pesticide-free agricultural products do not use organic synthetic

pesticides at all, and chemical fertilizers must be used within 1/3 of the recommended application amount. It must be a livestock product produced in accordance with The following <Table 6> summarizes the display methods for each type of eco-friendly certification.

<Table 6> Method by Type of Eco-Friendly Certification

Type	Certification marks	
Organic		
Non-Pesticide		
Non-Antibiotic		
Organically Processed Food		

Cultivate crops in materials other than soil, which is not soil, or in materials other than soil designed to supply all or part of the nutrients necessary for the growth of cultivated agricultural products, such as soil, mushrooms, nutrient solution (referring to culture medium), or to grow crops. Agricultural products grown by relying on substances dissolved in natural water without supplying necessary nutrients from outside or without external supply shall be separately labeled as hydroponic or hydroponic agricultural products.



### 3.3.2. Details of Organic Product Certification Standards

#### 1) Cultivation, Packaging, Irrigation, Seed

For the soil of cultivation fields, inspection is conducted at least once a year to maintain and improve soil fertility, and efforts are made to prevent excessive concentration of salt. In case the soil fertility level is below the appropriate value or excessive concentration of salt is present, an improvement plan is prepared, and must be fulfilled. As a result of the soil test, if soil fertility (organic matter) and salt concentration (electrical conductivity) are maintained at an appropriate level, the soil test for the following year can be omitted.

On the other hand, if there are pollutants such as a common control area around the cultivation field, appropriate buffer zones or protection facilities must be secured from them, and a separate management plan for agricultural products produced in the area must be established and implemented, and a cultivation field entrance or nearby cultivation field must be established and implemented. Signs indicating that organic products and organic forest products are cultivated must be installed in conspicuous places such as the borders of departments.

The cultivation field must be an area that complies with the cultivation method according to the designated items for a conversion period of 3 years or more prior to the first harvest of organic produce. However, the conversion period does not apply to the cultivation and packaging of crops that are not directly planted in the soil (agricultural products that sprout and eat directly, young leafy vegetables or mushrooms).

Water must meet the following water quality standards for each purpose of use.

(1) In the case of water used for washing agricultural products, water used for growing agricultural products and young leafy vegetables that sprout and eat directly, or water used for growing mushrooms grown in facilities, “drinking water quality standards and inspections, etc. Water Quality Standards for Drinking Water

in accordance with Article 2 of the 「Regulation on Water Quality」. However, the water used for mushroom cultivation may be water suitable for both the microbial category of the drinking water quality standard and the agricultural water standard.

(2) Water used for purposes other than 1) must be at least agricultural water according to Article 2 of the 「Enforcement Decree of the Framework Act on Environmental Policy」 and Article 11 of the 「Rules on Water Quality Conservation, etc. of Groundwater」.

## 2) Cultivation Method

(1) Chemical fertilizers, synthetic pesticides, or materials containing synthetic pesticide ingredients must not be used at all.

(2) A long-term, appropriate crop rotation (crop rotation) plan must be established and implemented using either of the following methods using leguminous crops, green manure crops, or cardiogenic crops.

In detail, a) Plant leguminous crops, green manure crops, or cardiac root crops for a certain period of time within 3 years and return them to the soil. However, perennial crops (eg, ginseng) that are not harvested every year are returned to the soil by cultivating leguminous crops before sowing. b) Cultivate crops of different 'family' in terms of plant taxonomy within a two-year cycle, but include leguminous crops, green manure crops, or cardiomyogenic crops. c) Rabbit rotation by combining freshwater crops and field-grown crops in a cycle of less than two years. d) Beginner cultivation using leguminous crops, green manure crops, and cardiogenic crops every year.

On the other hand, compost and liquid manure using livestock manure as raw materials (hereinafter referred to as "livestock manure compost and liquid manure") are organic livestock product certified farms under Article 19 of the Act, farms practicing the farming and manure circulation farming method, and non-manure

under Article 42-2 of the Livestock Act. Only those derived from antibiotic livestock certified farms or animal welfare livestock farms certified according to Article 29 of the 「Animal Protection Act」 can be used. However, compost made from livestock manure derived from organic livestock product certified farms, farms practicing farming and livestock manure circulation farming, non-antibiotic livestock product certified farms, or farms that have not been certified as animal welfare livestock farms can be used if all of the following conditions are met: That is, a) antibiotics should not be included, and b) the content of harmful ingredients should conform to the compost standards set forth in the Public Notice on Establishment and Designation of Fertilizer Process Standards by the Director of Rural Development Administration in accordance with Article 4 of the Fertilizer Management Act.

Diseases and pests and weeds shall be controlled and controlled by the following methods. A) Selection of appropriate crops and varieties, B) Appropriate crop rotation (crop rotation) system, C) Mechanical tillage, D) Creation of an ecosystem that promotes natural enemy activities around crop plants, such as mixed cropping, intercropping and cultivation of symbiotic plants in the cultivation field, E) Mulching·reaping and flame weeding, f) utilization of natural enemies such as release of predators and parasites, g) measures to prevent diseases and pests using plants, farm compost and stone dust, h) release of animals, i) traps·fences·lights and mechanical controls such as sound.

### **3.4. Implications and Measures**

Livestock manure, which was previously recognized as waste, has changed into a raw material that can be recycled. Accordingly, related laws and regulations are also continuously revised, and livestock manure treatment policies are progressing in the

direction of promoting livestock manure resource utilization. On the other hand, in the case of agricultural by-products and food processing by-products, which are organic agricultural and livestock waste resources, they are currently classified as waste and are subject to the management of the 「Waste Management Act」. There is no clear management system except for rice straw, which is managed by the forage supply and demand activation policy of the Ministry of Agriculture, Food and Rural Affairs.

In addition, compared to the generation and treatment of livestock manure, the amount of agricultural by-products generated and treated has not been statistically identified. Therefore, in order for agricultural by-products generated in the cultivation sector to be used as compost and feed in connection with the livestock sector, it is necessary to review the waste classification of agricultural by-products, revise related laws, and collect statistical data to understand the current situation.

As livestock manure is being used as a resource, management and supervision of livestock manure disposal, such as a complete ban on marine dumping of livestock manure in 2012, new standards for livestock manure compost and liquefaction in 2013, legalization of unlicensed barns in 2014, and mandatory inspection of livestock manure compost maturity in 2020 Regulations have been strengthened. In addition, the Ministry of Environment is currently working to revise the Livestock Excreta Act in the direction of strengthening livestock manure regulations.

Reinforcing regulations on related systems, such as strengthening standards for livestock manure composting and liquid manure and compulsory compost stability testing, may initially cause difficulties in livestock farming due to introduction. However, in the long term, it is judged that it will be possible to improve the reliability of cultivating farms and activate distribution through livestock meal quality control.

Currently, the department responsible for the 「Livestock Manure Act」 is the Ministry of Environment, and the department responsible for the 「Fertilizer

Management Act」 is divided into the Ministry of Agriculture and Food. The 「Livestock Manure Act」 is very relevant to the Ministry of Agriculture and Food.

In March 2020, the Ministry of Environment issued a bidding notice for five research services related to the revision of the Livestock Manure Act. Specifically, five research services were promoted. Namely, ▲A study on measures to improve the law on the management and use of livestock manure, ▲a study on the establishment of a comprehensive plan for livestock manure management, ▲a study on how to revise the standard design drawing for livestock manure recycling facilities, ▲evaluation and presentation of compost maturity analysis methods, and ▲electronic handover of livestock manure. These include the enhancement of management system and information service system functions.

Even at that time, the 「Livestock Manure Act」 was independently enacted by the Ministry of Environment due to objections from livestock producers and inconsistency with other policies. Meanwhile, the Ministry of Environment is planning to introduce a nutrient management system that manages the amount of chemical fertilizers and livestock manure compost and liquid fertilizer in order to create a sustainable agricultural and livestock production environment in 2021.

In the nutrient management system, contents related to livestock manure compost and liquid manure management are expected to occupy a large portion. However, there is still a lack of discussion between the two responsible ministries, the Ministry of Environment and the Ministry of Agriculture, Food and Rural Affairs. Therefore, it is important for the Ministry of Agriculture, Food and Rural Affairs and the Ministry of Environment to seek ways to cope with related pending issues.

The ban on incineration of agricultural by-products is being implemented to reduce fine dust and prevent forest fires. However, social consideration on how to utilize non-incinerated agricultural by-products as compost or feed is insufficient. Currently, recycling of agricultural by-products is carried out only in terms of returning them to the land by composting after crushing.

However, in the future, it is necessary to diversify the material transfer route by preparing a plan to utilize agricultural by-products in the livestock sector as well as an approach in terms of land reduction. Through this, it is necessary to establish a virtuous cycle structure of materials.

# 4

## Conclusions and Suggestions

### 4.1. Joint Investigation Conclusion

#### 4.1.1. Villages in Champa Commune, Prey Kabas District in Takeo Province

As a result of examining the location of the village and the current status of crop cultivation and livestock farming in Takeo City, there are 9 wards, 100 dongs (including 3 wards within a dong), and 1,191 villages.

There are many projects that are currently underway as a policy supported by PDRD to villages. In addition, agricultural related projects are also in progress. There is also a livestock business that can be raised at home. There is also a pig and chicken support project (supported only in some villages participating in the project). In addition to this, other crops are planted after rice farming is completed through rice, cabbage, watermelon, and cucumber. Currently, the government office is conducting training on how to raise chickens and pigs, but plans to resume related training in 2023 after being suspended in 2021.

The primary purpose of farming in this village is to grow and consume only enough

to use at home rather than to sell. Residents were educated on making organic fertilizers, but most farmers choose chemical fertilizers because of the convenience of using them.

As a result of examining the livestock breeding status of farmhouses, pigs and chickens are mainly raised, and pig farms exist. The Takeo area is famous for the quality of duck eggs, but the reality is that the number of ducks is not large because the breeding area is not large.

The problem that farmers in these villages have is the weakening of Cambodia's chicken price competitiveness (cheap price of Vietnamese chicken). First, consider the limitations of market size. In other words, the fact that Vietnamese poultry products or raw chickens are being imported is also evidence that the market is judged to be sufficient. However, the reason for the low price competitiveness is the high cost of raising livestock by importing feed and fertilizer from Vietnam.

In the case of Cambodia, the establishment of an association such as a livestock cooperative was not considered to secure price competitiveness, but a Korean organization established a livestock cooperative in Bhatti. Government information on markets, number of associations, etc. in the Takeo area can be obtained through the Ministry of Planning, but there are around 40 farmer cooperatives.

Looking at the current status of other businesses in the Takeo area, one of the Takeo area businesses is the ADB business (climate friendly and agribusiness value chain) with value chain support (2020-2024). is scheduled to be extended. In this project, three departments of agricultural development, agriculture, and water resources management are involved in the project, and each department is in charge of support for farm roads, technical support (education), and irrigation.

On the other hand, as a result of examining the prices of cow manure and fertilizer, it was found that Cambodian farmers sell dry cow manure at 75 cents per 20kg, and Vietnam processes and resells it at \$1 per 1kg. For reference, the selling price of rice is around \$0.25 per kg.



In addition, rice straw and coconut shells are all exported to Vietnam, processed in Vietnam, and sold back to Cambodia. Organic fertilizers are also sold, but in reality they are no different from chemical fertilizers. These fertilizers are at the level specified as organic only in the name, and it has been confirmed that they are not organic products in a strict sense.

Looking at the agricultural status of the village, it is said that each family has a field of 2,000m<sup>2</sup> (usually cucumber cultivation), and the main crop is rice, which can be cropped three times a year. It is said that 70% of the village is doing 3 crops.

As a result of examining the difficulties of farming in the village, the village of Resay Tumoy cultivates the most vegetables, but the cultivation technology is not high, pests (resistance to drugs), market instability, and livestock farming. They cited diseases, difficulty in increasing livestock weight, and market prices that did not meet the fair price. There were no cooperatives in the village.

On the other hand, cows, pigs, chickens, ducks, etc. are raised, but the difficulties in breeding these livestock have been pointed out as major problems due to lack of technology and lack of market demand.

Requests from the village included establishing a value chain (packing, sales) for rice production, stabilizing rice prices, financial support (supporting rice exports through this), and resolving high fertilizer prices. Meanwhile, when looking at the current status of contract cultivation with cooperatives, a contract was being prepared with the Provincial Department of Agriculture (PDA) under the Ministry of Agriculture.

The contents of the Q&A through the village tour are summarized as follows.

1) In the case of Chumpu Preok village, there are a total of 223 households. The manure is not classified by livestock and is collected in one place, but mainly only cow dung (including some pigs) is collected, and the rest is used as manure for banana cultivation.

On the other hand, the number of cows is about 10, and at the time of KOICA's

Saemaul Undong, 4 cows were sold and when they gave birth, they were sold to villagers. However, they are mainly fed weeds rather than fodder.

2) There is a fertilizer factory of a Vietnamese company in Takeo Province. Before COVID-19, the price of fertilizer was \$15 per 25kg, but now it has increased to \$25. It is said that about 200 kg of chemical fertilizer is needed per hectare. Rice harvest is said to harvest 5 to 6 tons per hectare in case of good harvest. In addition, although each farmhouse farmed fish in its pond, it was not possible to actually check the fish in the pond.

3) Reusey Temey village has a total of 292 households. Of these, only about 10 percent were raising livestock, and even in the case of relatively large-scale livestock farming, it was about 2 to 3 cows and 50 to 100 chickens/ducks. The number of agricultural households was about 40, and the scale was large, with each farm household occupying more than 20 hectares. Other than that, most of them are small-scale farming for household consumption.

4) Osaheum-dong has good land, and compared to other areas in Pusat Province, it is said that vegetable production is superior to other areas. It produces vegetables (cabbage, cucumber, red pepper, radish, ginger, etc.) and fruits (avocado, pineapple, monkey banana, etc.), and yields are good without using pesticides. As access to roads has improved recently, the number of farms producing agricultural products is increasing.

As for government support, the government visited Osaum-dong and provided technical training to about 20 farmers. In addition to Osaum-dong, agricultural instructors are dispatched to areas with high vegetable production in Pusat Province to provide training, and the government is providing support to purchase and sell crops produced in the village. However, the related documents could not be confirmed.

We had the opportunity to hear about the agricultural status of the region. Below is a summary of this.

1) (Case of 1 farmer): The cultivation area is about 2 hectares (1 hectare of radish, 1 hectare of ginger), and agricultural products are sold through middlemen after harvest. In the case of Cambodian ginger, a major crop, the defective rate of ginger increased due to weakened fertility during multi-year production. Harvesting is done with manpower rather than agricultural machinery.

In the case of 2021, the sales amount compared to the cost (7,500 dollars) per hectare was 8,500 dollars, and it was possible to generate about 1,000 dollars in profit, and there was no profit in 2022.

2) (Case of Farmer 2): In Osaheum-dong, vegetables such as radish and cabbage are produced from 10 hectares to 30 hectares. there was.

3) (Cooperative status): Consultations are underway to establish a cooperative in Osaheum-dong from January 2023, and Dutch technicians are scheduled to visit the village in February 2023 through a project supported by the United States. .

4) (Difficulties): Lack of technology, absence of excellent seeds, adherence to traditional methods, absence of sustainable crop production methods, market opening, and frequent price volatility were cited.

#### 4.1.2. Villages in Krang Lvea Commune, Kampong Chhnang Province

As a result of examining the main situation of the village, it is said that agriculture has generally declined and the production of major agricultural products is not sufficient. In addition, there are no large-scale farms, so it is said that it is difficult to open a sales channel. However, it was difficult to determine how many farms there were in the actual area.

As for livestock-related private farms, there are 1 or 2 pig and poultry farms. Pig farms have about 5,000 heads (all sows), and it was difficult to determine the number of poultry farms.

Among them, as a result of examining the current status of Ksach Sar village, there were 8 farmhouses in the village, and an organic production association was created and operated. Vegetable cultivation was the majority, but technology was lacking. Although there is market demand for organic products, the production volume was very insignificant.

The village had received support from the German government for organic production. Produced organic products are currently purchased by local organic organizations, and in the past Germany purchased all of them. It is said that the local organic group that they are currently dealing with also started selling with the introduction of German technicians.

Fertilizer made in Germany was provided for the production of organic produce, and local organic groups provided fertilizer at an appropriate price, but the reality was that the production cost was high and only a small amount of vegetables were produced, so there was not much profit.

Contents supported by the German government include 1) Soil investigation (salinity test), 2) Organic certification and organic production technology training in Bangkok, 3) 500 liter water tank and water spray equipment, etc. 4) Training on how to form a cooperative and operate it, 5) equipment support such as a compost mixing shovel, 6) construction of greenhouse cultivation facilities for pest control, and 7) compost making education.

As a result of the site visit, it was judged that the soil was sandy and very barren, requiring extensive soil improvement. In addition, the compost facility was circular, which made it very inconvenient to work with, and a moisture regulator was not used to make compost.

On the other hand, as a result of examining the current status of Sambok Kreal village, it is said that organic farming started with German support at the same time as Ksach Sar village, and the current status of organic produce production and compost use is mostly similar to that of Ksach Sar village. do. As a result of the site

visit, the village also had a very barren soil, so it needed extensive soil improvement, and it did not know how to make liquid fertilizer, so it was mixed with manure and stored. In addition, there was a cost problem as water was brought in from a relatively long distance because there was not enough water.

In addition, as a result of examining the current situation of Knar Tei Mok and Tang Krong villages, it is said that the same items were planted at the same time, and the price plummeted, and livestock were raised, but all died due to disease. In the case of Tang Krong village, due to the lack of a young population, the land is not properly utilized due to lack of labor force.

## 4.2. Policy Recommendations

Considering the reality of Cambodia, as the perception of livestock manure, which was previously recognized as waste, is changing as a raw material that can be turned into resources, related laws and regulations must be continuously revised to promote livestock manure recycling policies. On the other hand, in the case of agricultural by-products and food processing by-products, which are organic agricultural and livestock waste resources, they must be classified as waste and subject to management.

In addition, compared to the generation and treatment of livestock manure, the amount of agricultural by-products generated and treated must be statistically identified. Therefore, in order for agricultural by-products generated in the cultivation sector to be used as compost and feed in connection with the livestock sector, it is necessary to review the waste classification of agricultural by-products, revise related laws, and collect statistical data to understand the current situation.

In the future, it is necessary to diversify the material movement route by preparing a plan to utilize agricultural by-products in the livestock sector as well as an

approach from the land reduction level of livestock manure. Through this, it is necessary to establish a virtuous cycle structure.

By region, in the case of Kampong Chhnang Province, the distance between villages is far, and some organic technologies and facilities have already been supported to promote organic farming due to support from Germany and others. However, there is still no understanding of livestock manure composting or liquefaction technology, the soil is very barren, and water resources necessary for farming are insufficient. Therefore, for this region, it is proposed to promote the development of value chains for local organic produce production areas and organic agriculture. Through this project, it is believed that it will be possible to establish a business plan in the direction of supplementing the existing organic business and supporting necessary facilities and supplies such as livestock manure composting technology so that soil improvement can be steadily implemented.

In the case of Takeo Province, it is judged that there is no problem in targeting only the farming and livestock manure circulation business, but it is not easy to expand the business by linking it with organic farming. Due to the external and internal environment of this region, it is judged that only the livestock manure circulation project should be promoted for the candidate site. Accordingly, it is proposed to install and operate composting processing facilities by collecting livestock manure. In other words, by manufacturing high-quality organic fertilizer from livestock manure and using it as organic fertilizer within its own region, it can increase crop productivity, reduce the use of chemical fertilizers, reduce absolute and relative costs, and open markets that can be sold or exported. It is judged that it is desirable to promote the project in the direction of promoting farm household income improvement.

## 4.3. ODA Project Proposal

### 4.3.1. Project Scope and Description

#### (1) Current Problem

Following the peace achievement, the Royal government of Cambodia commits to reduce poverty by at least 1 percent per year toward to eradicate poverty for the whole country as soon as possible. Therefore, the Royal Government has tried its best to set up several policies and strategies in terms of how to reduce the poverty level for the whole country such as National Poverty Reduction Strategy (NPRS, 2003), the Rectangular Strategy (RS, 2014-2018), the National Strategic Development Program (NSDP, 2014-2018), the Cambodia Sustainable Development Goals (CSDGs, 2016-2025). Furthermore, the government is making a deep reform in all sectors in order to ensure the commitment will meet the goals.

Rural Development is one of the key strategies to reduce the poverty in Cambodia. The Ministry of Rural Development (MRD) is one of priority ministries that are mandated by the government to have the role and responsibilities to promote rural development. Within the government development goal/ commitment, the Ministry of Rural Development (MRD) is playing a crucial role in improvement of rural people's quality of life which is its key mandate through community development actions, construct and improve rural roads, rural water supply and primary health care and rural credit.

The Community Development Department (CDD) is a key department that has the responsibilities to introduce changes in the rural communities through Community Development (CD). CD is a method to initiate a process of transformation of social economic life in the villages. It is designed to promote better living for the whole community with the active participation. Therefore, capacity of CD workers is limited to use for instruction to VDC and villagers to gain knowledge about

developing community. Therefore, CD workers should have strong understanding about community to sharing their experience to local people. There are 52.29% of the total village in Cambodia have been trained to VDC with 1,206 courses equal 7,398 Villages in 2018, of the total village in Cambodia have been trained to VDC with 1,206 courses equal 7,398 Villages in 2018. Therefore, capacity of CD workers is limited to use for instruction to VDC and villagers to gain knowledge about developing community. Therefore, CD workers should have strong understanding about community to sharing their experience to local people.

The COVID-19 pandemic has posed magnitude of impacts on the Cambodian economy from manufacturing and tourism to construction sectors, which consequently affect lives of millions of people, who depend directly and indirectly in these sectors. Amidst this pandemic, there has been an influx of villagers, returning home in rural areas after being laid off from their jobs. With abundant land and natural resources available, villagers feel secure that they will be able to find sufficient food to feed their families. Most of the villagers have access to agricultural lands for food production, while catching aquatic animals from their paddy fields, ponds, rivers, and natural waterways, and/or going to the forests to collect plants, herbs, honey, and other types of non-timber forest products to feed their family. In addition, with family and community support in place, to most villagers, if not all, homeland is a safe haven when shocks, such as the COVID-19 and other extreme events, happen. A villager can turn to their close families or other villagers for support when they are in need of assistance, for example in case of food shortage or family member falling sick.

## **(2) Project Beneficiaries**

Direct Beneficiaries: This project will be piloted in (1) Kampong Chhnang province. The province is located along the Mekong River, facing with low-level



application of agricultural technology. Severe agricultural technique and skills pose tremendous challenges for household agricultural production for subsistence and income generation, which gives rise to chronic poverty, unproductive land use, poor well-beings, and water-borne diseases and sickness, among others in the commune. Amidst the COVID-19, rural farmers face with even more severe problems, as some of the families can no longer receive remittance from children, who are laid off from work, and return home.

Indirect Beneficiaries: Indirect beneficiaries are often, but not always, all those living within the zone of influence of the project. Thus, all of living infrastructure and products will not only to be used by those of selected villages, but the closer villages also get benefit too. The target area is along the Mekong River, so they can increase between their income and to reduce the number of migrations to find work in the other countries.

### **(3) Project Scope**

Project Vision: To promote better living standard for rural communities.

Project Mission: To build resilient and prosperous rural communities through sustainable agricultural practices.

### **(4) Objectives**

- To provide sufficient food and extra income for local people through integrated farming practices;
- To provide capacity building to villagers and sub-national staff, organic farming and husbandry, and particularly crops-livestock cultivation;
- To promote good working environment for VDC;

- To supply sufficient water for agricultural production and daily consumption;
- To promote a sense of community through the development of teamwork spirit and joint activities in the commune;
- To promote community leadership in water management and organic vegetable planting and integrated farming; and
- To promote hygiene and sanitation

#### **(5) Project Expected Output/Outcome**

- Water irrigation system for the community is set up;
- Community groups for water management and integrated farming practices are established;
- Local capacity of villagers and staff on integrated farming and livestock are built;
- Small scale irrigation, modern farming system, and necessary facilities are provided to set up and delivered to farmers;
- Family latrine is provided to ID poor 1, ID poor 2 as priority group
- Villagers have stronger sense of community;
- Additional income for community and households are generated; and
- Local livelihood and well-being are improved.

#### **4.3.2. Governance Structure**

##### **(1) Project Implementation Structure**

- Korean Government:

- Support grant for project implementation
  - Provide technical support and consultation on project implementation
- Cambodian Government: MRD
- Lead overall project implementation
  - Coordinate and monitor implementer like CKRDC, PDRD, VDCs
  - Conduct baseline and end-line survey, monitoring and evaluation of the project
  - Coordinate procurement for the project sub-contractor
- CKRDC (Cambodia-Korea Rural Development Center)
- Provide capacity building on leadership and management skills to CC, VDCs and farmers
  - Provide market information to MRD/PDRD and target beneficiaries
  - Coordinate with private partners to seek agriculture marketing for target farmers
  - Provide place and facilities for experiences sharing workshop or seminar of the project
- PDRD
- Facilitate project implementation procedure with local authorities and other related stakeholders
  - Monitoring project progress and reporting to MRD
  - Support and guide CC, VDCs to develop village action plan
- Provincial/ District Administrative
- Cooperate in project implementation

- Facilitate administrative documents
  - Coordinate with related stakeholders during project implementation
- PDAFF: Provincial Department of Agriculture, Forestry and Fisheries
- Support agriculture extension service
  - Provide training on agricultural technologies to target beneficiaries
  - Facilitate to provide relevant information on agriculture sector
  - Provide technical consultant on issues, challenges, and solution during farming implementation
- Commune Councils/VDCs
- Cooperate and coordinate with local communities for better performance of project implementation
  - Conduct daily monitoring of the project progressing and reporting to PDRD
- Other stakeholders that may be involved
- Local NGOs who are working in rural development and agriculture sector
  - Private businessmen/wholesale market who wish to make a contract to purchase local agriculture production

## **(2) Personnel**

The proposed project will be implemented by the Department of Community Development of Ministry of Rural Development by collaboration with provincial department of rural development (PDRD), provincial and district authorities, commune councils and village development Committees of the project site.

No	Description	Person	Responsible	Duties
1	Project director	1	Director of CDD	<ul style="list-style-type: none"> <li>To ensure project objectives are achieved and implemented smoothly;</li> <li>To monitor ongoing project result framework and target are achieved;</li> <li>Progress report to MRD, and donor</li> </ul>
2	Project manager	1	Deputy director of CDD	<ul style="list-style-type: none"> <li>Responsible for project operations;</li> <li>To ensure project is implemented to be achieved the work-plan</li> <li>To ensure monitoring of project progress and expenditures;</li> <li>To conducts other duties as necessary.</li> </ul>
3	Technical officer	3	CDD Chief of Office	<ul style="list-style-type: none"> <li>Provide technical support</li> </ul>
4	Admin and finance Officer	2	CDD officials	<ul style="list-style-type: none"> <li>Admin and finance support</li> </ul>
5	Project Assistant	1	CDD official	<ul style="list-style-type: none"> <li>Assist in project administrative works</li> </ul>
6	Provincial coordinator	1	Director/deputy of PDRD	<ul style="list-style-type: none"> <li>Coordinate with all relevant organizations and local authorities in the project area</li> </ul>
7	Provincial CD officers	2	CD officers at PDRD	<ul style="list-style-type: none"> <li>Facilitate community development at the project targeted communes</li> </ul>
8	Driver	1	Contract person	<ul style="list-style-type: none"> <li>Providing driving services for project staffs</li> </ul>
Total		12		

### 4.3.3. Cost Estimation and Time Schedule

#### (1) Project Goals/Outcomes/Outputs

Project log frame			
No	Activities	Outputs	Outcomes
<b>Capacity Building on agricultural technical skills</b>			
1.1	Training need and assessment (TNA) and leadership skills for CC and VDC	CC and VDC of targeted areas are well trained on TNA and leadership skills	Improved skills and Capacity Improved accountability and transparency Good leaders were produced for the sake of their community
1.2	Training on compost fertilizer processing and natural pesticide	300 villagers are well trained on how to do compost fertilizer and natural pesticide Be able to do the compost fertilizer and natural pesticide and able to share knowledge to other villagers	Improved agriculture good practice by using compost fertilizer and natural pesticide instead of chemical one Saved cost Healthier agriculture products

Project log frame			
No	Activities	Outputs	Outcomes
1.3	Training on home gardening	300 villagers are well trained on how to make home gardening Be able to make home gardening and able to share knowledge to other villagers	Extra food for family daily meal consumption Spent less money on food Extra income generated Additional saving Better well-being
1.4	Training on vegetable planting	300 villagers are well trained on how to do vegetable planting Be able to do vegetable planting and able to share knowledge to other villagers	More vegetable production Support family daily meal consumption Spent less money on food Extra income generated Additional saving Better well-being
1.5	Training on Crops-Livestock Cultivation	300 villagers are well trained on how to do vegetable planting Be able to do the mixed crops-livestock cultivation and also able to share knowledge to other villagers	More agricultural production Support family daily meal consumption and earn extra-income Save cost from buying chemical fertilizer by using organic fertilizer made from animal manure Safe and health agricultural production
<b>Note: Trainers will be selected from relevant ministries or provincial departments</b>			
Demonstration Farm			
2.1	Compost fertilizer and natural pesticide	Top model students will be selected to show how to do compost fertilizer and natural pesticide in front of other students with the assistance of trainers Other students will do the compost fertilizer and natural pesticide by themselves or with the assistance of the four top model students	Each student has compost fertilizer and natural pesticide for the usage of their farm instead of chemical one Spirit of cooperation and sense of community are upheld inside the village
2.2	Home garden and vegetable plantation	Top model students will be selected to show case to other students Other students will start to do home gardening by leaning-and-doing process With the assistance of the four top model students	Each student has home garden, which will help generate extra household income Spirit of cooperation and sense of community are upheld inside the village
2.3	Mixed Crops-Livestock Cultivation	Top model students will be selected to show case to other students Other students will start to do the mixed Crops-Livestock Cultivation by leaning-and-doing process With the assistance of the four top model students	Each student has started mixed Crops-Livestock Cultivation approach which will help generate extra household income and produce safe and health agricultural production Spirit of cooperation and sense of community are upheld inside the village

Project log frame			
No	Activities	Outputs	Outcomes
<b>Community Water Reservoir and Small-Scale Irrigation System and Hygiene and Sanitation</b>			
3.1	Community Water reservoir and Small-Scale Irrigation construction	Water reservoir and Small-Scale Irrigation will be constructed (Ponds, Wells, dripping or sprinkler system for modern farming...etc.,) More water supply for a whole year round	Save time and cost of getting water usage Increase home garden Generate community fund Sustainable community development
3.2	Family Latrines construction	Family latrine will be constructed for ID poor 1, ID poor 2 as priority group	Promoted hygiene and sanitation in the community
<b>Monitoring system</b>			
4.1	National field coordinator	Field visit once a month To do cross check To monitor and evaluate	Project is being implemented in the effective way Transparency and accountability Sustainability of the project
4.2	Provincial field facilitator	Field visit at any required To follow up To help and facilitate	

## (2) Project Budget

No	Budget Categories	Unit	Amount	Price	Total
				(USD)	(USD)
<b>I</b>	<b>Actual Project Activities</b>				
1.1	Capacity Building and oversea study visits				
1.1.1	Capacity Building	Course	200	2,000	400,000
1.1.2	Oversea Training and Study Visits	Trip	4	85000	340,000
2	Demonstration Farms				
2.1	Vegetable Plantation Demonstration Farms	Farm	300	3000	900,000
2.2	Crops-Livestock Demonstration Farm	Farm	150	5000	750,000
3	Community Water Reservoir and Small-Scale Irrigation System and Hygiene and Sanitation				
3.1	Community Water Reservoir	Ea	10	25,000	250,000
3.2	Small Scale Irrigation System for Community	Ea	10	30,000	300,000
3.3	Public Latrines (2 rooms, 2m x 3m)	Ea	10	2,500	25,000
3.4	Family Latrine for ID Poor I and ID Poor II families	Ea	100	1,500	150,000
Sub Total I					3,115,000
II	Project Management and Monitoring and Evaluation (M&E)				1,500,000
III	Technical Support				250,000
IV	Contingency				100,000
Total (I + II + III + IV)					4,965,000

### (3) Project Work Plan

Project Activities																							
No	Outputs /Activities	2024				2025				2026				2027				2028					
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
<b>1</b>	<b>Administrative and Logistic Arrangement</b>																						
1.1	Office set-up																						
1.2	National Project coordinator recruitment																						
1.3	Provincial field facilitator recruitment																						
<b>2</b>	<b>Field Activities</b>																						
2.1	Training on Need and Assessment for CC and VDC																						
2.2	Overseas Training and Study visits																						
2.3	Training on Compost Fertilizer (Including composting demo) and provide Material Support for Composting																						
2.4	Training on Home Gardening and provide Material Support for Home Gardening																						
2.5	Training on Vegetable Planting and provide material support																						
2.6	Community Water Reservoir																						
2.7	Small scale irrigation rehabilitation																						



Project Activities																							
No	Outputs /Activities	2024				2025				2026				2027				2028					
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
2.8	Set up Demonstration Farms																						
2.9	Public and Family Latrines Construction																						
3	Field monitoring and evaluation																						
4	Mid-term writing																						
5	Final report writing																						



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