Groupe de Recherche et d'Echanges Technologiques

GRET
Professionnels du développement solidaire

# VEGETABLE VALUE CHAIN ASSESSMENT IN DELTA

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GRET, No. (B-1), Kan Yeik Mon Housing Compound, Kan Street, 10 Quarter, Hlaing Township,
Yangon, Myanmar.

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by

The Consultant

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Any inquiry regarding this report should be addressed to:
Cin Khan En Do Pau (John), Consultant, Email: jpau05@gmail.com and/or
Ms. Premila Masse, Project Manager- GRET Delta, E-mail: masse@gret.org

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## Summary of Key Findings

- Most proportion of vegetable production are concentrated in about 8 villages of Thee Kone area in Mawkyun Township and the average gown area is 0.3acre. Though various types of vegetable are grown, growers in Thee Kone area obtain about 90% of their income from radish.

- Vegetables are also grown in villages outside Thee Kone area, but most of them are sold out in villages and their contribution to the main value chain is limited. Growers in those villages rarely link with wholesalers, but sell their vegetables in Tawzeytan of Bogale.

- Vegetable supply in Bogale market mainly come from Thee Kone, Kaing, and Yangon. The major competitors for growers in Thee Kone are those from Kaing area, but the competition is mainly confined to winter season. Growers in Thee Kone can grow vegetables three times a year and one time is concurrent with peak season of Kaing.

- Most vegetable growers have their own traditional skills for growing vegetables and apply chemical fertilizers. According to wholesalers and retailers, some farmers also apply fertilizer just before they harvest that the practice reduces the storage life of vegetables.

- The major constraints in vegetable production include the increasing incidence of pests and diseases and continued heavy rains in monsoon season. According to growers, local vegetable varieties are lower in yield, but more resistant to heavy rains while many growers now use hybrid seeds.

- There is limited processing activity for value addition except the fact that growers in Thee Kone clean their vegetables before selling. Retailers in Ahmar used to process spoiled vegetables into vegetable pickles whereas those in Kadon remove the spoiled parts so to reduce their losses.

- Growers in Thee Kone usually sell their vegetables to collectors who further sell the vegetables to other rural market centers especially in the south. Collectors are those who gain the highest values as they charge as high as 30-40% of the original prices of vegetables while wholesalers normally charge 10% commission.

- The most common transport mode is by boat for almost all markets in this study area. Transport charges range 6-8kyats/viss (of vegetable) for a travel time of one hour. Normally, labor charge for selling is paid by buyers and for buying is paid by sellers.

- Those who suffer most along the vegetable value chain are retailers in rural market centers because vegetables usually get spoiled in their hands and they used to bear the losses. Most retailers see that vegetable trading is profitable unless the problem of spoilage happens.

- There are some vegetables (e.g. tomato, cabbage, cauliflower) which are highly demanded in the market, but not grown by growers. The growing of other potential cash crops like Zaw flower, mushroom, and betel leaves also is still limited in the study area.

- Input suppliers also play an important role in the value chain. There are three major input suppliers who teach vegetable growers how to use chemical fertilizers and pesticides.

- The innovative irrigation system supported by GRET is most effective in saving labor since farmers need to carry water for 200times a day for irrigating 0.16acre of vegetables. It is also efficient in irrigating vegetables if farmers use the system properly as recommended.

- Most vegetable growers now use hybrid seeds, but we have found that the knowledge of farmers about hybrid varieties is limited. Some farmers report that yields are not higher compared with local varieties and some said that they were not successful in keeping the seeds for the next cropping season.

- Crop diversification and application of natural fertilizer are still limited despite the related trainings provided by GRET. But some key farmers have reported increased incidence of pests and diseases.

- We have found that most of losses at production level are related to heavy rains in monsoon and the resulting pests and diseases. At the same time, certain innovative solutions like semi-protected farming like the ones being tested by WHH in Pa Det and Toe Hla villages.

- It has been learned that early spoilage of vegetables remains a problem and cool storage facilities can solve the issue to a certain extent. At the same time, we have also found that such cool storage facilities are not affordable for most lower-level actors of the value chain and may not be possible without external intervention.

- We have also found that vegetable growers in the study area used to work individually that they lack bargaining power and pay more in transport charges if they sell their vegetables in person. Similar regards apply to collectors who trade individually.

- According to key informants of the assessment, support services by the government for the development of vegetable value chain in terms of services related to capital, technology, capacity building, and market linkage are still very limited in the study area.

**Report on Vegetable Value Chain Assessment in Delta**

## 1. Background and Rationale

This vegetable value chain assessment has been conducted as port of the project "Promoting innovative irrigation techniques for poor family farmers in Myanmar and Cambodia" with funding support from Foundation Louis Dreyfus. Regarding the Myanmar Component, GRET started its program in the Ayeyarwaddy Region[1] (Bogale and Mawkyun Townships) in October 2008, shortly after Cyclone Nargis. The program relies on an experienced and well trained team focusing on agriculture and livelihood sectors. The intervention area is a major rice producing region at the national level however the proportion of landless in the Delta is much higher than in the rest of the country, especially in the targeted Townships (66%). The project targets at households that have no or very limited access to land especially paddy field. Generally they represent the vulnerable part of the population. These households have to generate income from various off-farm activities like casual labor, fishery, livestock, migration remittances and horticulture.

GRET started implementing this project in December 2014 in partnership with Welthungerhilfe (WHH) on improvement of horticulture production since 2011 under others funded projects (LIFT 1 and 2, Danida, LANN). The two organizations have been working in a total of 118 villages in Bogale and Mawkyun Townships, of which 66 villages are covered by GRET and 52 villages by WHH. Under Dreyfus funding, the project aims at helping poor farmers to be the actors of food security and agricultural development by becoming self-reliant horticulture farmers. The project consists of three components as described below:

1. Testing and disseminating innovative and adapted irrigation techniques and technologies through farmer-led experimentations and demonstrations, trainings, exchange visits
2. Providing beneficiaries with farmers' education, farming techniques and market linkages to develop profitable and lasting horticulture farming activities
3. Scaling-up and empowering farmers through networking and sharing good practices between farmers at a regional level

The activities planned under the three components include piloting of innovative irrigation system, awareness raising on the irrigation system, provision of support for innovative irrigation system, training and education on improved crop management, and facilitation of market. The project mainly targets at small and medium farmers who work on a minimum 0.5 acre of horticultural land with water source. The criteria also said that the beneficiaries should be farmers who with high motivation, plan to make two cropping seasons, and are willing to share the results with other farmers. GRET started implementing the project by conducting pilots on the innovative irrigation system with 25 farmers.

[1] Hereafter, the region will be referred to as Delta region.

The number of beneficiaries targeted by the project is 100 small and medium farmers. According to the project strategy, GRET contributes 40% of the total cost of the irrigation system and arrange loans for those poorest farmers who are unable to contribute the remaining 60%[2]. Alongside the irrigation system, GRET also provides farmers with technical advisory services, vegetable seeds, fertilizer, and arranges exchange visits of farmers for sharing good practices. After successful results in terms of production, the vegetable producers are now facing marketing constraints:

- Lack of collection system and transport facilities
- Lack of market transparency
- Lack of access to profitable market
- Lack of reliable market network
- Lack of post-harvest management

While there has been a certain level of progress in the aspect of vegetable production after the project, GRET is now concerned about understanding what really happens with vegetable produces beyond farm gates of the farmers and tackling the arising marketing issues listed above so that the vegetable value chain properly functions and the poor farmers benefit from it. To realize this, the most pressing need is to assess vegetable value chain of the target area and find out appropriate interventions so that small-scale vegetable producers ensure proper access to market. Moreover, such assessment will be helpful in reviewing whether the previous assistance are effective and efficient in improving the productivity of vegetable farmers.

## 2. Description of the Study

### 2.1. Study area and sample

The study was conducted in Bogale, Mawkyun, and Pyarpon Townships of Delta Region during October 7-21, 2015[3]. Covered by the study are 6 villages and one urban retail market in Mawkyun Township, 3 villages, 2 urban retails markets, one wholesales market in Bogale Township, and one rural market in Pyarpon Township. Up on consultation with field teams of GRET and WHH in Bogale, study villages and markets (rural/urban) were selected mainly based on their size and distance from Town especially Bogale where major wholesalers take presence. We first considered agro-ecological location as one important indicator for selecting the study villages as we assumed that vegetable production might be more or less affected by the state of any location being salty. But we did not use location as indicator in actual village selection for this study since all of the major vegetable growing villages fall under fresh water area.

[2] Three types of irrigation system (petro engine, solar pump, and buffalo drip) have been provided. The average cost of the three types of irrigation systems is 100576.27kyats (minimum 57000 kyats and maximum 133000kyats) based on the support planned for the first 59 small and medium farmers.

[3] We were not able to conduct the study as planned due to prolonged rains in Bogale and the meteorological news that emphasized the occurrence of depression in the Bay of Bengal.

Thus, we finally chose the study sample in order to cover all actors of vegetable value chain with different contexts in such a way that they are represented on our study sample. The types and numbers of vegetable value chain actors interviewed during the study consist of a total of 76 people including 51 growers, 10 collectors, 3 wholesalers, 6 sub-wholesalers/intermediate traders, and 6 retailers. Moreover, some follow-up interviews were conducted via telephone with certain informants for information that are deemed unclear by the consultant. The types and numbers of informants interviewed during the assessment are listed in Appendix A.

**Figure 1** Map of the study area


### 2.2. Purpose and objectives

The assessment aims at providing an overview of the vegetable value chain at local level (Delta region) and providing critical recommendations for further improvements. Specific objectives of the assessment are:

1) To review past and present actions of the program (GRET/WHH) addressing vegetable production

2) To assess current constraints of local vegetable producers in accessing market
3) To assess current situations, constraints and opportunities of all operators along the local vegetable value chain
4) To provide recommendations for a comprehensive approach to improve integration (access, quality, quantity) of vegetable producers in the local vegetable value chain: which market to target? How to reach them?

### 2.3. Method of assessment

The assessment is totally qualitative in terms of data collection except the fact that some qualitative data were quantified during the analysis in order to capture and present the true picture of the actual opportunities and constraints encountered throughout the vegetable value chain in Delta Region. Different checklists were developed and used for different actors. Focus group discussions were employed in collecting data from farmers or primary producers while semi-structured interviews were used for other key actors, such as collectors, wholesalers, sub-wholesalers, and retailers.

To ensure data triangulation, we compared the information provided by particular value chain actors with those provided by the immediate upper and lower actors of any actor interviewed. Direct observations were made as and where necessary. Moreover, follow-up interviews were also conducted via telephone in order to clarify information that are deemed unclear or confused during data analysis. The collected qualitative data were descriptively analyzed using tables, graphics, sketch maps, flow diagrams, star diagrams, SWOT analysis, and spider web, etc.

### 2.4. Scope and limitations

Vegetable value chain of Delta Region is totally complicated. Unlike the same value chains of the same products in other regions, it belongs to three dimensions, of which each dimension is subject to different sources of vegetable products referred to as 'lines of value chain' in this report and also to varied characteristics of the vegetable value chain. We have tried our best to cover all of those sources and characteristics. Briefly, the study mainly covers the production, processing, and marketing of 10 types of vegetables in the study area as well as the various actors and their functions in the vegetable value chain in context. Moreover, the study also covers the value chains of *Zaw*[4] flowers and mushroom to a certain extent due to their explicit potentials for income-generating opportunities.

Most of the information presented in this report are mainly related to vegetable products produced from an area called *Thee Kone*[5] which is located in fresh water area of the region. In fact, Thee Kone is located in Mawkyun Township, yet is closer to

[4] A leafy flower mainly used for religious purpose, offering at Altar, especially by Burmese people who belong to Buddhism.

[5] *Thee Kone* is an area consisting of about 10 villages in the north of Bogale where sandy soils are available for vegetable cultivation. The entire area is called 'Thee Kone' though there is a village with the same name. Thee Kone in Myanmar language, if directly translated, means elevated land with sandy soil.

Bogale in terms of transportation. As such, the production part of the study is mainly confined to Thee Kone area since there is not preliminary information about vegetable cultivation in salty and brackish areas. With similar regards, the study cannot cover in full about the vegetable value chains outside the study area. These include the value chain of vegetables imported from *Kaing*[6] and Yangon since the products of those value chains do not originate from the target area and they do not fully represent the value chain of vegetable growers of the study area.

## 3. Literature Review

### 3.1. Definitions and concepts in value chain

There occurs a value chain when various actors and their activities of a particular product vertically interact in creating values on the same product. The term 'value chain' thus is used in describing a group of companies working together to satisfy market demands. It involves a chain of activities that are associated with adding value to a product through the production and distribution processes of each activity. An organization's competitive advantage is based on their product's value chain. The goal of the company is to deliver maximum value to the end user for the least possible total cost to the company, thereby maximizing profit (Porter, 1985 & Schmitz, 2005 cited by Woldesenbet, 2013).

In another definition provided by Kaplinsky and Morris (2001), a value chain stands for the full range of activities required to bring a product from conception, through the different phases of production and transformation. As such, a value chain is made up of a series of actors (or stakeholders) from input suppliers, producers and processors, to exporters and buyers engaged in the activities required to bring a product from its conception to its end use (Kaplinsky & Morris, 2001 cited by Woldesenbet, 2013). In the value chain of a product, the relationship of actors at different phases is vertical following the flows of the product that the horizontal relationship of similar actors at each stage of the value chain could be paid as much emphasis only as possible.

Kaplinsky and Morris (2002) also added that a typical value chain describes the full range of value-adding activities required to bring a product or service through the different phases of production, including procurement of raw materials and other inputs, assembly, physical transformation, acquisition of required services such as transport or cooling, and ultimately response to consumer demand. As such, value chains include all of the vertically linked, interdependent processes that generate value for the consumer, as well as horizontal linkages to other value chains that provide intermediate goods and services. Value chains focus on value creation - typically via innovation in products or processes, as well as marketing - and also on the allocation of the incremental value (Kaplinsky and Morris, 2002 cited by Webber and Labaste, 2010). In its most simple form, therefore, value chain can be defined as the process (of a particular product) in which different actors and their activities are

[6] The term 'Kaing' means a land formed by the process of silting. Kaing products thus mean agricultural products produced from Kaing cultivation. In this study, Kaing area collectively means about ten villages near the border of Bogale and Maubin Townships where intensive vegetable cultivation is done in winter season.

vertically linked to create values on the product at various stages along the chain in an attempt to fulfill the demand at end market.

### 3.2. Supply chain

While value chain is about values created and the actors involved and their activities at each stage, supply chain looks at the physical flow of goods that are required for raw materials to be transformed into finished products. Supply chain management is about making the chain as efficient as possible through better flow scheduling and resource use, improving quality control throughout the chain, reducing the risk associated with food safety and contamination, and decreasing the agricultural industry's response to changes in consumer demand for food attributes (Dunne, 2001 cited by Woldesenbet, 2013).

The term 'supply chain' is used internationally to encompass every logistical and procedural activity involved in producing and delivering a final product or service. Since the primary focus of supply chains is efficiency, effective value chains must rest in efficient supply chains (Feller, Shunk, & Callarman, 2006 cited by Webber & Labaste, 2010). The term supply chain and value chain are often used interchangeably, but in fact there are some important differences. In its simplest definition, the term is synonymously used to describe all participants involved in an economic activity which uses inputs and services to enable a product to be made and delivered to a final consumer (Hobbs *et al*.,2000 cited by Woldesenbet, 2013).

### 3.3. Vegetable value chain in context

#### 3.3.1. Production

Throughout the developing countries, vegetables are grown for consumption or income generation. Vegetable production is essentially a small-farm venture that benefits thousands of families in urban, peri-urban and rural communities. Growing vegetables provides self-employment to families who are engaged in all aspects of the business: propagation, production, harvesting, preparation for the market, and even selling. Many smallholders engage in vegetable cultivation because higher yields per unit area can be achieved in the small farm sector only through the production of crops like vegetables, which have far greater productivity than other crops. The yield per unit area can be increased many times by application of the appropriate technologies such as irrigation, use of high quality seed and the application of appropriate agronomic techniques. While many developing countries are struggling with such constraints, several basic conditions must be met for a country to enter the fruit and vegetable value chain (Fernandez-Stark et al, 2011).

In Thailand, the contribution from vegetables (covering 2.8 percent of the arable crop area) to total crop production in Thailand was only nine percent in 1997. Although the country remains in a food surplus situation at present, the low economic status of rural and urban communities who are nutritionally vulnerable may pose a serious problem if the smaller production units are not given adequate attention. In recent years however, production costs have increased by about 50–60 percent. Most farmers

need to use family labor in order to cut costs and remain competitive in local markets. High costs constrain resource-poor farmers in limiting their inputs, such as fertilizer and agro-chemicals resulting often in crop losses and lower outputs. Growers are also forced to use open pollinated varieties and traditional land races since they are unable to purchase hybrid seeds that can give much higher yields and incomes. Market gardeners and peri-urban growers on the other hand, use intensive production systems around the periphery of large cities to maximize outputs from small plots of land. Often, there is an overuse of harmful chemicals, which endanger the health of consumers and pollute the environment. In times of food shortages, vegetables provide sustainability and food security when other sources of food are scarce (FAO-RAP, 1999).

In the case of Africa, traditional vegetable production is based on conventional, traditional production practices; producers did not apply recommended good agricultural practices such as use of high quality improved cultivars, integrated pest management practices and drip irrigation. But it was found that farmers were getting higher household income from the adoption of improved/hybrid varieties of the vegetable crops. In many cases local farmers had been able to embrace vegetable cultivation as self-employment opportunity as well. Since people were well aware about the negative effects of excessive chemical use in the commercial production, the production of vegetable without pesticide use was on rise. But, interestingly, the farm-gate and market price was almost similar in with or without pesticide use. However, the non-pesticide farmers confirmed that they still chose to produce without pesticide because they saved their money from medical payment and this means to higher income (Afari-Sefa & Pitoro, 2014).

In Andhra Pradesh of India being endowed with a huge market, a significant gap was observed between actual production and potential production of different vegetable crops in 2006-07. This critical gap can be minimized by strong extension services, training, and demonstration. Improvement in the productivity can be achieved through replacement of traditional varieties by hybrids and adoption of improved production/protection technologies (Reddy, Murthy, & Meena, 2010). In Maharashtra, a private company played a role to create market linkage for the cooperatives with a goal to manage production, harvesting, procurement, grading, pooling, handling and marketing, selling and export of primary produce of its members. The purpose of this producer company in Maharashtra state is to link the farmers' cooperatives (largely established by small and marginal tribal households) to organized markets (Raj, 2011).

In China, one of the key means to improve the efficiency of production for smallholder farmers is applying chemical heavily and this lead to some difficulties when the company deals with these small producers resulting business risks and transaction costs. Therefore, companies are willing to cooperate with large farmers instead of small ones. However, that does not mean that small farmers will be excluded from the contract farming system. Sall farmers have to be aware of the regulation and respect to the contract in order to sustain the development

opportunity in the long run, and group organization could be helpful in the management issues. As stated by Bennett and Franzel (2009), contract farming is much more efficient if farmers are organized in groups, and sometimes it is feasible only with groups. Groups take on key functions such as assembling and grading produce and distributing inputs, thus reducing transaction costs (Jue, 2012**).**

After Cycle Nargis devastated Myanmar Delta and the global financial crisis happened in 2008, the government of Myanmar encouraged the private sector to establish so-called crop specialization companies to promote contract farming, especially for rice and vegetables. Despite the stated policy, the private sector remains weak. Most of Myanmar's agribusinesses lack access to capital, know-how and human resources. A few big companies have developed often as a result of cronyism, monopoly licenses, and the backing of the military government, but many lack competitiveness. It has been learned that there remain inefficiencies and underperformance in many supply chains and their lack of effectiveness in stimulating growth and poverty reduction (MDRI-CESD, 2014). In Myanmar, this sector requires the receiving and warehousing facilities of goods, raw materials, inputs for agriculture before the cultivation and also storing agricultural produces after cultivation. Generally, the farmers are undertaking these activities at their own expenses using traditional way of storing and transporting the goods (APO, 2007).

A major challenge to enabling small producers to gain access to markets is reliably producing adequate volumes of sufficiently high quality produce to supply wider markets. The major constraint to producing larger volumes again is the lack of input and service providers that can enable smallholders to take advantage of market opportunities. Thus, the most sustainable approach to financing small farmers has been the development of farmer saving and credit groups. This revolving system places peer pressure on each group to succeed and to make repayments reliably so that resources are available for the next group. As these revolving credit groups become established and gain experience, they improve their administration and fund management. A key dimension of improved capability is the next step of successful registration as cooperatives. The formation of horizontal farmer groups and affiliated saving and credit groups has led to an increase in trust and cooperation among the group members. In addition, saving and credit groups serve as safety nets for farmers who need immediate funds for buying inputs. If a farmer has a family or financial emergency, he or she can take out low-interest loans (USAID, 2008).

### 3.3.2. Processing

Due to the fragile and perishable nature of the product, this industry requires a high degree of coordination between the different actors along the chain. Logistics and transportation are key supporting activities in the global fruit and vegetable value chain. These functions ensure the perishable product reaches its destination in good condition. Cool storage units are used throughout the chain to keep the produce fresh, and both air and sea freighting supported by the cold chain are key elements to ensure timely delivery. Today, entry strategy into the global produce market for

some developing countries requires them to leverage regional markets where standards are generally less rigorous. Only countries that are able to comply with high standards are rewarded with easy access to developed countries' markets. Conversely, countries that have problems in meeting the standards may lose the export market. Karina, Penny, and Gary (2011) point out the followings as prerequisites for entering processing sector:

- Understanding the market is a priority in this sector, especially as this is a buyer-driven value chain.
- Investment in new technologies increases the shelf life of produce.
- Upgrading into the packing segment depends significantly on the existence of a local packaging industry to supply the appropriate containers on a regular and reliable basis.

It has been learned that upgrading is required at any stage of any value chain of any product. But it is not always possible for farmers to engage in upgrading due to various aspects. This is because, some upgrading activities are technology-intensive while others are capital-intensive – both are often beyond the capacity of poor farmers. Upgrading into the processing segment of the value chain has been difficult to achieve for low income developing countries since the processing of fruit and vegetables is cost-prohibitive at low levels of crop production. Therefore, they suggest that countries must gain a level of expertise during the production stage to increase output to a level that will enable the country to upgrade to the fruit and vegetable processing stage.

Improved processing could contribute to improved access to market through the use of improved processing technologies and equipment. Simply thinking, any product well processed but poorly packaged or a poor product wrapped in a poor packaging material will not make more prices. For export purpose, most vegetable products are normally processed in dried forms. And export potentials are determined by the availability of such improved technology and equipment despite the perceived opportunities. In Thailand, vegetable export was only 5.8 percent of the total vegetable production in 2010-2011[7]. There is great potential and scope for export of processed vegetable products and selected fresh vegetables in the regional markets (FAO-RAP, 1999).

### 3.3.3. Marketing

In most places in Thailand, a number of middlemen operate and assist the movement of produce from regions with well-organized transport to local and urban wholesale markets. The middlemen serve as suppliers of credit, in addition to their role as buyers. They ensure the smooth flow of produce to the larger markets. Organized groups of growers formed with the assistance of the DOAE[8] also have their own markets from

[7] Prem at al. (n.d) Overview and Situation of Vegetables Production in Thailand, RAP Publication 1999/38 (Focus on Chinese broccoli and chili pepper), Bangkok: FAO RAP.

[8] Department of Agricultural Economics and Extension.

which most of the produce reaches the central market near Bangkok and the market in the South. From these points, vegetables are distributed all over the country. Exports to Singapore and Malaysia are done from the Southern wholesale market. For certain commodities that are subject to processing, the marketing channels are slightly different. For the marketing of contract grown commodities, companies from importing countries carry out their own system of marketing.

The marketing of perishable commodities is one of the most challenging enterprises. The system of marketing could be improved further by the introduction of more modern postharvest technologies in handling operations. The problem is aggravated during periods of oversupply. The only alternative is to develop infrastructure facilities, such as irrigation in the main production areas as well as off-season production technologies in order to spread production throughout the year and develop the processing sector further, to siphon off surpluses when they occur (FAO-RAP, 1999).

In Myanmar context, Mercy Corps stresses that volatile market prices make farmers reluctant to invest in case they end up in debt. Price fluctuations stem largely from limited and unstable markets, including both domestic and international trade, and associated barriers including a lack of cold storage. Farmers may also not be able to get a higher price for higher quality crops and so fail to recoup their investment which further limits commercial investment by private sector actors. Contract farming arrangements are limited, although there is scope for growth and exports are unstable. Other efforts to add value through off-farm processing, and promotion of off-farm income opportunities, are limited. The risks of crop failure that could lead to intractable debt or the loss of inherited land are too great for many farmers to bear. As a result, technical solutions to farming methods or improved information provision may not be effective without other steps that reduce the risks facing farmers (Mercy Corps, 2015).

This section of the report could not be concluded without telling about access to market. Regarding the livelihoods of smallholder farmers especially in rural areas, the term 'access to market' appears to be misinterpreted. Access to market might mean much more than physical access to market centers. For many farmers, however, market centers could be places where they are first or most exploited. Thus, access to market needs to be interpreted in a deeper and more critical sense. The Asia Foundation and AsiaDHRRA[9] (2008) note the following in terms of pricing and marketing information.

- Most producers do not access to market prices. The farmers who are currently not commercial farmers rarely pay attention to market information.
- Cooperative concepts introduced among target farmers and many collective sales of agricultural commodities have been organized by several farmer/producer groups. The approach has been working well and some farmers associations have gained the sales bargaining power.

[9] Asian Partnership for the Development of Human Resources in Rural Asia.

- The prices are usually set by wholesalers who are interacting with consumers and aware of market size. The demand and supply are influenced by wholesalers. The middlemen are profitable from taking partnership with wholesalers and ensure more purchase bargaining power than producers.

### 3.4. Contract farming

While vegetables farmers in most developing countries face with price volatility, there is a need of a particular system guaranteeing stable prices for vegetables. So far as we have learned, the system of contract farming is found to ensure price stability in the vegetable market. Yet it seems that smallholder farmers find it difficult to engage in contract farming with private companies due to their lack of capacity to meet the required standards and qualities. Farmers who specialize in higher value crops or market segments have greater investment costs and more demanding quality management standards, but data cited by Poapongsakorn (2006) suggests that growing vegetables under contract can be more profitable, with net revenue to farmers for instance growing baby corn under contract gave twice the return from alternative revenue options.

While individual farm size has been decreasing, a key trend in the production sector has been the development of cooperative and contract production and marketing arrangements. Under contract to processors, exporters, or supermarket suppliers, farmers usually gain increased market security but they must also improve quality management, production efficiency, and cost control. The traditional marketing chain is characterized by many steps and players, while the modern trend is toward simplification, fewer steps, improvements in transport, logistics, and cool-chain handling and increasing use of returnable containers (DOAE, 2007)[10]. In Myanmar, situations are progressive, but it seems that farmers need to wait for some years to get ready for engaging in contract farming and the required quality control and associated technology and equipment.

As we know, contract farming is a way for small holder farmers to participate in the organic vegetable supply chain (Liu, 2008). It is a system by which contracting entities agree to buy from smallholders all produce that meets contract standards. In this arrangement, a contractor obtains the certification and ensures that the contracted farmers meet certification standards, often supplying technical assistance and inputs (Bennett & Franzel, 2009). Small farmers sign contract with companies to build the cooperative relation in the long run, and form a win-win mechanism between enterprises and farmers. On one hand, the company can ensure there are adequate products to fulfill the market demand, and on the other hand, small farmers can get the technical support and primary investment from company with a lower cost, and receive stable income.

[10] Prem at al. (n.d) Overview and Situation of Vegetables Production in Thailand, RAP Publication 1999/38 (Focus on Chinese broccoli and chili pepper), Bangkok: FAO RAP.

Therefore, companies are willing to cooperate with large farmers instead of small ones. However, that does not mean that small farmer will be excluded from the contract farming system. Small farmers have to be aware of the regulation and respect to the contract in order to sustain the development opportunity in the long run, and group organization could be helpful in the management issues. As stated by Bennett and Franzel (2009), contract farming is much more efficient if farmers are organized in groups, and sometimes it is feasible only with groups. Groups undertake key functions such as assembling and grading produce and distributing inputs, thus reducing transaction costs (Jue, 2012).

### 3.5. Organic Farming

Organic vegetable farming has become an option attracting the attention of various actors in the vegetable value chain over the world. However, not all actors in the organic vegetable value chain benefit from organic vegetable farming. The reasons can be summarized as 1) organic agriculture enterprises have limited processing capacities, and 2) producers are lack of systematic knowledge of branding and marketing (Jue, 2012). Despite the booming market of organic vegetables, poor farmers may not meet the requirements for having vegetables certified as organic products. It is thus vital for farmers to critically consider whether to enter organic vegetable market or not.

A company-based approach with contract farming can achieve a number of the requirements by providing farmers with the necessary knowledge and inputs and also helping fulfill the chain linkages required in order to successfully bring a product to market (Aigelsperger *et al.*, 2007). The main reason for this is the relatively high cost for the certification. The application of organic certificate cost about 30,000 CNY (about 4,675USD) for each variety of products, while vegetable farmers usually have a combination of different varieties as a strategy to cope with the seasonality, and they cannot afford such cost with the average yearly income of 4,520 CNY. In addition, farmers don't have enough knowledge about the complex regulation about organic production and the certification and accreditation system. Although the organic development office in the county provide information but mainly enterprise oriented instead of reaching the farmers.

A research conducted by World Bank shows that smallholders do not have competitive advantage in delivering products to markets particularly formal domestic and export markets because of low volumes, high transaction costs and the need for skills to meet the demands of formal markets (World Bank, 2007). According to the study, the possible path of process upgrading is to develop and promote anti-season vegetables. Anti-season vegetable can stagger the timing of planting and marketing with the regular non-organic vegetable, therefore increase the added value. Furthermore, deep processing can help the products reserve longer and reduce loss during the transportation and logistics. In addition, branding of the products can increase the efficiency of promotion and gain trust from consumers, and further contribute to increase sale and profit.

An important aspect of organic farming worth serious considering is that organic vegetable plantation is labor-intensive but the price of organic vegetable in developed countries is 50%-150% higher than the non-organic ones. Therefore, organic vegetable planting not only helps to increase farmers' income, but also contributes to the local employment (World Bank, 2007). The daunting part of organic farming again in developing country context is that the prices of organic and non-organic vegetables are almost the same as that of inorganic vegetables as it happens in Thailand (Juthathip & Bastakoti, n.d). Thus, it is quite critical for smallholder farmers to carefully decide whether to grow organic vegetables. On the contrary to statements mentioned above, it is clear that farmers do not always benefit from organic farming unless there exists a niche market for organic vegetables.

Effective farmer groups can help smallholders capitalize on advantages they may have over large producers and overcome disadvantages (Bennett & Franzel, 2009). Firstly, small farmers can obtain a group certification and share the costs with all the group members. Secondly, farmer organizations can improve farmers' bargaining position, and play an important role in organic product marketing. Thirdly, the organization also can facilitate the exchange of knowledge and information. However, organizing and maintaining effective farmer groups is very difficult. External private firms or NGOs can fill some of the gaps but may not be an ideal substitute for farmer associations (IFAD, 2005). Creating alliances for organic farmers is strongly needed to face the actors of the organic sector with strong financial capital and to allow the farmers to draw further benefits from this organic opportunity (Blanc, 2009), and organic agriculture may be a development path for small farmers if the supporting structures are provided at a small financial interest rate (Oelofse et al., 2010).

There is growth demand of increasingly mainstream distribution channel such as supermarket for organic products. However, it is difficult for small famers to be the target of supermarket suppliers (Giovannucci, 2007). Tan (2004) believe that there is need for organization of small farmers to provide organic products targeting at the supermarket chains or large stores directly. The key to build such direct link is to shorten the intermediate process such as collection and wholesale, and ensure the access of farmers to supermarket. The advantage of this chain could be prompt supply, freshness of products, less loss during the logistic, and reduced price. However, small farmers along the value chain might lack the capability to build such link with supermarket, and collective action with public and private support in this case is strongly needed (Juthathip & Bastakoti, n.d).

In India, some state governments have also initiated programs to encourage farmers to convert to organic farming and to facilitate the organic certification process, which is necessary to obtain a premium price in the market. Exports consist of about 35 commodities, including cotton, spices, tea and basmati rice. The domestic market for organic produce is much smaller. The study focuses on the supply chains for the export of organic basmati rice in the state of Uttarakhand, situated in northern India,

through a review of two case studies (Alam, 2007, cited by FAO, 2013). In 2005, organic farming in Thailand covered about 21, 701 ha (up from 2 000 ha in 2000), representing 0.1 percent of the total agricultural land area, with 7 186 farmers, representing 0.14 percent of the total number (IFOAM, 2010). Thai organic agriculture is dominated by rice and field crops. Besides rice, the second most important export to the European Union (EU) is fresh vegetables (FAO, 2013).

In Vietnam, the major actors in general circulation and distribution of fresh vegetables are producers, collectors, wholesalers, retailers and export organizations. Each marketing actors can take over one or more functions such as transportation and distribution. There are two groups of retailers; fixed retailer in markets and another on street. The second popular marketing channel is retail on market places. The major constraints encountered by vegetable growers in Vietnam primarily include that vegetable yield and production efficiency are low. The increase of vegetable output is mainly influenced by the increase of vegetable areas. Also the effects of urbanization pressure result in vegetable growing areas being scattered and small scaled. Another important constraint is the poor technique of vegetable production. Producers are facing many problems as diseases and pests attacks, lack of water supply as well as poor quality of vegetable seeds. Other constraints include low capital investment for safe vegetables production such as water supply, compost processing system and hydroponics vegetable cultivation to manage fertilizer applications. Moreover, vegetable producers in Vietnam also suffer from poor facilities for post-harvest (Ly Nguyen et al, n.d).

## 4. Vegetable Business in Delta

The vegetable market of the study area is totally complicated since vegetable products traded in the market come from three different sources, thereby creating three forms of vegetable value chains. The first value chain is related to vegetable products from Yangon market while the second value chain is built up on products from Kaing area. The third value chain deals with vegetables locally produced in Thee Kone area which is located in the study area. Another reason for focusing on Thee Kone-based vegetable value chain is that it represents a full chain of vegetable while the other two cover only parts of the chain. Therefore, this study mainly focuses on the value chain of Thee Kone-based vegetable products though the other value chains also are covered in part. One interesting thing is that these value chains affect each other by different means and generate different impacts on one another since they are closely linked in some stages of the whole vegetable value chain.

### 4.1. Agro-ecological conditions

Delta region can be divided into three agro-ecological areas: salty area, brackish area, and fresh water area. Salty and brackish areas are known for the state of water being too salty that the areas are not suitable for vegetable cultivation. In exceptional cases, some villages have tried to grow vegetables through their limited fresh water. However, their production is limited especially due to the limited source of irrigation water. Most of the vegetable growing villages in Delta region are thus

located in fresh water area. In fresh water area also, vegetable cultivation is confined to some ten villages in Thee Kone area which is located in Mawkyun Township near the border of Bogale and Mawkyun. In fact, mass production mainly concentrates in 7-8 villages of the area.

Vegetable cultivation in Delta is confined not only by type of water, but also by soil type. Therefore, not all villages in fresh water area are suitable for vegetable cultivation. Thee Kone area is subject to sandy soil with fresh water that it is most suitable for vegetable cultivation. The agro-ecological conditions allow farmers in Thee Kone area to grow vegetable all year round though they usually encounter some production constraints in rainy season. According to elderly farmers in Thee Kone, the special characteristics of Thee Kone area date back to colonial period in which Kyway Chan canal was excavated by the then colonial government. By the time the canal was excavated, the operators pumped up sand and loaded on to the west bank of the canal. Thus, the west bank with sand later became the major vegetable growing area of Delta. At the same time, the operators loaded soil on to the east bank of the canal and vegetable cultivation on the east bank thus is relatively limited.

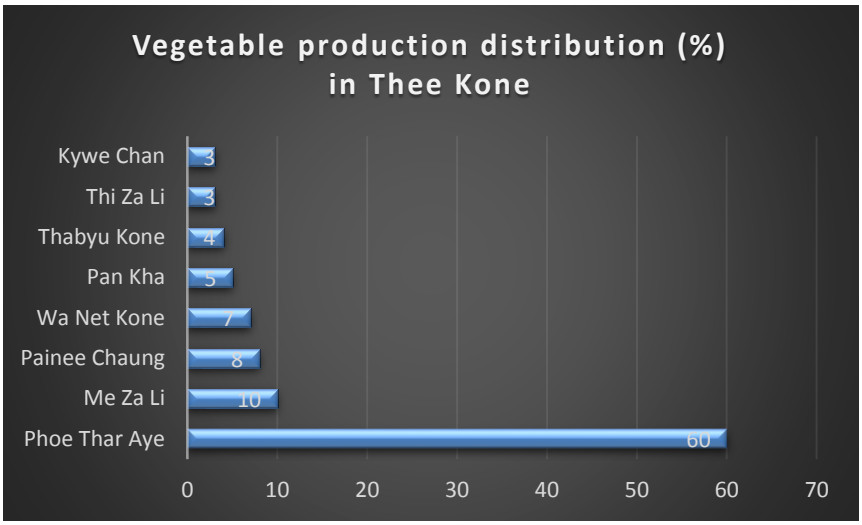
### 4.2. Production

Most vegetable growers in Thee Kone said that they started growing vegetables since their ancestors' period, i.e. about some 90 years ago. As such, they have a tradition following the cultural practices of their ancestors in the past. Nowadays, they still keep on employing their traditional practices, but used to apply chemical inputs such as fertilizers and pesticides. Yet the number of farmers who grow vegetables on large scale is still limited. On average, the area under vegetable cultivation for those farmers who grow vegetables as their major income source is only about 0.24 acre. Most growers grow on small scale in their home gardens especially for family consumption though they sometimes sell the extra-products. In this study, we do not pay emphasis on those small-scale producers since they do not constitute to any part of the vegetable value chain.

The mostly grown vegetables in Thee Kone include radish (tuber and leaf), snack gourd, bitter gourd, coriander, water cress, yard long bean, cucumber, Roselle, bottle gourd, and okra. Alongside vegetables, some farmers in Thee Kone also grow Easter flower. But about 90% of income from vegetable cultivation is gained from radish cultivation. For leaf radish, farmers harvest the leaves after 20 days of seed sowing. For radish tuber, they need to wait for another 20 days after leaf harvest. In the past, they harvest radish tubers when they got mature and large enough to weigh more. But now they harvest radish tubers at the size most preferred by consumers. Some key farmers reported that they now face with pest and disease problems which they have never met before but only after they applied organic fertilizers. They believe that the incidence of pests and diseases might be related to the extensive use of chemicals.

The investment for a 60-feet plot[11] of land for radish is about 80,000kyats. The output per unit area is 300viss or 2,400 bundles of radish tubers and the prices normally range 45-90kyats/bundle. For leaf radish, the output per unit area is about 800-1,000bundles with prices ranging 30-60kyats/bundle. They can grow three times a year, of which one time is concurrent with products from Kaing area. In this way, they can gain a net profit of 55,000-190,000kyats from a 60-feet plot per cropping season. Most prices presented here are farm gate prices and not necessarily related to prices gained at other levels of value chain. This means that a famer with a 60-feet plot grown under vegetable can earn a net income of 165,000-570,000kyats per year. The lower prices mainly apply to one season only which is concurrent with the peak season for vegetable growers in Kaing area.

**Figure 2** Production distribution of vegetables in Thee Kone




One of the major production constraints encountered by vegetable growers in Thee Kone area is continued heavy rains in monsoon season as it has happened this year. The major vegetable crops grown in Thee Kone, especially radish, could not tolerate heavy rains and associated water logging. Continued heavy rains thus often result in losses of vegetable crops at least for one cropping season. In some villages, WHH has initiated plastics roof to protect vegetables from heavy rains during monsoon season. We observed such innovative initiation in Pa Det, Min Hla Su, and Toe Hla villages. Plastics roofs might not be effective as green houses, but they will overcome the critical problems of vegetable cultivation in monsoon season. In parallel with the expected benefits, the investment for plastics roofs will be higher compared with open field cultivation. Therefore, it is essential to take cost-benefit analysis into consideration if plastics roofing is to be supported. Another problem with vegetable growers in Thee Kone area is the continued growing of the same crop every year. From technical perspective, such growing pattern is susceptible to the higher incidence of pests and diseases that crop diversification/rotation is worth introducing.

[11] A unit of measurement for land used in upper Delta. The unit measures 60x60feet in size and there are 12 plots of this size in one acre of land.

There are some villages outside Thee Kone area that grow and sell vegetables. Such villages covered by this assessment include Pa Det, Min Hla Su, and Pan Kha villages where farmers grow vegetables on small scale. But those small scale vegetable growers grow vegetables more than family consumption. These farmers rarely use chemical fertilizers that their vegetables are organic despite the fact that there is not certification process. Unfortunately, their production volume is relatively small that their markets are confined to their neighboring 3-4villages and not necessarily are part of the major vegetable value chain. Since the demand is not met by supply, the profit margins of vegetable producers in those villages are higher than those from Thee Kone area. On the other hand, those vegetable producers could be at risk any time if more external traders penetrate their area and offer lower prices.

### 4.3. Processing

Throughout the study and in most villages covered by this assessment, we did not find any significant processing activity that leads to value addition or improved access to market. As processing, vegetable growers in Thee Kone normally do sorting, cleaning, and bundling as required by wholesalers in Bogale. But these minor processing activities do not add additional values to the original products. One benefit of such minor processing is that vegetable products from Thee Kone are more preferred than those from Kaing area, particularly since the consumers no more need to clean and sort. But there is no major processing like production of value-added products. In this regard, investment in cool storage facilities might lengthen the shelf life of vegetable products as it has been done in other countries. Yet we do not see that the unit prices of vegetable products might increase due to such large-scale investments in Delta like cool storage facilities.

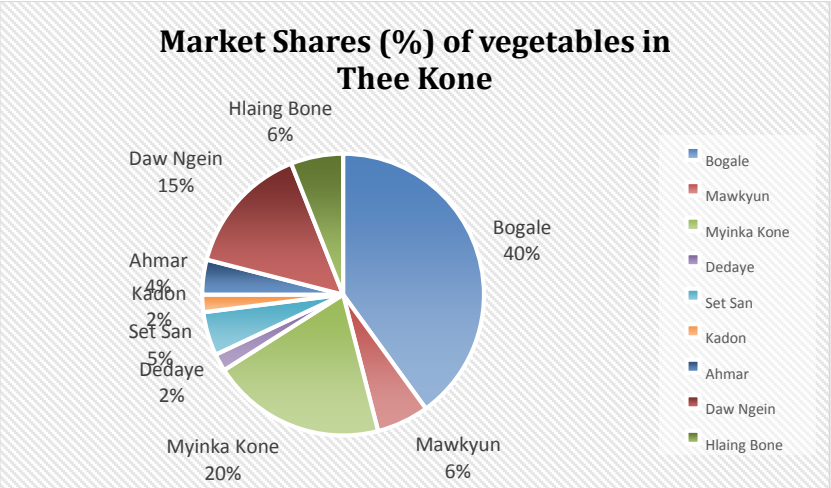
Retailers in Kadon and Ahmar do some value-adding activities (of course, loss-reducing activities) so to reduce their losses due to spoilage. There are many levels of vegetable value chain and it takes times to go through from primary producers to final consumers. And we have learned that most vegetables products get spoiled in the hands of retailers while consumers are not responsible to bear such damages and losses. In order to reduce their losses, therefore, retailers in Ahmar produce vegetable pickles with those vegetables worth discarding. They sell those processed products to restaurants and food shops, thereby recovering their losses. If large scale production of such vegetable processing can be initiated, losses of vegetable will be substantially reduced and the prices of fresh vegetables will be increased to a certain extent. Retailers in Kadon also do such loss reduction activities. They cut and remove the damaged parts of their vegetables and sell the health parts at normal prices.

### 4.4. Marketing

Vegetable marketing in Delta is not seen as a major problem especially for vegetable growers in Thee Kone area generally since the demand is not met by supply. Farmers do not usually sell their vegetable products by themselves. There are vegetables collectors who are the same villagers engaging in small-scale vegetable trading. Those collectors/small traders collect vegetables from vegetable growers and sell

them to other parts of the region. Such small traders not only trade vegetables from Thee Kone area, but they also trade vegetables from Kaing area and Yangon. Those small traders earn most proportions of values created along the value chain of vegetables in Delta region. They buy vegetables from Thee Kone, Kaing, and Bogale (Yangon products) and sell to other villages and market centers in the salty areas. In trading the vegetables, they charge as high as 30-40% of the original prices as profits.

**Figure 3** Market shares of vegetable (%) in Thee Kone




Most vegetables are sold in bundle though some are sold by weight or in pieces. Despite the way they are sold in retails, most vegetables are packaged in bamboo baskets being insulated with banana leaves for distant transportation. There are two ways of transport: one is from village to wholesale centers by growers or collectors/small traders and another is from wholesale centers to rural market centers by sub-wholesalers or retailers. The major transport mode for vegetables is mainly by boat. In addition, both sub-wholesalers who buy vegetables from Bogale and Yangon and collectors who sell vegetables to Bogale and rural market centers need to pay extra-charges for loading at the ports concerned and for transporting between the ports and market centers or vice versa. Again, those sub-wholesalers who buy vegetables from wholesalers in Bogale and Yangon through purchase agents have to pay certain amounts of money as services fees.

The actual boat charges paid by collectors and sub-wholesalers vary based on travel times determined by distance. If they go in person, they should pay also for passenger charge separately. It is a bit complicated to calculate transport charges using a similar unit of measure since charges are sometimes claimed based on weight and sometimes on baskets. In the case of collectors who normally use their own boats, transport cost is calculated by the number of bottle of fuel consumed. As such, travel to Bogale from Thee Kone needs about 3 bottles of fuel that is equivalent to 1,800kyats (1botle=600kyats). If the travel is from Thee Kone to Kadon (also Ahmar and other market centers in the south), then collectors spend about 14,400kyats/per trip which is equivalent to 24bottles of fuel. Yet if the transport of vegetables is by line boat, transport charges range 300-500kyats/basket for a travel time of about 2hours

like Setsan and 500kayts/baskets for Kadon and Ahmar. For this much of travel, passenger charge for one way is normally 1,000kyats. Moreover, collectors and sub-wholesalers have to pay also for loading charges that cost about 500-600kyats/basket in most market centers.

One significant feature of the vegetable value chain in Delta is the existence of a number of actors at various levels of the different value chains. Since each of these actors charges respective amounts on any vegetable product, there occurs a huge gap between producers' prices and consumers' prices. Unlike what happens in other value chains, wholesalers are not seen as the one who most exploit other lower level actors such as retailers and consumers. Of the many vegetable value chain actors, collectors/small traders ensure the highest profit margins. Yet they are not responsible for any damage or loss due to production and processing of vegetables. Finally, retailers at rural market centers are the ones who most bear the damages and losses to marketed vegetables.

## 5. The Vegetable Value Chain

As stated earlier, vegetable value chain in Delta region is subject to a truly complicated nature and operates in various forms. Viewed from supply side, it is composed of three value chains, i.e. Thee Kone-based value chain, Kaing-based value chain, and Yangon-based value chain. Since this assessment was conducted in relation to the Dreyfus project of GRET, it mainly focuses on Thee Kone-based value chain while other value chains are also covered in part and to a lesser extent. In fact, the Thee Kone-based vegetable value chain can also be further categorized into various lines of value chain according to the end markets like Setsan, Kadon, and Ahmar, etc. The following sections deal with the different vegetable value chains with special emphasis being placed on Thee Kone-based vegetable value chain.

### 5. 1. Chain actors

Vegetable value chain of the study area is operated by various actors of which those at lower levels of the value chain usually play more than one role. Those actors perform multiple tasks along the value chain and thus influence the value chain to a certain extent. For example, collectors are intermediate dealers who not only serve as intermediate dealers but also retail vegetables in the target market centers. They sell vegetable through their own boat or boats. With similar regards, some actors perform as both sub-wholesalers and retailers since the markets are relatively small. Followings are different key actors along the vegetable value chain of the study area:

***Input suppliers:*** Input suppliers are those shopkeepers in Bogale who sell agricultural inputs. There are three major input suppliers in Bogale. Input suppliers in fact play an important role in the vegetable value chain by educating farmers about the correct and systematic application of farm chemicals.

***Growers/Primary producers:*** These are farmers who grow vegetables in the study villages. They mainly relate with input suppliers, collectors/small traders, and

wholesalers. They buy farm inputs such as fertilizers and pesticides from input suppliers and sell their products to collectors/small traders in the village or wholesalers in Bogale. Of wholesalers and collectors, growers prefer selling to collector since they still buy their vegetables even when wholesalers refuse to buy due to over-supply.

***Collectors/Small traders:*** These category of actors are villagers from Thee Kone area who engage in vegetable trading as their major livelihoods. Most of these actors belong to landless families though some of them own land and grow vegetables. They normally buy vegetables from farmers (in Thee Kone and Kaing) and wholesalers (in Bogale) and sell them to villages and market centers in the southern salty areas.

***Wholesalers:*** Wholesalers are those people specializing in large-scale vegetable trading. Most wholesalers are based in Bogale. They buy various types of vegetable from Yangon, Kaing, and Thee Kone, and sell them to sub-wholesalers and retailers in Bogale and other rural markets. They usually make income by charging commission (10%) on every vegetable product traded. Most wholesalers used to allocate loans to retailers whom they deem trustworthy.

***Purchase agents:*** The role of purchase agents is to facilitate the purchasing process of vegetables especially in Yangon and Bogale wholesale centers. They are mainly responsible for facilitating the purchase of vegetables by sub-wholesalers in rural market centers who order vegetables from them instead of buying in person to save transport charges. It is the options for sub-wholesalers whether to hire purchase agents or not.

***Sub-wholesalers:*** Sub-wholesalers are those who do the works of both wholesalers and retailers. They mainly buy vegetables from wholesale centers and sell them in wholesales to retailers or in retails directly to consumers. The difference is that sub-wholesalers are not in the capacity to allocate loans to retailers as wholesalers do. Moreover, sub-wholesalers pay more transaction costs than do wholesalers since they need to chase the products.

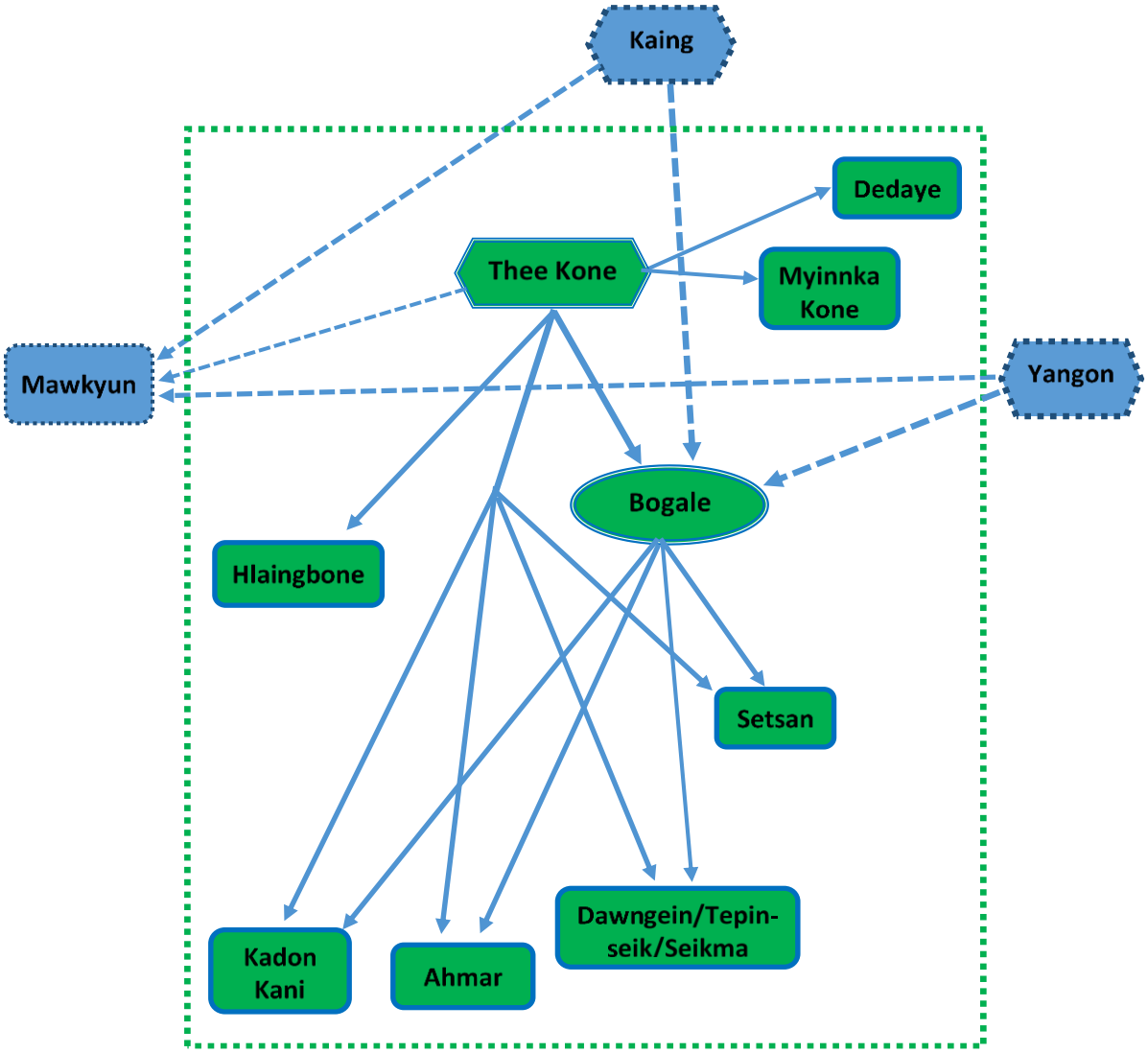
***Retailers:*** Retailers are those who buy vegetables from wholesalers or sub-wholesalers and directly sell them to consumers. The benefits of retailers is that they do business with a little capital thereby ensuring less risk of loss in terms of trading. The daunting part of vegetable business for retailers is that most vegetables get spoiled in their hands and are often subject to bear the losses.

### 5.2. Thee Kone-based value chain

In general, Thee Kone area remains the pivotal center of vegetable value chain in Delta region. The area is located in Mawkyun Township in the north of Bogale and it is closer to Bogale than Mawlkyun. There are about ten villages in Thee Kone area, but only eight villages mainly focus on vegetable cultivation. Even in the eight major vegetable producing villages, only about 20households engage in large-scale vegetable growing. The average grown area of vegetables is only 0.24 acre for those farmers who grow vegetable as their major income sources. Inputs suppliers are

mainly from Bogale and they also provide vegetable growers with occasional technical advisory services especially regarding the application of fertilizers and pesticides. Figure 4 below shows an overview of vegetable value chain for the study area.

**Figure 4** Overview of vegetable value chain in the study area




The structure of Thee Kone based vegetable value chain includes various chain actors such as growers, collectors/small traders, wholesalers, retailers, and consumers. But the actual value chain operates primarily in two forms. In one form, vegetable growers themselves sell their vegetables to wholesalers in Bogale who further distribute the vegetables to retailers in urban and local markets. At present, most farmers no longer sell their vegetables directly to wholesalers in Bogale as they see that they do not earn more through selling by themselves if transport charges and travelling times spent are taken into consideration. In another form, vegetable growers sell their vegetables to collectors/small traders who directly sell to retailers in rural market centers without necessitating the role of wholesalers. In both cases, consumers buy from retailers.

The target markets for collectors/small traders include Bogale, Mawkyun, Dedaye, Pyarpon, Myinkakone, Set San, Kadon Kani, Ahmar, Seikma, Tepinseik, Asihphyar, and Dawngein, and Kaingtaung. They carry vegetables through their own boats and they normally spend 1-3 days per trip based on the distance between Thee Kone and the target market centers. They mainly trade vegetable products from Thee Kone area during peak season especially monsoon. But they also trade vegetables from Kaing and Yangon during the lean season for Thee Kone. For vegetables from Kaing area, they sometimes go up to the area and buy the vegetables by themselves while they sometimes buy also from wholesalers in Bogale. For vegetables from Yangon, they buy only from wholesalers in Bogale. Due to the more neatly prepared bundles, buyers prefer vegetables from Thee Kone than those from Kaing area.

Information provided in this report relating to wholesalers, sub-wholesalers and retailers in rural market centers of Bagale, Setsan, Kadon, and Ahmar. All other rural market centers in the south are assumed to have similar conditions with Setsan, Kadon, and Ahmar except variations in prices and transport charges. Vegetable prices vary based on their supply sources and distances of transport routes provided that all modes of transport are by boat except for those collectors selling vegetables to Pyarpon and Dedaye which are accessible by car.

### 5.3. Kaing-based value chain

Vegetable production in Kaing area has certain opportunities and limitations alike. Farmers in that area can grow vegetables only in winter season especially after rice harvest. But as they grow, the production volume is quite high and they need to sell out their vegetables during the season. Therefore, they used to sell their vegetables at significantly reduced prices which affect the prices of vegetables from other areas. Since the production volume is huge and they do not have enough time to clean and sort, their market prices are usually low. Moreover, there are competitions from Thee Kone and Yangon with products of larger quality.

The structure of Kaing based vegetable value chain consists of primary producers, small traders, wholesalers, retailers, and consumers. Vegetable producers from Kaing area rarely sell their vegetables by themselves. They used to sell to wholesalers in Bogale and small traders who do mobile trading. Wholesalers in Bogale distribute vegetables to retailers in rural and urban markets who later sell to final consumers. In general, vegetable products from Kaing area are larger in volume during winter season compared with those from Thee Kone. Due to the seasonal limitations, vegetable growers in Kaing area have a chance to compete with growers from Thee Kone area for only one season.

### 5.4. Yangon-based value chain

The strength of Yangon based vegetable value chain is that vegetables are available all year round. According to wholesalers in Thiri Minglar fresh market, vegetables in that market mainly come from Hmawbi, Tatkone (Pyinmana), Kalaw, Nyaungtone, and Mongywa. In addition to the normal vegetable value chain actors, Yangon

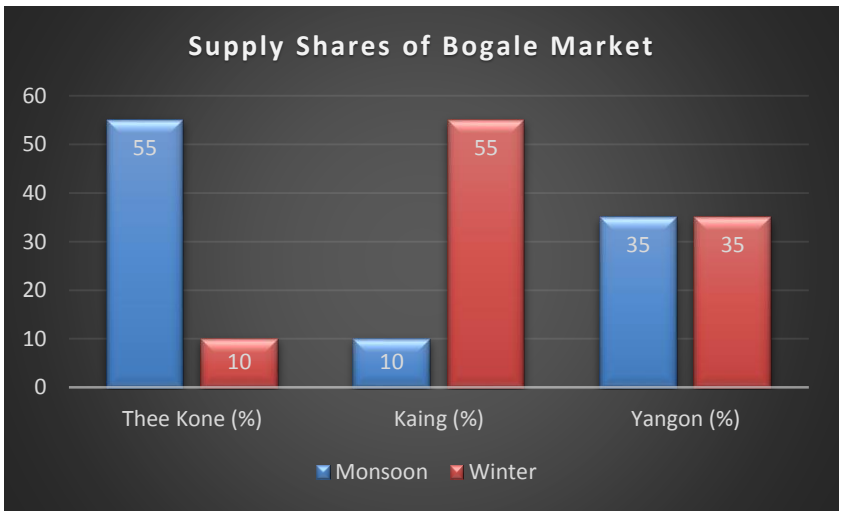
based vegetable value chain includes Purchase Agent who facilitate the purchase of vegetables in Thiri Minglar fresh market. These Purchase Agents mainly serve wholesalers and sub-wholesalers in buying vegetables. Sub-wholesalers in Yangon based value chain again are those wh0 buy vegetables from wholesalers in Thiri Minglar fresh market and sell the vegetables to retailers in rural markets. But Purchase Agents and sub-wholesalers are found only in Yangon based vegetable value chain.

Wholesalers in Bogale just order from wholesales centers in Thiri Minglar fresh market in Yangon rather than going by themselves. Then they distribute the vegetables to small traders and retailers in urban markets. Most retailers in rural markets of Kadon Kani and Ahmar just order from wholesalers in Bogale. In rare cases, some retailers in Kadon Kani order/buy directly from Yangon. In most cases, transportation and loading charges are borne by retailers. Retailers from other rural market centers like Set San and Dawngein depend on small traders who carry vegetables by themselves. In such cases, the retailers can save transportation charges.

### 5.5. Bogale as intermediary market

Due to its strategic location, Bogale can be considered as an intermediary center of most traded vegetables in the study areas. Vegetables from Thee Kone, Kaing, and Yangon first come to wholesalers in Bogale and are distributed to retailers of local markets in Bogale and sub-wholesalers of rural market centers in the south, salty areas. There are 6 large wholesalers in the main fresh market of Bogale and those wholesalers have about 10 to 20 suppliers in vegetable-growing villages and 20 to100 retailers in Bogale and rural market centers. The way wholesalers in Bogale make money is that they charge 10% commission on every vegetable they trade. As they trade in vegetables from Thee Kone, Kaing, and Yangon, wholesalers in Bogale are in the position to manipulate prices in the vegetable market.

**Figure 5** Supply shares of Bogale market




In the past, wholesalers in Bogale provided small loans to those farmers or retailers who are in critical need of money for business or subsistence purpose. The purpose of providing loans is to ensure regular supply of vegetables by maintaining business

relationship with vegetable growers. Later on, however, most wholesalers no longer provide loans since some farmers are not faithful and sell their products to other wholesalers who offer higher prices. Moreover, wholesalers in Bogale have more options in dealing vegetables than other actors of the vegetable value chain do especially during peak season for the three major supply sources of vegetables. Yet, the critical importance of the existence of wholesalers is that they are in the capacity to sell out all the vegetables brought to them regardless of the prices fetched. They also play a critical role for sustaining the vegetable market in Delta.

The fresh market of Bogale is composed of one main market and two sub-urban market centers. The sub-urban market centers include *Tawzeytan* and *Aungthabay* where the prices of vegetables are usually lower than those claimed in the main fresh market of Bogale. This is because collectors/small traders directly buy from vegetable growers and sell to retailers in rural market centers without necessitating the involvement of wholesalers. But this does not pose a threat to wholesalers since the volume of vegetables traded in sub-urban market centers is relatively small. With similar regards, the key drivers of sub-urban market centers are sub-wholesalers who have limited relationship with wholesalers. Except the fact that sub-wholesalers also buy vegetables in small scale, most of the activities or the role they perform do not vary from those of wholesalers.

### 5.6. Number of actors and traded volumes

We have learned that vegetable chain of the study area has created various employment opportunities for growers and landless people along the value chain though the actors and their works widely vary. However, it is interesting to know how many people are involved in the value chain and how much vegetable are traded. This helps us in making an approximate calculation of the flows and volumes of vegetables traded in the value chain under study. According to this study, there are six wholesalers and ten sub-wholesalers in Bogale. Each wholesaler has relationship with at least 20 retailers in terms of vegetable trading though some wholesalers have up to 100 retailers. With similar regards, each sub-wholesaler in Bogale and other local market center has trade relations with at least 5-10 retailers.

Key actors of the vegetable value chain at rural market centers in Setsan, Kadon, and Ahmar are sub-wholesalers cum retailers. Our approximate estimate indicates that there are 5 sub-wholesalers and more than 25 retailers in Setsan. In Kadon, the numbers are 7 for sub-wholesalers and 35 for retailers. It is paradoxical that there are more sub-wholesalers in Ahmar than Kadon. However, the traded volumes of individual sub-wholesalers in Kadon is much higher than that of those sub-wholesalers in Ahmar. According to the assessment, there are 10 sub-wholesalers in Ahmar who have trade relationship with 5 retailers on average. The distinctive feature of retailers in Ahmar is that most of them are vendors who engage in mobile trading of vegetables both in Ahmar and nearby villages.

Based on the information obtained from the four markets visited during the assessment, the number of collectors/small traders in Thee Kone area is roughly

estimated to be about 26 though some of them do vegetable trading only on a part-time basis. Albeit not a standard survey, the assessment also estimates the number of growers in Thee Kone to be about 120 farmers, of which again 20 are categorized as large growers. This numbers do not include those households who grow vegetables only in their home gardens for family consumption. The numbers do not include also those small-scale growers in the neighboring villages of Setsan, Kadon, and Ahmar whose supply to the vegetable value chain is not regular. With reference to the approximate numbers of actors mentioned above, we could come up with an estimate of traded volumes for the entire Thee Kone-based vegetable value chain as described in Table 1 below.

**Table 1** Approximate traded volumes in Thee Kone-based vegetable value chain

| S. No | Crops | Unit | Thee Kone | Bogale | Setsan | Kadon Kani | Ahmar | Total |
|---|---|---|---|---|---|---|---|---|
| 1 | Cucumber | piece | 7358 | 20000 | 1500 | 1225 | 1500 | 31583 |
| 2 | Coriander | bundle | 2080 | 1000 | 600 | 875 | 500 | 5055 |
| 3 | Roselle | bundle | 8242 | 15000 | 2500 | 1925 | 250 | 27917 |
| 4 | Water cress | bundle | 8242 | 10000 | 1250 | 2450 | 1000 | 22942 |
| 5 | Bitter gourd | piece | 6500 | 5000 | 750 | 1400 | 300 | 13950 |
| 6 | Yard long bean | bundle | 9100 | 10000 | 1500 | 1225 | 300 | 22125 |
| 7 | Bottle gourd | piece | 572 | 250 | 25 | 56 | 50 | 953 |
| 8 | Radish | bundle | 9438 | 3000 | 1500 | 875 | 150 | 14963 |
| 9 | Okra | piece | 47658 | 20000 | 2000 | 5250 | 1000 | 75908 |
| 10 | Snake gourd | piece | 5902 | 1000 | 500 | 525 | 300 | 8227 |

The numerical data provided in this figure might not be exactly identical with what are in real world situations since they are not the results of formal survey. However, they will at least highlight the approximate flows and volumes of vegetables daily traded along Thee Kone-based vegetable value chain. Moreover, we are also optimistic that this numbers can bring important information for estimating the measures of vegetable market for the study area. This rough information might be useful also in formulating interventions for developing vegetable value chain of the study area.

### 5.7. Value creation

Any work related to value chain development can be simply translated as a work of creating values for each actor. Also in this study, it is worth reporting that how much values are created by different actors of the vegetable value chain. One important finding is that, despite the modes and charges of transport characterized by distance, the values created by different actors along the value chain are proportionally the same except in the case of collectors/small traders in Thee Kone who are found to gain the highest profits. Normally, wholesalers in Bogale only charge commission equivalent to 10% of the price of every vegetable traded. Retailers in rural market

centers also charge about 10-20% of the price of every vegetable item traded, but they bear most of the losses happening along the vegetable value chain. Unfortunately, the values created by growers is proportionally the leaset compared with values created by other actors at the upper level of the value chain.

Since the vegetable value chain of the study area itself is complicated and the types of vegetable under study are many, it is difficult to sort out the values created by any actor of each vegetable variety. Tables 2-6 below provide rough information on value creation which are calculated by averaging the values created by similar actors of different market centers. This data are mainly related to the major expenses incurred by the actors concerned and not necessarily include those minor expenses deemed negligible by the consultant. The values created at different value chains are presented in such a way that they present all rural market centers for Thee Kone-based vegetable value chain. For example, we assume that the travel costs and subsequent vegetable prices might be the same in different market centers of the south like Dawngein, Tepindeik, etc.

Again, in the tables provided below, we come up with the values created by various actors at different stages of the entire vegetable value chain. Thus, the information provided are general as the values are averaged across all the market centers covered by this study. And the information are not specific to any particular vegetable product or chain actor or market center. The following tables (Tables 2-6) provide more discrete information that are specific to a particular market center. This data also shows the distinctive structures and characteristics of each vegetable sub-value chains which finally constitute the Thee Kone-based vegetable value chain. What we can learn from those tables again is that the prices at which vegetables are consumed might not be quite different if transportation is convenient.

**Table 2** General description of values created by various chain actors

| Types of Vegetable | Unit Input | Growers' Prices | Values Created | Collectors' Prices | Values Created | Wholesalers' Prices | Values Created | Retailers' Prices | Values Created |
|---|---|---|---|---|---|---|---|---|---|
| Cucumber | 48 | 95 | *47* | 138 | *43* | 151 | *14* | 114 | 21 |
| Coriander | 48 | 160 | *112* | 600 | *440* | 660 | *60* | 313 | 85 |
| Roselle | 9 | 30 | *21* | 75 | *45* | 83 | *8* | 56 | 11 |
| Water cress | 8 | 20 | *12* | 35 | *15* | 39 | *4* | 29 | 11 |
| Bitter gourd | 45 | 90 | *45* | 160 | *70* | 176 | *16* | 154 | 47 |
| Yard long bean | 21 | 50 | *29* | 55 | *5* | 61 | *6* | 136 | 34 |
| Bottle gourd | n.a | 510 | *510* | 950 | *440* | 1045 | *95* | 735 | 141 |
| Radish | 17 | 55 | *38* | 185 | *130* | 204 | *19* | 136 | 31 |
| Okra | n.a | 6 | *6* | 13 | *7* | 14 | *1* | 23 | 10 |
| Snake gourd | 63 | 125 | *62* | 175 | *50* | 193 | *18* | 190 | 40 |

When we look at the values created by each chain actors as described in Tables 2 above, we can see that collectors/small traders in Thee Kone partake values higher

than those of any other chain actor including retailers who often are supposed to bear most proportions of the losses happening in end markets. Growers also create relatively high values, but they are responsible for the entire production investment. Compared with what they gain, the values they create are not as high as those of collectors/small traders in Thee Kone. Unless losses due to spoilage of vegetables happen, wholesalers and sub-wholesalers, and retailers used to benefit most from the vegetable trading.

**Table 3** Values created along Thee Kone-Tawzeytan (Bogale) line

| Types of Vegetable | Unit Input | Growers' Prices | Values Created | Sub-Wholesalers' Prices | Values Created | Retailers' Prices | Values Created | Notes |
|---|---|---|---|---|---|---|---|---|
| Cucumber | 48 | 60 | *12* | 75 | *15* | 98 | *23* | |
| Coriander | 48 | 160 | *112* | 375 | *215* | 500 | *125* | |
| Roselle | 9 | 30 | *21* | 35 | *5* | 50 | *15* | |
| Water cress | 8 | 12 | *4* | 15 | *3* | 20 | *5* | |
| Bitter gourd | 45 | 85 | *40* | 100 | *16* | 150 | *50* | |
| Yard long bean | 21 | 50 | *29* | 65 | *15* | 125 | *60* | |
| Bottle gourd | 0 | 510 | *510* | 750 | *240* | 1000 | *250* | |
| Radish | 17 | 55 | *38* | 90 | *35* | 135 | *45* | |
| Okra | 0 | 6 | *6* | 14 | *8* | 20 | *7* | |
| Snake gourd | 63 | 125 | *62* | 140 | *15* | 200 | *60* | |

**Table 4** Values created along Thee Kone-Setsan line

| Types of Vegetable | Unit Input | Growers' Prices | Values Created | Sub-Wholesalers' Prices | Values Created | Retailers' Prices | Values Created | Notes |
|---|---|---|---|---|---|---|---|---|
| Cucumber | 48 | 60 | *12* | 110 | *50* | 125 | *15* | |
| Coriander | 48 | 160 | *112* | 145 | *85* | 225 | *80* | |
| Roselle | 9 | 30 | *21* | 55 | *25* | 60 | *5* | |
| Water cress | 8 | 12 | *4* | 20 | *8* | 45 | *25* | |
| Bitter gourd | 45 | 85 | *40* | 110 | *26* | 155 | *45* | |
| Yard long bean | 21 | 50 | *29* | 120 | *70* | 135 | *15* | |
| Bottle gourd | 0 | 510 | *510* | 525 | *15* | 550 | *25* | |
| Radish | 17 | 55 | *38* | 95 | *40* | 120 | *25* | |
| Okra | 0 | 6 | *6* | 12 | *6* | 17.5 | *6* | |
| Snake gourd | 63 | 125 | *62* | 125 | *30* | 175 | *50* | |

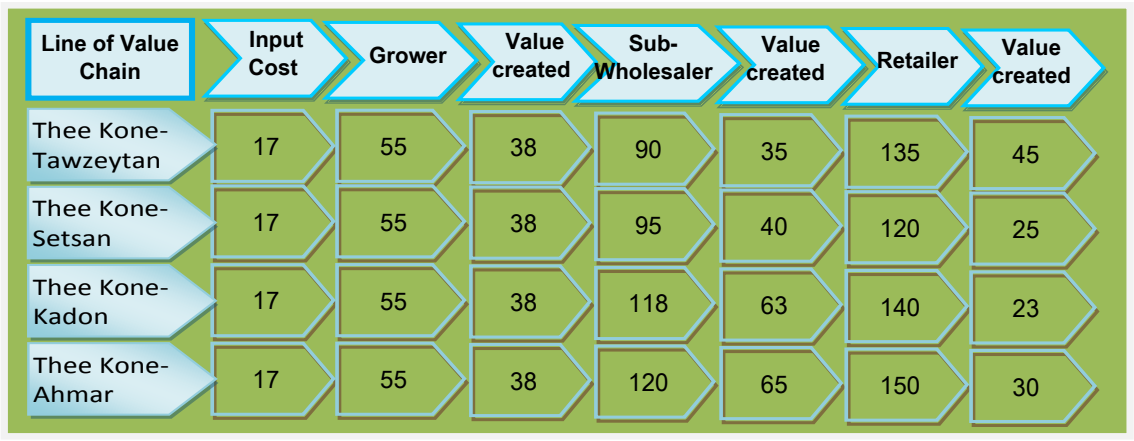
**Table 5** Values created along Thee Kone-Kadon line

| Types of Vegetable | Unit Input | Growers' Prices | Values Created | Sub-Wholesalers' Prices | Values Created | Retailers' Prices | Values Created | Notes |
|---|---|---|---|---|---|---|---|---|
| Cucumber | 48 | 60 | *12* | 103 | *43* | 133 | *30* | |
| Coriander | 48 | 160 | *112* | 268 | *158* | 325 | *58* | |
| Roselle | 9 | 30 | *21* | 38 | *8* | 53 | *15* | |
| Water cress | 8 | 12 | *4* | 21 | *9* | 24 | *4* | |
| Bitter gourd | 45 | 85 | *40* | 134 | *50* | 175 | *41* | |
| Yard long bean | 21 | 50 | *29* | 160 | *110* | 185 | *25* | |
| Bottle gourd | 0 | 510 | *510* | 700 | *190* | 838 | *138* | |
| Radish | 17 | 55 | *38* | 118 | *63* | 140 | *23* | |
| Okra | 0 | 6 | *6* | 21 | *15* | 39 | *19* | |
| Snake gourd | 63 | 125 | *62* | 160 | *65* | 180 | *20* | |

**Table 6** Values created along Thee Kone-Ahmar line

| Types of Vegetable | Unit Input | Growers' Prices | Values Created | Sub-Wholesalers' Prices | Values Created | Retailers' Prices | Values Created | Notes |
|---|---|---|---|---|---|---|---|---|
| Cucumber | 48 | 60 | *12* | 85 | *25* | 100 | *15* | |
| Coriander | 48 | 160 | *112* | 125 | *15* | 200 | *75* | |
| Roselle | 9 | 30 | *21* | 50 | *20* | 60 | *10* | |
| Water cress | 8 | 12 | *4* | 18 | *6* | 25 | *8* | |
| Bitter gourd | 45 | 85 | *40* | 85 | *15* | 135 | *50* | |
| Yard long bean | 21 | 50 | *29* | 65 | *15* | 100 | *35* | |
| Bottle gourd | 0 | 510 | *510* | 400 | *75* | 550 | *150* | |
| Radish | 17 | 55 | *38* | 120 | *65* | 150 | *30* | |
| Okra | 0 | 6 | *6* | 8 | *2* | 15 | *8* | |
| Snake gourd | 63 | 125 | *62* | 175 | *80* | 205 | *30* | |

**Figure 6** Value creation in the value chain of radish



### 5.8. Pocket value chains

While this study is mainly concerned with the value chain of vegetables produced in Thee Kone area, there are some villages where villagers grow and sell vegetables in small scale and are not linked to the conventional vegetable value chain. Such vegetable value chains are purposively called 'pocket value chains' for this study. Of the villages visited for this study, Pa Det and Min Hla Su are engaged in pocket value chains. In those villages, vegetable growing is possible, but limited to a certain extent due to their locations being at the border of brackish and fresh water areas. The constraints are not confined only to salty water, but also to the soil type that is not suitable for vegetable growing. Yet some farmers grow vegetables in small scale and sell them to 4-5 villages nearby using their own boats.

There are some small traders in the villages who engage in trading vegetables from Bogale. However, consumers prefer vegetables grown in the village since they recognize the vegetables are being organic. Accordingly, it has been learned that vegetable growers in those villages rarely apply chemical fertilizers. On the other hand, vegetable growers in those villages do not see vegetable growing as their major livelihood. For the villages are a bit remote from Bogale and transportation by boat is limited due to narrow water routes, small traders of vegetables from Bogale are not in the position to significantly compete with vegetable growers in the villages. This is because those traders used to pay a relatively high rate of boat charges for their vegetables due to the difficult accessibility by large boats. As such, the supply of vegetables in this pocket area still does not meet the demand for that particular market.

Nevertheless, there are some potential threats to the stability of prices and sustainability of market for vegetable growers in those villages. There are two important factors worth taking into account. Firstly, vegetable growers in the villages may lose their competitive advantage if vegetable production in other parts of the region increases and vegetable prices remarkably go down in Bogale. This will also result in reduced prices of vegetables traded in local markets without affecting the profits of small traders and the local producers will need to sell their vegetables at further reduced prices. Secondly, most consumers in that pocket area are subsistence farmers who might not choose organic vegetables if the prices are significantly higher than that of those vegetables treated with chemical fertilizers despite their perceived knowledge about the better quality of organic vegetables.

## 6. Business Development Services

### 6.1. Support services

In fact, vegetable growers in Thee Kone area had employed traditional practices in vegetable growing before development agencies came. GRET is the one who provides significant support services to vegetable growers. The support provided by GRET includes improved irrigation (i.e. solar-powered drip irrigation) system, improved seeds and fertilizers, trainings on improved vegetable cultivation, and technical advisory services. But in most villages visited, we have learned that vegetable growers

still need to adopt the technologies transferred and adapt the new technologies to local conditions.

In the three villages visited in the WHH's implementation area, WHH had conducted trial on the use of plastics roofing with an aim to protect vegetables from heavy rains in monsoon season. It has also initiated a mechanism to trace family income and expenditure. Another significant initiative conducted by WHH is provision of Family Agri-business Advisory Service called '*MaSaLaKa*'. Through these services, farmers are able to get timely technical information about any problems and constraints arising from their farm activities.

Throughout this study, we have not found about any support services provided by the government itself or related line departments especially Myanmar Agriculture Service. Similar regards apply to the involvement of private sector actors except the fact that some fertilizer companies occasionally sell bio-fertilizers to the vegetable growing villages. But they mainly focus on selling their products to farmers and do not provide farmers with technologies or any other business development services. There is a need of collaboration between the government, private sector, and development agencies if the vegetable value chain should be improved.

### 6.2. Employment creation

The state of vegetable value chain in Delta being complicated enables employment opportunities especially for landless households. In Thee Kone area, small-scale vegetable trading is done by many landless households, who otherwise will do casual works for their family subsistence. The widely scattered nature of vegetable market in Delta also causes market segmentation that it further creates employment for some sub-wholesalers and a number of retailers in rural market centers. At production level, vegetable sector ensures employment for many farmers and landless casual laborers in the particular vegetable growing villages of Thee Kone area. This is because, large-scale vegetable growers need to use hired labor throughout the production cycle and thereby generating employment opportunities for landless households.

If vegetables are processed into value-added products, then the likelihood of employment creation will be remarkably increased even at the higher level of the value chain. This would require upgrading of production volume and grown area while maintaining the quality of vegetables and the timing of production. As vegetables are processed, there will be more levels of actors in the value chain and thereby create more employment opportunities. However, such innovation might not be realized without the active involvement of public and private sectors. The level of employment creation especially for women is higher in Zaw flower than in vegetables. High employment creation is expected to reduce the rate of women migration as it happens in Saw Kae Chaung.

### 6.3. Growers' association

The decision for whether to form farmers' groups or not largely depend on why and how farmers work together in group. There can be various reasons for forming farmers' groups as characterized by the ongoing situations of any context. For vegetable growers in this study area, forming of farmers' groups might have at least two benefits. One is that farmers may ensure more bargaining power and increased profit margins by marketing their vegetables in group. Secondly, farmers will become able to engage in more information sharing on the issues of technology, production, and marketing in relation to vegetable business.

Until now, farmers grow and sell vegetables individually that their economy of scale and bargaining power are limited in one way or another. They also fail to undergo those production and marketing constraints due to the lack of proper information sharing among individual growers. The absence of behavior for doing business in group also limits their earnings in money value since they need to pay charges separately. However, vegetable growers in Thee Kone area are not likely to organize themselves into groups without being initiated or mobilized by any external intervention. Thus, we are optimistic that farmers' associations might be a means for improving vegetable business of the study area.

## 7. Structural Elements

The vegetable value chain in Delta is subject to a total complexity. As a result, the structural elements of the value chain may be various. But this study deals with the following structural elements that are deemed helpful for the development of vegetable value chain in Delta. Such elements include end markets, business enabling environments, and vertical/horizontal linkages.

### 7.1. End markets

The end markets of vegetable value chain in Delta are widely scattered throughout the entire study area. The end markets can be defined as local market centers from which final consumers buy vegetables. The buyers include individual households and restaurants or food shops. Due to the various sources of vegetables and the different marketing channels, end users pay different prices for the same product. Distance also constitutes a decisive factor for prices at the end markets, meaning that the longer the distance, the higher the prices and vice versa. As such, distance differentiates consumer prices and is often subject to the various levels of value chain and the different actors at each level.

In Delta context, however, end markets include both local and urban and sub-urban markets at which vegetables are finally consumed. In this case, sub-urban markets in Bogale and rural markets in Setsan, Kadon, and Ahmar will be at the same level since they are the destinations of vegetables from which final consumers directly buy. Despite the various situations of transport, we have found that the prices of consumers are not much different across the markets under study. Again, the prices paid by consumers differ again based on the distance and transport mode between end markets and final consumers.

### 7.2. Enabling environments

The business enabling environments of vegetable value chain in Delta region is governed by the government policies and their implementation. We already know that the Myanmar government is in support of the benefits of smallholder farmers. But we have not learned any government activity performed in support of vegetable growers in Delta region. We do expect that the value chain of vegetable might be improved through the involvement of the government and private sector. However, the line departments of the government and private sector actors might not take risks investing in vegetable sector of Delta without ensuring the existence of reliable structural measures.

We have found through this study that cold storage facilities are required to ensure longer storage life of vegetables and for the protection of spoilage during transport and storage. But who will engage in such expensive investment without proper legal protection and profit margins. Similar regards may apply to processing industry which is supposed to be realized by private sector. At the absence of reliable structural measures, other actors of the vegetable value chain also will not benefit from any investment. Thus, proper structural changes are necessary if the vegetable value chain in Delta is to be improved.

### 7.3. Vertical/horizontal linkages

It has been found that both horizontal and vertical linkages among actors throughout the vegetable value chain are weak. During the assessment, we have not observed any strong linkages either horizontally or vertically. The major actors of vegetable value chains operate individually and there has not been any network or association. This limits the economy of scale for vegetables and the bargaining power of vegetable growers. Though some growers timely obtain market information, such information is rarely shared among vegetable growers. Similar regards apply to vertical linkages between farmers and other value chain actors at different levels of the vegetable value chain.

One of the strongest vertical linkages exists between wholesalers and retailers in Bogale context. Wholesalers provide loans to retailers and sometimes allow late payment. Moreover, there is a regular flow of market information between the two actors. But the linkage between these two actors does not much affect the relationship between wholesalers and other lower level actors like collectors/small traders and primary producers. The linkage between wholesalers and retailers is strong because they established certain social ties that stabilize their relationship without affecting linkages with small traders and primary producers.

### 7.4. Supporting markets

Regarding supporting markets, we are about to point out two factors: one is the lack of financial services providing loans to vegetable growers and another is the lack of entity providing technical services. In most villages we visited, vegetable growers reported that they lack financial capital for upgrading or expanding their vegetable

production. For a vegetable cultivation aiming at subsistence level, the financial and technical support made available by development agencies might be sufficient. As stated in earlier sections, however, any investment in cold storage facilities and processing industry will go beyond the capacity of the existing vegetable growers.

On the other hand, the emergence of supporting markets also is characterized by the structural measures held by the government. Simply stating, the policies of previous government have not provided environments conducive to providers of especially financial services. Alongside the democratic transition processes happening in Myanmar, we are quite optimistic that the future democratic government may come up with policies conducive to the development of supporting markets for vegetable value chain in Delta region. Vegetable growers from some villages in Thee Kone report the need of contract farming, but contract farming will not appear or work well without reliable structural measures.

## 8. Dynamic Elements

In this section, we will discuss about the dynamic elements deemed most relevant to this assessment. These dynamic elements of a value chain can be abstract in nature, but their impacts on the value chains actors are not worth underestimating. The dynamic elements elected for analysis include chain governance, linkages and relationships, upgrading, and competition.

### 8.1. Chain governance

According to this assessment, there are different actors who influence respective vegetable value chains in different ways. As previously assumed, wholesalers are not always the ones who dominate vegetable value chains. As the vegetable value chain in Delta itself is complicated, the way dominating actors influence the value chains also differs from one chain to another. Vegetable value chains for Yangon-based products and Kaing-based products share a similar pattern of chain governance while Thee Kone-based value chain is subject to a varied form. This is because vegetable value chain actors in Delta region only share part of the entire value chains for vegetables from Yangon and Kaing area.

In Yangon- and Kaing- based vegetable value chains, wholesalers most dominate the market. They decide vegetable prices and control the flows and market shares of vegetable products. As to Thee Kone-based vegetable value chain, chain governance is shared by wholesalers in Bogale and local collectors/small traders. Wholesalers hold the chain governance if vegetable growers directly sell to wholesalers where markets prices are controlled by collectors/small traders if primary producers sell vegetables to those local collectors/small traders. But primary producers have the option to choose their preferred buyers who can be wholesalers or collectors/small traders based on the prices offered. Finally, the complexity of vegetable value chain in the study area allows the actors to avoid unfair domination among actors.

### 8.2. Upgrading

In the vegetable value chain under study, upgrading is needed especially in production. Upgrading in production should encompass various inputs (i.e. seeds, fertilizers, and pesticides) and production technology. Until now, we have learned that vegetable growers in Thee Kone are able to combine well traditional practices and modern technologies. The most lacking parts are the innovative approaches and the required equipment. While vegetable growers do not report constraints related to cultivation practices and essential farm inputs, we have learned that they do not have the capacity to overcome damages and losses of their vegetable crops imposed by continued heavy rains in monsoon season.

Another area worth upgrading is the type of vegetables grown. Vegetable growers in Thee Kone keep on growing the same crop on the same land every year. The practice finally results in incidence of pests and diseases, albeit soil depletion is rarely reported by growers in the study villages. Thus, crop diversification and/or crop rotation could be a possible means of production upgrading. Though vegetable growers in Thee Kone report that they grow various vegetables, their production mainly concentrates on radish growing which is repeated every year on the same land.

### 8.3. Competition

Looking at the entire vegetable value chain of Delta region, Thee Kone area is not the sole supplier of vegetable products. Much more volumes of vegetables come from Kaing area and Yangon, the former being seasonal that its competition thus is known to be intense seasonally. Vegetables from Yangon are available all year round that its competition remains constant. And the most intense competition among the three sources of vegetables traded in Delta region happens in winter season when supply exceeds demand. Therefore, vegetable growing in Thee Kone area during winter season is subject to reduced profit margins provided that the investments in monsoon and winter seasons are the same.

Normally, wholesalers offer lower prices when vegetables from the three sources (Thee Kone, Kaing, and Yangon) accumulate in Bogale wholesale centers. And vegetable growers in Thee Kone have no better option other than competing with products from Kaing and Yangon. The result is that they gain lower prices for most of the times compared with what they earn during monsoon season for the same products. In another respect, competition can be reduced if there can be product diversification and market segmentation in such a way that some vegetables are directly sold on markets and some are processed into value-added products.

## 9. Review of Thee Kone-Based Vegetable Value Chain

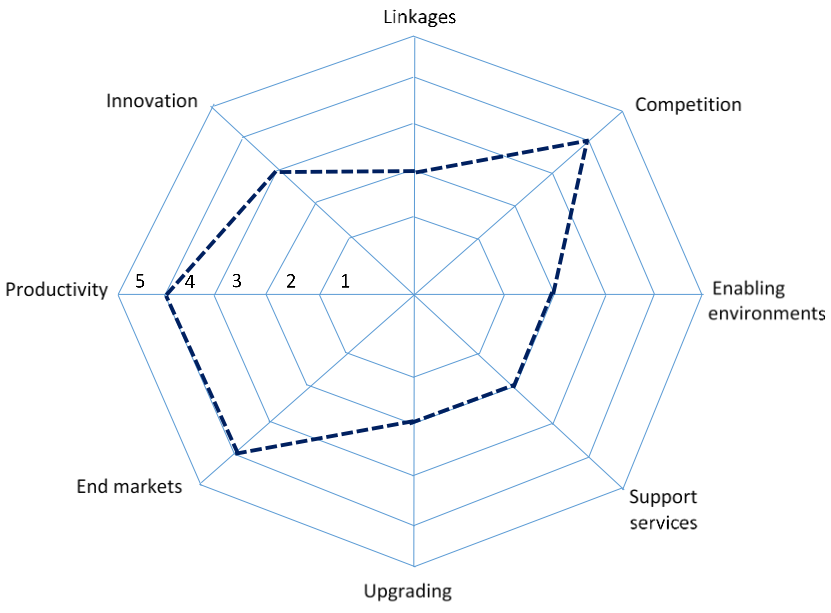
This section reviews Thee Kone-based vegetable value chain by synthesizing the assessment findings described in the previous sections. As stated earlier, primary producers for this vegetable value chain are present in Thee Kone area with the end markets being scattered in various parts of the region. Though there are three main

value chains, this project is about vegetables from Thee Kone area that the study mainly deal with Thee Kone-based vegetable value chain. There are about 10 villages growing vegetable in Thee Kone area and the vegetables produced are distributed to Myinka Kone and Dedaye in the north and Setsan, Kadon/Ayer, Ahmar, Hlaingbone, Dawngein, Seikma, Tepinseik, Kiangtaung, and Asihphyar in the south. But this report mainly deals with Setsan, Kadon and Ahmar which are the major rural market centers and where the study has been conducted.

At first, vegetable growers in Thee Kone area follow traditional methods of vegetable growing. At the same time, they are not capable of controlling pests and diseases and the issues often result in losses of vegetable crops. GRET through its project funded by Dreyfus Foundation has provided technical training on improved crop management and relevant agricultural advisory services. Though there are various types of vegetable traded in the market, farmers in Thee Kone area do not grow all those vegetables. They grow nine types of vegetable in total, but earn about 90% of their income from growing radish which is sold in the forms of both leaf and tuber. They are able to grow three crops of radish a year - twice in monsoon season and once in winter season.

Though the vegetable production in Thee Kone is relatively huge in volume, it contributes to Bogale market only by about 10% of the total traded volume in winter and 55% in summer. Marketing of this 10% of traded vegetables is performed in two forms: one is by growers themselves and another through collectors/small traders. The remaining 90% of the total traded volume of vegetables are dealt with by collectors/small traders and the major markets are mainly in the south. But those collectors/small traders are the ones who gain the highest values created throughout the vegetable value chain. Yet growers prefer selling their vegetables to collectors/small traders because collectors offer market prices even when wholesalers in Bogale reject their products especially in winter season.

**Figure 7** Spider web of Thee Kone based vegetable value chain



The spider web above uses selected indicators deemed appropriate in guessing the current situations of Thee Kone-based vegetable value chain. It indicates that Thee Kone-based vegetable value chain currently has less constraints at the levels of production and end markets, but situations are worse in innovation and worst in linkage with lower and upper level actors, enabling environments such as policies and legal instruments of the government, support services like extensions services and training, and upgrading like improvements in the types and quality of products. These indicators at times appear abstract, but it is widely accepted that they greatly influence the value chain of any product. It has been also learned that competition in this particular value chain is seasonally very high at the time peak seasons from Thee Kone and Kaing are concurrent.

Again, the following SWOT analysis (Figure 9 below) shows the strengths, weaknesses, opportunities, and threats of Thee Kone-based vegetable value chain. This SWOT analysis serves as a brief description of the entire Thee Kone-based vegetable value chain and the summary of this report. The various items presented in this SWOT also contribute largely to the critical recommendations made at the end of this report. In fact, the vegetable growers in Thee Kone have not reported that they face with any particular constraint either in the production and marketing of vegetables. As we assessed the entire Thee Kone-based vegetable value chain, however, we have revealed a number of issues that are not current, but might be constraining the future functioning of vegetable value chain in Thee Kone area.

Regarding innovation, there are some factors worth considering in introducing new technologies and equipment to farmers. With similar regards, upgrading like adopting crop diversification in Thee Kone might require some sorts of careful considerations. Though the expected impacts of those innovation are great, they might not come true if the proposed interventions fails. And the pros and cons of upgrading could be influenced by the belief and traditions of the target farmers. Apart from these, there are still many potentials that might change over time based on government policies enabling environments conducive for smallholder farmers to grow. If the government is active in supporting smallholder farmers, then there will be financial support and other means of support for technology and training.

One factor being not included in the SWOT analysis is market information since recent changes in Myanmar had made communication easy and vegetable growers in Thee Kone usually know the changing prices of vegetable almost timely. A farmer from Thabyukone said that they usually obtain updated market information from the wholesalers. This help vegetable growers in Thee Kone make the right decisions about whether to sell their vegetables to wholesalers or collectors. We have learned that wholesalers in Bogale do not hesitate to share price information.

**Figure 8** SWOT analysis of Thee Kone-based vegetable value chain

| Strengths | Weaknesses |
|---|---|
| • Farmers have the skills to produce vegetables and GRET has been strengthening their capacity<br>• Farmers in Thee Kone grow various vegetables but currently gain 90% of their income from radish<br>• Adequate land and water resources are available for vegetable growers in Thee Kone<br>• Farmers can build relationship with traders when vegetable supply from Kaing and Yangon is low<br>• Vegetables from Thee Kone are known in the vegetable business for its clean and neat preparation<br>• Farmers have options to sell their products either to wholesalers or collectors based on prices offered<br>• Some farmers can overcome constraints imposed by heavy rains in monsoon by growing radish of local variety | • Improved methods introduced are not properly adaptable and the required inputs are not affordable<br>• Vegetable production in Thee Kone is mainly confined to radish cultivation, resulting in the incidence of pests and diseases<br>• The drip irrigation system provided by GRET is not efficient for existing crops<br>• Most farmers fail to maintain their production in monsoon due to continued heavy rains<br>• Farmers are unable to maintain relationship with traders due to their irregular supply<br>• Local varieties are subject to long duration and low yield compared with hybrid ones<br>• Vegetable growers lack proper marketing ideas either in the production and marketing of vegetables |
| **Opportunities** | **Threats** |
| • There is no soil in Bogale and Mawkyun Townships as suitable for three harvests of vegetable a year as in Thee Kone<br>• Innovative techniques and equipment like plastic roof, elevated beds, etc. con overcome constraints in monsoon<br>• There are villages outside Thee Kone with elevated threshing grounds suitable for vegetable growing being left unused<br>• Crop diversification may enable market segmentation which will result in increased prices and reduced losses<br>• Combination of organic and chemical fertilizers can result in vegetables of better quality and longer shelf life<br>• Farmer groups may enable farmers to ensure stable prices and market<br>• Proper trainings and awareness raising may enable farmers to adopt crop diversification<br>• The upcoming government is supposed to invest more for smallholder farmers | • Introduction of innovative methods like plastic roofs and elevated beds might be risky without prior piloting<br>• Vegetable growers from Kaing areas copy the successes in such innovative methods<br>• Better transport from Yangon and Bogale to rural market centers may affect vegetable growers in Thee Kone<br>• Rapid progress in democratic tradition and lucrative vegetable market in Delta may attract private companies for large-scale investment vegetable production in the region which might cause dramatic decrease in vegetable prices and disappearance of market for smallholders<br>• Potential withdrawal or reduced operations of development agencies due to recurrent disasters in Myanmar<br>• Increase in the number of small-scale vegetable growers may result in reduced prices |

## 10. Other Potential Value Chains

Apart from vegetables, there are two cash crops with reliable market potentials identified during this study. One crop is Zaw flower and another crop is mushrooms. The major Zaw flower growing area is outside the area primarily proposed for this study. However, farmers in some of the study villages grow it and make proper business that this study includes Zaw flower. With the suggestions from key staff of GRET/WHH and one existing grower, we also made observation at two mushroom cultivation sites supported by WHH; one in Pa Det village and another in Bogale. There we found the potentials of mushroom cultivation either as a means of income diversification.

### 10.1. Zaw flower

The major Zaw flower growing village is Saw Kae Chaung of Mawkyun Township. The growing of Zaw flower was started in this village some 20 years ago, but it became commercial only since ten years ago. Most villagers in this village grow Zaw flowers as their major income source. There are eleven varieties of Zaw flower, but growers in that village mainly grow three varieties, namely; *Zaw lone*, *Zaw bayin*, and *Zaw htoke*. Zaw bayin is most expensive followed by Zaw Htoke, but Zaw lone is most sold in the market.

According to the growers, the benefits of growing Zaw flowers is that they can tolerate heavy rains (and subsequent water logging)[12] and prolonged drought. Moreover, Zaw flowers can easily root up and the cultivation practices are simple and low-cost. Once Zaw flowers are planted well, they can be harvested for years without additional investment for seedlings and planting. Again, Zaw flower can be grown at a very high plant population (600,000plants/acre) per unit area, thereby reducing land requirement compared with other cash crops. Other essential inputs required for Zaw flower growing are shelter and fertilizer. While they used to buy fertilizers, such locally available and cheap materials as palm leaves and bamboo can be used for constructing shelter.

The major market for Zaw flower is Thiri Minglar fresh market in Yangon. There are middle dealers in the village who are also growers. They alternately buy Zaw flowers from growers in the village and send the flowers to Yangon market. There is no significant competition among those middle dealers. The middle dealers do not need to go to Yangon for selling the flowers. They hire a truck and the truck driver takes responsibility to bring the flowers to wholesalers in Yangon. The daily sales volume of Saw Kae Chaung village ranges 100,000 to 400,000 plants. Zaw flowers are most sold and fetch highest prices during the period of Thadingkyut festival (October-November).

Zaw lone is sold in two grades based on the length of the flower. The farm gate price of ordinary Zaw lone during this assessment (mid-October 2015) was 9kyats/plant.

[12] Our informants in Saw Kae Chaung said that water logging should be avoided. But we observed that their Zaw flower plants had been water-logged for about two weeks and they did not report any problem.

Middle dealers sell the flowers to wholesalers in Thiri Minglar market of Yangon at 15kyats/plant. Wholesalers again sell the flowers to retailers at 18kyats/plant. The selling price of wholesalers in Yangon during the assessment was as high as 35kyats/plant for special Zaw lone since it was very close then to Thadingkyut festival. In local market, retailers sell ordinary Zaw lone in bundle (5plants/bundle) and at about 40kyats/plant. The growers in Saw Kae Chaung also sell in bundle, but they used to make each bundle include 10 plants.

This study finds that the business of Zaw flower is lucrative and cost-effective especially for smallholder farmers. The investment is relatively low compared with the profits per season and unit cost of investment. The limitation of this study, however, is that it does not cover the whole value chain which spreads up to upper Myanmar. According to wholesalers in Thiri Minglar market interviewed, the market of Zaw flower is stable except the fact that market prices fluctuate at times. Yet middle dealers in Saw Kae Chaung said that they have never encountered any situation in which the flowers they sent to Yangon are sent back to them. This means that the prices may fluctuates, but growers can sell out their flowers any time.

### 10.2. Mushroom

Mushroom cultivation is seen as another potential business for small-scale farmers in Delta region. Though we have had some knowledge about the cultivation and business potential of mushroom, the opportunity for mushroom cultivation was re-realized during this study with the help of key staff of WHH/GRET. According to an existing mushroom grower in Bogale, the cultivation technology is available and the market for fresh and dried products exists. More specifically, the demand of mushroom in domestic market is not met by the supply from domestic production without regarding export markets.

We have become interested in mushroom cultivation since it can also serve as a means of crop/income diversification for smallholders farmers in Delta region including vegetable growers. Moreover, there can be a chance to integrate mushroom cultivation with vegetable growing. On the other hand, mushroom cultivation is capital- and technology-intensive compared with vegetable growing. At the same time, we have learned that WHH and GRET have already had expertise in mushroom cultivation technology. Where proper capital can be made available, mushroom cultivation can thus be a reliable source of income for smallholder farmers.

Another strong point of mushroom growing is the limited space needed compared with other cash crops of the region. Moreover, the raw materials required for mushroom cultivation such as straw, water hyacinth, etc. are readily available in the region. In addition, mushroom can be processed as dried products that the market can be diversified, thereby reducing the risks of losses due to oversupply of fresh produce. As lesson learned, one key staff of GRET shared his experience about the oversupply of fresh mushroom in Bogale market due to the concurrent harvest and selling of mushroom by all growers. According to him, the attention of farmers in mushroom cultivation has decreased since then. This can also be viewed as the issue

of marketing rather than solely of the market itself. To this end, it is interesting about what would happen to the market and prices of mushroom if half of them were sold as dried products.

**Table 7** Prices by type of mushroom products

| S. No | Types of Mushroom | Price-Fresh (kyats/viss) | Market | Price-Dried (kyats/viss) | Market |
|---|---|---|---|---|---|
| 1 | Rat ear | 2,500 | Thiri Minglar | 15,500 | Nyaungpinlay |
| 2 | Button | 2,500 | Thiri Minglar | 20,000 | Nyaungpinlay |
| 3 | Straw | 4,000 | Thiri Minglar | n.a | n.a |

Therefore, the consultant of this study would like to insist that the issue is not about oversupply, but about the limited marketing ideas and perhaps associated technical/financial limitations for storage and/or processing. If oversupply of fresh mushroom in local market poses a problem, then those fresh produces can be processed into dried products without affecting the original prices of mushroom. This will remarkably reduce the supply of mushroom in the market and thereby result in increase in demand. Another critical point is that the issue of oversupply of mushroom can also be viewed as an issue of the lack of market information since it is confined to Bogale context while the demand of mushroom is not met at national level. Yet it is undeniable that mushroom of any type is have proper potential market either in domestic and international markets. Followings are current market prices of mushroom as provided by an existing grower in Bogale.

In addition to the species mentioned above, there are other potential species of mushroom like Linshi and Shiitake. These species are known as being suitable to temperate or cold climate, but we have observed that the existing mushroom grower successfully grow Linshi mushroom in Bogale conditions. Our discussions with the existing grower also revealed the potentials of mushroom for export markets while our further investigation indicates that the demand of mushroom in export markets is not met by domestic production in Myanmar. It is thus evidenced that the market of mushroom will be larger if the volume of production increases.

### 10.3. Betel leaves

Being a non-vegetable cash crop, the study does not fully cover the value chain of betel leaves. This is because betel leaf is not grown in Thee Kone, the major vegetable growing area for the project under which this study has been conducted. Moreover, we have learned from this assessment that farmers in only one of the study villages, Pan Kha of Mawkyun Township, grow betel leaves. At the same time, we have also learned from the informants that betel leaf growing is more capital-intensive compared with other vegetables and the prices of betel leaves greatly fluctuate (1000-11000kyats/viss). Such high rate of fluctuation poses risks for growers who without crop diversification.

The timing of price fluctuation in betel leaves if much governed by the sharp changes in betel leave supply. Though the prices sometimes go down up to 1000kyats/viss, they sometimes rise up to 11000kyats/viss when local production does not meet local consumption. This happens mainly when betel leave production is greatly reduced due to flood and/or associated pest and disease infestation in the area. Once such supply shortage occurs, local dealers even buy from Kunchan Kone of Yangon region and the prices are very high. Then the prices go down again very shortly as there is increase in local supply. Thus, betel leaf can be a high-value crop only for a very short period of time when it is scarce and will become a normal cash crop when it becomes abundant.

Like monsoon vegetables in Thee Kone, betel leaf growing can be a potential business if methods and equipment innovative enough to undergo the reported constraints in monsoon season are available. Yet such innovation are not worth initiating without prior piloting since the risk of loss is very high. For its consumption rate is very high, betel leaf growing has potentials for income generation provided that potential growers obtain the required innovative methods and equipment. Instead, it is worth studying betel leaf as a separate value chain.

## 11. Case Studies

The study also organizes some case studies that are deemed supportive to analyzing the vegetable value chain. While there can be a number of case study worth constructing, we have sorted out two, of which the first one is prepared at village level and the second one is at farmer level.

### 11.1. Village case: Pan Kha

This village is located in Mawkyun Township, but outside Thee Kone area and not being regarded as a major vegetable growing village. The village one of the target villages of GRET under Dreyfus-funded project. There are about 10 vegetable growers in the village and 3 of them have been selected as beneficiaries for innovative irrigation system supported by GRET. In this village, vegetable growing is confined to winter season. The average grown area under vegetable is 0.24 acre and the most grown vegetable varieties include Roselle, okra, cucumber, water cress, bitter gourd, chili, brinjal, bottle gourd, snack gourd, and Indian coriander. According to vegetable growers in this village, the most sold vegetables are coriander, Roselle, and water cress.

Despite the relatively high interest in vegetable growing, most vegetable growers are most interested in betel leaves. Accordingly, the current grown area of betel leaves exceeds that of any vegetable variety. But most growers do not afford the capital required for expanding the betel leaf growing. Yet observations indicate that betel leaf growing is current made possible by using local materials like bamboo and nipa palm leaves. This highlights that the investment for betel leaf growing can be significantly reduced if local materials are used. The main constraints faced with by growers of both vegetable and betel leaves are flood in monsoon and rodents.

One distinctive finding in this village is that there are a lot of rice threshing grounds being left unused. Those threshing grounds are usually raised up to at least one foot above original ground level. Most of the threshing grounds have an averaged size of about 0.16 acre which is equivalent to the averaged grown area of vegetable for the village. Normally, soils of threshing grounds appear to be more fertile that those in other parts of the main farm. Moreover, the investment and risk of flood can be reduced since threshing grounds are already raised. Since vegetable and betel leaves have potentials for income generation, utilizing those threshing grounds for vegetable/betel leaf growing can be a good initiative to ensure proper incomes for farm households. Finally, potential success in such innovation can be replicable to other villages outside Thee Kone area.

### 11.2. Grower case: Daw Win Kyi

Daw Win Kyi (50) is vegetable grower from Toe Hla Village of Bogale Township. Toe Hla village falls in the salty water area and situations are difficult for vegetable growing as constrained by salt water. She grow vegetables on 0.11 acre (70x70feet) of horticulture land and is the beneficiary of WHH under Dreyfus-funded project. She is also a very active member of Family Agri-business Advisory Services initiated by WHH. She is selected for case study in this report especially because of her innovative ideas and the resulting successes in growing vegetables under the most difficult situations. This case study at its core aims at sharing the major factors supporting her success so farmers in other areas can learn lessons.

The types of vegetables mostly grown by Daw Win Kyi include radish, yard long bean, cucumber, okra, water cress, Rosele, and straw mushroom. She can grow radish even four times a year while Roselle and water cress can be grown only in winter season. Except these, she is able to grow the other vegetables once a year. In order to overcome the common constraints imposed by continued heavy rains in monsoon season, she initiated constructing nursery beds under plastics roof with support from WHH. The major market for her vegetables is Patbyae and the vegetables are sold by her younger sister. She is able to earn a total income of 705,000kyats/year. The distribution of her income by types of vegetables is shown in Table 9 below.

**Table 8** Description of annual income of Daw Win Kyi by types of vegetable

| S. No | Vegetable | Income by crop (kyats) | Notes |
|---|---|---|---|
| 1 | Radish | 100,000 | Four times/year |
| 2 | Yard long bean | 45,000 | |
| 3 | Cucumber | 200,000 | |
| 4 | Okra | 90,000 | |
| 5 | Water cress | 80,000 | winter only |
| 6 | Roselle | 60,000 | winter only |
| 7 | Straw mushroom | 130,000 | |
| | **Total income** | **705,000** | |

It can be said that the annual income of Daw Win Kyi from vegetable growing is not negligible for a smallholder farmer and the level of productivity is very high compared with the grown area. Here it can be imagined again that a smallholder farmer in fresh water area in the north can earn similar amount of income from the same size of land at a significantly reduced investment. From this case study, it is worth learning that the success of Daw Win Kyi is not only about working hard, but she always tries to obtain technical advices from WHH. Last but not the least, she has a well understanding about the production and marking of vegetables she grows.

## 12. Conclusions

Vegetable supply in Bogale comes from three main sources: Yangon, Kaing, and Thee Kone. And this study mainly deals with Thee Kone-based vegetable value chain since the project under which this study was conducted has provided support to vegetable growers in Thee Kone area. Yet it also covers in part about vegetables from Kaing and Yangon since they also contributes to the entire vegetable value chain of the study area. There are some vegetable growers in other villages outside Thee Kone, but their contribution to the main value chain of the study area is very limited. The contribution of vegetables from Thee Kone to Bogale fresh market is about 55% in monsoon and 10% in winter, and the reverse is contribution by vegetables from Kaing area, i.e. 10% in monsoon and 55% in winter. The contribution by Yangon is stable at 35% both in monsoon and winter seasons.

There are about eight major vegetable growing villages in Thee Kone area though almost all households grow vegetable in their home gardens for family consumption. The average grown area of vegetable growers is 0.24acre[13]. Vegetable growers in Thee Kone had followed their traditional method of vegetable growing until recently when GRET introduced improved vegetable cultivation methods and provided innovative irrigation system. In their traditional systems, vegetable growers in Thee Kone did not apply chemical fertilizers. The most commonly grown vegetables are cucumber, coriander, Roselle, water cress, bitter gourd, yard long bean, bottle gourd, okra, and snack gourd. In fact, there are more than 20 varieties of vegetable traded, but this study covers only with those grown in the study area. A few farmers in some villages also grow Zaw flowers, mushroom, and betel leaves. Since these crops are categorized as non-vegetable cash crops and their production is still limited, they are presented separately in this report.

Vegetable growers in Thee Kone can grow vegetables for three times a year including two times in monsoon season and one time in winter season. The volume of vegetable production in winter is the highest, but it is usually concurrent with the peak season of vegetable growers in Kaing area that prices are significantly low. Though they grow various types of vegetable, farmers in Thee Kone earn 90% of their income from radish which they used to sell both as leaves and tubers. Vegetable growers in Thee Kone prepare their vegetables to be clean and tidy that they fetch the satisfaction of consumers. Vegetable growers sell their vegetables either to local

[13] The average grown area is 0.4 acre according to the project data of GRET Bogale.

collectors in villages or wholesalers in Bogale. For most of the times, vegetable growers choose to sell to collectors since wholesalers often reject their vegetables during peak season whereas collectors keep regular buying. Even farmers who sell to wholesalers in Bogale have two options as to whether to sell their vegetables by themselves or just send to the wholesalers by line boats.

Vegetables from Thee Kone area go to a number of urban and rural market centers in Bogale and Mawkyun Townships mainly through collectors who engage in mobile trading. There are about 26 collectors in Thee Kone and their total traded volume of radish together amounts about10, 888 bundles per day. These collectors sell the vegetables by their own boat and charge as high as 40% of the original price of some vegetables as profit which is the highest among values created by the various actors along Thee Kone-based vegetable value chain. Once they travel with vegetables, it takes about 1-3 days per trip and cost about 6-8kyats/viss (of vegetable) for a travel time of one hour[14]. They also trade with vegetables from Kaing and Yangon when vegetables from Thee Kone are no longer available.

In addition to the major vegetable-growing villages in Thee Kone area, there are some villages growing vegetables and are not linked to the conventional vegetable value chain of the region. The distinctive features of vegetable growers in those villages are that they keep their vegetables organic and sell only to their neighboring 4-5 villages. Vegetable growers in those villages are still convenient until now since people prefer organic vegetables and the prices of organic and chemical vegetables are almost the same. Since this locality market functions, it later becomes isolated from the main vegetable market chain. However, the sustainability of those markets might be questionable if vegetables treated with chemical fertilizers enter the market at prices significantly lower than the locally produced organic vegetables. One important point worth critical consideration is about whether consumers in those particular markets will be willing to pay more for organic vegetables if prices vary significantly.

One of the major constraints limiting vegetable production remain continued heavy rains in monsoon season during which competition from other vegetable-growing areas are the lowest and vegetable prices are the highest. Prolonged heavy rains in monsoon season usually result in certain losses due to the incidence of pests and diseases. Another constraint that limits marketing is that vegetables treated with chemical fertilizers can easily get spoiled according to retailers in the end markets. Once vegetables get spoiled, they spoil in the hands of retailers who used to bear the losses due to spoilage. Along the Thee Kone-based vegetable value chain, therefore, retailers are those who suffer most from the state of vegetable quality and processing/storage facilities being poor. Situations are worsened by the distant location of rural market centers which lengthen the storage times of vegetables without proper storage facilities.

[14] Calculated based on travel time using data provided in Section 4.4.

Apart from the issues related to production and marketing, the most significantly lacking parts of Thee Kone-based vegetable value chain are enabling environments and support services which are usually beyond the capacity of farmers and development agencies. As it has been known, public services in the previous government are not interested in providing policy and legal support to smallholder farmers. This much limits the support services needed by vegetable growers. Fortunately, such support services like skills training are provided by development agencies. Yet, the capacity of existing development agencies is limited again as characterized by the changing government policies. At local level, vegetable growers are not organized well to penetrate the market together due to the lack of the tradition of doing business in group. In fact, there is a need of innovation in every stage of Thee Kone-based vegetable value chain. But any innovative intervention might be more effective and efficient in terms of bringing impacts if such intervention is exceeded by a thorough piloting.

## 13. Recommendations

Recommendations for this report are made in a way they can be translated into practices in the real world situations.

### 1) To Growers

- While most hybrid vegetable seeds yield more, farmers cannot keep the seeds for the next crop. Since farmers in the study area increasingly adopt hybrid seeds, there is a risk of extinction for local varieties. Therefore, local varieties of vegetable need to be conserved.
- Farmers heavily depend on chemical fertilizers for increased production of vegetables. Some farmers even apply nitrogen fertilizer just before harvest so to have their vegetables more fresh and attractive. Such treatment affects the storage shelf life of vegetable. Reduced use of chemical fertilizer supplemented with organic fertilizer might be effective.
- More vegetable farmers in Thee Kone area mainly focus on radish and repeat growing the same crop on the same land every year that the potential risks of loss are high in terms of production and marketing. Adoption of crop diversification can make their vegetable business more productive and sustainable.
- Most farmers in the study area employ traditional methods of vegetable growing and have been successful for many years. But many pest and disease problems often go beyond their capacity of control, resulting in severe losses. Farmers need to regularly obtain technical advices from experts.
- As most farmers in Thee Kone focus on monsoon vegetables, the benefit is that competition from Kaing is low and vegetable prices are high. The daunting part is that vegetable growing in monsoon season is subject to various constraints like continued heavy rains, high incidence of pests and diseases, etc. An innovative, affordable, and semi-protected cultivation system is worth exploring.

- In addition to improper use of chemical fertilizer and improved storage facilities, poor processing/storage and high ambient temperature shorten the storage life of vegetables. Yet improved cool storage facilities might not be affordable to farmers. There is a need to experiment natural cool storage system by utilizing local materials like sand.
- Though the types of vegetable already grown by farmers are already various, there are some vegetables like tomato, cabbage and cauliflower which farmers do not grow and are highly demanded in the market fetching high prices. Growing of these crops together (diversification) or alternately (rotation) with existing vegetables may insure their regular incomes and reduce potential risks of loss.
- Until now, vegetables growers work individually both in production and marketing and group behavior is limited. This costs them higher transport charges, low bargaining power, and limited sharing of market information. Though forming into groups might not directly benefit production, it might be an effective tool at least in marketing even in the short run. In the long run, those farmer groups can grow into formal association and leverage the processes towards contract farming.
- For farmers in villages outside Thee Kone area with raised threshing grounds left being unused, utilization of those threshing grounds for vegetables might reduce the risks of loss in monsoon. Possible innovations worth integrating into vegetable growing on raised threshing grounds can be semi-protected cultivation, pot planting, etc.

**2) To Development agencies**

- Conservation of local vegetable varieties is quite important to ensure the sustainability of vegetable business. However, it will not be effective if farmers do not have proper knowledge about seed preservation. There is a need for development agencies to facilitate the conservation of local varieties by farmers.
- Though organic vegetables are known for their quality in terms of taste, health, and environment, they are also known for their lower yield and majority of vegetable consumers in Myanmar are not yet in the position to choose organic against chemical if prices are significantly different. A better and more realistic approach right now can be a combination of organic and chemical fertilizers in vegetable growing. This being one feature of conservation agriculture will maintain high yield without affecting the quality of vegetables. Development agencies can provide awareness-raising and technical training.
- Though crop diversification is expected to diversify products and incomes and reduce the risks of loss that might arise from mono-cropping of vegetable, farmers might not easily adopt such transition unless they are well aware of the benefits. They might have problems also in growing new crops. Development agencies can assist in the adoption of cash crops like tomato, cabbage, cauliflower, Zaw flower, mushroom, and betel leaves.

- Continued heavy rains monsoon and the subsequent incidence of pests and diseases pose risks of loss. In this case, it is worth conducting practical trial on semi-protected or anti-season[15] vegetable cultivation. Semi-protected design could be as simple as the ones being tested in Pa Det and Toe Hla by WHH, but with gutters which are connected with drip irrigation pipes down to the ground. Development agencies can conduct a trial and scale up the results if positive.
- Losses due to spoilage of vegetables almost always happen in the hands of retailers in rural market centers due to the very long way/time of transportation. According to this assessment, among others, improper use of fertilizer and high ambient temperature contribute to the rapid spoilage of transported vegetables. Development agencies can assist in exploring (by conducting trial) a natural and low-cost cool storage system using locally available materials like sand.
- During the assessment, 'lack of capital' is one of the most repeated answers to questions asking farmers about their needs. Mobilizing savings could be an approach probably contributing to farmers' capital need and the cultivation of group behavior among farmers. Development agencies can mobilize savings and cultivate group behavior among farmers.
- Saving groups can increase capital and cultivate group behavior at grassroots level, but might not contribute to the value chain for the benefits of growers. Saving groups are not supposed to have proper access to timely market information required for process upgrading and technology innovation. Development agencies can facilitate the establishment of linkages, networks, and mechanism for sharing market information among the groups.
- Contract farming can ensure regular market and market prices for vegetable growers while ensuring regular supply for private industries. If a farming is contracted, the farmers are responsible to provide the product volume and quality required by the contracting industry who is in turn responsible for offering prices as prescribed in the contract. Though contract farming can be a good opportunity for farmers, there are certain requirements that should be met by farmers and farmers are not well aware of them. Development agencies can provide awareness-raising on the potentials, processes, and pros and cons of contract farming.
- There are many issues manifested by farmers and development agencies. However, any attempt aimed at tackling those issues (legal, technical, and financial) usually get in vain without the involvement of government. Also all those issues are governed by policy that development agencies can advocate the government to formulate policies supporting the activities proposed for dealing with the issues mentioned above.

**3) To Policy makers**

- We are quite sure that the government has been following pro-poor policies. But those policies are not matched well with situations on the ground that their

[15] The term anti-season is borrowed from World Bank. The idea is about to make vegetable growing possible under difficult situations and capture the highest prices caused by scarcity.

effectiveness is minimal. There is a need of policies that really represent the issues of people in grassroots communities.

- Majority of citizens in Myanmar are farmers and those farmers do not survive only on food alone, but need cash incomes to meet their other basic needs. Both food production and income generation need capital and technology. Therefore, provision of financial and extension services to smallholder farmers (vegetable growers for this study) is worth taking into consideration while formulating government policies.
- Most development agencies in their efforts to assist subsistence farmers mainly depend only on technologies and equipment available in the country. Any product or service produced using those technologies and equipment usually fail to find proper access to market. But development agencies and farmers are normally not in the capacity to access technologies and equipment needed for marketable products. The government can facilitate the acquisition of those technologies and equipment through appropriate export channels.
- Experience shows that organic farmers in Thailand are not profitable, yet they can survive as the government subsidize their losses. In Myanmar, farm business is seen as a business with the highest risks of loss. The government can initiate a system of crop insurance and/or subsidy in order to redeem farmers from total failure.
- If production (of vegetable) increases and consumption remains the same, there will be over-supply of vegetables and the livelihoods of smallholder farmers might be greatly affected. Such risks can be reduced if the government can facilitate exporting of the vegetables of smallholder farmers provided that the products have export quality.

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## Appendices

### A. Study sample of the assessment

(Village selection was made in consultation with field teams of GRET and WHH in Bogale)

| S. No | Town/Village | Types of Informants | | | | | |
|---|---|---|---|---|---|---|---|
| | | Growers | Collectors / Small Traders | Whole-salers | Sub-Wholesalers | Retailers | Total |
| 1 | Saw Kae Chaung | 2 | 2 | 0 | 0 | 0 | 4 |
| 2 | Mawkyun | 0 | 0 | 0 | 0 | 1 | 1 |
| 3 | Painee Chaung | 6 | 0 | 0 | 0 | 0 | 6 |
| 4 | Thabyu Kone | 5 | 0 | 0 | 0 | 0 | 5 |
| 5 | Pa Det | 8 | 0 | 0 | 0 | 0 | 8 |
| 6 | Minn Hla Su | 3 | 0 | 0 | 0 | 0 | 3 |
| 7 | Bogale | 0 | 0 | 3 | 1 | 1 | 4 |
| 8 | Toe Hla | 8 | 2 | 0 | 0 | 2 | 12 |
| 9 | Setsan | 0 | 0 | 0 | 1 | 2 | 3 |
| 10 | Phoe Thar Aye | 7 | 3 | 0 | 0 | 0 | 10 |
| 11 | Ahmar | 0 | 0 | 0 | 2 | 0 | 2 |
| 12 | Kadon Kani | 0 | 0 | 0 | 2 | 0 | 2 |
| 13 | Wah Net Kone | 8 | 3 | 0 | 0 | 0 | 11 |
| 14 | Pan Kha | 4 | 0 | 0 | 0 | 0 | 4 |
| | **Total** | **51** | **10** | **3** | **6** | **6** | **76** |

## B. Assessment checklists

**B1: Inputs Suppliers**

(Method: Semi-Structured Interview, Case Study, Observation)

*Name/Village/Phone Number*

- How many inputs suppliers in this market/Town?
- How long have you been in this business?
- Why do you engage in this business?
- What items/goods do you sell for farmers?
- Where do you buy those items/goods?
- How do you choose your sold items?
- Which items are mostly bought by farmers?
- What are your buying prices of those items?
- What are your selling prices of those items?
- Mode and costs of transportation
- Do you have any support service to farmers (e.g. loan, selling in credit, etc.)?
- How do farmers mostly buy your goods – in cash or in credit?
- When bought in credit, can farmers repay in time?
- If not, how do you settle the problem?
- Do you think you are profitable in selling farm inputs?
- If not, how and why?
- How do you get price/market information?
- Do you have any linkage (horizontal/vertical) with other actors?
- In your opinion, who control prices? How?
- In your opinion, who govern the vegetable value chain? How?
- Is there any competition among inputs suppliers?
- If so, who are your competitors? How is the competition?
- Will you continue trading farm inputs? Why or why not?
- Opportunities
- Constraints
- Your opinion (for further improvement)

**B2: Farmers/Growers/Primary Producers**

(Methods: FGD, Case Study, and Observation)

*Name/Village/Phone Number*

- Do you have land?
- Start of vegetable cultivation started in the village (when, who, why, how)?
- # of vegetable growers in the village
- Types of vegetables grown
- Where do you mostly grow vegetables?
- Location of inputs suppliers
- Investment in cash value (kyats)
- Which vegetable(s) are most preferred/best sold? Why?
- Which vegetable (s) are most grown? Why?
- Grown area per grower
- Yield rate/volume (viss)
- Consumption/sales volumes? If not sold, why?
- Where do you sell vegetables? (…to whom? Provide name and contact number)
- Prices by type of vegetables
- Modes and charges of transportation, if any?
- How do you get price information?
- Do you get profit from selling vegetables? If so, how much per year/season?
- Who decide vegetable prices?
- Do you think prices are fair?
- Do you do any value adding activity on your products? If yes, why and how?
- Does it really add values to your product? If so, how and how much?
- How is your relationship (horizontal) with other farmers? (Any networks?)
- How is your relationship (vertical) with middle dealers/collectors?
- How do you link/relate (vertical) with higher chain actors, if any?
- Who are your competitors? How is the competition?
- Who mainly do growing (men and women)?
- Who mainly do selling (men and women)?
- External support received (in kind and in cash), if any
- Will you continue growing vegetables?
- Opportunities
- Constraints
- Your opinion (for further improvement)

**B3: Middle Dealers/Collectors**

(Method: Semi-Structure Interview, Case Study, Observation)

*Name/Village/Phone Number*

- When did you start (how long have you been in) this business?
- # of middle dealers/collectors in this market?
- Types of vegetables traded?
- Bought volumes (viss) by types of vegetable this year
- Buying prices by type of vegetable (kyats)
- Sold volumes (viss) by types of vegetable this year
- Selling prices by type of vegetable (kyats)
- How do you get price information? From whom?
- Types of vegetables traded?
- Bought volumes (viss) by types of vegetable this year
- Buying prices by type of vegetable (kyats)
- Mode and charges of transportation, if any?
- Sold volumes (viss) by types of vegetable this year
- Selling prices by type of vegetable (kyats)
- How do you get price information?
- Where do you mostly buy villages (village)?
- From how many growers do you used to buy vegetables?
- To how many buyers (wholesalers) do you sell?
- Are you involved in deciding prices?
- If yes, on what basis (type, quality, etc) do you decide?
- Do you further process vegetables?
- Do you do any value addition? If yes, how and how much?
- Do you think prices are fair?
- Are you profitable in vegetable trading?
- In your opinion, what control prices?
- How is your relationship with farmers?
- How is your relationship with wholesalers?
- What is your relationship with other middle dealers?
- Who are your competitors? How is the competition?
- In your opinion, who govern the vegetable value chain?
- Is there any support service?
- Opportunities
- Constraints
- Your opinion (for further improvement)

**B4: Wholesalers**

(Method: Semi-Structured Interview, Case Study, Observation)

*Name/Village/Phone Number*

- When did you start (how long have you been in) this business?
- #of wholesalers in the market
- Types of vegetables traded?
- Bought volumes (viss) by types of vegetable this year
- Buying prices by type of vegetable (kyats)
- Sold volumes (viss) by types of vegetable this year
- Selling prices by type of vegetable (kyats)
- Which vegetable do you usually trade? Why?
- How do you get price information?
- From whom do you mostly buy vegetables?
- How many suppliers (middle dealers/collectors) do you have?
- To whom do you mostly sell vegetables?
- How many buyers/retailers do you have?
- Do you pay for transport charges? If how, how and how much?
- Is there any vegetable being not sold and you would like to trade? Why?
- Do you think vegetable trading is profitable for you?
- If yes, how much income this year? If not, why?
- Are you involved in deciding prices? If yes, how?
- If not, who decide the prices?
- Do you do any value adding processing to your traded vegetables?
- If yes, what kind of processing/value-adding activity?
- If yes, how and how much?
- Do you have linkage with middle dealers? How?
- How is your relationship with other wholesalers?
- How is your relationship with retailers?
- Who are your major competitors?
- How if the competition?
- Is there any support service?
- Will you continue doing vegetable trading?
- Opportunities
- Constraints
- Your opinion (for further improvement)

**B5: Retailers**

(Method: Semi-Structured Interview, Case Study, Observation)

*Name/Village/Phone Number*

- How long have you been in vegetable retail market?
- # of retailers in the market?
- Types of vegetables traded?
- Bought volumes (viss) by types of vegetable this year
- Buying prices by type of vegetable (kyats)
- Sold volumes (viss) by types of vegetable this year
- Selling prices by type of vegetable (kyats)
- Which vegetable do you usually trade? Why?
- How do you get price information?
- Modes and charges of transportation, if any?
- From whom do you mostly buy vegetables?
- How many suppliers/wholesalers?
- To whom do you mostly sell vegetables?
- How many buyers/customers do you have?
- Is there any vegetable being not sold and you would like to trade? Why?
- Do you think vegetable trading is profitable for you?
- If yes, what is your daily income? If not, why?
- Are you involved in deciding prices? If, yes, how?
- If not, who decide the prices?
- Do you do any value adding processing to your traded vegetables?
- If yes, what kind of processing/value-adding activity?
- If yes, how and how much?
- Do you have linkage with wholesalers? How?
- How is your relationship with other retailers?
- How is your relationship with consumers?
- Who are your major competitors?
- How is the completion?
- Is there any support service?
- Will you continue doing this business?
- Opportunities
- Constraints
- Your opinion (for further improvement)

## C. Preliminary criteria for value chain selection

(Developed in consultation with Market Development Officer of GRET Bogale)

| S. No | Vegetables | Chain Selection Criteria | | | | | Total Score |
|---|---|---|---|---|---|---|---|
| | | Market demand | Suitability of crop | Profit-ability | Farmers' Preference | Potential growth | |
| 1 | Betel leaves | 5 | 2 | 5 | 5 | 3 | 20 |
| 2 | Cucumber | 5 | 5 | 4 | 4 | 5 | 23 |
| 3 | Coriander | 2 | 1 | 3 | 2 | 2 | 10 |
| 4 | Zaw flower | 3 | 3 | 2 | 2 | 3 | 13 |
| 5 | Roselle | 4 | 5 | 5 | 4 | 5 | 23 |
| 6 | Water cress | 3 | 3 | 3 | 2 | 2 | 13 |
| 7 | Bitter gourd | 3 | 4 | 3 | 4 | 3 | 17 |
| 8 | Yard long bean | 4 | 3 | 4 | 3 | 5 | 19 |
| 9 | Bottle gourd | 3 | 2 | 3 | 3 | 3 | 14 |
| 10 | Raddish | 4 | 3 | 3 | 3 | 4 | 17 |
| 11 | Tomato | 3 | 1 | 4 | 1 | 1 | 10 |
| 12 | Okra | 3 | 3 | 3 | 2 | 2 | 13 |
| 13 | Chili | 3 | 3 | 3 | 2 | 1 | 12 |
| 14 | Water melon | 4 | 1 | 5 | 1 | 1 | 12 |
| 15 | Snake gourd | 4 | 3 | 5 | 3 | 5 | 20 |
| 16 | White gourd | 1 | 1 | 4 | 1 | 1 | 8 |
| 17 | Brinjal | 4 | 2 | 3 | 2 | 1 | 12 |

Score:

5= Highest

4= Upper medium

3= Medium

2= Lower medium

1=Lowest

## D. Selected field photos

Land preparation for radish in Phoe Thar Aye

Thriving leaf radish in Phoe Thar Aye

Mulched Roselle beds in Wah Net Kone

A sub-wholesaler in Ahmar

A retailer in Setsan

Growers selling vegetables at Bogale jetty

Zaw Bayin, the most expensive among Zaw flowers in Saw Kae Chaung

Women employment through Zaw flower processing in Saw Kae Chaung

A new mushroom grower in Pa Det

Rat ear mushroom in Bogale

Linshi mushroom in Bogale

Vermicomposting in Min Hla Su

Semi-protected structure in Toe Hla