

Executive Summary

The Food Security Working Group (FSWG) is a member based network of non-governmental organizations, community based organizations and individuals addressing food security in Myanmar. The FSWG directly engages with members to develop their knowledge and skills on food security and mobilizes the collective capacities of the network to identify and formulate issues for research, dialogue and policy advocacy that will benefit the lives of vulnerable communities in Myanmar.

Currently FSWG is implementing a three-year project funded by the Livelihoods and Food Security Trust Fund (LIFT) aimed at “Harnessing resources and partnerships to achieve food security in Myanmar”. These grants support knowledge sharing, capacity building of FSWG members to include food security activities in their programming, and the promotion of pro-poor public policies and practices in Myanmar.

As part of its support to members, FSWG has launched a call for food security related research proposals. The overall objective of the FSWG Evidence-based Research Program is to strengthen evidence-based information and research to influence food security and livelihoods programming and to support the growth and capacity of FSWG’s members in the fields of food security, agricultural development and consumer protection.

Specific objectives of this study:

- To provide an overview of food safety issues at different stages of the vegetable value chain in Myanmar
- To improve the safe production of vegetables by suggesting to all actors concerned - including policy makers - better ways of producing and selling vegetables, free from agro-chemical residues.
- To provide inputs for awareness programs and trainings by highlighting the misuse of agrochemicals in current vegetable production in order to improve the safety of farmers, of consumers, and of their environment

This research emphasizes on the current issues pertaining to vegetable safety along the whole supply chain including production and post-harvest management, transportation, wholesaling and retailing of vegetables in different outlets. Finally, consumer knowledge of basic nutritional facts in Myanmar is assessed.

Methodology used for data collection:

The Research Team consisted of five members who are well experienced in their relevant fields of agricultural development and consumer protection.

- (1) surveys conducted with 180 vegetables growers; 84 retailers, 18 wholesalers, 18 transporters and 30 consumers along the supply chain; the team also conducted interviews with key informants from 18 restaurants and 3 supermarkets to study how they prepare the food for the consumers
- (2) Focus group Discussions with key informants from the Plant Protection Division, the Vegetables and Fruits Research and Development Center and Golden Key Agrochemical Company.
- (3) Literature review and review of other relevant documents to get an overview of food safety issues pertaining to vegetables in parts of Myanmar that are not directly covered by the surveys.

Vegetable wholesale:

Interviews with wholesalers and observations at their warehouse show that workers are not well trained in handling vegetables; this is often done in a very rough way, which can make bruises and damages; inappropriate containers are used; the vegetables are heaped directly on the ground; injuries often happen because there is no protective lining in the big bamboo basket and the the warehouse is not cleaned regularly.

Vegetable transport

Interviews with transporters reveal that: untrained workers load vegetables in the vehicles; there is a limited use of covered transport vehicles; there is no temperature control to make sure the atmosphere is suitable for the produce; vegetables are mixed with other non-compatible produce; there is rough handling during loading and inappropriate stacking.

Retailing at supermarkets:

During the visits and observations conducted at the supermarkets, it was observed that: workers pack and handle produce under a shed; some of the workers are well trained; all supermarkets have packing equipment and tables and use clean water and all workers avoid using equipment, which provoke injuries to the vegetables.

Consumers

The consumers in the urban area have basic knowledge of health issues pertaining to vegetable consumption and the importance of using clean water and clean utensils for cooking. Moreover, all interviewed urban consumers knew of the nutritional value of vegetables.

Conclusions and suggestions derived from the research include:

- The Pesticide Law should stipulate that companies selling pesticides should provide PPE together with the agro-chemical.
- The reason why farmers apply pesticides above the required dose may be due to pesticide resistance or limited efficiency of the chemical components. This issue should be solved **urgently** (PPD from DoA and chemical dealers)
- The selection of appropriate pesticides adapted to crops especially for vegetables must be made easy.(Clear PHI on label-Pesticide Law)
- Handy chemical analysis kits should be arranged for farmers, PPD & FDA staff. (DoA, Ministry of Health)
- Keeping Crop Record Books must be started. First in Research Centers & YAU and the practice should later be transferred to farmers. (MoAI, then BY Law)
- Transportation of vegetables to faraway places/cities should be done using cars with cold chambers to limit food waste and secure food safety.
- More in depth research on vegetable safety and postharvest issues should be done for consumer safety and exports. (DAR, YAU, FDA)

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Acronyms

ASEAN	-	Association of South East Asia Nations
ATD	-	Agriculture Technology Development
AVRDC	-	Asian Vegetable Research & Development Center
DAR	-	Department of Agriculture Research
DoA	-	Department of Agriculture
DoH	-	Department of Health
F₁Seed	-	Hybrid seed
FGD	-	Focus Group Discussion
GAP	-	Good Agriculture Practices
GRET	-	Group of Research and Exchange Technology
IPM	-	Integrated Pest Management
LIFT	-	The Livelihoods and Food Security Trust Fund
MAA	-	Myanmar Agro Action
MCU	-	Myanmar Consumers Union
MoAI	-	Ministry of Agriculture and Irrigation
OP	-	Open pollinated
PHI	-	Pre Harvest Interval
PPD	-	Plant Production Division
PPE	-	Personal Protective Division
PRB	-	Pesticide Registration Board
QASAFN	-	Quality of Assurance System for ASEAN Fruits and Vegetables
VFRDC	-	Vegetables, Fruits Research and Development Center
YAU	-	Yezin Agriculture University

1 Introduction

The Republic of the Union of Myanmar is the second largest country in Southeast Asia (with a land area of approximately 677,000 square kilometers). It has abundant arable land, forests, natural resources, minerals, gas, oil and freshwater and marine products. It has an estimated population of about 59.13 million in 2010 and average growth rate of 1.29 percent per year (Zaw Aye Moe, 2013). Myanmar's economy is chiefly agro-based, including fisheries and forestry, and the sector accounts for nearly half the total economic output of the country and employs more than 60 percent of the total labor force (FAO, 2013).

The objectives of the agriculture sector as stipulated by the Ministry of Agriculture are: to fulfill the domestic consumption needs; to export the surplus of agricultural products to earn foreign exchange and to support rural development through agricultural development.

The key factors for development are: the creation of profitable and sustainable markets for the farmers, the utilization of good quality seeds to produce quality products with higher prices and the adoption of good agricultural practices. (MOAI, 2012)

The development of vegetable production is absolutely necessary in the context of modern agriculture. It is one of the quickest ways to increase food and nutrition security through coverage of larger areas with high yielding varieties of vegetables which have a short productive cycle, are grown almost year round and provide sustainable employment to a large number of farm families in both rural and urban areas.

Vegetable demand at present is strong, unsatisfied, and expected to continue expanding in the future as there will be more urbanization and increased income leading to an increase in the consumption of vegetables. Myanmar is relatively rich in natural resources and has a rich agriculture, livestock and fishery biodiversity. Although rice is grown as it is the staple food of the Myanmar people, other cereal crops such as corn, wheat, as well as numerous vegetables crops and crops useful for consumer goods and industrial use present a potential in agriculture diversification which could lead to the development of the nation in a sustainable manner (Mandal, 2008).

2 Background and rationale of the research

2.1 Background

The Food Security Working Group (FSWG) is a member based network of non-governmental organizations, community based organizations and individuals addressing food security in Myanmar. The FSWG directly engages with members to develop their knowledge and skills on food security and mobilizes the collective capacities of the network to identify and formulate issues for research, dialogue and policy advocacy that will benefit the lives of vulnerable communities in Myanmar.

Currently FSWG is implementing a three-year project funded by the Livelihoods and Food Security Trust Fund (LIFT) aimed at "Harnessing resources and partnerships to achieve food security in Myanmar". These grants support knowledge sharing, capacity building of FSWG members to include food security activities in their programming, and the promotion of pro-poor public policies and practices in Myanmar.

As part of its support to members, FSWG has launched a call for food security related research proposals. The overall objective of the FSWG Evidence-based Research Program is to strengthen evidence-based information and research to influence food security and livelihoods programming and to support the growth and capacity of FSWG's members in the fields of food security, agricultural development and consumer protection.

2.3 Objectives of the research

2.3.1 Overall objective:

To understand the current situation, opportunities and constraints of the vegetable supply chain from vegetable production on the outskirts of Yangon to their wholesaling and retailing at local markets and supermarkets. The focus is given on assessing the food safety hazards linked to chemical residues found on the vegetables.

2.3.2 Specific objectives:

- To suggest improved practices in order to get vegetables free from agrochemical residues (to ensure food safety through improved production practices);
- To plan awareness programs and trainings by highlighting the misuse of agrochemicals in current vegetable production practices in order to protect farmers, consumers, and their environment from hazards linked to these toxic products;
- To improve the current vegetable supply chain in view of protecting consumers' health
- To suggest concerned organizations actions required to vegetable food safety issues.

3 Research Methodology

The methodologies used for data collection is three fold:

- (1) Review of literature and other relevant documents to get an overview of food safety issues regarding vegetable production in parts of Myanmar that are not directly covered by the surveys.
- (2) Surveys conducted with 180 vegetables growers; 84 retailers, 18 wholesales, 18 transporters and 30 consumers along the supply chain
- (3) Focus Group Discussions (FGDs) with key respondents from the Plant Protection Division, the Vegetables and Fruits Research and Development Center and Golden Key Agrochemical Company.

3.1 Secondary data collection (Literature review)

Collecting secondary data from research and thesis papers from Yezin Agriculture University, and other appropriate literatures such as An Introduction to ASEAN Good Agriculture Practices (ASEAN GAP), Managing food safety and post-harvest quality of fruits and vegetables, Proceedings workshop on vegetable for sustainable Food and Nutritional Security (FAO), Our right to safe food (Consumers' Education Program of Myanmar Consumers Union), Evaluation of programs to ensure food safety (WHO), Managing food safety and postharvest quality of fruit and vegetables Myanmar, and Quality insurance systems for ASEAN fruits and vegetable project.

3.2 Surveys

3.2.1 Organisation of the surveys

Information collection from vegetable farmers, retailers, wholesalers, transporters and consumers was done as a survey via prepared questionnaires.

Questions to the wholesalers:

- How to collect and transport from growers
- How to prepare to store and use of stoning equipment
- Selling system
- Disposal of waste vegetable
- Provision of training to the workers for their personal hygiene.
- Awareness of food safety, health and environmental knowledge.

Questions to transporters:

- Types of vehicles used

Transport system from farm to local markets. How are the loads protected from water loss and exposure to the sun; what is the stacking system used for loading.

Questions to the consumers

Consumers included people who prepare food for family members and chefs in restaurants who prepare food for consumers.. All consumers were interviewed while they were buying vegetables at the market or returning from markets

- How are the vegetable purchased from retailers and wholesalers chosen
- How is food prepared and cooked
- Storage system to maintain fresh vegetables
- Awareness of nutritional value of vegetables.

3.2.3 Location of the survey

The study area chosen to analyze the supply chain process included Thingankyun, Thanlyin, Mingaladon, Mayangone, South and North Okkalapa, and Twantay townships in Yangon Region and Paungde Township in Bago Region.

Wholesalers, transporters, retailers and consumers were chosen from Township City Development markets and Thirimingalar main wholesale market. Apart from those, 3 supermarkets (*City Mart, Capital Diamond Star, and Super One*) in Yangon were also selected to study storing and preparation of fresh vegetable for retail sale.

18 restaurants were also chosen to observe practices including storage, handling and preparation of vegetable to cook and serve to the consumers.

Direct observations were made while interviewing the different groups along the supply chain, and pictures were taken to record the practices and the situation in the survey area.

The four research teams supported one another during the surveying period. The research teams also delivered manual booklets and knowledge sharing papers to vegetable growers and consumers. Moreover, the team leaders provided awareness raising discussions with consumers in Paungde Township in Bago Region.

4.2.2 Retailers

During the survey conducted with 84 retailers, selling system was assessed.

64 (76%) out of the 84 retailers were road side sellers and 20 were selling from their own shop. Most of the retailers use waste water to wash vegetables. In Thirimingalar wholesale market some retailers heap the vegetables directly on the ground near the drain. All of them use bamboo containers and bamboo trays.

The capital for the vegetable sale is about 150,000 MMK to 500,000 MMK per day. Roadside sellers who invest about 150,000 MMK per day can be considered poor small sellers. Shop owners selling vegetables can be considered as large scale sellers. The majority of the retailers be them small or large scale are indebted either to wholesalers or relatives. 70% of small scale sellers state that collateral and a good reputation makes it easier to get a loan. When borrowing with collateral, the interest rates amount to 5% to 8% compared to 10% to 20% without collateral or even 30% to 40% for a daily pay system. Other adult members of the family have another job to cover daily costs, education of children and their health expenses. Most of the small sellers do not have surplus for saving once they repay their debts. Lack of education and knowledge of post-harvest handling are connected with each other. This is a basic cause of poverty cycle.

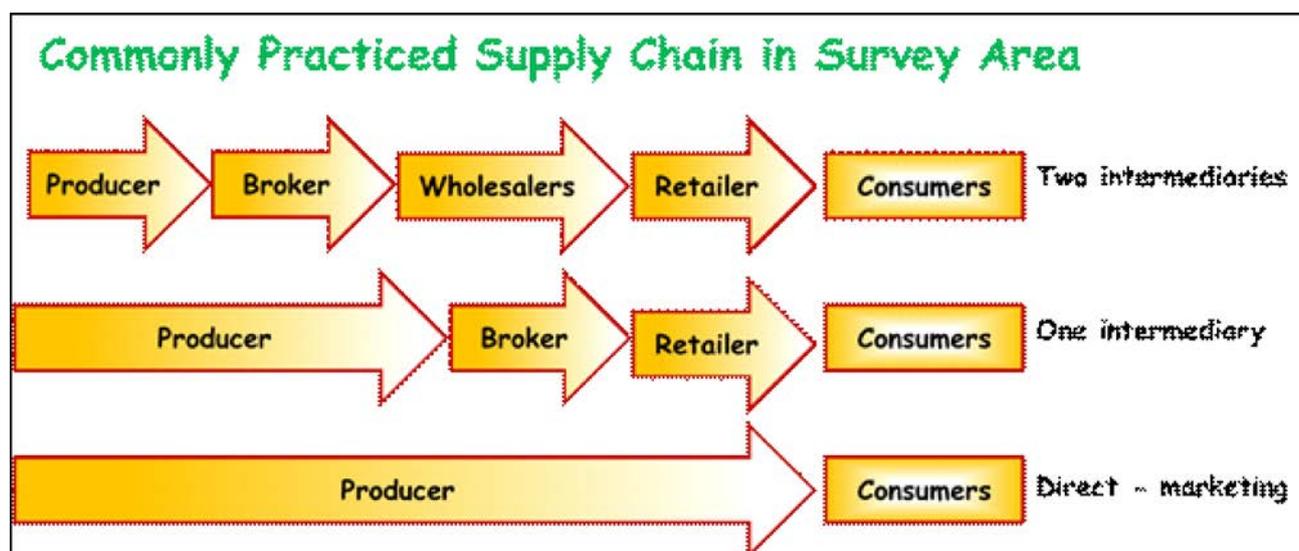


Figure 8 Vegetable food supply chains

4.2.3 Good Agricultural Practices (GAP) and Food Safety issues

The research findings revealed that pre-harvest practices and post-harvest practices were very different from the GAP guidelines in vegetable production.

Improper **pre-harvest practices** were observed in the surveying area at different stages of the supply chain.

- Most farmers use pure animal manure like cow dung for soil preparation but they do not make compost.
- All farmers use chemical fertilizers and pesticides excessively. Most of them lack knowledge on agrochemical use, although they have a long experience in vegetable growing
- Only 10% of growers store agrochemicals in a secure area away from the fresh produce
- Most pesticides used are not legally approved and there are no labels in Myanmar language
- 80% farmers do not use suitable protective clothing and equipment during pesticide application

Key finding by interviewing transporters:

- Untrained workers to load vehicles
- limited use of covered transport vehicles
- no temperature controlling system
- Mixing with non-compatible produce
- Rough handling during loading and inappropriate stacking.
- Lack of awareness on transportation system to follow GAP.



Figure 14 Vegetables in improper transportation

Information gathered through the survey of supermarkets

- Workers pack and hold the produce under a shed
- Some workers are trained
- All supermarkets use packing equipment and tables and wash with clean water
- All workers avoid using equipment, which risks causing injuries to the vegetables

Information gathered from consumer survey

- Consumers in urban area had more knowledge in health than the rural consumers
- Use clean water and clean preparation for cooking.
- All in urban area know the nutritional value of vegetables.

There were some positive findings among farmers, transporters, retailers and consumers, these are shown in Fig.15

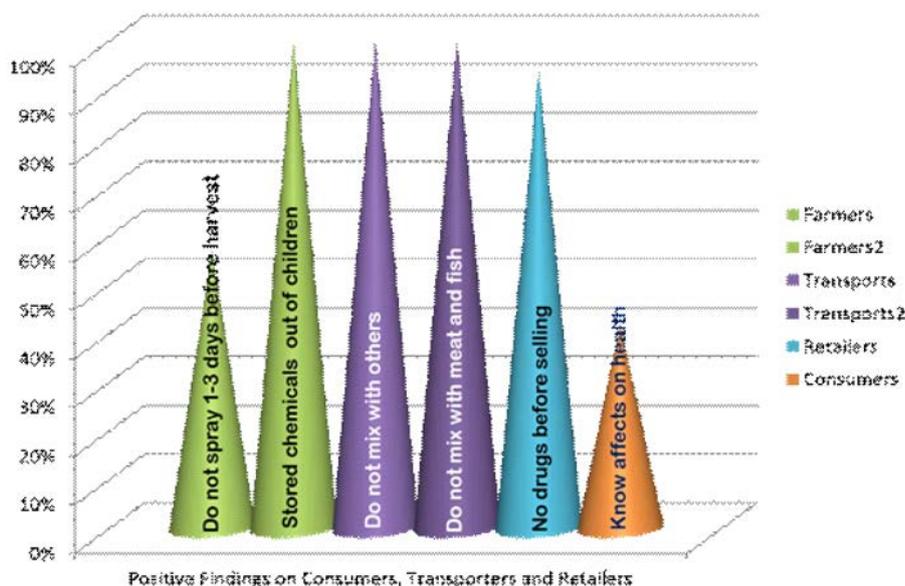


Figure 15 Positive findings among farmers, transporters, retailers and consumers

According to the FAO (2008), causes of postharvest losses and poor quality for various groups of fresh vegetables were mentioned as follows in table 3. This information can be useful for quality maintenance of vegetables.

Some farmers may use not well decomposed animal dung and lime.

B. Chemical Usage

At the centre, chemical pesticides are used including fungicides, insecticide, and nematicides, which are registered at Plant Protection Department. The bottles or bags used are all labeled with readable instructions in Myanmar language. Pre-Harvest Interval is also mentioned in the instruction.



The best control measures should be adopted based on the symptoms observed on vegetables and fruits. All the VFRDC staff is familiar with the law for PPE and Sale Chemicals. Effective spraying is done according to plant needs.

Most farmers do not know PP law for food safety and effective spraying. As a result, natural enemies disappeared because of their pesticide misuse. Most growers do not know the damages caused by pest or diseases very well. Many growers use cheap pesticides (mostly not recognized by Plant Protection Division). Moreover, some growers misused fungicides and pesticides).

C. Harvest

After harvest, fruits and vegetables are washed with clean water. In VFRDC, water resources are extracted through a tube well and the water has already been tested. Crop record during the plant growing season is done by the centre's staff. Most of the farmers and retailers use the water available close to them. It may come from a river, dirty places, or sewage water. However, most of the private growers do not keep farm records due to the lack of time, illiteracy, lack of knowledge etc.



D. As post-harvest

Transportation from field to market is difficult for most of growers. Post-harvest techniques (eg. Canning, preservation methods) were discussed. Vegetable and fruit growers all require cold storage facilities; post harvest techniques and investment support.



E. Export and Import

Some companies are trying to export Vegetables and Fruit abroad after providing a sample to the importer. Most fruits such as apple, orange, grapes, pears are imported.



F. Chemical residue analysis

According to the current system, for horticultural export products, the plant quarantine section checks the produce according to buyers' requirements. Some countries have very strict laws; as a result many Myanmar products cannot be exported.

In recent years, staff from the Plant Protection office tested the cabbage from the Thiriminglar wholesale market for pesticide residues. Chemical residue analysis cannot be done in field and market and there is no handy analysis, apparatus in field.



4.3.2 Plant Protection Division (PPD)

Key informants met

- U Aye Tun Deputy Director General of DoA
- U Tin Aung Win Director of PPD
- Daw Aye Aye Mar Deputy Director from PPD
- Daw San San Lwin Head of Pesticide Registration Board Section, PPD
- Daw Khin Lay Zan Staff Officer of Pesticide Analysis Laboratory Section, PPD

Discussion points:

(1). Registration procedures

A. Pesticides are approved by PRB (Pesticide Registration Board)

B. Myanmar labels must include following facts:

a.i (active ingredient)%,	trade name
Manufacturer	Distributor
Direction for use	Precautions
HWO hazardous classification	Pictogram
Safety (Handling, disposal, storage)	First aid
Antidote	PHI (Pre Harvest Interval)

C. PHI should appear clearly and in bigger font size. At present this is not mentioned in the law.

D. Although PPD has CPA (Certificate for Pesticide Applicators) and other educating trainings; these are not followed by farmers. Pesticide companies should give PPE (Personal Protective Equipment) when they sell the pesticides, and it should be included in the Pesticide Law.

E. *Guarantee of content* (this is not included in the law and does not appear on the label. This should be the duty of the concerned company. Now this is a big problem in the market, and a solution should be found fast.

F. Retail of unregistered pesticides

Currently, PPD staff from the regions and states are taking action for such cases but more staff and handy lab apparatus is required.

Nevertheless, law enforcement is still weak; there needs to be more training for farmers to identify pesticides without registration. Moreover, a detailed survey should be carried out as to why farmers are using those pesticides.

The Pesticide Law was approved on May 1st 1990. Its objectives are:

- To produce effective pesticides
- To decrease health hazards for humans and the environment
- To manage systematic use of pesticides and their registration.

The pesticide law refers to the International Code of Conduct on the Distribution and Use of Pesticides (FAO) which is amended every year by the FAO. There is now an ongoing process for some amendments for Myanmar.

5 Conclusion and suggestions

5.1 Conclusion

In order to improve the production of safe vegetables today, small vegetable farmers should see their socio-economic condition improve. Findings of the research reveal that there are some in-country-program of INGOs and LNGOs who have implemented livelihood development with income generation activities including back-yard gardening in some rural areas. Moreover, MAS is now providing training on GAP with the aim to improve vegetable production in both an economically and environmentally sustainable way. FAO said that there is an urgent need to foster a better understanding of the safer production and market systems by those who are involved in the whole supply chain from farm to table. Here, according to the findings from the research, training on the effective and safe use of pesticide is urgently required for vegetable farmers from Yangon. Moreover, feedbacks from the INGOs (Annex 12), and discussions with key informers from different organizations also highlight that similar training is essential for vegetable growers around Myanmar.

According to the secondary data, fruit and vegetable production using GAP in Myanmar was introduced by Myanmar Agriculture Services in some townships. This must be expanded in order to reach a wide audience with technology transfer not only to rural farmers but also to the private sector. Most of the vegetables are consumed as raw and fresh and present healthy nutritional qualities. Nevertheless, because chemical pesticides are being applied without any care taken as to the dosage, frequency and pre-harvest interval, vegetables produced in the Yangon region may be very hazardous to health.

Vegetable research in Myanmar is not sufficiently developed. Postharvest technologies which follow GAP guidelines will be very important to uplift the livelihoods of all farmers and other stakeholders along the supply chain.

FAO has started to accelerate the research and development of the vegetable sector with relevant consultants and government departments.

Myanmar Agriculture Service (MAS) associated with Myanmar Fruit and Vegetable Production and Exporter Association should encourage vegetable farmers to follow GAP widely.

Necessary training programs, seminars and workshops should be continued to be held periodically.

Cooperative societies of vegetable farmers and micro finance program must be provided to support the livelihoods of vegetable farmers in important areas. Moreover, training on health and environmental conservation will be conducted for those growers. Retailers and wholesalers must improve their personal hygiene as well as that of their workers. They are in desperate need to be trained to use facilities and sanitation.

Whole sale markets are overcrowded, dirty and lack the necessary facilities for loading and unloading produce. Better wholesale market facilities must be provided by the city development committee in relevant townships. In Myanmar, roads are not adapted to the proper transport of fresh vegetables. Drivers, vehicle owners and workers don't know how to stack vegetables properly. Moreover, they have limited personal hygiene. Raising awareness to avoid heaping directly in the car and to limit rough handling is needed.

None of the operators involved in the supply chain have a clear appreciation on how to maintain quality. An effective capacity building program on GAP is needed critically now and should continue to be essential in the future. Other basic requirements include transport by vehicles with cool chambers, appropriate available tools and facilities for storage and transport.

Moreover, fully funded new research will also need to be conducted by research teams.

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Annex 3a: the research team and responsibilities of its members

Duties and responsibilities of the four groups, places and number of respondents

Sr	Team Leader	Duties and Responsibilities	Places where data was collected	Number of respondents and dates interviewed
1	U Yan Lin Team Leader (1)	(1) Field survey Grower interview. Data quality control. Manual books delivery. (2) Collection of secondary data (3) Report Preparation	Vegetables farms on the outskirts of YGN (Yankin, Bauktaw, Thiriminglar, Thinkangyun, Thanlynn, Mingalardon, Tonte and other farms of different regions). Government line Departments under umbrella of DoA. Dealers of Agrochemical companies.	1) 180 growers
2	U ThetOoTeam Leader(2)	Field surveying Interviewing Analyze using Pesticide Appropriate using of chemicals Harmful hazards of pesticide, fungicides and herbicides Support to U Yan Lin to get secondary data and FGD	Vegetable farm of outskirts of (Yankin, Bauktaw, Thiriminglar, Thinkangyun, Thanlyin, Mingalardon, target places and other farms of different regions).Government umbrella of DoA	48 retailers 18 transporter 18 wholesalers 15 consumers
3	U Hla Shwe TeamLeader (3)	Field surveying Interviewing Control data's qualities Deliver knowledgepapers to interviewees Collect Secondary data	(1) Retailers, transporter, wholesalers, consumers of local markets (Yankin, Bauktaw, Thiriminglar, Thinkangyun, Mingalardon, Kongyangone and Tonte) (2) Government line department under umbrella of DoA	40 retailers 18 transporter 18 wholesalers 15 consumers
4	UMaung Maung TeamLeader (4)	Collect Secondary data and conduct for food safety with FDA and other departments	(1)Wholesale markets RestaurantsSupermarkets Consumers of Yangon Township (2) Field surveying Interviewing Control data qualityDeliver knowledge papers to interviewees	18restaurants 3super-market 15 consumers
5	Daw Nu Nu Yi	Collecting of findings, and literatures, data entry and analysis, report writing	Fields and office	

U Maung Maung (Marine Electrical Engineer)

Name of Organization Myanmar Consumers Union

From 1987 to 2006 Worked as a marine electrical engineer in (10) international Oil and Gas Shipping Company.

From 1990 to nowadays Founded the Vocational Technical Training school for young people

From 2012 to nowadays Founder and Secretary General of Myanmar Consumers Union to promote the consumers rights in collaboration with other public interest organization, Government officials, businesses and standard and regulatory.

Organization Profile of Myanmar Consumers Union (MCU)

MCU was formed on the 18th November 2012 and most of the members at the beginning were professionals from different fields such as Health, Education, Agriculture, Engineering, Chemical, Economic and so on.

Objectives of MCU

- To implement the process of educating systematically to all consumers so that they will come to realize their rights.
- To organize all producers all those who are giving services and all distributors and sellers, to do their services systematically with the help of ISO, GMP, HACCP and SOP, so that all products should become harmless.
- To coordinate with the Authority and Ministry concerned to examine, announce and educate concerning with the important goods from abroad so that they should not be the one which are not standardized.
- To Educated concerning the standards and limitations to use of any products, how to store them, How to write information of the ingredients of the products with the comparison of international standards.
- To upgrade and update what is concern with the consumers by coordinating and cooperating with the Ministries concerned, International Organizations and Society Based Organizations.

Daw Nu Nu Yi B.A (History), Intermediate Science (physics)

Business development manager of Shan Maw Myae Co,Ltd. She has been sharing knowledge of organic farming system and environmental conservation in public talk program provided by Shan Maw Myae Co.Ltd, which is a leading business Co of organic farming redevelopment.

She had been attended the training of GAP, conducted by MAS of Parthian Township in 2010, and Organic farm Inspection trained by KOICA International (KoreanLNGO) at VFRDC in Helga Township. She is also a Vice Chairman of DEAR Myanmar, LNGO and E.C Member of Myanmar Consumers Union (MCU).

Organizational profile of Shan Maw Myae Company

Shan Maw Myae Company was established in 2001. The major business activities of Shan Maw Myae Company are as follows:

1. Manufacturing and selling agriculture input products such as bio foliar fertilizers, organic foliar fertilizers and organic pesticide.

Annex 4: List of informants interviewed during the surveys

List of Vegetable Growers

No	Name of Farmer	Township	acre	Date of Survey	Variety of Vegetable
1	Maung Naing	ThinganKyun	1	1.10.13	Mustard, Lettuce
2	U San Naing	ThinganKyun	160 RB	1.10.13	Mustard, Lettuce, Bottle gourd, Drum Stick, Roselle Leaves
3	U Nyo	ThinganKyun	40 RB	1.10.13	Drumstick, Roselle Leaves, Lettuce, Mustard
4	U Pho Ngwe	ThinganKyun	50 RB	1.10.13	Mustard, Lettuce, Roselle Leave
5	U Tin Myint	ThinganKyun	12 RB	1.10.13	Mustard, Lettuce, Roselle Leave
6	U Kyin Thein	ThinganKyun	20 RB	1.10.13	Mustard, Lettuce
7	U Myint Aung	ThinganKyun	60 RB	1.10.13	Mustard
8	U Aung Thait Tun	ThinganKyun	13 RB	1.10.13	Mustard, Lettuce, Roselle Leave, Drum Stick
9	U Myint Thu	ThinganKyun	40 RB	1.10.13	Mustard, Drum Stick, Ridge Gourd
10	U Myint Thu	ThinganKyun	40 RB	1.10.13	Water Cress, Mustard
11	U Thein Aung	ThinganKyun	8 RB	1.10.13	Mustard, Amaranth
12	Daw Than Nyein	ThinganKyun	100 RB	1.10.13	Mustard, Lettuce
13	U Nye Nye Min	ThinganKyun	70 RB	1.10.13	Water Cress
14	U Pyone	ThinganKyun	13 RB	1.10.13	Mustard, Lettuce, Roselle Leave, Amaranth
15	U Kyaw Lia	ThinganKyun	100 RB	1.10.13	Chinese Kale, Onion, Kwe Sai
16	U Tin Myo Win	ThinganKyun	60 RB	1.10.13	Mustard, Onion
17	U Kyaw Oo	ThinganKyun	40 RB	1.10.13	Mustard, Taro
18	U Khin Mg Win	ThinganKyun	70 RB	1.10.13	Mustard, Lettuce, Amaranth, Onion
19	U Chit Lwin	ThinganKyun	40 RB	1.10.13	Mustard, Lettuce, Amaranth
20	U Aung Min	ThinganKyun	30 RB	1.10.13	Mustard, Onion
21	U Cho Min Latt	ThinganKyun	75 RB	1.10.13	Water Cress
22	U Myint Soe	ThinganKyun	40 RB	1.10.13	Mustard, Amaranth
23	U Than Pyayaung	ThinganKyun	75 RB	1.10.13	Mustard, Lettuce, Taro, Onion Spring
24	U Kyaw Soe Win	ThinganKyun	300 RB	1.10.13	Mustard, Kwe Sai, Onion, Amaranth
25	U Tin Win Hlaing	ThinganKyun	40 RB	1.10.13	Mustard, Drum Stick, Roselle, Lettuce
26	U Phyto Wai Aung	ThinganKyun	40 RB	1.10.13	Mustard, Roselle Lettuce
27	U Ye Wai	ThinganKyun	45 RB	1.10.13	Water Cress, Amaranth
28	U Ag Ko Latt	ThinganKyun	60 RB	1.10.13	Mustard, Onion
29	U Ye Lay	ThinganKyun	40 RB	1.10.13	Mustard, Roselle, Lettuce
30	U Soe Nyunt	ThinganKyun	60 RB	1.10.13	Mustard, Lettuce, Brocolle
31	U Zaw Min Oo	YankinBaukhtaw	30 RB	7.10.13	Mustard, Lettuce, Water Cress
32	U Ko Ko	YankinBaukhtaw	50 RB	7.10.13	Mustard, Lettuce, Chinese Kale
33	U Htun Aung	YankinBaukhtaw	15 RB	7.10.13	Mustard, Drum Stick
34	U Aung Than	YankinBaukhtaw	45 RB	7.10.13	Mustard, Drum Stick, Roselle, Lettuce
35	U Bo Yan Naing	YankinBaukhtaw	10 RB	7.10.13	Okra, Bottle Gourd, Roselle
36	U Than Soe	YankinBaukhtaw	40 RB	7.10.13	Mustard, Drumstick, Roselle, Lettuce

An Analytical Study on Food Safety Issues in Different Stages of Vegetable Production from Farm to Table

79	U Pain Ka Lar	Thanlynn	3 acre	11.10.13	Radish, Cauliflower, Okra, Drumstick Roselle, Lettuce
80	U Myo	Paung Tae Pa Tee Gone	1 acre	16.10.13	Eggplant, Culiflower, Cabbage, Cucumber
81	Daw Thaug	Thae Gone	1 acre	16.10.13	Eggplant, cabbage
82	Daw Htay Myint	Thae Gone	40 RB	16.10.13	Cabbage
83	U Myint Aung	Thae Gone	1 acre	16.10.13	Eggplant, lettuce, Okra
84	U Kyee Ngwe	Thae Gone	1 acre	16.10.13	Yard long bean, Eggplant, Bottle goude
85	U Myint Mg	Thae Gone	.5 acre	16.10.13	Bottle Gourd, Okra, Roselle, Cabbage, Cauliflower, Eggplant
86	U Than Win	Thae Gone	1 acre	16.10.13	Tomato, Cucumber, Chili, Cauliflower, Roselle
87	U Moe Kyaw	Thae Gone	.5 acre	16.10.13	Cauliflower, Cabbage
88	U Htun Htun	Thae Gone	-	16.10.13	Bottle gourd, Okra, Roselle, Cabbage, Cauliflower, Eggplant
89	Daw Pyone	Thae Gone	1 acre	16.10.13	Cauliflower, Cabbage, Cucumber, Okra
90	Daw Mya Aye Thwin	Thae Gone	1 acre	16.10.13	Bottle gourd, Okra, Roselle, Cabbage, Cauk flower, Eggplant
91	U Win Naing	Thae Gone	2.5 acre	16.10.13	Cabbage, Okra, Roselle, Drum Stick, Lelluce, Tomato, Eggplant
92	U Win Shwe	Mayangone	1 acre	22.10.13	Water Cress
93	U Yan Win Aung	Mayangone	3 acre	22.10.13	Water Cress
94	U Myo Kyaw	Mayangone	4 acre	22.10.13	Water Cress
95	U Pho Kyaw	Mayangone	5 acre	22.10.13	Water Cress
96	U Than Htun Win	Mayangone	7 acre	22.10.13	Water Cress
97	U Kyaw Thu	Mayangone	1/2 acre	22.10.13	Water Cress
98	Daw Cho	Mayangone	1 acre	22.10.13	Water Cress
99	U Myo	Tontay	1 acre	23.11.13	Tomato, Cucumber,
100	U Win Naing	Tontay	2 acre	23.11.13	Cucumber, Brinjals,
101	U Win Aung	Tontay	3 acre	23.11.13	Ladies' Finger
102	Ko Thein Oo	Tontay	1 acre	23.11.13	Cucumber
103	Daw Mya Kyi	Tontay	2 acre	23.11.13	Brinjals
104	Daw San Aye	Thea Gone	.5 acre	26.10.13	Okra, Eggplant, Cabbage, Roselle, Lettuce
105	U Win Nyunt	Thea Gone	2 acre	26.10.13	Eggplant, Cabbage, Okra, Roselle, Lettuce
106	Daw Htay Htay	Thea Gone	1 acre	26.10.13	Eggplant, Carliflower, Cabbage
107	U Aung Myint	Thea Gone	2 acre	26.10.13	Carliflower, Cabbage
108	U Win Lwin	Thea Gone	2 acre	26.10.13	Eggplant, Cabbage
109	U Win	Thea Gone	.5 acre	26.10.13	Eggplant, Cabbage, Roselle, Lettuce
110	U Hla Htun	Thea Gone	1 acre	26.10.13	Cabbage
111	U Aung Moe	Thea Gone	5 acre	26.10.13	Tomato, Cucumber, Chili, Cauliflower, Roselle
112	U Kyaw Oo	Thea Gone	5 acre	26.10.13	Tomato, Eggplant, Chilli, Cabbage, Cauliflower, Lettuce
113	U Win Naing	Thea Gone	.5 acre	26.10.13	Cabbage, Lettuce, Chilli

An Analytical Study on Food Safety Issues in Different Stages of Vegetable Production from Farm to Table

158	U Aung Khing	Tontae	2 acre	23.11.13	Cucumber,Cho-cho,Snake Gould
159	U Pyae Zone	Tontae	4 acre	23.11.13	Eggplant, Okra, Radish,
160	U Sin Kyae	Tontae	2 acre	23.11.13	Cucumber,Cho-cho,Snake Gould
161	U Maung Lay	Tontae	4 acre	23.11.13	Cucumber,Cho-cho,Snake Gould
162	U Win Aung	Tontae	3 acre	23.11.13	Cucumber,Cho-cho,Snake Gould
163	U Myint Thein	Tontae	2 acre	23.11.13	Cucumber,Cho-cho,Snake Gould
164	U Min Myat	Tontae	3 acre	23.11.13	Cucumber,Cho-cho,Snake Gould
165	U Win Naing	Tontae	3 acre	23.11.13	Eggplant, Okra, Radish,
166	U Zaw Htew	Tontae	2.5 acre	23.11.13	Eggplant, Okra, Radish,
167	U Nay Lin	Tontae	3 acre	23.11.13	Eggplant, Okra, Radish,
168	U Lay Myint	Tontae	5 acre	23.11.13	Eggplant, Okra, Radish,
169	U Maung Tar	Tontae	1 acre	23.11.13	Eggplant, Okra, Radish,
170	U Soe Lay	Tontae	2 acre	23.11.13	Eggplant, Okra, Radish,
171	U Aung Soe	Tontae	4 acre	23.11.13	Eggplant, Okra, Radish,
172	U Myint Maung	Tontae	3 acre	23.11.13	Cucumber,Cho-cho,Snake Gould
173	U Maung Maung	Tontae	5 acre	23.11.13	Cucumber,Cho-cho,Snake Gould
174	U Khing Thein	Tontae	3 acre	23.11.13	Eggplant, Okra, Radish,
175	U Soe Maung	Tontae	1 acre	23.11.13	Eggplant, Okra, Radish,
176	U Hla Toe Win	Tontae	3 acre	23.11.13	Eggplant, Okra, Radish,
177	U Aung Naing	Tontae	1 acre	23.11.13	Eggplant, Okra, Radish,
178	U Bo Lay	Tontae	3 acre	23.11.13	Cucumber,Cho-cho,Snake Gould
179	U Tun Tun	Tontae	4 acre	23.11.13	Eggplant, Okra, Radish,
180	U Hla Toe	Tontae	2 acre	23.11.13	Eggplant, Okra, Radish,
181	U Thaw Dar	Tontae	2 acre	23.11.13	Okra, Eggplant, Cabbage, Roselle, Lettuce
182	U Shwe Ba	Tontae	3 acre	23.11.13	Okra, Eggplant, Cabbage, Roselle, Lettuce
183	U Tin Shwe	Tontae	3 acre	23.11.13	Okra, Eggplant, Cabbage, Roselle, Lettuce
184	U Theu Yin	Tontae	1 acre	23.11.13	Okra, Eggplant, Cabbage, Roselle, Lettuce
185	U Soe Myint	Tontae	1 acre	23.11.13	Okra, Eggplant, Cabbage, Roselle, Lettuce

Team Leader for No. (1) to (13) U Yan Lin + U Thet Oo

Team Leader for No. (14) to (120) U Yan Lin

Team Leader for No. (121) to (185) U Hla Shwe

List of retailers

No	Name	Kind of Vegetable	Date Of Survey	Market Place
1	Ma Wai Wai Htun	Several Kinds of Vegetable Road Side shop	7.10.13	Kanbe Market
2	Ma Swe	Several/ Road Side Selling	7.10.13	Kanbe Market
3	Ma Khin Htoo Wai	Several/ Road Side Selling	7.10.13	Kanbe Market
4	Ma Kyi Kyi Aye	Several/ Road Side Selling	7.10.13	Kanbe Market
5	Ma Naing Naing Myint	Several/ Shop	7.10.13	Kanbe Market
6	U Zaw Mg	Several/ Road Side Selling	7.10.13	Kanbe Market
7	Ma Myint Myint Than	Several/ Shop	7.10.13	Kanbe Market
8	Ma Than Hla	Some/ home shop	7.10.13	Kanbe Market
9	U Than Kyaw	Several/ Shop	7.10.13	Kanbe Market
10	Ma Khaing	Several/ Road Side Selling	7.10.13	Kanbe Market
11	Ma Sa Bae	Several/ Shop	7.10.13	Kanbe Market
12	U Zaw	Several/ Road Side Selling	7.10.13	Kanbe Market
13	Ma Khin Mar Wai	Several/ Shop	7.10.13	Kanbe Market
14	U Maung Aye	Several/ Road Side Selling	7.10.13	Kanbe Market
15	Daw Sein	Several / Shop	7.10.13	Kanbe Market
16	Ma Aye Thwe	Several / Shop	7.10.13	Kanbe Market
17	Daw Hla Lay	Several/ Road Side Selling	7.10.13	Kanbe Market
18	Daw Khin Moe	Several / Shop	7.10.13	Kanbe Market
19	Ma Maw Maw	Some / Raod Side	7.10.13	Kanbe Market
20	Ma Khet	Several / Shop	7.10.13	Kanbe Market
21	Daw Nyo Htwe	Several / Shop	10.10.13	San Pya Market
22	Daw Tin Tin Moe	Several / Shop	10.10.13	San Pya Market
23	U Han Ko	Several / Shop	10.10.13	San Pya Market
24	U Kyaw Kyaw Hlaing	Several / Ownshop	10.10.13	San Pya Market
25	Daw Hnin Yee	Several / Ownshop	10.10.13	San Pya Market
26	Daw Tin Tin Oo	Several / Ownshop	10.10.13	San Pya Market
27	Daw Hla Win	Several/ Road Side Selling	10.10.13	San Pya Market
28	Daw Khin Than	Several / Shop	10.10.13	San Pya Market
29	Daw Khine Zin Oo	Several/ Road Side Selling	10.10.13	San Pya Market
30	Ma Ei Ei Mon	Several / Ownshop	10.10.13	Myoma Bazaar
31	Ma Ei Thea Phy	Several / Ownshop	10.10.13	Myoma Bazaar
32	Daw Own Mya	Several / Ownshop	10.10.13	Myoma Bazaar
33	Daw Lone	Several / Ownshop	10.10.13	Myoma Bazaar
34	Daw Sandar Linn	Several / Ownshop	10.10.13	Myoma Bazaar
35	Ko Aung Myo Htet	Several / Ownshop	10.10.13	Myoma Bazaar
36	Daw Tin Shwe	Several / Ownshop	10.10.13	Myoma Bazaar
37	Daw Nyein Nyein Khine	Several / Ownshop	10.10.13	Myoma Bazaar
38	Daw Tin Sein	Several / Ownshop	10.10.13	Myoma Bazaar
59	Ma Phyu	Several/ Road Side Selling	10.10.13	Myoma Bazaar
39	Ma Sabai	Several / Ownshop	10.10.13	Myoma Bazaar
40	Daw Htwe Htwe	Several/ Road Side Selling	17.10.13	Shwe Tyi Bazaar

List of super markets

No.	Name of Supermarket	Tounship	Survey Date	Team Leader
1	Capital	Thargayta	9.11.2013	U Hla Shwe
2	Super One	Yangin	9.11.2013	U Hla Shwe
3	Yangin Center	Yangin	9.11.2013	U Hla Shwe

List of Consumers

No.	Name	Township	Survry Date
1	U Tin Aung	Yankin	7.10.2013
2	Daw Sein Aye	Yankin	7.10.2013
3	Daw Khaw Khaw Win	Yankin	7.10.2013
4	Daw Nilar	Yankin	7.10.2013
5	Daw Naw Yin Nyaunt	Yankin	7.10.2013
6	Daw Shin	Yankin	7.10.2013
7	Ko Mg mg Oo	Yankin	7.10.2013
8	Ma Chae Khing	Thanlyin	10.10.2013
9	Ma Aye Khin	Thanlyin	10.10.2013
10	Daw Tin Shwe	Thanlyin	10.10.2013
11	Ma Khin Hla Soe	Thanlyin	10.10.2013
12	Daw Than Htwe	Thanlyin	10.10.2013
13	Daw Hla Win	Thanlyin	10.10.2013
14	Daw Tin Oo	ThinganKynn	30.10.2013
15	Daw San San	ThinganKynn	30.10.2013
16	Daw Thu Zar Lin	ThinganKynn	30.10.2013
17	U Zaw Gyi	ThinganKynn	30.10.2013
18	Daw Yi	ThinganKynn	30.10.2013
19	U Lay Lwin	ThinganKynn	30.10.2013
20	Daw Moe Aye	ThinganKynn	30.10.2013
21	Daw Nan Myat	ThinganKynn	30.10.2013
22	U Kyaw Gyi	ThinganKynn	30.10.2013
23	U Aung Mon	ThinganKynn	30.10.2013
24	Daw Myat Kay Thwe	ThinganKynn	30.10.2013
25	Ma La Min	ThinganKynn	30.10.2013
26	Ma Mon Myat	ThinganKynn	30.10.2013
27	Daw Moe Le	ThinganKynn	30.10.2013
28	Ma Hla Mon	ThinganKynn	30.10.2013
29	Daw Khin That Htar	ThinganKynn	30.10.2013
30	U Lay Aung	ThinganKynn	30.10.2013
31	Daw Thein Mon	ThinganKynn	30.10.2013

Team Leader U Hla Shwe

- C. Harvest (Washing; Packaging; Transport (Local, away); Crop record)
 - D. Postharvest (Techniques; Current problems)
 - E. Export & Import (Current management system)
 - F. Chemical residue analysis
 - ❖ Current system
 - ❖ Apply in field & market
 - ❖ Handy analysis apparatus in field
2. Role of VF in vegetable growing from States & Regions
 3. IPM for farmers & Plant Protection materials for Organic farming
 4. Check for vegetable safety from super markets & wholesale markets
 5. Comment by VF on Current Vegetable growing & pesticide usage in Myanmar
 6. Trainings for LNGOs, CBOs (from FSWG)
 - ❖ Vegetable growing systems (OP & F1)
 - ❖ IPM for vegetables
 - Organic materials for Plant Protection

Annex-5 C (Question in FGD with Golden Key)

Focal Group Discussion between Golden Key Company & Evident- based Research team (Food Security Working Group)(/11/2013)

1. Introduction to members & research
2. Discussions
 - Q. 1. Pesticide Law-Constraints in field to enforce
 - A. Registration
 - B. Myanmar instruction (easy to see)
 - C. PHI (label for easy to see)
 - D. Law for PPE & sale chemicals
 - E. Material grantee
 - F. Unofficial materials
 - Q. 2. Vegetable growing & pesticide usage-crop record
 - Q. 3. Chemical residue analysis
 - A. Current system
 - B. Apply in field & market
 - C. Handy analysis apparatus in field
 - Q. 4. Role of company staff in vegetable growing from States & Regions
 - Q. 5. IPM for farmers & Plant Protection materials for Organic farming
 - Q. 6. Comment by the company on Current Vegetable growing & pesticide usage in Myanmar
 - Q. 7. Suggestion on Current Pesticide Policy

Annex 6: Food safety hazards and its practices

Food safety hazards

A food safety hazard is any chemical, biological or physical substance or property that can cause fresh fruit and vegetables to become and unacceptable health risk to consumers Food safety is important

To protect consumer health:

To again market access:”

Chemical Hazard”: Harmful chemical high levels have been associated with chronic illness and death. Chemical contaminants in fresh fruit and vegetables may be naturally occurring or may be added during production and post-harvest handling. Chemical are applied during growing and handling after harvest to control insects, diseases, and weeds. These chemicals are commonly called pesticides. The types of pesticides include insecticides (used to control insects), fungicides (used to control diseases) and herbicides (used to control weeds).GAP said that chemicals must be purchased from and authorized chemical dealers and sellers. Those chemical purchased from unauthorized dealers and sellers may not be true to label and may contain excessive amounts of the active ingredient.

Possible causes of chemical contamination in vegetables were;-

- Using a chemical that is not approved for the crop
- Not reading the label directions
- Incorrect mixing
- Chemical applied too often
- With holding period between spraying and harvest is not observed-
- Spray drift from another block of farm
- Equipment not working properly or has not been calibrated-
- Equipment not cleaned after use
- Equipment used for spraying and washing produce
- Waste from left over spray mix or from washing of equipment is dumped into the water source.
- Picking containers used to store chemicals
- Leakage of chemicals transported with produce.

“Biological Hazard”:

Microorganism are found anywhere in the environment. Fruits and vegetables contain in a dynamic and diverse mixture of microorganism. The produce was handle daily may contain asmany as 100 million organisms per gram as normal inhabitants that do not affect the health of consumers. Animal manure and water can be a source of chemical and biological contamination of fresh fruit and vegetables. Also fresh vegetables can

be contaminated by dirty hands and also through sneezing, coughing and spitting from farm workers. Farm workers can be included both family members and employees.

Guide line of GAP for fertilizer and water using;

- Where an organic material is treated on the farm before applications, the method, date and duration of the treatment are recorded.
- Human sewage is not used for production of any produce destined for human consumption
- Water is treated and monitor and a record is kept of the treatment method and monitoring result
- Untreated sewage water is not used during production and post-harvest handling
- Not to applied untreated animal manure within 60 days of harvest
- Avoid applying composted manure or organic products over the top of produce
- Do not apply composted manures near plants that are ready for harvesting
- Water must be treated with a sanitizer or another safe source of water used.
- Sanitizers for treating water should be approved for use on fresh fruit and vegetables.
- Treatment of water with a sanitizer should be monitored to ensure that it achieves the desired level of microorganism control.
- Farm workers should was their hands after visiting the toilet, handling animals, smoking and handling waste food and rubbish.
- Cuts and sores should be covered with bandages or gloves to avoid contact with produce. If gloves are used when handling produce, they should be washed each day.
- Adequate toilets and hand washing facilities likeclean water, soap and towels or cloths need to be used.
- Workers with infectious diseases such as Hepatitis A diarrhea, vomiting, fever and jaundice should not be do jobs that involve handling produce.
- To minimize contamination from vermin includes rats, mice and cockroaches, picking containers and packing materials must be dry ventilated areas and cover.
- Check picking containers and packing materials for presence of vermin before use and use appropriate baits and traps if necessary.
- Do not use dirty picking containers and packing materials equipment containers and materials must be cleaning regularly.

Annex 7: Food safety and quality assurances

Basic quality expectations

There are some broad characteristics which purchasers may consider when buying fruit and vegetables. Their purchasing decisions will be influenced by them

- Free of major injury, spoilage or blemish likely to affect keeping quality
- Not overripe, soft or wilted, free of foreign odors and tastes, and free of unhealed injury and blemish which is likely to affect keeping quality
- Free of dirt, dust, unacceptable chemical residues and other foreign matter
- In a condition that is acceptable to eat
- Free of foreign odors and taste

Quality at harvest

Determining when a product is mature and ready for harvest can be a difficult decision. For some crops, maturity (harvest) indices have been developed to assist in the decision process. For other crops, harvesting at the correct time can be highly subjective.

There are two words “maturity” and “ripeness” which are frequently used in describing quality. Their meanings are different and they are often used incorrectly.

“Maturity” refers to a stage of development in the process of growing of the fruit or vegetable. Maturation continues until the start of senescence, leading to the death of the product.

Definitions of horticultural maturity which apply to quality include:

- *Having completed natural growth and development and reached a stage where the characteristics are optimum for eating*
- *The stage of fruit development which will ensure proper completion of the ripening process.*

“Ripening” is specific to fruit. It is the combination of processes involving changes in quality attributes that leads to increasing eating acceptability. Examples of changes are softening, decrease in acids and tannins, increase in sugars, development of aroma and changes to skin color. If produce is harvested when they are not mature, they are not mature; they may lack the required flavor or texture, or may not progress through ripening to provide the desirable flavor and texture for the consumer. If produce is harvested too mature, senescence may occur before the produce reaches the consumer. There are many reasons why produce loses quality after harvest. Some of these are the normal processes of the fruit or vegetable which cannot be stopped, but which need to be minimized. Others are the result of external practices which adversely affect the produce, and which need to be eliminated.

Major causes of quality loss after harvest are

- Acceleration of senescence
- Water loss
- Mechanical (physical) injuries
- Physiological disorders
- Disease infection
- Growth and development

- ❑ Chilling (cold) injury
- ❑ Ethylene damage
- ❑ Carbon dioxide damage
- ❑ Low oxygen (anaerobic) Injury

Disease infection

Infection by disease organisms, mostly bacteria and fungi, is a major cause of quality loss in many fruit and vegetables. Infection can occur in the field during growth, or during postharvest handling. The susceptibility of produce varies considerably and is affected by several factors. One important factor is mechanical injury, where bruises, abrasions, cracks and cuts allow the organism to enter the produce. Subjecting produce to stress such as excessively high or low temperatures, high or low humidity or unsuitable atmospheres can allow infection to occur or can increase disease development. Spoilage organisms are spread in wash water, particularly where the water is not treated to control the organisms or is not changed frequently enough. Disease symptoms may range from small surface lesions that degrade appearance to server infections with external and internal breakdown of a substantial part of the produce. Symptoms of moderate severity commonly appear as areas of excessive softness, off-color or off-flavor.

Growth and development

Some types of produce continue phases of their growth after harvest. This can detract from the appearance of the produce and also cause quality deterioration internally as the produce uses its components to support the growth. Sprouting of potatoes, shooting of onions, and elongating and changing shape of asparagus are examples of continued growth after harvest. Formation of fibers can also occur in some produce.

Annex 8: Introduction of GAP to Myanmar

The Forces Driving the Global Demand for GAP are:

- ❑ Changing consumers lifestyles
- ❑ Increased global trade and tracing of trade
- ❑ Growth in global supermarket
- ❑ Government policy changes to ensure safe supply of food and to protect the environment and workers
- ❑ Communities demanding accountability for environmental protection, worker's safety and welfare and
- ❑ Increased use of electronic commerce for buying and selling products

The Forces Driving The Demand For GAP Within The ASEAN Region Are:

- ❑ Income growth and reduced poverty
- ❑ Changing consumers lifestyle
- ❑ Increasing imports and exports
- ❑ Development of infrastructure
- ❑ Growth in supermarket
- ❑ Increased tourism and travel by Asians
- ❑ Increasing community awareness of the need to protect the environment and
- ❑ Government policy changes to ensure safe supply of food and to protect the environment and workers

- ❑ First Draft (Review the draft by relevant department)
- ❑ Second Draft (Review the draft by relevant department)
- ❑ Third Draft (Final Draft)

Road Map (Action Plan)

- ❑ After finishing the final draft, will invite all stakeholders
- ❑ Formation of accreditation body
- ❑ Formation of certified body
- ❑ Submit to the cabinet
- ❑ Training to inspector, advisor, and farmer
- ❑ Target crops for export are mango, water melon, and muskmelon
- ❑ Target crops for domestic consumption are chili, tomato and cabbage (Ko Ko, 2008)

Annex 9: Food safety issue concerns with agricultural exports

Food Safety Regulations

Producers need to ensure the quality and safety of their products and avoid all potential hazards such as risks from contaminated water or from other microbial or chemical contaminants. Regulations on the minimum residue limits (MRLs) of pesticides are effective both national and international levels.

Food Safety and Good Practice Certification

European supermarket chains are increasingly demanding that their suppliers be certified against a private food safety standard such as GLOBALGAP, BRC, and FIS. Likewise in the Asian market, some minimum certification on food safety is required by local supermarket chains or local agro-processing businesses. Farmers and food producers will be increasingly required to be certified against a food safety standard.

What are good agricultural practices (GAP)?

Good agricultural practices are “practices that address environmental, economic and social sustainability for on-farm processes, and result in safety and quality food and non-food agricultural products” (FAO 2003)

What are GAP codes, standards and regulations?

These are guidelines which have been developed in recent years by the food industry, producers’ organizations, governments and NGOs, aiming to codify agricultural practices at farm level for a range of commodities.

Why do GAP codes, standards and regulations exist?

It is because of growing concerns about food quality and safety worldwide.

What are the main benefits and challenges?

The benefits of GAP codes, standards and regulations are numerous, including food quality and safety improvement; facilitation of market access and reduction in non-compliance risks regarding permitted pesticides, MRLs and other contamination hazards. The main challenges related to GAP implementation include an increase in production cost, especially record keeping, residue testing and certification, and inadequate access to information and support services.

What does agricultural policy mean?

Agricultural policy describes a set of laws relating to domestic agriculture and imports of foreign agricultural products. Governments usually implement agricultural policies with the goal of achieving a specific outcome in the domestic agricultural product markets. Outcomes can involve, for example, Food security and export of surplus, domestic price stability, product quality and safety, product selection, land use right or employment.

Legal infrastructure in agriculture sector

- ❑ Myanmar Agricultural and Rural Development Bank Law, 1990
- ❑ Plant Pest Quarantine Law, 1993
- ❑ Fertilizer Law, 2002
- ❑ Procedures Relating to Fertilizer Law, 2007
- ❑ Procedures Relating to The Pesticide Law, 2007
- ❑ Seed Law, 2011
- ❑ National Water Vision
- ❑ Land Law, 2012

(Tin Mg Shwe, 2012)

Annex 11: Feedback from MercyCorps

Review on Vegetable Production Projects (MercyCorps/GRET/Golden Plain)

1. Kinds of vegetable in your project...

Ans:

No	Type of Variety
1	Chili
2	cucumber
3	Pumpkin
4	roselle
5	maize
6	water melon
7	Pole Bean
8	Lady’s Finger
9	Bitter Guard
10	Snake Guard
11	Radish
12	Mustard
13	Brinjal
14	Calabash
15	Marrow
16	Tomato
17	string bean
18	Water Cress (Taiwan)
19	Coriander
20	Lemon grass
21	Lettuce

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- | | | |
|--|--------------------|---------------|
| h. mix chemicals with water
Ans: in farm | near well | in farm other |
| i. dispose empty bottles
Ans: in farm | in farm near house | other |
| j. use vegetables for
Ans: home consumption + selling | home consumption | selling |
| k. face pesticide resistant problems
According to Sayar Chit, the farmers don't know it | Yes | No |
| l. let his family to spray
Ans: Yes | Yes | No |