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Preface

This report on the vegetable industry in the Philippines was prepared by Curtin University of Technology, with support from the University of the Philippines in Diliman, the University of the Philippines in Mindanao and Benguet State University.

The report describes a scoping study (ACIAR project ASEM/2005/062), which sought to link smallholder vegetable producers in the Philippines to profitable institutional markets.

The objectives of the scoping study were to;

- review the current supply chain research activities being undertaken by the Government of the Philippines, industry and other donors
- identify the major institutional markets for fresh vegetables in metro Manila
- identify consolidators in metro Manila who supply these markets
- identify private sector collaborators
 - institutional customers (executive chefs, retailers, food processors)
 - consolidators (wholesalers) supplying metro Manila
 - traders and market intermediaries who will assist smallholder producer groups in selected production areas (Ilocos Norte, Benguet, Cavite, Northern and Southern Mindanao) to establish commercial linkages
- identify the volume and quality specifications (technical, functional and service) of institutional customers (executive chefs, retailers and food processors) in metro Manila and for each market intermediary along the supply chain
- identify major production and marketing constraints along the supply chain
- identify potential market and technological interventions.

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Executive summary

In 2005, some 604,000 hectares of vegetable crops were cultivated in the Philippines, which produced over 4.5 million tonnes of fresh vegetables. Although the average yield (10.65 t/ha) compares favourably to many other countries in South East Asia, there is considerable potential to increase yields through improved farm practices and investment in new technologies.

Being in the tropics, most areas of the Philippines are suitable for growing lowland tropical vegetables, however, as altitude is able to substitute for latitude, large quantities of high value temperate vegetables are cultivated at high elevation. Nevertheless, vegetable production in the Philippines is highly seasonal in response to temperature, rainfall, and the frequency and intensity of typhoons. Vegetable prices are generally lowest in March to May and highest in September to December.

Vegetable consumption in the Philippines is currently estimated at only 39 kg per capita, well below the 146-182 kg per capita recommended by the WHO/FAO. Most Filipinos use vegetables as only a small part of a meat or fish dish and very seldom as a meal in itself. Increasing vegetable consumption is therefore a major public health challenge.

The majority of fresh vegetables in the Philippines (75-85%) are sold through the traditional marketing system, where farmers sell their produce on the spot market to traders, consolidators, vegetable processors and wholesalers in the wet market. As personal disposable income rises, greater quantities of fresh vegetables are being sold through modern retail markets and the institutional food market. Throughout most of the Philippines, the supermarket share of the market is thought to approach 10% but in Metro Manila, the major market for fresh vegetables in the Philippines, supermarkets are believed to currently hold a 15% market share.

As the average farm size in the Philippines is just 2.02 hectares, it is very difficult for smallholder vegetable farmers to access the institutional market. Inconsistent supply, poor quality, low prices, unfavourable terms of payment and penalties associated with non compliance provide little incentive. Poor quality is a multifaceted problem that has root causes at the farm level and post-farm gate: poor quality seed; poor cultural practices; excessive insect and disease damage; inappropriate post-harvest handling; the high cost of inputs and limited access to finance. Furthermore, most smallholder vegetable farmers are unaware of the quantities of vegetables planted, the customers' quality requirements, preferred varieties, the seasonality of production and the supply and demand situation in both domestic and export markets.

Without consolidation, smallholder vegetable farmers will not have sufficient production to maintain the quality or continuity of supply and most farmers do not have the financial resources to purchase the required inputs, nor access to the appropriate technology to produce quality product on a consistent basis. To

this end, this scoping study has identified six alternative mechanisms for smallholder farmers to access the emerging institutional market.

1. Introduction

The Philippines is an archipelago of 7,100 islands on the western rim of the Pacific Ocean between Taiwan and Borneo, extending about 1,851 km north to south and with a maximum breadth east to west of 1,070 km. It lies between latitudes $4^{\circ} 23'$ and $21^{\circ} 25'$ N and between longitudes 116° and 127° E¹. It is bounded by the Pacific Ocean to the east, the Celebes Sea to the south, the Sulu Sea to the south-west, the South China Sea to the west, and the Bashi Channel to the north. The country has a total area of 300,000 km² and a total coastline of 17,461 km (Librero and Rola 2000)(Figure 1).

Figure 1: Map of the Philippines



^{1 1} Much of this overview of the Philippines is based on Librero and Rola (2000).

The Philippines is divided into three major island groups: Luzon, with an area of 141,395 km², the Visayas (56,606 km²) and Mindanao (101,999 km²). These three groups are further divided into regions, provinces, cities, municipalities and barangays (villages). In 1994, there were 15 regions, including metro Manila, 73 provinces, 60 cities, 1532 municipalities and 40,904 barangays (Librero and Rola 2000).

The Philippines has a varied topography with lofty highlands and lush valleys (Librero and Rola 2000). The four major lowland production areas are the Central Plain and Cagayan Valley in Luzon, and the Agusan and Cotabato Valley in Mindanao. These lowlands contrast sharply with the adjacent highland areas of the Central and East Cordillera and the Zambales mountains. There are also several plateaus, among them the Bukidnon and Lanao plateaus in Mindanao. The Sierra Madre and the Cordillera of Luzon are mountain ranges that run almost parallel. The Sierra Madre extends from the north-east of Cagayan to a point east of Laguna Lake. The Cordillera runs along the western side of Luzon

The Philippines has a generally mild tropical climate characterized by relatively high temperatures, high humidity and abundant rainfall. The country has four main types of climate, classified according to the presence or absence of a dry season and the duration of the rainy period:

Type I: Two pronounced seasons: dry from November to April and wet the rest of the year. The western parts of Luzon, Western Mindanao, Negros, and Palawan have this type of climate.

Type II: No dry season, with most of the rain falling from November to January.

Catanduanes, Sorsogon, the eastern part of Albay, the eastern and northern parts of Camarines Norte and Camarines Sur, and a large portion of eastern Mindanao have this type of climate.

Type III: Seasons are not very pronounced: relatively dry from November to April and wet for the rest of the year. The maximum rainfall periods are not very pronounced, but the short dry season lasts only from one to three months. This type of climate is found in the western parts of Cagayan, Isabela, Nueva Vizcaya, the eastern portion of Mountain Province, southern Quezon, Masbate, Romblon, eastern Negros, central and southern Cebu, part of Northern Mindanao, and most of eastern Palawan.

Type IV: Rainfall is more or less evenly distributed throughout the year, such as in the area of Batanes, north-eastern Luzon, the south-eastern part of Camarines Norte, western parts of Camarines Sur and Albay, eastern Mindanao, Marinduque, western Leyte, northern Cebu, Bohol, and most of Central and Southern Mindanao.

The mean temperature in the Philippines is 27°C. January is the coolest month, with a mean temperature of 25°C, while the warmest month is May, with a mean temperature of 28°C. Baguio, with an elevation of more than 1500 m, has a mean annual temperature of 18°C. Typhoons are frequent from July to November. On average about 20 typhoons occur every year. Conditions are often made worse by monsoon rains which cause flooding in low-lying areas. With roughly half of the total land area devoted to agricultural crops, the Philippines is a largely agricultural economy. In 2002, agriculture, forestry and fisheries contributed 15 percent to the nation's GDP (NSO 2007). In 2006, the agriculture sector grossed PsP887.6 billion, with gross earnings in the crops sub-sector estimated to exceed PsP458.8 billion (BAS 2007).

In 2002, there were more than 4.8 million registered farms in the Philippines, covering an area of more than 9.7 million hectares (NSO 2007). Although agriculture utilised 32 percent of the country's total land area, only some 19 percent of the land is arable. The most important food crops are rice, corn, cassava and sweet potatoes.

In the Philippines, agricultural productivity is heavily dependent on weather patterns. In turn, these weather patterns are defined by typhoons, the occurrence of El Nino and La Nina, and the Northeast (NE) and southwest (SW) monsoons. Microclimates arise from variations in topography, particularly in both Luzon and Mindanao.

2. Vegetable production in the Philippines

In 2005, some 604,000 hectares were allocated to vegetable production in the Philippines (which includes peanuts and cassava). Over 4.5 million tonnes of vegetables were produced (Maghirang 2006)(Table 1).

Table 1: Vegetable production in the Philippines²

	Area (ha)	Volume (t)	Yield (t/ha)
Major	449,482	2,856,459	6.35
Priority	113,986	1,151,953	10.11
Minor (upland)	22,554	218,261	9.68
Minor (lowland)	17,916	295,003	16.47
TOTAL	603,938	4,521,676	10.65

According to the Bureau of Agricultural Statistics (2005), the average vegetable yield in the Philippines was 10.65 t/ha. While this compares favourably with other countries in South East Asia (Table 2), there is considerable potential to increase yields through improved farm practices and investment in new technologies.

Table 2: Average vegetable yields (metric tonnes per hectare)

	2000	2001	2002	2003	2004
Australia	22.80	24.75	25.20	22.93	22.93
China	18.96	18.92	19.58	19.91	19.27
Indonesia	7.81	7.72	7.64	7.64	7.67
Malaysia	16.27	16.42	16.52	16.64	16.72
Philippines	8.41	8.41	8.48	8.48	8.48
Thailand	8.74	8.92	8.77	8.67	8.67
Vietnam	11.47	11.80	11.76	11.73	11.78

Source: FAO statistics

While vegetables are produced extensively throughout the Philippines archipelago, the majority of commercial production is conducted on the main island of Luzon (73%) (Table 3)(Remotigue 2005).

Table 3: Vegetable production areas in the Philippines

	Percent of vegetable production									
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Luzon	75	75	77	78	77	76	76	76	74	73
Visayas	11	11	10	10	10	10	10	9	10	11
Mindanao	14	14	14	12	13	14	14	14	15	17

² The vegetables that comprise each group can be found in Appendix 1

Not unexpectedly, being in the tropics, most areas in the Philippines are well suited for growing lowland, tropical vegetables. This is reflected by an examination of the major vegetable crops produced (Table 4).

Table 4: Volume, Area and Value of Vegetable Crops in the Philippines

	2003	2004	2005
Production (000 tonnes)			
Tomato	150.1	172.3	173.7
Garlic	15.5	15.0	13.2
Onion	93.8	86.7	82.0
Cabbage	92.0	92.8	91.4
Eggplant	177.0	182.7	187.8
Area (000 ha)			
Tomato	16.8	17.7	17.7
Garlic	5.5	5.3	4.7
Onion	9.5	9.5	8.9
Cabbage	7.7	7.7	7.4
Eggplant	21.0	21.1	21.2
Value (Ps million)			
Tomato	1800.6	1582.1	1808.7
Garlic	784.2	603.6	674.3
Onion	1594.5	1275.9	1701.1
Cabbage	748.7	786.8	1904.4
Eggplant	1904.4	2183.7	2118.4

BAS (2007)

Higher elevations in many agricultural areas allow the production of both lowland and highland vegetables. Although heat tolerant cabbage can be produced in the lowlands, the higher value varieties are cultivated at higher elevations. Other high value temperate vegetable crops include broccoli, cauliflower, carrots and lettuce.

2.1 Vegetable production areas in the Philippines

In Northern Luzon, Benguet and Mountain Province produce and consolidate temperate fresh vegetables primarily for the wet markets in metro Manila.

Benguet is in the southern most part of the Cordillera Administrative Region. Benguet is classified as having a Type II climate or two pronounced seasons: the dry season lasts from December to March while the other months are wet. The average monthly rainfall ranges from 20 mm in February to 1120 mm in August. The majority of the eco-zones in Benguet are identified as cool highlands. The temperature in Benguet is the lowest in the country. This is mainly due to the high elevation of the province. The annual mean temperature is 17°C. It varies from a monthly mean temperature of 15.5°C for January to

18°C in May. For this reason, Benguet is the major producer of temperate vegetables.

However, the overall productivity of the province is low due to the lack of irrigation and severely degraded watersheds. As farmers abandon their depleted soils, forested areas are being cleared and converted to new farms. In some places along the Halsema Highway, farmers have terraced the slopes, but only a few can afford the high costs of terracing.

The economy of Benguet province is predominantly agricultural. At least 54 percent of the population is dependent on agricultural activities as their main source of income and livelihood. Landholdings in the province are relatively small, with less than one hectare per farming household. Most of the farmers do not own the lands that they cultivate. This is explained by the fact that 90 percent of the land in Benguet is owned by the government and classified as forest reservation or watershed areas. The farmers who occupy the land only have a tax declaration which does not provide proof of ownership.

The main agricultural activity in the province is vegetable production. Currently, some 31,300 hectares are cultivated, producing over 471,200 tonnes per annum. While potato is the most widely cultivated crop (8,120 hectares), cabbage, Chinese cabbage, carrots, chayote, beans, lettuce and broccoli are the other major vegetable crops produced.

Farmers usually harvest and sell their produce to assembler-wholesalers who transport the produce to the La Trinidad Vegetable Trading Post and Baguio City Market. The La Trinidad Vegetable Trading Post was established to thwart the practice of middlemen intercepting cargoes and directing them to non-consignees who offered higher prices. As envisaged, the trading post has reduced the number of middlemen and increased the prices of the commodities, thus increasing the income of farmers. It is believed that some 8,840 farmers deliver their produce to the La Trinidad Vegetable Trading Post and 5,580 farmers deliver produce to the Baguio City Market. Other farmers deliver their produce to nearby barangays, municipalities and to adjacent provinces such as La Union, Pangasinan and Nueva Vizcaya during scheduled market days. The majority of fresh vegetables go directly to the metro Manila markets.

Vegetables producers in Southern Luzon (Cavite and Laguna) have an advantage over the producers in Benguet in terms of a shorter travelling time to metro Manila. Farms in this area maximize their market opportunities by tapping into the institutional markets such as hotels, restaurants and top end supermarkets. Farms in Cavite have been able to access the resources necessary to upgrade the quality of their produce with the help of various government agencies located in Manila. Sophisticated chillers for vegetables and refrigerated vans have allowed them to gain a foothold with downstream food processors who supply the food service industries including restaurants, airlines and high end office cafeterias.

In the Visayas, tropical vegetables are planted by small farmers, particularly in Cebu and Iloilo. These products are sold mainly within the Visayas.

In Mindanao, some 450,230 tonnes of vegetables are produced (Remotigue 2006). The main production areas are in the northern regions (62%), southern Mindanao (13%) and the western regions (7%). Mindanao produces both temperate and tropical vegetables. The vegetable producing areas in Mindanao are located in areas that are classified as having Type III and Type IV climates. In Bukidnon, there are portions of the province that belong to the Type III and Type IV climate, while most of the areas in Southern Mindanao have a Type IV climate. The more or less even distribution of rainfall throughout the year contributes to the ability of the island to produce vegetables all year round. Furthermore, Mindanao is located in the typhoon-free region of the country. Not unexpectedly therefore, Mindanao is the major supplier of temperate vegetables to metro Manila during the wet season (June to November). However, because of the distance from the metro Manila market, Mindanao requires a very efficient delivery system that is both reliable and fast. The Philippines government has established the RO-RO (roll-on, roll-off) highway which connects Mindanao to Luzon from the port of Cagayan de Oro (Digal and Concepcion 2004).

In Southern Mindanao, the main vegetable producing areas are Maragusan, Kapatagan, Tupi and Marilog. Most of the farmers sell their produce to traders in the rural areas who then bring their produce to the Bangkerohan Wholesale Market in Davao City.

2.2 Seasonality of vegetable production in the Philippines

Different climatic conditions are required by different kinds of vegetables. Temperate vegetables thrive at elevations greater than 800 meters above sea level. The common temperate vegetables are cabbages, carrots, potatoes, Kentucky beans and tomatoes. The common tropical vegetables are eggplant, squash, bitter melon, string beans and okra.

Depending on the prevailing agro-ecological conditions, vegetable production exhibits a distinct seasonality of supply (Librero and Rola 2000)(Table 5).

Table 5: Regional and seasonal production of vegetables in the Philippines

	January-June			July-December		
	Prodn	Area	Yield	Prodn	Area	Yield
Cabbage						
Cordillera	25.9	1.9	13.4	25.7	1.9	13.8
Philippines	34.6	3.3	10.5	33.7	3.1	10.7
Eggplant						
Ilocos	27.9	3.2	8.7	4.4	1.1	3.8

Tagalog	13.5	1.1	11.8	8.2	0.9	8.9
Philippines	78.0	10.4	7.5	34.6	6.1	5.7
Tomato						
Ilocos	43.6	4.2	10.3	20.8	1.9	10.8
C. Luzon	21.7	3.0	7.5	1.9	0.4	4.8
Tagalog	19.9	2.0	9.9	3.8	0.7	5.2
Visayas	19.2	0.9	21.8	3.9	0.5	7.6
Mindanao	10.7	0.8	14.3	11.7	0.8	15.5
Philippines	134.2	14.0	9.6	49.8	8.0	8.3

Prodn (000 tonnes) Area (000 ha) Yield (t/ha)

In the Philippines, greater quantities of vegetables are harvested during the first part of the year due to favourable cool and dry weather. Other vegetables are more prevalent in particular regions at particular times. Temperate vegetables are more widely grown in Mindanao (19%)(Figure 2) than tropical vegetables (15%)(Figure 3)(Remotigue 2005).

Figure 2: Temperate vegetable production in the Philippines by region

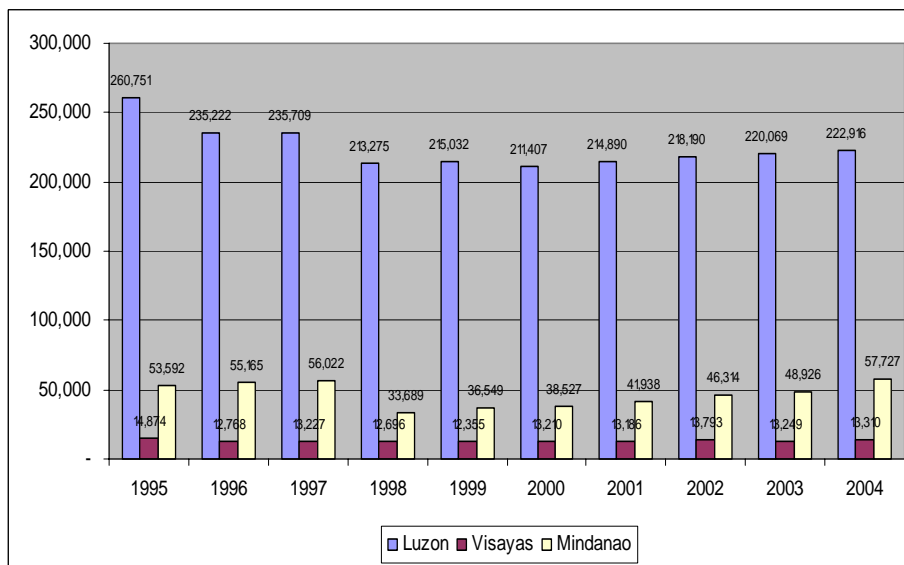
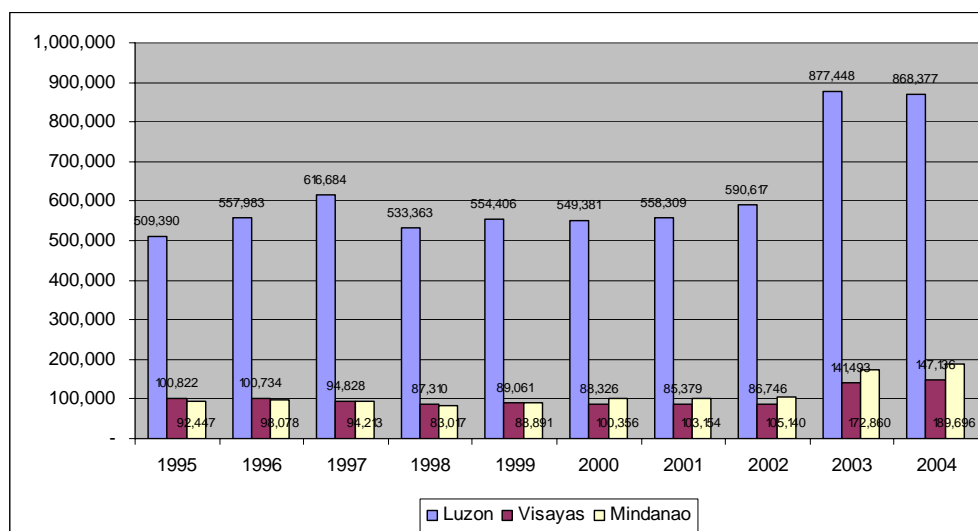


Figure 3: Tropical vegetable production in the Philippines by region



Cabbages and tomatoes are planted all over the country (Digal and Concepcion 2004). The Cordillera Autonomous Region (CAR) in Northern Luzon is the major producer of cabbages and is responsible for 73 percent of cabbage production in the Philippines (Table 6).

Table 6: Cabbage production in the Philippines (tonnes)

	1999	2000	2001	2002	%
CAR	61,826	63,580	65,704	66,875	73.19
Ilocos	2,619	2,711	2,611	2,540	2.78
Cagayan Valley	913	829	846	889	0.97
Southern Tagalog	2,738	2,024	2,234	2,293	2.51
Bicol	2,085	1,038	754	699	0.77
W. Visayas	442	434	420	394	0.43
C. Visayas	5,757	6,050	6,225	6,633	7.26
E. Visayas	134	136	137	141	0.15
Zamboanga Peninsula	295	308	321	327	0.36
N. Mindanao	2,389	2,413	2,545	2,684	2.94
S. Mindanao	6,351	5,866	5,203	5,293	5.79
C. Mindanao	774	992	1,390	1,460	1.60
CARAGA	229	254	258	269	0.29
ARMM	919	941	895	871	0.95
Philippines	87,471	87,576	87,309	91,368	100.00

For tomatoes, the Ilocos Region is the largest producer, followed by Northern Mindanao. Decreases in tomato production have been observed in the Cordillera Autonomous Region (CAR), Cagayan, Bicol, Western Visayas and Central Visayas, while other regions have increased production (Table 7)(Digal and Concepcion 2004).

Table 7: Tomato production in the Philippines (tonnes)

	1999	2000	2001	2002	%
CAR	3,721	3,592	3,665	3,692	2.47
Ilocos	47,379	49,264	49,598	50,153	33.60
Cagayan Valley	12,299	8,940	8,060	7,707	5.16
C. Luzon	15,806	15,614	15,708	17,159	11.50
Southern Tagalog	12,968	17,289	17,677	19,109	12.80
Bicol	5,916	3,933	3,510	3,732	2.50

W. Visayas	12,758	11,633	10,209	10,366	6.95
C. Visayas	6,721	6,774	5,628	4,833	3.24
E. Visayas	629	648	660	679	0.45
Zamboanga Peninsula	1,360	1,308	1,281	1,303	0.87
N. Mindanao	19,841	20,726	21,374	21,362	14.31
S. Mindanao	3,441	4,238	3,981	3,955	2.65
C. Mindanao	1,874	3,466	3,971	4,504	3.02
CARAGA	247	275	287	271	0.18
ARMM	400	401	420	423	0.28
Philippines	145,362	148,101	146,031	149,250	100.00

Lettuces from Bukidnon, for example, supplement the supply coming from Benguet in the latter part of the year, particularly when typhoons render the roads unpassable. At the same time, these typhoons often destroy the rain shelters in Southern Luzon, thus reducing the supply of lettuce and other salad greens (Table 8).

Table 8: Lettuce: volume, area of production and yield.

	2004		2005
	Jan-Jun	Jul-Dec	Jan-Jun
Total volume (MT)	661	1,060	1,657
Benguet	414	728	421
Bukidnon	41	150	959
Mt. Province	111	68	114
North Cotabato	7	56	27
Cavite	35	21	71
Other provinces	55	37	65
Area harvested (ha)	131	121	229
Benguet	65	59	65
Bukidnon	9	15	90
Mt. Province	17	11	17
North Cotabato	2	15	12
Cavite	6	4	7
Other provinces	32	17	38
Yield (MT/ha)	5.05	8.76	7.24
Benguet	6.37	12.35	6.47
Bukidnon	4.50	10.00	10.66
Mt. Province	6.50	6.18	6.71
North Cotabato	3.36	3.70	2.26
Cavite	5.88	5.15	10.19
Other provinces	1.71	2.21	1.70

(BAS 2005)

Other vegetables are more prevalent in particular regions at particular times, depending on pest and disease pressures, or the physiological impact of environmental conditions (e.g. night temperature on tomato fruit set). Tomatoes, for example, are supplied by Luzon growers before the onset of the rainy season, when the relatively high night temperatures can adversely affect fruit set. Northern Mindanao growers plant tomato in time for harvest during the lean months in Luzon.

Despite the natural conditions which limit year-round production of many vegetables, farmers continue to take the risk of planting under adverse conditions in the hope of capturing inordinately high prices when the supply is compromised. To take advantage of higher prices for off-season tomato, Nagcarlan growers plant *pahuli* (late crop), which is the late, dry season crop produced from February to May and *palusot* which is the wet season crop produced from August to October (BAR nd). The term *palusot* refers to the risky nature of planting during that period.

Nagcarlan is one of several sites for the testing of off-season tomatoes. These cultivars are tolerant to heat and foliar diseases. The availability of off-season tomatoes in Luzon will adversely impact on the production of tomatoes in Northern Mindanao.

However, there are instances where the seasonality of vegetable production is not related with the climatic conditions but rather with the social and economic needs of the farmers. According to Rasco et al. (2004), the planting of vegetables may be undertaken so that the harvest period will coincide with that period of the year when expenses are expected to be high: the school enrolment period in June. Farmers may also consider the demand: December is a period of high demand due to Christmas.

Furthermore, there is anecdotal evidence to suggest that vegetable farmers in Mindanao, will often plant with regard to the anticipated typhoon season in Luzon. During the typhoon season, farmers in Benguet will have lower production and vegetables from Mindanao have an opportunity to fill the gap in supply. Carrot growers in Dalaguete, Cebu, plant carrots in spite of the less than optimal conditions in the hope of a windfall when the supply, mainly from Benguet, declines during the typhoon season.

3. Vegetable consumption in the Philippines

In 2006, the population of the Philippines was estimated to exceed 89 million and to be growing at an annual rate of 1.8 percent. The annual per capita income was USD1,300 with 40 percent of the population living below the poverty line (Worldbank 2007).

In 2003, average per capita food consumption in the Philippines was 879 g per day (Maghirang 2006). The foods consumed in greatest amounts were cereals and cereal products which amounted to 360 g or 41 percent of the total intake. Of the cereal products consumed, some 288 g of rice was consumed per day, about one third of the total daily intake. For the other energy foods, starchy roots were 19 g, sugar was 24 g and fats and oils were consumed at 18 g per day. Meat, fish and poultry contributed 183 g and made up one fifth or 21 percent of the diet. Vegetable consumption was 110 g and made up 13 percent of the daily intake. This included green leafy vegetables at 30 g per day and other vegetables at 80 g per day. The most commonly eaten vegetables were squash, stringbeans, gourds, eggplant, kangkong, camote and malunggay.

The daily per capita consumption of vegetables in the Philippines translates to an annual per capita consumption of 39 kg, well below the Asian annual per capita consumption of 125.6 kg (FAO 2000) and well below the 146 - 182 kg/head/year recommended by the WHO/FAO (2003).

Within the Philippines, there are distinct differences in regional consumption (Table 9).

Table 9: Mean per day per capita vegetable consumption by region.

Total/Region	Vegetables	Green & Leafy Yellow Vegetables	Other Vegetables
National Average	106	30	76
Ilocos	172	40	133
Cagayan Valley	174	38	137
Central Luzon	120	19	102
Southern Tagalog	107	23	84
Bicol	100	27	73
Western Visayas	78	35	43
Central Visayas	61	30	32
Eastern Visayas	59	17	42
Western Mindanao	49	69	-
N. Mindanao	112	39	72
S. Mindanao	123	51	72
Central Mindanao	119	52	68
CAR	177	38	139
CARAGA	92	28	64
ARMM	106	35	71
NCR	87	18	69

Northern Luzon has the highest per capita consumption and the Visayas, along with Western Mindanao, the lowest (FNRI 2002). Although the national capital region (NCR) is a major consumption centre for vegetables, the daily per capita consumption in the region is among the lowest in Luzon.

Filipinos, in general, use vegetables only as a small part of a meat or fish dish and very seldom as a meal in itself (Digal and Concepcion 2004). Many Filipinos consider vegetables as a “poor man’s diet” and the consumption of vegetables may have some negative connotations. This means that households who have the capacity to buy will opt to purchase meat and meat-based products. However, high socio-economic households are more aware of the health benefits of vegetables and tend to consume a greater variety of vegetables, especially temperate vegetables. Even so, fresh vegetables are seldom consumed because they require more preparation, they have a short shelf life and many members of the household, especially young children, do not like the taste of vegetables. Furthermore, with the increasing trend towards double income families, fast food and instant food is expected to become more popular in those households where both adults are working and have little time to cook.

In metro Manila, metro Cebu and metro Davao, the most outstanding reason for not eating vegetables was the influence of a non-vegetable eating member of the family (Narciso et al undated). The FAO cites cost, convenience, taste and stigma as reasons for low vegetable consumption (FAO 2003).

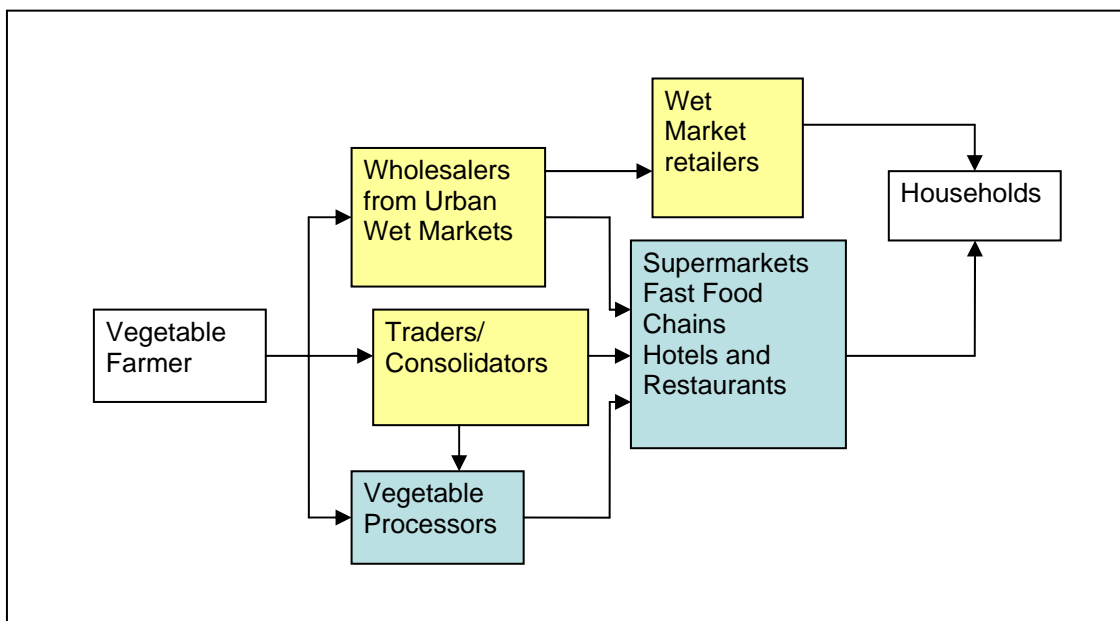
Increasing vegetable consumption is a major public health challenge especially since scientific studies increasingly demonstrate the health benefits of higher consumption. In 2003, the Department of Health (DOH) launched the Healthy Lifestyle campaign to address the increasing incidence of obesity and the associated problems of chronic heart disease, hypertension and diabetes (Sunstar 2005). Considering that 50 percent of Filipinos in urban areas like Metro Manila eat in fast food restaurants, a major target of the campaign is the fast food industry. Along with the DOH and DA, the FNRI recognizes the key role that improvements in vegetable production and marketing can play in this effort. The FAO/WHO Expert Consultation in 2003 highlighted the dual benefit of increased vegetable consumption; i.e. improving access to healthy food and enhancing the incomes of farmers.

Based on the 1995 census indicating a population of 9.4 M in the NCR, the projected population of this region will be 11.9 million by 2010 (NSO 2004). Metro Manila will remain the largest market for vegetables and other agricultural products. In 2004, metro Manila consumed an estimated 155,716 MT of both highland and semi-temperate vegetables and 218,596 MT of tropical vegetables (FRLD 2006). For highland vegetables, the supply-demand analysis indicates excess production of cabbage, wongbok, potato, carrots and broccoli for 2005 - 2010, and a deficit of lettuce for the same period. The projected increase in lettuce supply from Northern Mindanao was attributed to the increasing number of farmers adopting protected cultivation. Recently, more farmers in Benguet are adopting the same technology.

4. Vegetable marketing in the Philippines

The vegetable supply chain in the Philippines follows a traditional system (Figure 4) where farmers sell their produce on the spot market to traders, consolidators, vegetable processors and wholesalers in the wet markets. Wholesalers usually sell their vegetables in wet markets while some traders sell to institutional markets such as supermarkets, fast food chains, hotels and restaurants. Very few farmers supply directly to vegetable processors and institutional markets.

Figure 4: The Philippines vegetable supply chain



Around 75-85 percent of vegetables in the Philippines are sold through the traditional supply chain, where the wet markets and vegetable traders play major roles (Digal and Concepcion 2004). Farmers are generally price takers, accepting whatever price the traders give them in a spot market. While spot market trading is highly risky for the farmers and even the traders, it can also be highly profitable.

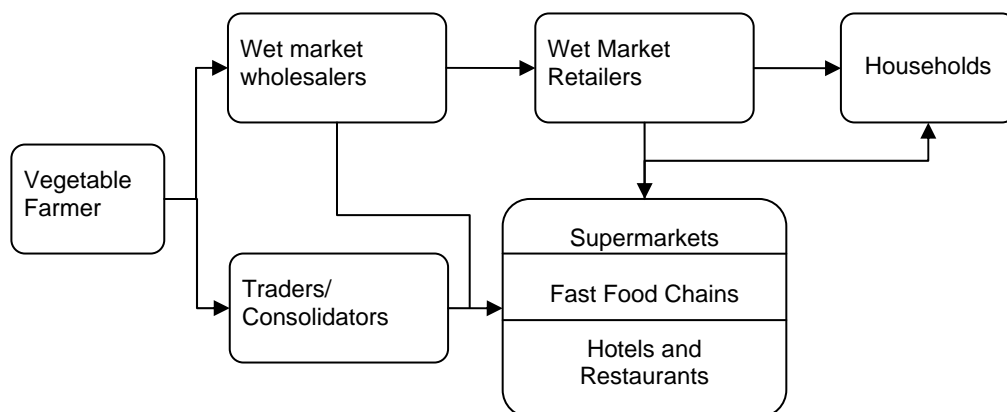
Digal et al. (2006) showed that there was an increase in the price of vegetables along the chain at each stage of transfer. The margins however, were generally higher at the retail stage. Value-adding activities like cleaning, sorting and packaging did not add significantly to the costs, but by performing these activities, intermediaries were able to achieve a higher value. Not unexpectedly, retailers have the highest margin, but they also incur the highest costs in handling and product loss.

Metro Manila is the largest single market for fresh vegetables in the Philippines. With a population approaching 10 million people, and 2 million households, the demand for fresh vegetables is thought to exceed 340,000 tonnes per annum.

However, as vegetable production in metro Manila is unable to satisfy more than 4 percent of the demand, there is a steady inflow of fresh produce from the major vegetable growing areas in Northern Luzon (76%) and Mindanao (15%). In metro Manila, some 15 percent of vegetables are purchased from supermarkets while the rest are sold in wet markets. The retail market for vegetables is still dominated by wet markets for a number of reasons. Consumers generally buy fresh produce like vegetables in wet markets that offer more variety and assortment of vegetables at lower prices than supermarkets. In Mindanao, 90 percent of households prefer to buy from wet markets and talipapas in small quantities, three (3) times a week (Concepcion 2005).

However, increasing income and the changing lifestyles of urban Filipinos have not only contributed to increased consumption of high value vegetables, but have also played a role in the proliferation of fast food outlets and one-stop shopping malls and supermarkets, as high income consumers demand greater convenience. This has triggered changes in the supply chain for fresh vegetables (Figure 5).

Figure 5: The dualist vegetable supply chain in the Philippines



The number of consumers buying vegetables from supermarkets has increased particularly in the urban areas, consistent with the increase in vegetable consumption (Digal and Concepcion 2004). However, in order to contain costs, the supermarkets have decreased the number of suppliers with whom they transact. Most prefer to deal with consolidators and concessionaires. As the supermarkets primarily deal with higher income consumers who are more quality conscious, they impose higher standards.

While most vegetable farmers supply the wet markets, there are other markets that are expanding. The food service sector (hotels, hospitals and restaurants) consume a sizable volume of vegetables and they require replenishment almost everyday. However, despite the advantages of these “direct selling” arrangements, as most small farmers are unable to maintain the quality and

consistency of supply, small growers supply traders, wholesalers and processors, who in turn supply the downstream customers.

4.1 Vegetable prices

The seasonal nature of vegetable production in the Philippines causes large fluctuations in supply and thus in the spot market price. Prices of most vegetables are higher during May-July and during the last quarter of the year than they are during February-April (Librero and Rola 2000).

However, seasonal variations in price depend upon the occurrence of typhoons, and regional variations in climate. Vegetable price indices are generally lowest in March to May (during the dry season) when major harvests occur, and higher from September to December, reflecting the greater demand relative to supply.

Generally, the real price of vegetables has been steadily declining as the increase in productivity exceeds the increase in the demand and low cost imports, primarily from China, set a new floor price which is often below the costs of production.

4.2 The institutional market

In the Philippines, vegetables are sold at the village level to traders and consolidators or direct to wholesalers in the urban wet markets (Concepcion et al 2006). At the barangay level, farmers often pass the vegetables they have cultivated onto agents who facilitate the transaction with the traders who then purchase and transport the produce to the city where the produce is on-sold to wholesalers, retailers, supermarkets and other institutional buyers.

Institutional buyers indicate that among their requirements, quality comes first, followed by assurance of supply and price is third (dela Torre 2003). These requirements are consistent with those identified by hotels (12 deluxe) and restaurants (21 full service) responding to a survey on quality and volume requirements of hotels and restaurants (Parker, unpublished data).

The food service industry

Parker (unpublished data) indicates that in the food service market, most institutional buyers used a daily market list and some sort of quality criteria in the selection of suppliers, deciding which produce and in what volume to purchase and what delivery to accept or reject. Although 92 percent of hotels and 67 percent of restaurants were guided by written specifications, these specifications are defined largely by the chef or cook and consisted mainly of descriptions and intended use. Specifications for vegetables (roots/tubers, stems/leaves, flowers and fruits) were based on the most obvious visual attributes; i.e. uniformity of size and shape, and weight for size.

Although many respondents did not express much concern for freshness and its associated attributes; e.g. crisp leaves, freshness was one of the most

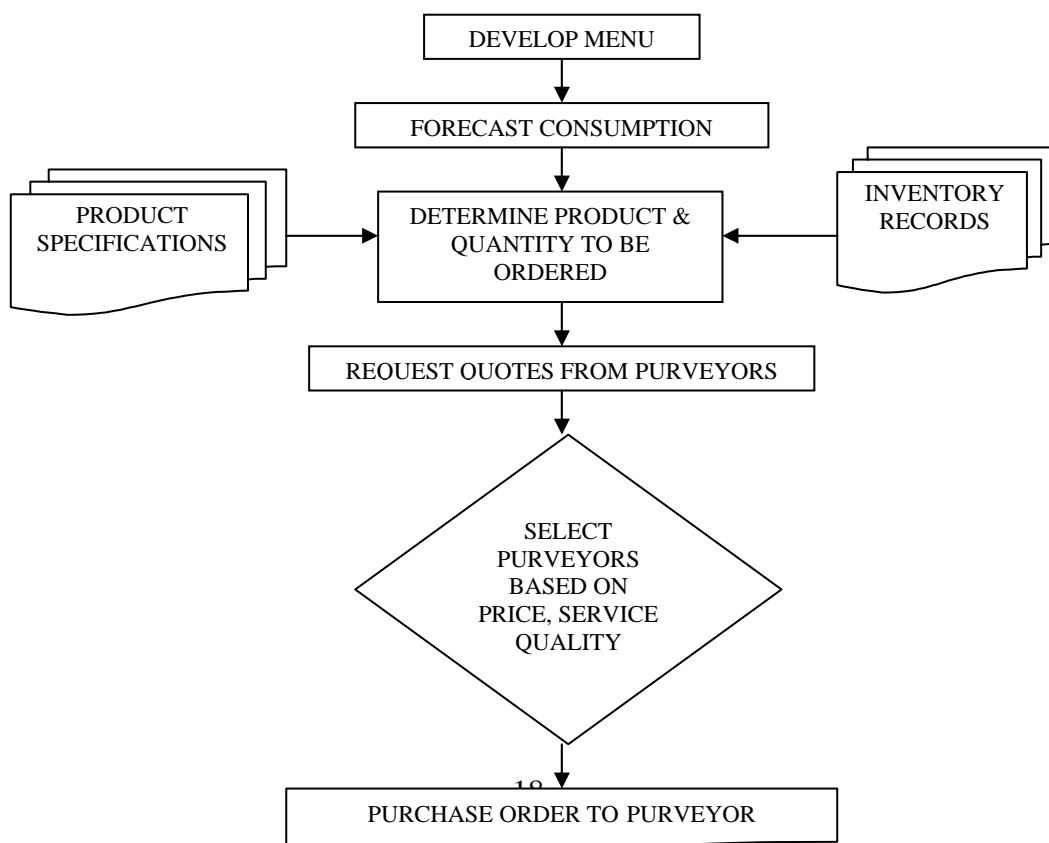
frequently cited reasons for purchasing locally grown produce over imported produce. Low price and availability were also frequently cited as advantages from sourcing locally.

Despite the fact that quality was not well defined by the respondents, all hotels and 19 restaurants suggested that superior quality was the main advantage imported produce provided over local produce. More than half of the restaurants surveyed identified failure to meet quality requirements as one of the most frequently encountered problems when purchasing vegetables. Other problems encountered were related to reliability and timeliness of delivery, seasonality and high price.

Most hotels buy mainly from distributors, which might include purveyors, although they might not be known as such. Werdenberg Corporation, a trading company, advertises itself as a company from whom major hotels and restaurants in the Philippines can source a wide range of high-quality gourmet products, including vegetables. While a number of hotels still source vegetables from the Divisoria wholesale market, only the big hotels have contracts with commercial suppliers such as Dole and Vava Veggies. In contrast, restaurants mainly source their produce from supermarkets.

The information provided by hotels and restaurants in Parker's study illustrates the disperse requirements that inherently make it difficult to transmit quality specifications through the supply chain to producers. It is well recognized that specifications provide the means for precise communication between the food establishment operators and their upstream trading partners (Helland 2006)(Figure 6).

Figure 6: Traditional purchasing flow



(Helland 2006)

Farmer groups are reluctant to supply hotels and full-service restaurants due to the unfavorable terms of payment, their stringent requirements and relatively small volumes required. The terms of payment range from 15 days to 60-90 days, depending on the commodity (DA-AMAS 2007). Although hotel and restaurant requirements might provide useful information and lessons to chains involving smallholder farmers, there is little to be gained by focusing on this market.

The fast food industry

With estimates suggesting that about half of the Philippine urban population regularly eats food outside the home, it can be surmised that a large proportion of the vegetables consumed in urban areas like metro Manila are consumed by fast food restaurant patrons. The fast food industry in the Philippines is expanding. Jollibee, the largest fast food chain in the country, commands 65 percent of the domestic fast food market. Last year, Jollibee opened 139 stores in the Philippines. McDonalds similarly views the market prospects with optimism (Arcibal 2007). The requirements for Kentucky Fried Chicken, i.e. processed (coleslaw) or fresh cut vegetables (at least three varieties) for salads, sandwiches and wraps; typify the vegetable product lines sold through these chains (Table 10).

Table 10: Vegetables required by most fast food restaurants.

Vegetable	Specifications Other requirements/comments
Cabbage	Absence of insects; freedom from foreign matter and chemical residues 700-1200 g/head; packaging, trimming requirements vary BDC needs ~ 36 MT 'Scorpio'/month for coleslaw
Carrots	
Lettuce	Parasites are a concern, but less so with protected cultivation; a mix of varieties needed; used for sandwiches (1 cm x 8 cm strips) and salads; supplied 2 kg packs, each equivalent of 10 servings; sourced from Mindanao during rainy season in Luzon; hydroponically grown lettuce no longer available as production ceased
Tomato	Good varieties
Bell pepper	
Green beans	Grown in many areas, but consolidator needed

Potato	Pre-processed and frozen for fries, but imported
Garlic, Onion	
Cob corn	Best quality from Quezon (Cadiz)

In a roundtable discussion, KFC identified the farmer's lack of access to information as a constraint, with farmers depending mainly on traders as their source of information. KFC identified partnerships with farmers' organization as the weakest link in the vegetable supply chain, thus preferring to source produce through a processor. Suppliers are evaluated using a quality audit system developed by the international franchise. Once evaluated and found to meet the criteria, a contract agreement is signed, using a two-tiered pricing system (ceiling and core price).

Supermarkets

The increasing patronage of modern retail formats in Asia has been attributed to rapid urbanization and changing demographics, lifestyles and family structures (Shepherd 2005). In the Philippines, supermarkets are currently thought to account for around 10 percent of fresh produce sales (Buenaflor 2004), and 15 percent for vegetables in metro Manila (Digal and Concepcion 2004).

Most supermarket chains impose daily volume requirements, monthly farm checks (Manalili 2004) and daily on-time delivery requirements (Table 11). Payment frequently takes between 15 - 60 days.

Table 11: Requirements of two supermarkets

Buyer	Kg per Month	Price P/kg	Specifications	Supplier	Terms of Payment (days)	Delivery Schedule
Landmark						
Onion	2,000	20	white (50-200 g/pc, 3-28 kg./sack)	N. Ecija, China (Jul-Dec)	15	
		33	red - 50 g./pc.			
Bell pepper	2,500	150-180	Local-green, big (200 -300 g/pc) packed in resinet (3 pcs./pack)	Baguio	15	Daily
Lettuce	5,500	180-230	big-medium, any variety	Bukidnon	15	Daily
Broccoli	3,250	140	local-big (300 g)	Bukidnon	15	Daily
Cauliflower	2,500	110	local (10-60 kg/sack)	Baguio, Bukidnon		Daily
Potato	7,500	35-38	Local-medium	Baguio	15	Daily

			(80-100 g/pc) (3-6 pcs/pack)			
	10,000	20	all varieties (400 g, green & good)	Baguio		
Cabbage	5,000	14-17	Wongbok (300 g, 2 pcs/ pack)	Baguio		
Unimart						
Bell pepper	295	65	local-green	Baguio	15-30	Daily
	610	65.00	local-red			
Lettuce	345	199	iceberg-local	Baguio	15-30	Daily
Broccoli	220	140	Local	Baguio	15-30	Daily
Cauliflower	215	50	local	Baguio	15-30	Daily
Potato	6,045	19	local-jumbo	Baguio	15-30	Daily
Cabbage	6,635	20-30	ordinary, wongbok	Baguio	15-30	Daily

(DA-AMAS 2007).

Fierce competition in the fresh produce market has resulted in some supermarkets implementing an alternative means of assuring supply while taking advantage of the increased demand for produce in supermarkets. Supermarkets have granted concessions to corporate suppliers, who are assigned a space in the store and given complete control of their stocks. A commission is taken out of the gross sales after an agreed upon period, e.g. 7 days, thereby greatly reducing the usual delay in payment.

Big R Supermarket saw linkages with farmers as being necessary to assure a regular supply and create a niche through customer identification (Tan-Gatue 2004). However, poor communication and transport systems, inconsistent quality and sustainability were seen as obstacles to such a proposal. Big R worked with government extension officers to communicate their quality specifications and technologies for improving yield and quality to farmers. Assistance and payment in cash paid off, and Big R was able to sell at lower prices as yields increased and postharvest losses declined.

Linkages with farmers was discussed with two supermarkets during the scoping study: Walter Mart in Makati and the NCCC Supermarket in Davao City.

Walter Mart is part of a conglomerate engaged in the retail and wholesale of a wide range of products. Walter Mart buys highland vegetables (Baguio beans, cabbage, carrots, cauliflower, lettuce, pechay, potato and radish) directly from Benguet cooperatives or through three La Trinidad traders who serve as consolidators. Lowland vegetables (bitter gourd, eggplant, squash, tomato and yardlong bean) are sourced from Nagcarlan through 2 consolidators.

Consolidators put in a bid every Tuesday. Deliveries of 8-10 tonnes are made every Tuesday and Friday at 6:00 am. Late deliveries and insufficient volumes

are penalized by deducting 5 percent from the payment. In 2003, Walter Mart started operating strategic delivery points (“buying points”) in Carmona (Cavite), Quezon City and Plaridel (Bulacan) to service the requirements of the different outlets. Each outlet orders its requirements by email, and a purchase order for the consolidated order for each buying station is then issued to suppliers. The required volume for each point is packed by the supplier, and positioned sequentially on the truck to facilitate unloading. Deliveries are checked on receipt, rejects culled and traders paid in cash for the accepted volume. Quality specifications include size, freshness and the absence of disease and/or pest damage. Walter Mart is not too concerned about maturity, but requires a weight of 0.7-1.0 kg/head for lettuce. Walter Mart has tried communicating to suppliers their need for the latter to support them in terms of price and quality so that their trading relationship can be sustained.

NCCC endeavours to provide its customers with quality and a variety of basic goods and new products at the cheapest price possible. In an effort to obtain fresher and better quality vegetables, NCCC started buying directly from Maragusan farmers. Not having to go through traders meant NCCC could get vegetables at better prices as well. A two-day lead time was given for deliveries, with specifications (colour, size) communicated via text. The quality of deliveries is visually checked at the receival area and vegetables that are blemished or off-shape are rejected.

5. Constraints to vegetable production and marketing in the Philippines

It is estimated that more than 5.7 million households in the Philippines are actively involved in vegetable production (Aquino 2003). Over 80 percent of vegetable growers are smallholders, with most (90%) earning less than Ps 3,000 per month. For many of these smallholders, there are few alternative means of generating an income, hence the income gap between rural and urban households is increasing.

The average farm size in the Philippines is declining (Table 12).

Table 12: Number and area of farms.

ITEM	1980	1991	2002
	NUMBER OF FARMS BY SIZE (‘000 Farms)		
TOTAL	3,420	4,610	4,823
Under 1.00 ha	776	1,685	1,936
1.00-2.99 ha	1,578	1,968	1,975
3.00-4.99 ha	588	523	509
5.00-9.99 ha	360	325	303
10.00-24.99 ha	104	96	89
25.00 ha & over	15	13	12
	AREA OF FARMS BY SIZE (‘000 ha)		
TOTAL	9,725	9,975	9,671

Under 1.00 ha	369	728	827
1.00-2.99 ha	2,522	3,038	3,002
3.00-4.99 ha	2,067	1,835	1,778
5.00-9.99 ha	2,243	2,046	1,914
10.00-24.99 ha	1,406	1,293	1,192
25.00 ha & over	1,118	1,034	957

NSO, sourced by BAS (2006)

The Census of Agriculture recorded an average farm size of 2.02 ha, which represents a 3 percent decline over that recorded in 1991 (BAS 2006). Although some 81 percent of the farms in the Philippines are smaller than 3.00 ha, collectively this amounts to just 40 percent of the total farm area.

Declining farm sizes in the Philippines are not necessarily a disadvantage with regard to the production of high-value, short-gestating crops. The production of horticultural crops, including vegetables, is very labour intensive, often involving operations that cannot be readily mechanized. Family labour can therefore be more effectively utilized. Furthermore, small farms have the capacity to service smaller markets with relatively small volume requirements (FAO 1989).

More recently, the Consultative Group on International Agricultural Research (CGIAR) highlighted the role of horticultural crops in increasing incomes of poor farmers around the world, citing the high rate of growth in fruit and vegetable production and the dramatic increases in the trade of horticultural crops from developing countries (Lumpkin et al. 2005). Vegetable production is thus an attractive option if increased agricultural productivity is to be achieved on small farms.

However, without consolidation, smallholder vegetable farmers are unable to supply the expanding demand from the institutional market. Individual farmers do not have sufficient production to maintain the quality or the continuity of supply and most farmers do not have the financial resources to purchase the required inputs, nor access to the appropriate technology to produce quality product on a consistent basis.

In the Philippines, smallholder farmers have been traditionally organized through associations, cooperatives or federations. The Department of Agriculture is actively encouraging farmers to form associations or cooperatives so that they can avail themselves of government projects, programs and funds. The Land Bank of the Philippines (LBP), for example, provides loans only to farmer cooperatives.

According to Nuevo and Lizada (2000), the usual practice for vegetable farmers in the Philippines is to look for a market when their product is ready for harvest. Thus it comes as no surprise to find that the most frequently cited problem for farmers is the market. This is supported by Manalili (2000), who indicates that marketing is the major problem in Asian agriculture.

Most smallholder vegetable farmers suggest that while they can produce the required volume, they cannot sell their produce at a premium price. One of the main reasons for the low price is that production exceeds demand. Oversupply leads to a sharp decline in price. Similarly, it is the significant and largely unpredictable day-to-day variation in supply, occasioned by the lack of strategic market information, seasonal influences and chance events such as typhoons that lead to much price uncertainty.

Given that prices are determined primarily by supply and demand, it is not unusual for farmers to realise higher prices for inferior quality produce. It is widely recognised that quality is at its peak in the main season, but as this most often coincides with peak production, prices are at their lowest. As chance events can often lead to a dramatic and sudden reduction in the quantity of produce available, prices will rise, irrespective of product quality. Market dynamics may thus lead many farmers to believe that there are few incentives for producing superior quality produce. Yet Nuevo and Lizada (2000) and Manalili (2000) conclude that poor quality is a major reason for low prices.

Poor quality is a multifaceted problem that has many root causes at the farm level and post-farm gate. Panganiban (1976) summarized these constraints as:

- the non availability of quality seed
- poor cultural practices
- excessive insect and disease damage and
- limited knowledge of proper postharvest handling methods

Lantican (2000) suggested that the production-related problems could be described as:

- high incidence of pests and diseases
- insufficient supply of good quality seeds
- high costs of inputs
- limited access to credit
- inadequate irrigation facilities

Furthermore, Lantican considered that the high incidence of pests and diseases could be attributed to three factors: (a) growers limited knowledge of basic cultural operations such as soil and seed sterilization, pest and disease control, weeding and rouging; (b) inappropriate variety selection; and (c) limited interaction of farmers with private and public institutions whose task it was to provide updated technical information relating to proper cultural practices, the varieties most suited to the prevailing agro-ecological conditions and improved technologies.

While limited access to reliable and accurate market information is often put forward as a factor contributing to low prices, modern technology, and in particular the mobile phone, has done much to improve the immediacy of price transmission. Improved price transmission does not in and of itself improve the farmers' income, for farmers are not always able to respond to the market needs. Without any appropriate means of storing product until prices improve, product must be marketed immediately after harvest. Furthermore, even if prices rise, the farmers' capacity to respond is contingent upon crop maturity.

What is apparent in the Philippines is the farmers' limited market horizon. Most smallholder farmers in the Philippines are unaware of the quantities of product planted elsewhere, of the customers' quality requirements, preferred varieties, the seasonality of production, and the supply and demand situation in both domestic and export markets.

Not unexpectedly, globalisation and market liberalisation is impacting on the Philippine vegetable industry. Cheap imports, particularly from China, have either displaced or are encouraging farmers to cultivate alternative crops. The two commodities which have been most affected by imports are carrots and garlic. Imports of lettuce continue from Australia, primarily into the high value food service market and, with the growth in the fast food sector, imports of processed potato products (French fries) continue to increase from North America. Domestically, the potato production industry in the Philippines is unable to satisfy the demand for both French fries and potato crisps.

Globalisation and rising per capita income has also encouraged many of the world's largest retail chains to enter the burgeoning market in the Philippines. With the need for regular and reliable deliveries of good quality produce, smallholder vegetable producers are increasingly finding themselves alienated and unable to supply the supermarkets and institutional users. In order to compete, smallholder growers must learn to collaborate. However, for a variety of agronomic and institutional reasons, the majority of cooperative groups in the Philippines have failed to deliver any superior economic value to either the farmers or market intermediaries. Inadequate quality control, a lack of customer focus, a short-term orientation and financial mismanagement are among the reasons often cited for the failure of cooperative marketing groups (Manalili 2000).

Although agriculture continues to contribute 15 percent to the economy, government support for the agriculture industry has been declining. From 1992, 1994 to 1996 and 1998 to 2001, less than 5 percent of government expenditure has been directed towards supporting agriculture (Bureau of Agricultural Statistics 2006). As most smallholder vegetable farmers are poorly educated, the relationship between farm practices and the use of improved techniques for higher yields and quality is not well understood, limiting the development of the sector.

Furthermore, the sustainability of on-farm operations continues to be influenced by both natural resources and economic policy. Natural resource factors include the degradation of the soil caused by inappropriate farming practices. This is due to the lack of knowledge of appropriate agronomic practices. Roads into many of the major vegetable growing areas, particularly in the uplands, are poor, limiting access to markets and crop expansion. The lack of capital resources for farmers to develop their farms is also a major limiting factor.

6. Activities in the Philippines to address the constraints

The issues and concerns that smallholder farmers are confronted with can be addressed through different strategies and by various organizations. Issues on infrastructure are best addressed by government while organizational strengthening and the provision of skills training can be performed by non-government organizations and institutions.

Within a more global economy and the growing importance of the modern retail, food service and institutional market, numerous interventions have focused on strengthening farmer organizations and the provision of marketing and bargaining skills. However, collective action and clustering as a strategy to make small farmers more competitive can only be effectively achieved if there is a deeper understanding of the individuals who comprise the membership.

While collective action and group formation is being advocated worldwide as a strategy for farmers to gain more bargaining power, it is more likely to result in improved access to markets that smallholder farmers acting individually would be unable to supply. With greater concentration and aggregation in food retailing and manufacturing, customers have more market power and with markets becoming more open to foreign competition, buyers have greater choice. Collective action therefore provides a means for smallholder vegetable farmers to consolidate and to better fulfil the needs of their downstream customers.

With the increasing emphasis on quality assurance, mobilising collective farmer groups makes it more cost effective to deliver training and extension programs to address specific impediments. The better and more progressive farmers can be supported and utilised as demonstration farms to facilitate the adoption of improved farming and post-harvest practices. With the increasing need to adopt Good Agricultural Practices (GAP), the impact of farming on the environment can be collectively addressed. Erosion and soil degradation are caused by inappropriate crop production practices. The lack of knowledge of proper agronomic practices often results in the inappropriate application of pesticides and fertilizers. One area that requires immediate attention is the waste that is generated by the vegetable industry from production to marketing. Fresh vegetables are sold in the public markets with an understanding that shrinkage and trimming are part of the system.

6.1 Government programs

To link farmers with the market, the Philippine Government has enacted two laws: the Republic Act (RA) 8435 and RA 7900 that aim to modernize the agriculture and fisheries sector and to provide smallholder farmers with the opportunity to compete in the domestic and international market (www.da.gov.ph).

RA 8435, more commonly known as the Agriculture and Fisheries Modernization Act (AFMA), *enhances government support for modernizing agriculture and fishery sectors and empowering people to attain food security and poverty alleviation.* RA 7900 or the High Value Commercial Crops Law *promotes the production and marketing of high value crops by providing Ps 1 billion fund allocation for credit.*

The Government is also implementing banner programs to support the AFMA. Under the Department of Agriculture (DA), the following programs support the development of the vegetable industry in the Philippines:

Agribusiness and Marketing Assistance Service (DA-AMAS)

The Agribusiness and Marketing Assistance Service (DA-AMAS) is responsible for facilitating and coordinating programs related to agribusiness development and marketing. Consistent with the idea that all agricultural enterprises should start and end with the market, DA-AMAS was created in the late 1980's to provide a market orientation to the DA's programs. Its programs were later aligned with the provisions of AFMA. Market intelligence/assessment, dissemination of market-related information and supporting market linkages figure prominently in AMAS programs. AMAS also provides support to other DA and government agencies in establishing transport infrastructure and facilities, and the promotion of standards and quality systems. Among its agribusiness related activities are the implementation of EO 376, which reinstates duty-free privileges for agricultural inputs, equipment and machinery, and securing funding for feasibility studies from the Agriculture Competitiveness Enhancement Fund (ACEF), consisting of in-quota tariffs collected from the importation of agricultural products under the Minimum Access Volume (DA 2003).

Bureau of Postharvest Research and Extension (BPRE)

BPRE aims to reduce postharvest volume and quality losses, ensure the value of agricultural products and enhance the capacity of smallholders and other stakeholders to undertake on-farm value-adding activities. BPRE also advocates policies that enhance the development of the postharvest industry (BPRE 2005). Among its programs that have benefited the vegetable industry are the provision of cold chain systems for use by vegetable growers and traders, and the provision of cableways in upland areas. These programs have led to private sector investment in cableways and cooling facilities.

Bureau of Plant Industry (BPI)

The BPI provides plant quarantine services, including pest risk analysis. In the Philippines, BPI is responsible for issuing phytosanitary certificates. It also provides accreditation services to seed growers as provided for by Republic Act 7308 (Seed Industry Development Act of 1992), to ensure the availability of quality planting materials for vegetable growers. BPI is also responsible for the implementation of Republic Act 9168 (Philippine Plant Variety Protection Act), which provides for a transparent system granting ownership or rights over new plant varieties to plant breeders. Rules and regulations covering the importation and release of plant and plant products derived from biotechnology (DA

Administrative Order 8, 2002) are implemented by BPI in collaboration with relevant DA agencies and in cooperation with the Department of Science and Technology (DOST).

Along with the Fertilizer and Pesticide Authority (FPA), the BPI are responsible for establishing maximum residue levels (MRLs) for pesticides and monitoring residue levels in vegetables to ensure safety and compliance.

Fertilizer and Pesticide Authority (FPA)

Assuring adequate supplies of fertilizer and pesticide at reasonable prices, rationalizing the manufacture and marketing of fertilizers, protecting the public from risks arising from the misuse of pesticides and educating the agricultural sector in the appropriate use of these inputs are the mandates of the FPA. It is a regulatory agency of the DA, although R&D and extension constitute part of the agency's functions. This agency checks pesticide residue levels in agricultural crops and monitors crop pest infestation in cooperation with the BPI.

Ginintuang Masaganang Ani-High Value Commercial Crops Program (GMA-HVCC)

This market-oriented banner program under the Office of the Secretary of Agriculture supports the production and marketing of high value commercial crops. The program covers policy advocacy, market development and promotion, infrastructure support, investment and financing; technology development and IEC. The program also provides high quality seeds and planting materials; postharvest facilities such as cold chain system, cableways and trading posts; timely market information, facilitation and linkages; better regulatory services including certification, pest and food safety risk analysis; and the development of improved production technologies. An integral aspect of this program is the RO-RO Strong Republic Nautical Highway, which links the three major island (Luzon, Visayas, Mindanao) groups in the country.

More recently, the Gintong Ani High Value Commercial Crops Program (GA-HVCCP) has been replaced by the Ginintuang Masaganang Ani (GMA) Program which promotes *a major shift towards a market-oriented production system through the introduction of the Commodity Producers Linkages with Users (Commodity-PLUS)*. The Commodity-PLUS is being used to identify and address the gaps in commodity marketing systems. The GMA will focus on achieving food security and poverty alleviation, with the local government units and other stakeholders developing their own plans and programs suitable to their respective localities. Such plans and programs should be able to ensure food security by increasing productivity in irrigated areas, while addressing poverty alleviation by providing support to marginal areas to empower those who have the least.

Diversified Farm Income and Market Development Project (DFIMDP)

The Diversified Farm Income and Market Development Project (DFIMDP) of the DA aims to enhance the competitiveness of the private sector through improved regulatory services, market linkages, technology development and dissemination, and planning, policy and budgeting systems.

The Quedan and Rural Credit Guarantee Corporation (Quedancor)

In 2001, Quedancor started implementing the program for Self-Reliant Teams (SRT), extending credit to a group of 3-15 smallholder farmers, with a leader who collects payments from members and assumes the responsibility for remitting them to Quedancor. The leader is exempt from the service fee on his loan and is given 15 percent of the total regular interest collected from his group. SRTs undergo training in values, leadership, agribusiness and financial management, and the technical aspects of production (Robles 2005). The interest paid is 16 percent per annum.

Packaging R&D Center (PRDC) of the Department of Science and Technology (DOST)

The PRDC is a flagship program of the DOST that develops innovations in packaging for both fresh and processed agricultural products. It has assisted farmers' groups in the adoption of appropriate packaging systems for fresh produce (DOST 2001).

Philippine National Agriculture and Research System (NARS)

The Philippine National Agriculture and Research System (NARS) is composed of two basic structures: (1) the Philippine Council for Agriculture, Forestry and Resources Research and Development (PCARRD) as the planning and coordinating body, and (2) the National Agriculture and Resources R+D Network (NARRDN), a constellation of research centres and stations. The NARRDN members are line agencies (DA, DENR, and LGUs) and R+D institutions (state colleges and universities), and the private sector (Lantican 2000).

A national research centre conducts basic and applied research across a broad range of disciplines. It packages generated technology appropriate for specific commodities and dominant farming or production systems after successful verification in regional and cooperating field stations.

A regional centre concentrates on applied research on commodities of major importance to the region. The purpose is to provide more location-specific information within the various agro-ecological zones of the country.

Cooperating field stations are selected as experimental sites for state colleges and universities, the DA, and private organizations that provide facilities for on-farm field trials.

In the Cordillera region, the Highland Agriculture and Resources Research and Development Consortium (HARRDEC) was established to build up regional capability for research management. Its members comprise the regional offices

of the DA, DENR, DOST, DAR, BNCRDC-BPI, the six state universities/colleges (SUCs) in the different provinces in the region, and the provincial governments of Benguet and Mountain Province.

The Ilocos Agriculture and Resources Research and Development Consortium (ILARRDEC) was established in 1979 with Mariano Marcos State University (MMSU) in Batac as the base agency. ILARRDEC is now a consortium of 17 member agencies mandated to coordinate, monitor and evaluate the implementation of R+D activities, provide direction for consortium-led programs and serve as an avenue for resource sharing among R+D agencies in Region I.

ILARRDEC has five working groups with different but interrelated functions. The Regional Research and Development Coordinating Council (RRDCC) is the policy making body; the Regional Technical Working Group (RTWG) is the technical arm of the consortium; the Regional Applied Communication Office (RACO) is the communication arm responsible in the production and development of information, education and communication (IEC) materials; and the Regional Management Information Service (RMIS) maintains the in-house information system that supports the function of R+D management and the information needs of various users. The Regional Technology Promotions and Commercialization Group (RTPCG) disseminates the generated mature technologies, through IEC, ICT materials as well as through trainings, seminars, demonstration farms and other techno-promotional strategies. ILARRDEC provides consultancy services, technical assistance, training and other capability development activities.

Aside from the Department of Agriculture (DA) and the Philippine Vegetable Industry Development Board (PVIDB), government and non-government organizations have implemented many different projects and programs to uplift and improve conditions for the farmers. Agencies such as the Provincial and City Agriculturist's Office in towns and cities are establishing trading posts, demonstration farms and the like.

Vegetables, although considered as high-value and capable of making a significant contribution to farmers income, have not been given much priority by the government. At best, the budget allocated to vegetables is about 4.7 percent of the total R+D expenditure in agriculture (BAR 2003).

6.2 Non government programs

USAID-GEM

The Growth with Equity in Mindanao (GEM2) Program is a five-year program (2002-2007) funded by the United States Agency for International Development (USAID). Although it covers the entire island, GEM has a focus on the Conflict Affected Areas of Mindanao (CAAM).

Within the GEM2 Program, the Business Growth Division is composed of the following components:

- Business Support Organization (BSO) Development
- High Value Horticulture (HVH)/Cold Chain
- China Export
- Sustainable Aquaculture and Fisheries Effort (SAFE)
- Targeted Commodity Expansion Program (TCEP)/LEAP

Those components of the program that have a direct impact on the vegetable industry include the Business Support Organization Development, the High Value Horticulture /Cold Chain and the Targeted Commodity Expansion Program. Aside from the Business Growth Division, the Infrastructure Division of the program has also contributed to the development of the linkage between farmers and markets.

The Infrastructure Division has two sub-programs: the Barangay Infrastructure Program (BIP) and the Regional Impact Program (RIP). The BIP aims to construct 800 village level infrastructure projects like water systems, warehouses, solar dryers, boat landings, culverts, community centres, trading centres, bridges and roadway upgrades. The RIP focuses on the construction or rehabilitation of critical infrastructure with regional impact such as improvements to ports, roads and bridges in the conflict-affected areas of Mindanao. The infrastructure projects, particularly road upgrading, bridges and trading centres will provide small farmers and communities with greater access to markets.

The GEM Program partners with producer organizations like the Northern Mindanao Vegetable Producer Association Inc. (NORMIN Veggies) and the Vegetable Industry Council of Southern Mindanao Inc. (VICSMIN).

Upland Development Programme in Southern Mindanao

The Upland Development Program (UDP) in Southern Mindanao is a project funded by the European Union that is being implemented by the Department of Agriculture. The aim of this project is to *“develop a replicable model for sustaining the upland resource base and to improve the living standards and prosperity of communities who derive most of their income from upland farming”*. UDP is being implemented *“through a participatory community-based development approach”* with local government units, the community and other partner institutions. The project was supposed to conclude in January 2006 but has been extended for another 18 months. The extension was designed to institutionalize the Sustainable Upland Development (SUD) model that was developed by the program.

The UDP operates in Davao (Region XI), which is composed of Compostela Valley, Davao del Norte, Davao Oriental and Davao del Sur. It is also being implemented in the provinces of Sarangani and South Cotabato in Region XII. The SUD model consists of six schemes:

- Land Use-Based Barangay Development Planning

- Agricultural Extension Delivery System for promoting the Diversified Farming System
- Barangay Forest Protection and Management
- Labour-Based Routine Barangay Road Maintenance
- Rural Financial Services
- Upland Village Enterprise Development

According to the Annual Report (2005), UPD has completed 250 infrastructure projects:

- 59 road rehabilitation projects (total length of 157 km)
- 20 foot-trail rehabilitation (total length of 28 km)
- 18 erosion control structures
- 124 water systems
- 29 footbridges

The Upland Village Enterprise (UVE) Development scheme *“calls for the establishment of producer or processor groups to work as the marketing arm of the upland communities”*. The scheme *“aims to increase incomes of upland farmers through consolidating crops produced by individual farmers to achieve volume that would enhance their competitive advantage and would allow negotiation for higher prices and institutionalization of markets”*.

An example of the linkages created between groups of farmers and institutional buyers recently happened in Koronadal City when the BALAKA Upland Farmers' Association, (BUFAI) of Barangay Miasong, South Cotabato, signed an agreement with General Tuna Corporation in General Santos City.

Kasilak Development Foundation Inc.

The Kasilak Development Foundation Inc. was founded in 1997 after a watershed management project in Davao del Norte, implemented by USAID and Dole-Stanfilco. Kasilak is registered with the Philippine Securities and Exchange Commission as a non-stock and non-profit social development organization. The organization operates in the provinces of Bukidnon, North Cotabato, South Cotabato, Compostela Valley, Sarangani and Davao.

Kasilak is involved in a variety of programs that support watershed and natural resource management, livelihood and income augmentation, and support for basic social services. The strategies employed include partnership development and linkages, program development and resource mobilization, strengthening of community-based organizations and their structures.

Kasilak has identified that low agricultural productivity, environmental degradation, inadequate infrastructure, limited access to basic social services and under developed tourist potentials are the main development concerns in Maragusan in the Compostela Valley in Southern Mindanao. As a response to these needs, they are implementing the Maragusan Valley Area Resource Development (MaVARD) Project. MaVARD is being implemented with the

support of Catholic Relief Services-United States Conference of Catholic Bishops Philippine Program under its Small Farms Marketing Program and Stanfilco and the local government unit of Maragusan. Components include agriculture extension, natural resource management, community infrastructure support, agro-enterprise development and marketing.

Catholic Relief Services

The Catholic Relief Services (CRS) is an organization that was founded by the Catholic Community in the United States. CRS has been operating in the Philippines since the end of World War II and also operates in 90 countries worldwide. The focus of the organization is on peace and reconciliation, health, microfinance, and agriculture and natural resource management.

Under the Small Farms Marketing Project, CRS has created partnerships with other development organizations in Mindanao. They are currently operating in Siay, Zamboanga Sibugay with the Xavier Agricultural Extension Service; Gen. S.K. Pendatun and Paglat in Maguindanao with Kadtuntaya Foundation; Impasugong, Bukidnon with the Kaanib Foundation; Davao City with PCEEM; and in Maragusan, Compostela Valley with the Kasilak Development Foundation.

7. Case study chains

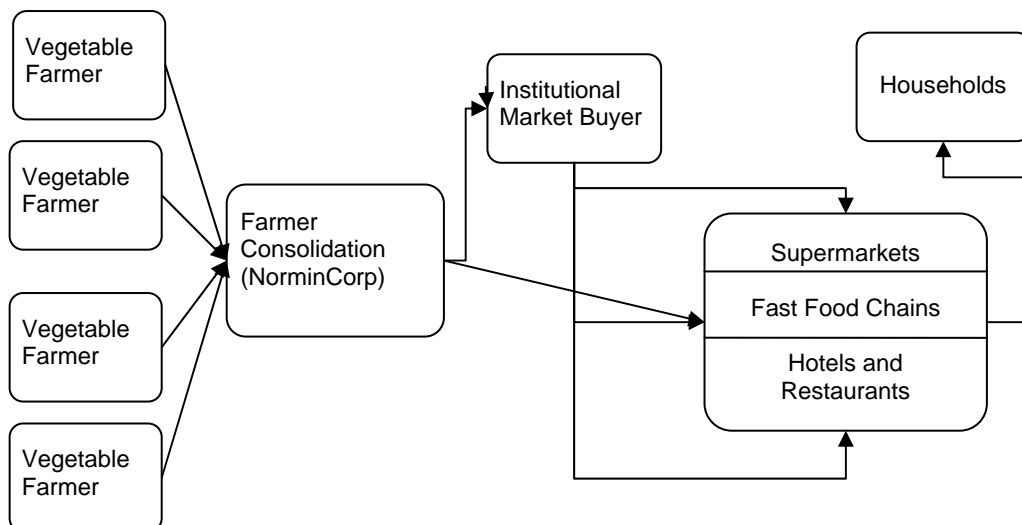
7.1 NORMIN Veggies – collaborative grower group (Region X)

The Northern Mindanao Vegetable Producers' Association (NORMIN Veggies) is an organization based in Cagayan de Oro. It was organized by small independent farmers in a concerted effort to facilitate the development of the vegetable industry in Northern Mindanao. The organization aims to improve the competitiveness of the vegetable industry by producing high value, high quality and safe vegetables. NORMIN sources fresh produce for the domestic and inter-island trade from all over Northern Mindanao, although most members' farms are located in the Kitanglad and Balatucan mountain ranges.

Northern Mindanao is an alternative source of fresh vegetables during the Luzon wet season. Some 14,200 hectares are available for semi-temperate and tropical vegetable production on a year-round basis (Uy 2006). According to the PAGASA Climate Map, Northern Mindanao has a Type III climate where the seasons are not very pronounced, although the months from November to April are relatively drier.

In 2005, the volume of vegetables shipped from Northern Mindanao increased by 53 percent to 1,978 tonnes. The increase in the volume of shipments was mainly attributed to the adoption of cluster farming (Business World 2006). NORMIN has facilitated the formation of clusters in order to meet the required market volume. The members of each cluster are committed to a production plan to ensure that downstream customers receive the desired quantity of product at the required time. The members of each cluster follow a specified crop production protocol. Each cluster has a cluster leader who is considered the best farmer for that crop. The cluster leader ensures that all members of the cluster abide by the production protocols and assists members if they have any problems with their crops (Figure 7).

Figure 7: Farmer Clustering to Target Institutional Market



Through the formation of marketing clusters, NORMIN have been able to achieve economies of scale in transporting produce, to access development assistance from government and NGOs, and to share market intelligence, production and postharvest technologies. However, as an incorporated association, NORMIN is unable to trade. To overcome this impediment, the membership established a private corporation NORMINCorp to act as the marketing arm. NORMINCorp operates at different nodes of the supply chain from production, postharvest, marketing and sales collections. The members are charged a facilitation fee based on a percentage of sales to ensure that NORMINCorp remains viable. This marketing arrangement is very attractive to farmers because they retain ownership of their product right up to the end buyer or institutional market (Concepcion et al. 2006).

The main focus of NORMIN's activities is to maintain the quality of the vegetables, to reduce postharvest losses and to increase the farmers' income. NORMIN have adopted postharvest practices like air drying, cleaning and sorting at the farm, and the use of plastic crates, boxes or wooden crates for packaging instead of sacks for vegetables like lettuce, broccoli, bell pepper, carrots and others. The only product that is still packed in sacks is squash. Buyers who are not used to the new packaging of the vegetables are shown the benefits, but if they still prefer the sacks, NORMIN will pack the vegetables in sacks.

NORMIN has established markets in metro Manila; in the cities of Cebu, Bacolod, Iloilo, Tacloban, Bohol, Dumaguete and Ormoc in the Visayas; and Camiguin, Butuan, Iligan, Dipolog, Gingoog, Pagadian, Ozamis, Jolo and other municipalities in Mindanao. Their markets are both the supermarkets and the wet markets in these cities. Cabbage, lettuce and wombok are delivered daily, while sweet pepper, bell pepper, carrot, sweet peas, beans, salad tomato, spring onions, cucumber, broccoli, and gourds are delivered weekly. Special products for specific markets are also delivered weekly like cherry tomato, baby sweet corn, red and white radish, red cabbage, herbs, onions, leeks, pai chai and spinach. NORMIN has become the preferred supplier for many buyers in the Visayas and Mindanao and as a result, they are able to command a price premium of 10 percent more than the spot market price because of superior quality.

NORMIN transport their products by trucks and vans and by sea to the markets in the Visayas and Luzon. Sometimes, the markets in metro Manila are willingly to pay for the additional costs of air shipping the vegetables, if supply is not available from Luzon. The main infrastructure constraint is the poor condition of the feeder roads from the main highway to the farms. While the main highway from Bukidnon to Cagayan de Oro City is completely sealed and well maintained, the roads to the barangays are third class roads. Most of the farms can only be accessed by a dirt road using animal drawn carts. At times, when rains are heavy and continuous, farmers have to resort to manual hauling to

bring their products to the roadside. This has implications on the efficiency of product movements during the rainy season.

Before 2006, consolidation was done at the pier prior to shipment. However, in May 2006, NORMIN acquired a market stall at the Agora Wholesale Market in Cagayan de Oro where the consolidation is done. The NORMIN Vegetable Consolidation Centre (NVCC) also provides an outlet for those members who need to access the spot market. The need for a traditional wholesale sales outlet emerged because the members are largely unable to control the growing conditions for their vegetables, which often results in poor quality and lower prices. NVCC acts as a warehouse and business centre for small farmers by providing storage facilities and services such as cleaning and drying. The centre also acts as a business centre by providing a meeting area for farmers and buyers. The NVCC has been able to make a significant contribution to the vegetable industry in Northern Mindanao by providing innovations in packaging and improved postharvest technologies. It has also provided NORMIN members with an additional market, promoted the market demand and provided independent price monitoring and other industry data gathering services (Concepcion et al. 2006). While spot market transactions do occur, over 80 percent of the transactions conducted through the NVCC are for contract buyers seeking regular deliveries.

The small farmer members of NORMIN are assisted by the Department of Agriculture and GEM (USAID) and 3 other development agencies. A group of 20 small farmers in the municipality of Impasug-ong, Bukidnon, are supported by the Kaanib Foundation. These farmers are considered marginal but they have an asset base, particularly land (ownership or access through rental or use for free in the case of common family land); draft animals (70% own), ploughs (70%) and garden tools (60%). Most farms are family operated using mostly family labour.

Another group of 30 farmers, assisted by the Lutheran World Relief (LWR), is located in the highlands around 1000 metres above sea level. Their crops are mainly cabbages and carrots.

The third group of 20 farmers, assisted by Catholic Relief Services (CRS), is in the lower elevation areas between 600 to 800 metres above sea level. This group of farmers are mostly rice and corn farmers, where vegetables are cultivated as a cash crop. Their products include sweet pea, sweet pepper, eggplant and ampalaya. For these farmers, commercial vegetable farming is generally financed by the traders.

In July 2006, NORMIN Veggies had 85 members (Table 13).

Table 13: Members of NORMIN Veggies (July 2006)

Farmers		72
Individual Producers	52	

Development Foundations	2	
Corporate Farms	7	
Farmers' Associations	4	
Farmer's Cooperatives	7	
Associate (Inputs/Service Providers)		9
Honorary (Institutional Partners)		4
Total		85

Source: Uy, 2006

The farmer members of NORMIN Veggies generally own their own land and have an average of 3-5 hectares per family. The better financed farmers have farm sizes of 5 to 20 hectares. While they can operate their farms more independently, they are the main driving force of the innovations that occur in NORMIN for they are well educated and professionally manage their farms. They act as the leaders of the association and have initiated measures to increase the involvement of the smaller farmers in the association.

While most small farmers are unable to make the transition from being production-oriented to market-oriented, the members of NORMIN Veggies have been able to do so. Many factors contribute to the success of this group. First, their membership comprises of some independent growers who are more educated, better trained and more financially independent than the typical small farmer. These independent growers lead the association, look for new markets and new ways to reach these markets. Secondly, the small farmers who are involved in the association have been assisted by various non-government organizations who have represented their needs and guided the farmers in their decisions. Thirdly, NORMIN has been able to access funds from development agencies because they were able to demonstrate that they have taken initiatives to strengthen their organization and develop their markets. Fourthly, members of NORMIN Veggies established a marketing arm for the association in the form of NORMINCorp, which has been managed as a business enterprise to service the marketing needs of NORMIN Veggies members. Finally, members of NORMIN Veggies have consolidated their volume through a clustering strategy based on product fit and market fit. While membership in the clusters is optional, farmers who are cluster members have an assured market and can command better prices because of the production protocols adhered to. The clustering strategy enables small farmers to be active players in the supply chain, to meet the basic demands for consistent volume and quality, and to participate in dynamic markets like the fast food chains, food processors and supermarkets.

The experience of NORMIN shows that an organized group can respond to dynamic markets. However, NORMIN needs to increase the involvement of the small farmers in marketing clusters. While some clusters are already assisted by development agencies and are able to benefit from the collaborative marketing arrangements, other groups still require assistance to link them to

institutional markets. Specifically, some farmers in Impasugong still want to cluster themselves in order to take advantage of better prices. The lead farmer, Mr. Ben Maputi, has been identified and has shown the ability to produce good cabbages. Currently, he is supplying the NVCC consolidation centre as an individual and believes that he can take advantage of economies of scale in transport and other production activities if he is a member of a cluster. Other neighbouring farms are not part of a cluster and they too have expressed their desire for him to form a cluster and to coordinate their marketing activities. This research project can provide the necessary documentation to support the process for this group of farmers and assist them through capacity building.

There is also an increasing demand for cabbages in the Visayas areas which the new cluster can provide. However, little is known about the potential institutional market in the Visayas.

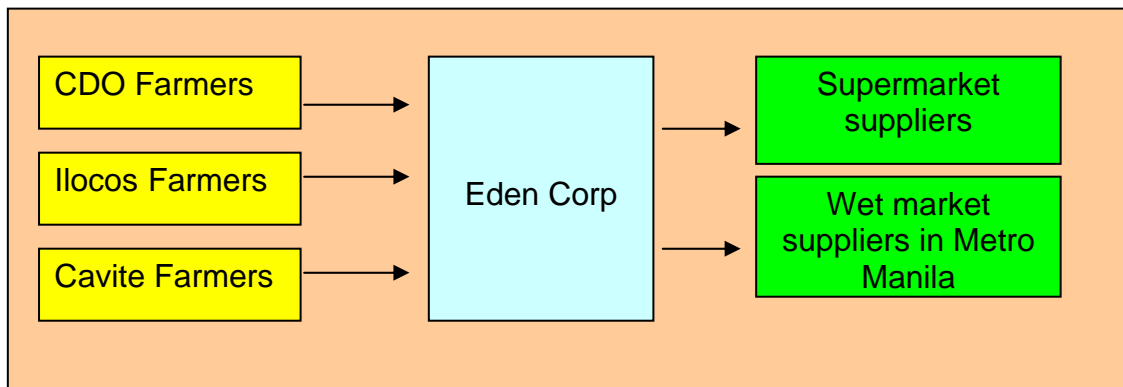
7.2 Eden – specialist tomato chain (Ilocos, Cavite, Region X)

Eden is a large Filipino-owned corporation with agribusiness ventures in bananas, papayas, vegetables, organic farming and marketing. Its main operations are in Mindanao, but marketing offices are located in Cebu and Quezon City for easier access to the supermarkets.

Tomatoes are the biggest single product for Eden. As a result, the company has a specific supply chain dedicated to this product. The company have been dealing with tomatoes for about 20 years and has cold storage facilities in Quezon City to handle 10,000 to 11,000 crates each week, or 230 to 275 tonnes per week. Eden controls 15-20 percent of the 60,000 crates of tomatoes traded per week in metro Manila during the second half of the year.

Eden sources tomatoes from several regions including Ilocos, Tagaytay, Benguet and Cagayan de Oro. During the first half of the year, Eden sources tomatoes from Ilocos, Tagaytay and Benguet. During the second half of the year (July to December), the supply comes mostly from Northern Mindanao (Figure 8).

Figure 8: Eden Corporation Tomato Supply Chain



According to the Bureau of Agricultural Statistics (2003)(cited by DA Region 1 2005), the average domestic production of tomatoes in the Philippines from 1993 to 2004 was 147,762 tonnes. The greatest quantity of fruit (49,862 tonnes or 34%) was produced in the Ilocos Region (Region 1), 14 percent in Mindanao, 11 percent in Central Luzon, 11 percent from Calabarzon, 7 percent from the Visayas and 23 percent from other regions.

The climate in the Ilocos region is Type 1 described as two pronounced seasons: a wet and a dry season, with maximum rainfall occurring from June-September and a dry season which lasts from 3-6 months. Rainfall in these areas occurs mostly during the southwest monsoon season. In the Ilocos lowlands, the cultivation of tomato normally begins at the onset of the dry season after rice is harvested (November to December). Due to the large volume of fruit that is available after Christmas, the price of tomato tends to be very low.

While the rainfed lowlands of Ilocos Norte serve as a model for intensive agricultural systems, intensification has led to an increased use of purchased inputs such as chemical fertilizers and pesticides (Agustin et al. 2000). The first signs of non sustainability such as increased nitrate contamination of ground water and reduced farm productivity are now becoming apparent. The major production constraints identified for tomato include: soil nutrient imbalance, high cost of fertilizer, pest and diseases, inadequate capital, and fragmented production area or small farm size. According to the Department of Agriculture Region 1, the major institutional problem is weak farmer groups.

The major marketing constraint identified by the Department of Agriculture Region I is the multi-layered marketing channel that leads to high consumer prices but low farm gate prices for the producers. According to Lantican (2000), most Manila based wholesalers in the Balinatwak and Divisoria wholesale markets frequently complain about the prevailing practice of including poor quality tomatoes (blemished, small sizes, shrivelled and overripe) in bulk deliveries. This practice results in high rates of product rejection.

The Northern Mindanao fruit is shipped to Manila through Cagayan de Oro from farms located in Libona, Bukidnon and Claveria. Eden Corporation has 20 contract farmers, mostly in Libona, with each farmer cultivating 2-10 hectares.

Farmers who choose to contract farm for Eden Corporation must decide upon the volume they will supply on a regular basis and agree to a maximum price. In turn, Eden will undertake to purchase a pre-determined quantity per week and to guarantee a minimum or floor price. To ensure they meet their commitments, farmers must periodically plant tomatoes to ensure a regular and reliable supply. At the grower level, the various problems identified were the high incidence of Leaf Curl Virus, which has resulted in significantly lower yields, and inadequate postharvest facilities.

Farmers harvest and pack their tomatoes on farm, placing both their name and a code on each crate of tomatoes. They are encouraged to pack 23 kg of tomatoes per crate instead on the industry practice of 25 kg to reduce the incidence of bruising. Over-packing the crates has become an established industry practice because of the high cost of transport. The farmers however, do not see the effect of the over-packing, for it is not evident until the fruit reaches the retailer. Consequently, Eden have developed a system of taking photographs of the bruised fruit on arrival in Manila and emailing the photos to the farmer. With this practice, farmers are encouraged to continuously improve their post-harvest practices to achieve the best price.

Farmers are responsible for transporting their crates of tomatoes to the Eden office in Cagayan de Oro, where the shipment to metro Manila is consolidated. Farmers pay for the cost of freight to Manila which is deducted from their sales receipts. Farmers pay Eden Corporation a commission of 22.5 percent. The journey to Manila takes 36 hours.

On arrival at the Eden consolidation point in Quezon City, workers repack the tomatoes into 1 kg plastic bags for the supermarket buyers. Different supermarket chains have different purchasing arrangements with Eden. With one supermarket chain, Eden has a concession and is responsible for filling the shelves with produce, cleaning, wrapping, replacing and bar coding. The supermarket generates income from the rental of the shelves as well as a percentage of sales. With other supermarket chains, Eden has an outright purchase agreement where the buyer orders and pays after 7-15 days. Because Eden controls the majority of the supply of quality tomatoes, they are able to maintain their relationship with the supermarket chains and supply them with other items as well. Specialization in one product has enabled them to open doors for other products.

For those wholesalers who supply the wet markets like Divisoria, Marikina, Balintawak and Pasig, tomatoes are purchased by the pallet. Eden is preferred to the Divisoria by their non supermarket buyers as the fruit is of better quality, storage facilities are available for renting, and buyers are able to make their selection based on quality, size and other criteria. Eden values loyalty and long-term buyers are accorded priority in making their selection. Wholesalers are responsible for loading and transport from the consolidation centre to their own retail areas where the product may be resorted and regraded according to individual customers needs. When the prices of tomatoes are high, supermarkets purchase the larger tomatoes while the wet markets generally purchase the smaller fruit so that consumers buying in the wet markets can still afford them.

The president of Eden Corporation is very enthusiastic about the forthcoming ACIAR project and looks forward to some form of partnership with the research team. The reason for their involvement is their desire to improve the overall performance of the supply chain. Eden have verbally informed the team that they are willing to provide any information required to enhance and to improve the linkages that the farmers have with them.

7.3 CRS – Maragusan (Region XI)

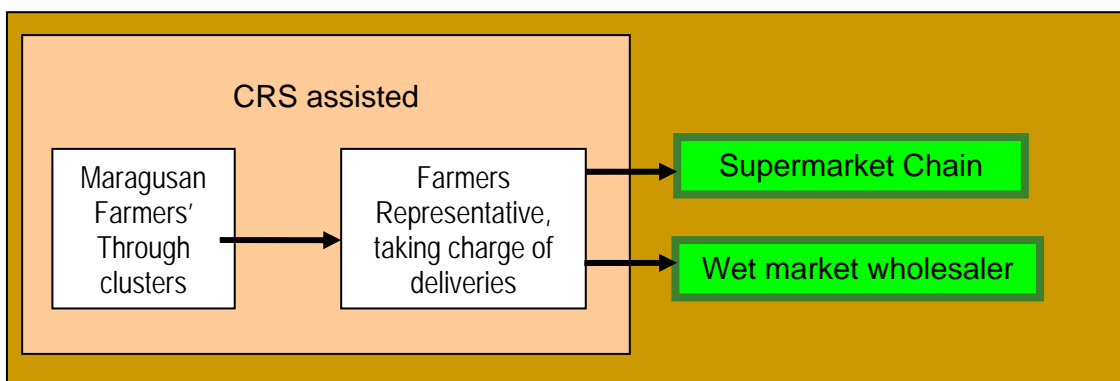
Maragusan is a municipality located in the Compostela Valley in Davao Region in the south-eastern part of Southern Mindanao. Maragusan lies in an elevation of 630 metres above sea level, with a peak elevation of 2,295 metres. The topography ranges from flat to very gently sloping, gently sloping to undulating, moderately sloping to rolling, and mountainous and rugged. The municipality has a relatively cool climate.

Maragusan has 24 barangays, most of which rely upon agriculture for the main source of income. An interesting development in the vegetable supply chain in Maragusan is the move by at least 5 of the barangays from the traditional supply chain to a more producer managed chain. This transition is being initiated by Catholic Relief Services.

The development strategy employed by CRS is four-pronged and includes agricultural extension, infrastructure, natural resource management and marketing assistance (Mendoza 2006). The marketing assistance package is composed of basic marketing training, product selection, market visits, cluster formation, enterprise planning and trial shipment. To date, 14 of the 24 barangays have been included in the marketing program.

Initially, a cluster of 5-10 farmers was formed to coordinate production, harvest and marketing activities. Consolidation provided the farmers with better access to markets and lower transport costs. The farmers themselves identified what products they were good at and how much volume they could commit to the cluster. If one farmer failed to comply with their commitment, this farmer was eliminated from the group by the other farmers in the cluster. A cluster leader with good farming skills and the ability to lead was selected from among the farmer members. The lead farmer takes care of reminding the others of the harvest schedule and the need to bring the vegetables to a central packing and loading area. Trucks are rented to bring the produce to the market. The cost of the truck is divided among all the farmers depending on the value of their product. Each time the farmers deliver, they must consolidate enough to have 4 tonnes of vegetables in order to maximize the load on the truck (Figure 9).

Figure 9: CRS assisted Maragusan supply chain



One of the first markets for these farmers was the NCCC supermarket in Davao City. To assist the development of the group, the buyer waived all the requirements for a regular supplier like official receipts, certificate of registration and the like, since the farmers were not organized enough to have these legal documents. The supermarket provided the receipts for all the transactions to be signed by the lead farmer. The volume supplied continued to increase and the relationship seemed to be going well for the first half of 2006. The supermarket wanted 2.5 tonnes of assorted vegetables twice weekly, but the farmers were only able to deliver 3 tonnes per week. Furthermore, the farmers were unable to provide the volume at the price the supermarket wanted to pay. As a result, the group have temporarily stopped supplying the supermarket in order to rethink their marketing strategy.

More recently, the Maragusan farmers have started to transport their vegetables by land to Cagayan de Oro where NORMINCorp purchase and ship the product to the Visayas. A week before the vegetables are delivered, prices in Cagayan de Oro are monitored by contacting buyers in CDO. A truck is then contracted to pick up the vegetables. The volume available is then confirmed by the cluster heads a day before the packing materials are delivered to the farms. Harvest is done the next day and delivery to a consolidation centre in each barangay is performed the day after that. The truck travels at night and the vegetables reach Cagayan de Oro approximately 12 hours later.

Farmers have also been taught to calculate and record the costs of production and all other expenses related to the postharvest, transport and marketing activities. While chemical fertilizers are used, some farmers use organic fertilizers made from fermented plant juice. Cash constraints, bad roads and the distance from agri-input stores support the farmers' attempts to minimise the use of inputs.

Great potential exists to strengthen the production and marketing systems used by the Maragusan farmers. There is much support from the local government who stand to benefit from improved farms in their municipality. The demand from the supermarkets in Davao continues, for supermarkets still experience great difficulty in finding a reliable supplier of fresh vegetables. The current practice for supermarkets in Davao is still to source their vegetables from the central wet market therefore, they neither have a price or a quality advantage over wet market retailers.

The main impediment to the Maragusan supply chain is the road network to and from the farm areas, which are mostly unpaved and rugged and inflicts much damage on the produce. Major improvements could also be made in the packaging of the vegetables, as well as other postharvest strategies.

Small subsistence farmers can only take an active role in the development of their farm as a business enterprise if the development agency assisting them empowers them to learn that farming should be viewed as a business that satisfies markets, takes financial risks, improves delivery systems and develops enterprise plans.

7.4 VICSCo – food manufacturing chain (Region XII)

The Province of South Cotabato is located in the southern most portion of the island of Mindanao. It is comprised of Koronadal City, the capital, and the municipalities of Banga, Norala, Surallah, Lake Sebu, Tantangan, Polomolok, Tupi, T'boli and Santo Niño. The province supports a total population of 657,717.

Some 1,292 hectares are currently utilised for vegetable production, which is about 0.9 percent of the total agricultural area in the province (UDP 2002). The

temperature in the province ranges from 32-38°C during the day and 23-32°C during the night. Maximum humidity is recorded at 88 percent during the period of June to October and 72 percent during the months of February and April. The climate type for the province is classified as Type IV. This climate type is characterized by rainfall that is evenly distributed throughout the year.

The farmers in South Cotabato produce vegetables mainly for consumption by the local population. Their buyers are mostly traders and retailers that sell vegetables in the local market and institutional buyers from the same area. The South Cotabato farmers usually source their seeds and other chemical inputs such as fertilizers and pesticides from local agricultural supply stores. In some cases, seeds are obtained from previous harvests and farmers make fertilizers themselves from local materials on their farms. Several farmers are now starting to categorize their farms according to their growing methods: organic, organically grown and conventional. The shift to organically grown and organic is a result of programs implemented by the government.

Although there are a number of sources for credit like banks and other institutions, most of the farmers in South Cotabato are self-financed. This is due to the type of crops that they plant and their organic and organically grown methods. The vegetables that are mostly grown in South Cotabato are the tropical types of vegetables that include bitter melon, squash, string beans, okra and eggplant. In those areas with a higher altitude such as Tupi, Tampakan and Lake Sebu, farmers plant temperate and semi-temperate vegetables like potatoes, carrots and cabbage.

The Department of Agriculture through the Provincial Agriculture Office provides technical support and some areas are supported by the Upland Development Program (UDP) in Southern Mindanao. Seed companies may also extend technical assistance to their customers through their technicians.

The Vegetable Industry Council of South Cotabato (VICSCo) was formed in November 2005. The membership is composed of farmers from Koronadal City and the different municipalities of the province. VICSCo is assisted by the Provincial Agriculture Office of South Cotabato who are also supporting the construction of a wholesale trading centre in Surallah.

Fresh vegetables are brought into the traditional wholesale markets a day before the designated market day. Vegetables are transported using tricycles, jeeps and trucks, depending on the terrain and distance. In some instances, farmers will bring the produce to the trading areas and in other instances traders will collect the vegetables from the farms. The primary determinant for this is the price and scarcity of supply.

According to the farmers, consumers in South Cotabato prefer the tropical vegetables, yet market research by the UDP shows that the greatest demand is for potatoes, carrots and cabbage. Farmers in South Cotabato are seldom integrated with institutional buyers and their market horizon is limited to the

trader-receiver. This is unfortunate, for one of the largest industries in South Cotabato is the tuna canning industry and the tuna canning industry requires a regular supply of vegetables for their canned products.

In General Santos City, there are two tuna canning corporations that produce flavoured canned tuna for the domestic market. These corporations are General Tuna Corporation and Philbest Canning Corporation both located in Barangay Tambler.

General Tuna Corporation (GenTuna) is the maker of Century Tuna, Fresca Tuna, 555 Tuna and Blue Bay Tuna. These brands have a combined market share of 97 percent of the domestic canned tuna market. GenTuna requires 15-20 tonnes of potatoes per week, 3-4 tonnes of carrots and 4 tonnes of red bell pepper per week (Table 14).

Table 14: Vegetable Requirements of General Tuna Corporation

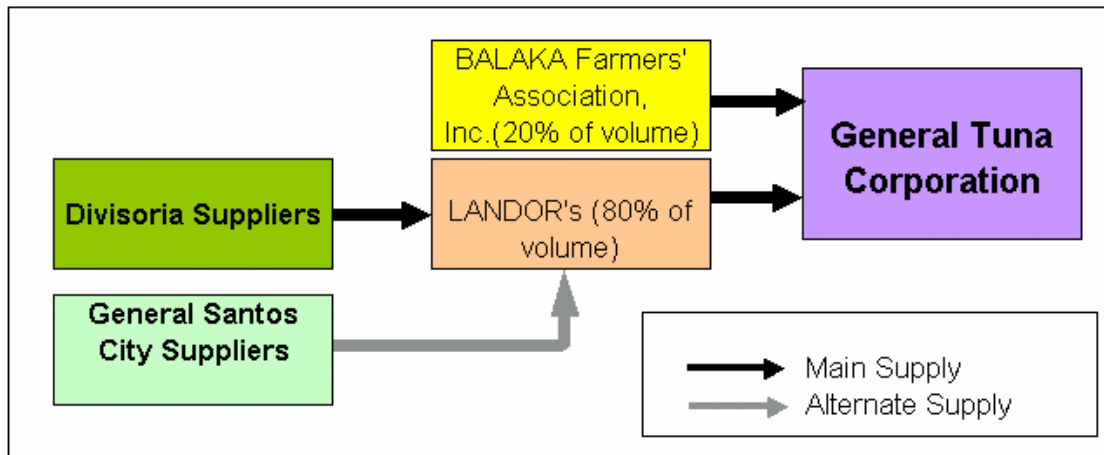
Vegetable	Requirements	Purchasing Requirements	Terms
Potatoes	15 to 25 tons per week (100 gram per piece kind)	Legal Identity Must submit company profile Must have official receipt Must have delivery slip Would have to apply accreditation from GenTuna	30 days
Carrots	3 to 4 tons per week (1 ½ inch in diameter)		
Red Bell Pepper	4 tons per week (1 ½ inch diameter, 3 inches in length)		

GenTuna has traditionally purchased vegetables from local suppliers in General Santos for their production requirements. However, the unstable supply of vegetables has caused interruptions in the production of canned tuna. This has compelled the company to purchase vegetables from a supplier (Landors) that is based in the Divisoria market and can reliably supply the required volumes. Landors may purchase vegetables from anywhere in the country or chose to import, just as long as the required volume reaches the canning plant in General Santos by the due date.

With the assistance of the Upland Development Program (UDP) and Development Consulting Group Inc. (DCGI), a group of farmers have been able to enter into a contract with GenTuna to supply 20 percent of the vegetables required for one year. If the performance of the group is satisfactory, the contracted volume will be increased up to a point where they will become the sole suppliers of vegetables.

The group of farmers supported by the UDP is the BALAKA Farmers Association Inc. (BUFAI) that is based in Barangay Miasong, Tupi, South Cotabato. BALAKA is an acronym for Benigno Aquino, Labtung and Katipunan, the three sitios in Barangay Miasong (Figure 10).

Figure 10: General Tuna Corporation Vegetable Supply Chain



Philbest Canning Corporation sells flavoured canned tuna under the Dolly and Philbest brand names. They have the remaining 3 percent market share for the domestic canned tuna market. For their production of their flavoured tuna products they require potatoes, carrots and red bell peppers. Generally, vegetables are purchased from local traders. While the company will pay cash, they prefer to purchase under a deferred payment system. This gives the company time to evaluate the quality of the vegetables that have been delivered and to return poor quality product.

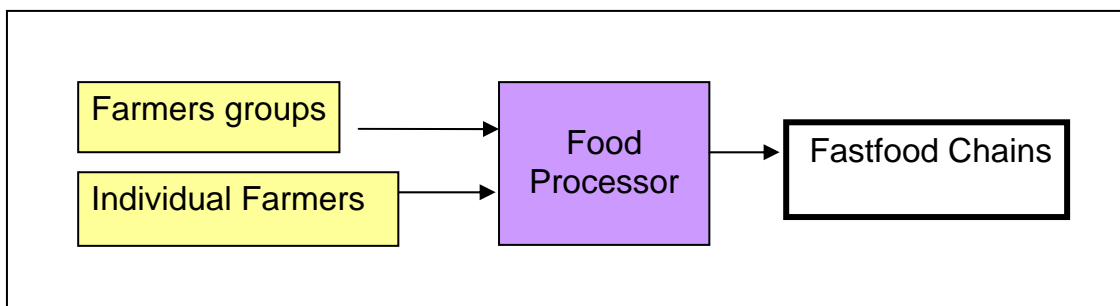
Of the two companies, General Tuna is the most profitable and stable given their 97 percent share of the domestic canned tuna market and a projected requirement that is not dissimilar to the combined demand of General Santos and Koronadal City. The other advantage that GenTuna provides is the projected production requirements, which are very helpful for farmers in planning vegetable production.

7.5 GTGF – food processor managed chain

The traditional vegetable chain provides the main source of fresh vegetables for most restaurants and hotels in most parts of the Philippines. In recent years, however, fast food chains have become the drivers for change. In order to streamline their operations and to cut costs, the fast food chains no longer want to purchase unprocessed vegetables. Consequently, the fast food chains have turned to vegetable processors to fulfil their needs.

An example of such a development is GTGF, a food processor that supplies fresh vegetables and coleslaw to fast food chains in Manila. Vegetables are sourced from farmers in Benguet through the La Trinidad Trading Post and through the formation of collaborative farmer groups (Figure 11).

Figure 11: GTGF food processor-managed chain



The formation of collaborative farmer groups or clusters was necessary to not only secure a reliable supply base but to ensure that growers could meet the stringent quality specifications of downstream customers. Initially, a fixed price for each crop was agreed for the whole year. However, while growers acknowledged the advantage of this arrangement, the allure of high prices in the spot market has proven to be the greatest hurdle to overcome

Through working with the farmer clusters, GTGF seeks to; (1) improve the efficiency of farming practice and compliance with the highest standards of farming, production programming, post-harvest procedures, packaging and sanitation; (2) develop business skills in order to be able to appreciate risk, opportunities and threats, and to manage their farming activities as a business, applying sound business practice; (3) improve the returns to farmers to reflect all the possible benefits due to them by recovering the cost of soil rehabilitation, land preparation, inputs, labour and subsistence; and (4) to nurture social values which underlie the first three objectives and will keep the partnership intact (Baniqued 2006). As the processing business is unable to absorb all the product produced by the growers and as not all of the product produced meets the quality standards, GTGF are exploring options to enter the household market and institutional food service market. There are also opportunities to tap into the export market and work towards meeting the requirements for global trading.

Lettuce is being grown in Benguet and Buguias and sold to high-end market outlets in metro Manila. Freshness and quality is maintained through the extensive use of cold storage at each step in the marketing system. The cold chain system for the lettuce involves harvesting and packing by the farmers. The harvest is then transferred to a pre-cooling plant where the lettuce are sorted, graded, packed, stored and later loaded onto a refrigerated truck for transport directly to the plant in metro Manila for processing and subsequent despatch. The cold chain was established in coordination with the DA-CAR, Benguet Vegetable Enterprise Multipurpose Cooperative, Bureau of Postharvest Research and Extension, Bureau of Agricultural Research and BSU.

At the farm level, micro-finance remains an important obstacle. For most of the small vegetable farmers in the Cordillera, traders provide the finance to those

farmers with insufficient capital to fund their production. As the traders then do the marketing for the farmers to ensure they recover their investments, this practice gives the traders absolute control over the price growers receive. As a result of this arrangement, growers are isolated from the market and the grower has little control over his income. Buguias farmers supplying GTGF have succeeded in obtaining a Quedancor loan through the SRT program, although the farmers still find the process too slow. The training on agribusiness and financial management provided by Quedancor to SRT chairmen needs to be echoed and, where needed, reinforced by other training courses.

GTGF supplies coleslaw and fresh-cut (minimally processed) salad greens to KFC, Jollibee and Red Ribbon. Depending on the customers needs, GTGF will trim, clean, cut and pack lettuce, and is currently assessing the prospects of selling fresh or ready-to-cook vegetable mixes such as *pinakbet* or *nilaga*. GTGF has indicated that it needs assistance in developing new products that it might sell to fast food restaurants or other buyers. GTGF is currently refurbishing a processing plant it recently bought in anticipation of expanding its operations and has requested assistance in ensuring GMP compliance and eventually HACCP accreditation. Waste management is another potential area for assistance. Furthermore, GTGF has been asked by one of its customers to benchmark against China. Although this is viewed with apprehension, GTGF feels that production technologies have yet to be fully exploited in the Philippines to make the growing of vegetables more cost-effective.

Shared culture and values are key elements in the GTGF approach to building stronger partnerships among farmers and with their trading partners in the chain. Production programming can only be successfully implemented with a strong farmers group and this can only be achieved by working through the clan leaders. As a native of Benguet, the GTGF President has a strong cultural attachment to the Ibaloy and Kakana-ey tribes, who he believes he can help organize and thereby transform farmers in the area into partners who can reliably supply the mix of vegetables GTGF needs. In the processing plant, the staff share common religious beliefs that guide them in their day-to-day work and relationships. When GTGF first started, it went into partnership with the larger producers who in turn helped the smaller producers familiarise themselves with new technologies. GTGF's partnership with small producers is anchored in the belief that it is not the land area that matters, but rather facilitating the adoption of innovation and a more corporate outlook.

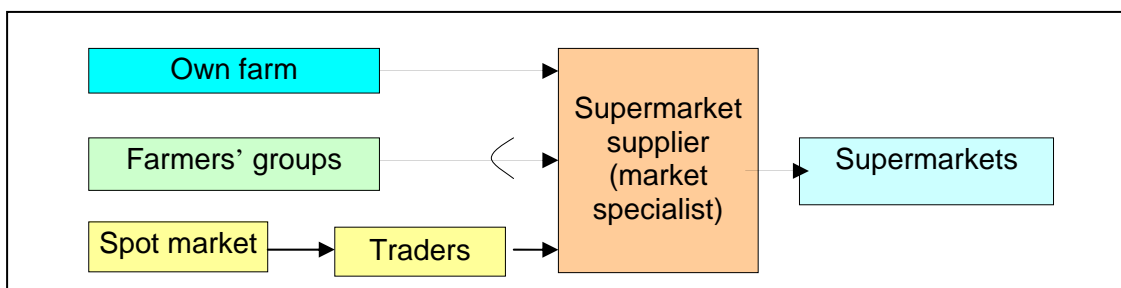
7.6 Dizon – specialist market chain

With the expansion in the institutional demand for fresh and semi-processed vegetables in the Philippines, market specialists are emerging who undertake to provide customers with everything they need. The market specialists provide a wide array of fresh vegetables including minimally processed, pre-cut and mixed vegetable packs, which are labelled and bar coded. They invariably brand their products, particularly their pre-packed salads.

Dizon Farms is the largest market specialist in metro Manila. Dizon has a strong relationship with the biggest supermarket chain in the Philippines and is their preferred supplier. Even although Dizon also supplies many of the other supermarkets, they are to some extent protected by their largest customers. In this type of relationship, supermarkets benefit because their preferred supplier will get them anything they need as often as required and to the quality specified.

Dizon source produce from their own farms and from multiple sources including other vegetable consolidators, domestic suppliers and importers in order to satisfy the needs of their preferred customers. The ability to source whatever product the supermarket needs gives Dizon Farms the edge over its competitors (Figure 12).

Figure 12: Dizon market specialist chain



Like most of the fresh produce companies who have attempted to establish a long-term collaborative relationship with farmer groups, Dizon have been disappointed in the past by the inability of grower groups to provide a consistent supply of good quality product. While much of the problem emanates from the lack of technical knowledge at the farm level, farmers will readily forgo whatever marketing arrangements they may have entered into to pursue a higher price. Initiatives to support and encourage the adoption refrigerated transport has been thwarted by the reluctance of buyers to provide any price incentive and while customers have yet to impose any standards for minimum chemical residues, growing consumer concerns about food safety and quality assurance may soon make it mandatory.

More recently, Dizon has started supplying restaurants like Pancake House, Max's, and MIASCOR Catering. MIASCOR Catering is a major inflight caterer in the Philippines, with a capacity of 5,000 meals per day.

8. Discussion and implications

Arising from this scoping study, six chains have been identified and agreed to participate in any future project:

Market specialist consolidator. Chain leader: Dizon Farms – is the largest vegetable consolidator in Manila. Dizon Farms are interested in establishing better linkages with farmer groups. Issues that need addressing for the chain associated with Dizon Farms include: agronomic support at the farm level; poor handling and packing procedures; opportunism, inconsistent quantity and quality; chemical residues and food safety.

Product specialist consolidator. Chain leader: Eden Corporation – is the largest specialist tomato consolidator servicing the metro Manila market. Eden ships fruit from Northern Mindanao and Luzon. Issues that need addressing for the chain associated with Eden Corporation include: technical expertise at the farm level; over-ripe and small fruit; disease issues; lack of market understanding; opportunism; and the high costs of transport.

Vegetable processor. Chain leader: GTGF Corporation – is a new processor who is a key supplier of coleslaw and lettuce to Jolibee and KFC. Issues that need addressing for the chain associated with GTGF include: lack of technical expertise at the farm level; infrastructure, transport and packaging from the farm to processor; quality assurance along the chain; and quality assurance at the processing factory.

Farmer group consolidator. Chain leader: NORMIN Veggies – a collaborative farmer association mainly composed of independent farmers who are shipping better quality product to institutional markets in Manila, the Visayas and Mindanao. Issues that need addressing for the chain associated with NORMIN Veggies include: technical expertise at the farm level; packaging and logistics; conflicts between small and large farmers; poor quality due to disease and weather; and market opportunities in the Visayas.

Assisted farmer cluster groups. Chain leader: Catholic Relief Services – in Maragusan, several farm clusters are being assisted by CRS, the Kasilak Foundation and NORMIN Veggies to consolidate vegetables for institutional markets in Davao and the Visayas. Issues that need addressing for the Maragusan chain include: agronomic assistance; identification of suitable markets for the quantities and qualities supplied by the farmer clusters; and the best approach for organising farmers to deliver consistent quantities of product.

Food manufacturer. Chain leader: General Tuna Corporation – is the largest tuna cannery in Southern Mindanao. It produces a number of canned products that require a regular and reliable supply of vegetables. Currently, it relies upon imported and dehydrated vegetables primarily because it cannot identify a reliable supply from local producers. Issues that need addressing include facilitating the clustering process and the linkage to market, technical expertise at the farm level, quality assurance along the chain.

The first 4 chains already have some established market linkages however they each have areas for improvement and opportunities to create new linkages with collaborative farmer groups. For example, GTGF have already had discussions

with NORMIN Corp and Benguet State University about creating linkages with additional groups of farmers. The latter two chains are in the development phase and will require linkages to be developed along the chain. All chains are directly or indirectly linked to the Manila market and offer the opportunity to observe and assist chain development with a range of drivers, stages of development, length, quality and type of relationships, product requirements and geographic locations.

A market orientation is essential for all chains, regardless of the nature of the production sub-system involved. Interventions in the GTGF, CRS, NORMIN Veggies and Eden chains are more easily defined since the primary producers have been identified and they have been participants in the respective chains for some time. The chains themselves are better defined as well. Participants in the chain, whether clusters of producers or their trading partners, have expressed the need for interventions. Internally or externally, there is some track record of technical and socio-economic innovations being adopted.

Most of the above interventions have to be commodity, location and situation-specific. Considering the potential in both modern and traditional markets, salad vegetables; i.e. lettuce and tomato, and the highland vegetables; i.e. cabbage, present the greatest opportunity for intervention. These vegetables also provide opportunities for multi-faceted interventions, including environmental management.

Regardless of the chain, systems for improved information flow, policy studies on credit and agricultural extension are identified needs. Consumer concern for safety needs to be adequately addressed, particularly since the campaign for increased vegetable consumption has been launched. Regulatory services to ensure food safety in vegetables need to be strengthened. Transport is another key area for possible intervention, more specifically, policy advocacy.

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Appendix 1

Major vegetable crops	Area (ha)	Volume (t)	Yield (t/ha)
Mongo	36,524.09	26,748.65	0.73
Peanut	27,484.00	28,406.81	1.03
Cabbage	7,419.20	91,438.98	12.32
Eggplant	21,285.64	187,863.00	8.83
Tomato	17,733.33	173,773.91	9.80
Garlic	4,704.70	13,234.38	2.81
Onion	8,886.12	82,018.66	9.23
Bermuda	4,469.00	46,510.97	10.41
Native	4,417.12	35,507.69	8.04
Camote	120,650.44	574,602.51	4.76
Cassava	204,795.13	1,678,372.54	8.20
Total	449,482.65	2,856,459.44	6.35

Priority vegetable crops	Area (ha)	Volume (t)	Yield (t/ha)
Habitchuelas	3,355.78	12,049.08	3.59
Asparagus	1,614.20	25,231.36	15.63
Banana blossom	-	59,977.00	-
Broccoli	207.33	2,071.70	9.99
Cauliflower	1,016.56	10,641.43	10.47
Kangkong	7,248.25	76,443.85	10.55
Lettuce	410.89	3,235.50	7.87
Pechay	10,218.00	80,638.87	7.89
Chinese	3,133.25	37,062.49	11.83
Native	7,084.75	43,576.38	6.15
Ampalaya	11,181.70	79,902.65	7.15
Chayote	15,292.00	117,017.52	7.65
Gourd	9,611.00	120,418.03	12.53
Okra	3,138.20	25,958.67	8.27
Squash fruit	14,148.00	272,531.96	19.26
Ginger	3,873.92	24,700.19	6.38
Pepper	4,109.62	15,775.91	3.84
Bell	2,439.82	10,950.84	4.49
Finger	1,669.35	4,825.06	2.89
Carrots	3,585.34	35,418.42	9.88
Gabi	18,075.14	109,684.36	6.07
Ubi	1,403.02	10,096.10	7.20
White/Irish Potato	5,497.00	70,160.18	12.76
Total	113,985.96	1,151,952.78	10.11

Minor upland vegetable crops	Area (ha)	Volume (t)	Yield (t/ha)
Stringbeans	6,338.35	75,693.86	11.94
Camote tops	-	62,254.15	-
Leeks	1,412.17	12,333.27	8.73
Patola	2,978.00	12,747.23	4.28
Radish	5,887.42	29,251.46	4.97
Singkamas	791.54	6,531.47	8.25
Black Pepper	1,863.00	4,416.08	2.37
Cucumber	1,587.04	9,225.45	5.81
Sweet Peas	1,696.80	5,808.18	3.42
Total	22,554.32	218,261.16	9.68

Minor lowland vegetable crops	Area (ha)	Volume (t)	Yield (t/ha)
Alogbati	2,480.18	32,303.73	13.02
Bago leaves	409.70	16,362.27	39.94
Gabi leaves w/ stem	-	3,230.77	-
Lumbia	7,693.35	41,292.94	5.37
Malunggay leaves	-	68,081.44	-
Jackfruit young	-	105,387.11	-
Malunggay Fruit	-	4,562.53	-
Chili pepper fruit	742.68	1,363.68	1.84
Arrowroot	611.95	2,257.20	3.69
Pao (galiang)	322.25	13,784.88	42.78
Tugue	5,057.00	2,711.06	0.54
Other vegetables	599.40	25,603.75	42.72
Total	17,916.51	295,003.16	16.47