

**SUPPLY CHAIN BOTTLENECKS OF CARROTS  
AMIDST PANDEMIC IN NORTHERN MINDANAO,  
PHILIPPINES**

**Hazel E. Soliven, DBA**

Central Mindanao University, Bukidnon, Philippines  
University Town, Musuan, Maramag, 8714 Bukidnon

**Abstract**

The increasing volume of food losses and unsold carrots in the market greatly affects the key players along the supply chain. The study was conducted to assess the carrot industry's supply chain in Northern Mindanao, Philippines. It covered major carrot-producing areas, specifically the IMMATASULA Complex. Reconnaissance surveys, courtesy calls, and visits to the LGUs and Agriculture Offices were done to identify the study sites. Through the referral method and site visitation, key players were identified in the carrot supply chain and interviewed a total of 96 respondents: 46 farmers, 13 traders (wholesalers and retailers), 1 processor, and 23 consumers. Results revealed that trust and informal agreements are involved along the chain, and fluctuation of prices three times a day is observed in the Bagsakan Center in Bulua, Cagayan de Oro City, especially since the supply of carrots is greatly affected by its seasonality and the presence of imported carrots from China. A total of eight (8) supply chains were traced, with the longest chain being Farmer-Canvasser-Trader-Canvasser-Wholesaler-Retailer-Consumer. High post-harvest losses were among the issues and concerns that can be attributed to many factors, such as inadequate post-harvest technology, poor farm-to-market roads, travel restrictions brought about by the COVID-19 pandemic, a lack of production programming and complementation across production areas resulting in gluts and dampening of prices, and the absence of cold storage facilities since the commodity is highly perishable and starts to lose its quality right after harvest. Hence, intervention projects must be done on production, post-harvest, and value-adding technologies to further boost the still-traditional supply chain of carrots in the region.

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**CORRESPONDING  
AUTHOR:**

**Hazel E. Soliven**

hazelesoliven109@gmail.com

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## INTRODUCTION

In order to achieve food security and provide important pathways out of poverty for millions of poor households, sustainable food supply chains must be developed. However, the majority of agricultural food supply chains continue to face sustainability issues such as supply chain inefficiencies and restrictions on supply creation. These issues have gotten worse as the COVID-19 pandemic has spread, and a new reality has brought new dangers to deal with.

There are bottlenecks in the supply chain caused by the local enforcement of quarantine regulations, particularly for the distribution of produce and production inputs. In the Philippines, even though farming was allowed during the lockdown, some farmers still felt their operations were constrained by various provincial regulations. For instance, stricter regulations were put in place in the province of Bukidnon in April 2020, allowing residents to only leave their homes in certain areas.

Many farmers faced difficulties selling their produce after harvesting their crops due to movement restrictions, in addition to production challenges (Oxford Business Group, 2020). Farmers in other regions have experienced difficulties in selling their produce due to logistical issues with moving food from farms to cities and the lack of customers after restaurants and institutional markets closed, which has resulted in the loss of fresh produce.

According to reports, the pandemic affects not only farmers but also other supply-chain participants and final consumers. For more than a decade, the final consumption of households accounted for over 70% of the GDP. During these years, food-related expenses made up 40% of total household consumption.

The Food and Agriculture Organization of the United Nations identified two things in their assessment of the impact of COVID-19 on food supply chains in the Philippines in 2021: (1) some farmers reported difficulties in securing inputs like fishing supplies, fertilizers, insemination services, and hatchery fry due to the closure of agro-trading shops; (2) across the supply chain's participants (farmers, assemblers, processors, and retailers), workers reported feeling underpaid and underutilized; (3) limited hours for operation in buying stations, trading centers, wet markets, and even fishing and landing ports resulted to ages of produce and caused its price to decline; (4) numerous farmers (and some consolidators) reported both a drip in sales; (5) retail prices showed a clear pattern of initial volatility. This clearly illustrates that there are still many improvements needed to make the food supply chains agile enough to withstand, immediately recover from, and adjust or adapt to such disruptions.

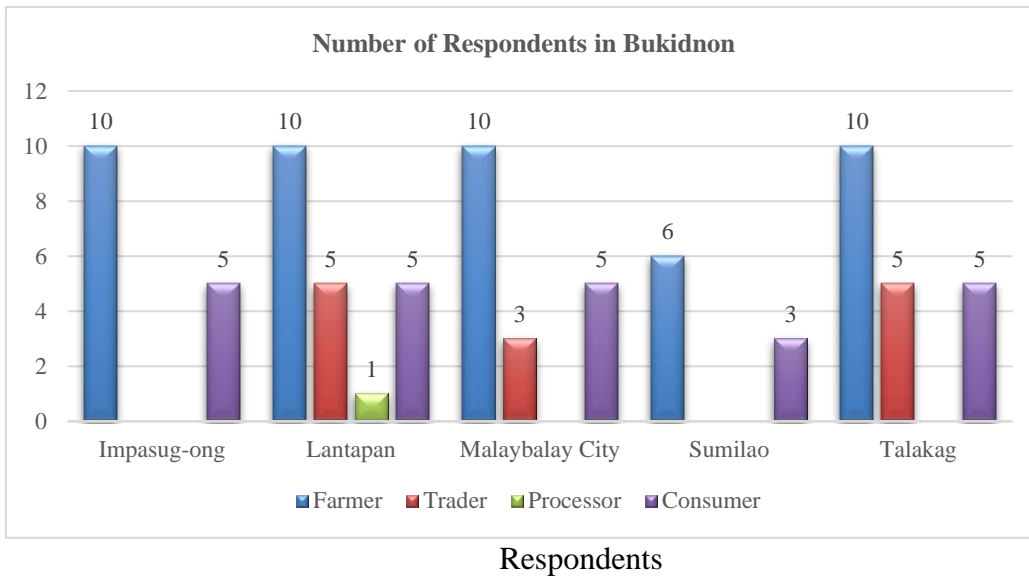
This study focused on the supply chain of the carrot industry, which was greatly affected by the COVID-19 pandemic. The increasing volume of unsold products in the market greatly affects the primary players in the chain, which resulted in the shift to different crops to sustain their lives. Thus, there is a need for a supply chain assessment to determine the gaps in the chain. Specifically, this study is designed to assess the supply chain of carrots: identify the key players, their roles, and product requirements; trace the product, information, and payment flows; and identify logistical issues and external influences.

## METHODOLOGY

Primary data were obtained using key informant interviews (KII) and focus group discussions (FGD). Various questionnaires were developed for farmers, traders, processors, and consumers. A personal interview using the structured questionnaire was conducted, and the flow of carrots from the supply side to the demand side was traced. Chain actors were identified, and their practices, roles, volume and form of products handled, and product requirements were determined, among others.

The five Provincial Agriculture Offices in Northern Mindanao were visited, and it was discovered that carrot production was concentrated in the municipalities of Impasug-ong, Malaybalay City, Talakag, Sumilao, and Lantapan (IMMATASULA) in the province of Bukidnon only. Furthermore, extensive supply chain mapping was done due to the limited baseline data on carrot production.

A total of 83 respondents were interviewed: 46 farmers, 13 traders (wholesalers and retailers), 1 processor, and 23 consumers, as reflected in Figure 1. The players were identified through the referral method and site visitation.



**Figure 1.**  
Number of

## RESULTS

### Key Players and their Roles

The key players identified that carry out the processes in the supply chain are the following:

#### Carrot Farmer

Carrot farmers cultivate their own farmland, while some rent the farmland from other farmers who have vast land area. Rental price is calculated based on the total land area used per year. For some carrot farmers, they also utilize their home yard to cultivate carrots.

#### Canvassers

Canvassers have substantial authority, typically delegated to them by those entrusting their goods. Canvassers serve as pivotal intermediaries within the carrot supply chain, responsible for facilitating transactions and bridging the gap between farmers and other key participants. They traverse the rugged highlands, engaging with farmers to establish carrot selling prices that are as equitable as possible. Their role extends to providing timely and accessible information about the intricacies of the carrot marketing system. Moreover, they serve as a vital link connecting farmers to

markets and various stakeholders.

At times, canvassers venture beyond their transaction-facilitating duties and venture into the realm of price manipulation, striving to establish pricing uniformity while accruing additional gains from the process. This often involves persuading farmers to sell their produce at rates set by traders. In these situations, canvassers may not always adhere to standard business practices, inadvertently imposing constraints on the marketing system. Consequently, they have earned the moniker "buwaya," as their earnings disproportionately overshadow other participants along the chain.

#### Traders

Traders frequently buy carrots directly from local farmers (if they are "suki") or employ canvassers to help them find farmers and arrange payment. Additionally, traders can choose to sell their carrots straight to retailers and wholesalers. Consequently, vendors merge the roles of gathering and offering their carrots for sale at the marketplace. Similarly, traders give farmers financial assistance in exchange for a "charge to crop." This will give traders the guarantee that farmer-creditors will only sell them the carrots that they have harvested.

#### Wholesalers

They have excellent marketing tools, including canvassers and storage, transportation, and communication facilities. Bulk buying typically occurs between wholesalers and traders, where the main transaction occurs. Since they are aware that the price of carrots rises when more parties are involved in the transaction before selling it to them, some wholesalers also buy carrots straight from the farmers in order to save money.

#### Retailers

They are actors who sell carrots in small quantities based on the needs of the customer. In the research area, retailers engage in the following activities as part of the carrot marketing system: purchasing the good, delivering it to retail locations, and selling it to customers. The majority of retailers purchased carrots from wholesalers to resell to city dwellers. In certain cases, they could also purchase directly from the manufacturers to save costs.

#### Consumer

This could include household buyers and institutional buyers such as hotels, restaurants or "karenderya".

### **Key Customers and their Product Requirements**

Key customers along the carrot supply chain were identified and their respective product requirements as reflected in Table 3. Likewise, the product requirements were tracked down in terms of quality, volume, delivery mode, schedule and packaging.

**Table 3.** Key Players, Customers, and Product Requirements

Key Player / Location	Key Customer / Location	Reasons for choosing customer	Frequency demand	Mode of delivery	PRODUCT REQUIREMENT				
					Volume	Size	Variety	Type of Packaging	Time of transaction
<b>Impasug-ong</b>									
Farmer	Wholesaler in Bulua Market, CDO	suki	anytime, harvest time	delivered by the key player	no limit	any size available	Takii's	sack	3:00am until all carrots were sold
<b>Malaybalay City</b>									
Farmer	Trader in Imbayao, MC, Bukidnon	suki	anytime, harvest time	delivered by the key customer	no limit	any size available	Takii's	sack	anytime after the carrots were packed
Trader	Wholesaler in Bulua Market, CDO	suki	anytime, harvest time	delivered by the key player	no limit	any size available	Takii's	sack	3:00am until all carrots were sold
<b>Talakag</b>									
Farmer	Wholesaler in Bulua Market, CDO	suki	anytime, harvest time	delivered by the key player	no limit	any size available	Takii's	sack	3:00am until all carrots were sold
<b>Sumilao</b>									
Farmer	Wholesaler in Bulua Market, CDO	suki	anytime, harvest time	delivered by the key player	no limit	any size available	Takii's	sack	3:00am until all carrots were sold
<b>Lantapan</b>									
Farmer	Canvasser	suki	anytime, harvest time	picked up by key customer	no limit	any size available	Takii's	sack	anytime after the carrots were packed
	Trader in Lantapan, Bukidnon	suki	anytime, harvest time	picked up by key customer	no limit	any size available	Takii's	sack	anytime after the carrots were packed

Trader	Canvasser	suki	anytime, harvest time	picked up by key customer	no limit	any size available	Takii's	sack	anytime
	Wholesaler in Bulua Market, CDO	suki	anytime, harvest time	delivered by the key player	no limit	any size available	Takii's	sack	3:00am until all carrots were sold

The key customer of carrots are usually the local canvassers, traders, wholesalers or bodega owners in Bulua Bagsakan Center, Cagayan de Oro City. Carrots produced organically commands a premium price which consumers are willing to pay (Mohring, 2016) coupled with packaging like sacks and wooden crates that use eco-friendly sustainable materials can influence consumers decision to buy fresh products (Hudges, 2018). Carrots can be eaten raw, pickled or boiled, processed into juice or cakes and pastries. Size and appearance are the most important product requirements and prices varies according to its classification. The carrots may be classified as 3-S, 4-S, 5-S, R-3, P-N, P-1, PX, and R-J. The largest size is the 3-S and the smallest one is PX. However, the classification varies to every farmer since there was no definite sizes and they rely on what they have known. At the point of transaction, the sizes that they pack does not match the market's preference and sell it at a lower price for it to be sold.

Table 4 shows the prices of the carrots according to its classification from the farmers. Surprisingly, even the rejected carrots have a price that ranges from Php 3.00 to Php 5.00 per kilogram. In addition, there was an additional amount that ranges from Php 10.00 to Php 15.00 for the prices from the farm gate to the 'bagsakan' at Bulua, CDO. Furthermore, the prices of the carrot changes over time within a span of day depending on the market demand. In most cases, the highest price would be in early morning and lowest at the evening due to its perishability.

Table 4. Carrots Prices according to its Classification

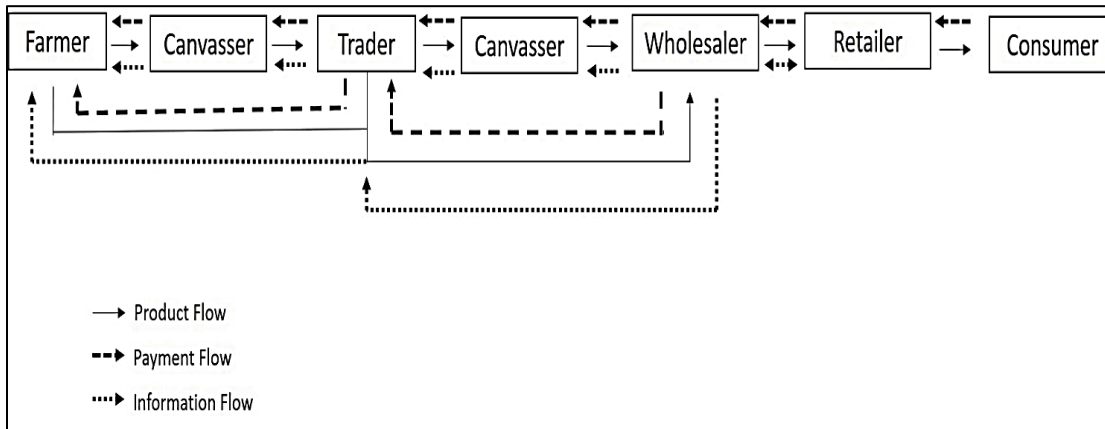
Classification	Farm Gate Price (Php)	Market Price "Bagsakan" (Php)
3-S	25-30	35-40
4-S	24-28	30-35
5-S	23-25	23-28
R-3	18-23	28-30
P-N	15-18	20-23
P-1	10-15	15-20
PX	7-10	12-15
R-J	3-5	8-10

Source: Interview

### Product, Information, and Payment Flow

A total of three (3) chains were traced for the product flow of carrot in the municipality of Lantapan as seen in Figure 2. The longest chain starts from the farmer to canvasser, to trader, canvasser again, to the wholesaler, retailer and lastly to the consumer. The shortest was from the wholesaler, to the retailer and to the consumer. In the area, canvassers were called "buwaya" since they are the ones that link the farmers to traders and traders to wholesalers and negotiated the price of the commodity which was in their favor. Such practice prompt other key players to ignore canvassers in their

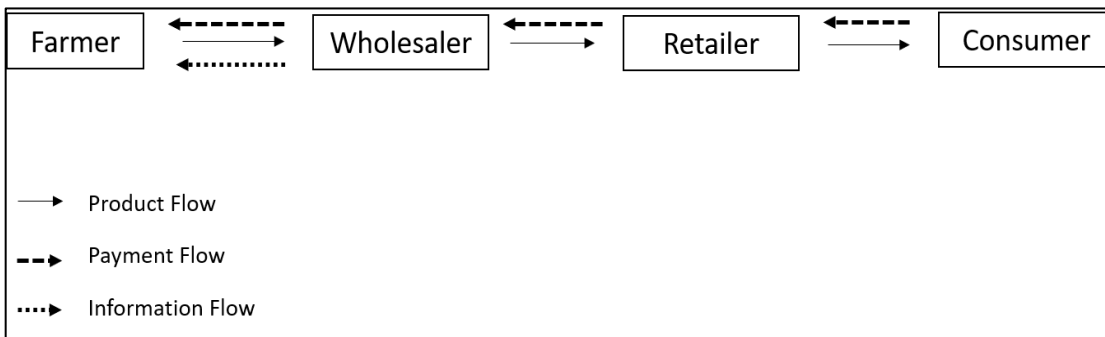
transaction to have a lesser price of the commodity but usually, the services of canvassers are an integral part of the supply chain of carrots in the area.



**Figure 2.**  
Product,

Information, and Payment Flow of Carrot in the Municipality of Lantapan, Bukidnon.

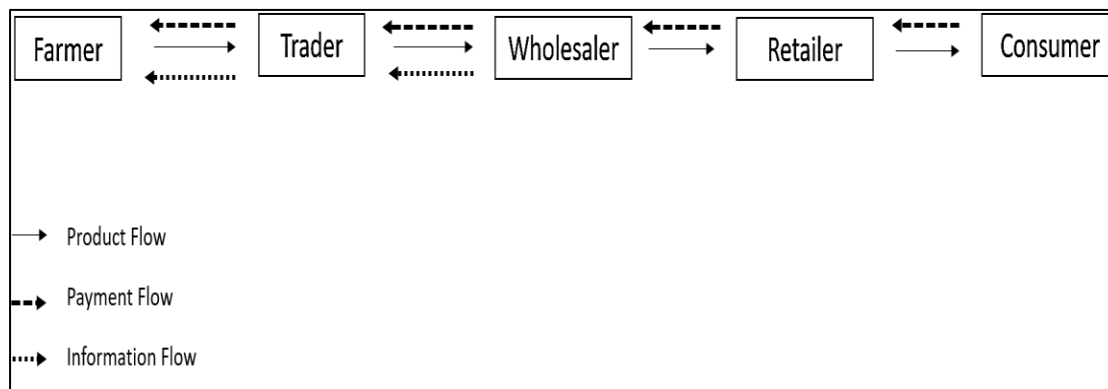
The municipalities of Impasug-ong, Talakag and Sumilao were grouped since they had the same product flow and one (1) chain as reflected in Figure 3. The flow starts from the farmer, to the wholesaler, retailer and consumer. Likewise, the farmers directly sold their harvested products to the “bagsakan” or Bulua Market, CDO and reduces the participation of middlemen such as traders and canvassers especially those farmers who own a bodega at the market or had known someone that had a bodega for them to display their products and payment will be negotiated directly.



**Figure 3.**  
Product,

Information, and Payment Flow of Carrots in the Municipalities of Impasug-ong, Talakag, Sumilao, Bukidnon

As shown in Figure 4, there was one (1) chain in the municipality of Malaybalay City. The product flow starts from the farmer, to the trader, wholesaler, retailer and lastly, the consumer. The trader will transport all of the farmers’ carrot produce directly to the “bagsakan” or Bulua Market, Cagayan de Oro City.

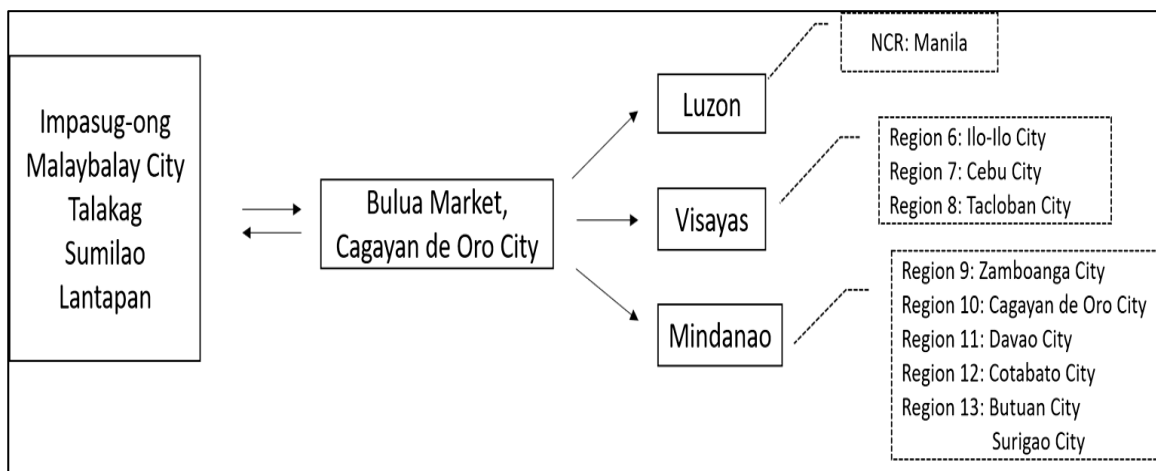


**Figure 4.**  
Product,

Information, and Payment Flow of Carrot in the Municipality of Malaybalay City, Bukidnon

General Geographical Flow of Carrot in the Province of Bukidnon

The IMMATASULA complex transport their harvested carrots to Bulua Market, CDO (“bagsakan”). As the team visited the “bagsakan” area in CDO, they interviewed (informally) some traders that will transport their products to the different cities in the Philippines and these are the following: Manila City, Ilo-Ilo City, Cebu City, Tacloban City, Zamboanga City, Cagayan de Oro City, Davao City, Cotabato City, Butuan City and lastly, Surigao City. As shown in Figure 5. However, the team could not specifically trace the flow of the product from the ‘bagsakan’ area due to the travel restrictions and travel requirements. Furthermore, the rejected products will be transported back to the different municipalities in Bukidnon where the farmer was located as a proof that their products were not sold.



*Figure 5.*  
*General*

*Geographical Flow of Carrot in the Province of Bukidnon*

**Issues and Concerns**

Perishability – Carrots are highly perishable; they start to lose their quality right after harvest and continued throughout the process until it is consumed. For this, an extensive marketing channels and elaborated purpose, facilities and technology are vital.

The supply chain of the carrot exposed the commodity not to be held for long periods and the fresh



produce from one area is often sent to distant markets without a firm buyer or price. Prices may be negotiated while the commodities are enroute, and they are frequently diverted from their original destination if there was a better price found. Sellers might have little market power in determining a price. As a result, a great deal of trust and informal agreements are involved in the product flow of carrot. At the Bulua Market, carrot price changed 3x within a day, different from early morning, afternoon and the night time. Likewise, the farmers and traders sold their products in the morning, especially if the buyers are limited, to ensure that all products will be sold since fluctuations of prices are inevitable. Farmers are normally price takers and are frequently exposed for cheating by any intermediary, locally called as “buwaya”.

Due to perishable nature and biological nature of carrot production process, there is difficulty of scheduling its supply to market demand. Carrots are subjected to high price and quantity risks with changing consumer demands and production conditions. Unusual production or harvesting weather or a major crop disease can influence badly the marketing system. While food-marketing system demands stable price and supply, a number of marketing arrangements like contract farming provide stability.

Seasonality – Carrot commodity have seasonal production directly influencing their marketing. Normally, they have limited period of harvest and more or less a year-round demand. Furthermore, the seasonality also worsened due to the lack of storage facilities which leads the farmers to adopt crop rotation, depends on the vegetable demand in the market. According to Bezabih and Hadera (2007), production is seasonal and price is inversely related to supply. Likewise, during the peak supply period, prices decline and the situation is worsened by the perishability of the products and poor storage facilities.

### *Presence of the Imported Carrot Variety in the Market*

The existence of a special variety of carrot where the texture and appearance were three times better than the locally produced carrots (Figure 6) with a much affordable price than the local one that ranges from Php 20.00-25.00 pesos per kilo. It was imported from China with no damages, clear appearance and much preferred by institutional buyers and some customers that posed a great threat to the local farmers. Locally produced carrots have great potential for export as reported by BIMP-EAGA (2021). Thus, stop importing carrots and explore exporting instead.



Figure 6. Imported Carrot at Bulua Market, Cagayan de Oro

*Product Loss*

There was a higher chance of product loss in the carrot production process from the time of transportation to commodity marketing. The absence of traceability and restricted accountability are unlikely to be affected even in the event that the product is subpar when it is delivered to the customers. Moreover, the commodity is susceptible to postharvest losses due to non-rigid packaging, overpacking, unpaved roads, high temperatures, and inefficiencies in the current transportation system. As was noted, diseases and unsold goods could cause farmers to lose up to 50% of their harvested volume. This would have negatively impacted their profit margin because production costs were high and transportation-related costs like car rentals added to the total. Furthermore, since no one would want to purchase the unsold goods any longer, they were either thrown on the side of the road or returned to the farmers (see Figure 7). In order to reduce the likelihood of a negative profit, supply addition of unsold products would be very beneficial. Additionally, workers and handlers frequently sit above trucks or other vehicles that are loaded with carrot sacks, which press against the commodity and accelerate its deterioration (see Figure 8)



Figure 7. Back-loaded Carrots to be Disposed



Figure 8. Laborers sit above vehicle loaded with carrots

### 5. Logistic Issues and External Influences

The following are the logistic issues and external influences identified by the team during the interview and survey in IMMATASULA Complex, Bukidnon.

- a. Unoperational trading post and the need to establish a trading post in the lower portion of the municipalities to accommodate the majority of the vegetable producing barangays.
- b. Heavy usage of chemical inputs (fertilizers and pesticides).
- c. Lack or non-existence of vegetable processing activities on a commercial level. Processing could solve oversupply of carrots, extend the shelf life of carrots and a source of additional income for farmers.
- d. Insufficient capital or financing for vegetable farmers. Farmers also have difficulty in accessing loans from financial institutions due to stringent requirements forcing them to access non-institutional financing intermediaries or loan sharks which offers easy capital but very high interest.
- e. Lack of promotion on vegetable consumption to address malnutrition particularly among children. Vegetable consumption within the IMMATASULA complex is low because most of the vegetables produced will be sold to the outside market.
- f. Based on interviews conducted, farmers do not consume any of their produce especially carrots.
- g. High post-harvest losses that can be attributed to many factors such as inadequate post-harvest technology, poor farm to market roads and absence of cold storage facilities.
- h. High costs of production inputs such as hybrid seeds, chemicals, fertilizers, and pesticides.
- i. Lack of production programming and complementation across production areas resulting to gluts in the market and dampening of prices
- j. Lack or complete absence of Research and Development (R&D) studies to match actual market requirements and vegetable product produced by farmers.
- k. Inadequate and poorly maintained infrastructure facilities such as farm-to-market roads, trading posts, and packing sheds resulting in increased marketing costs due to post harvest losses. Lack of irrigation in most key vegetable production areas thereby, decreasing productivity since farmers solely rely on raindrops. Likewise, weather condition will always be a great factor in production.
- l. Low and very unstable prices for vegetable products.
- m. High transportation cost from farm to bagsakan at Bulua, Cagayan de Oro.
- n. Inefficient/Lack of support for majority of carrot farmers. Extension services, although being conducted by the LGU are inadequate and not monitored.
- o. Handling of carrot products are inappropriate causing damage to the vegetable produce resulting in, again, post-harvest losses.

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## **COMPETING INTERESTS**

The author have no competing interests to declare.

## **Author's Affiliation**

**Hazel E. Soliven, DBA**

Central Mindanao University, Bukidnon, Philippines  
University Town, Musuan, Maramag, 8714 Bukidnon

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