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Research Article

ZERO KILOMETER FOOD PROJECT: AN ANALYSIS OF FOOD DEMAND AND SUPPLY STRUCTURE OF HIGH-VALUE CROPS

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ABSTRACT

This initial study of the "Zero Kilometer Food Project" investigates the intricate dynamics of food demand and supply of high-value crops(HVC) in the Municipality of Dinalupihan, Bataan, Philippines. This aims to shorten the food supply chain, reduce carbon emissions, ensure fresher produce, and promote sustainable agriculture and environmental practices. Specifically, the primary purpose of this paper is to profile the household consumers, farmers, and traders; determine the top HVCs consumed, produced, and traded; assess the practices of the key players in the market economy; analyze the food supply and demand performance, and identify the problems met and suggest possible solutions to their problems. The findings reveal the top HVCs consumed, produced, and traded, with banana, bitter gourd, eggplant, tomato, and onion playing significant roles. Consumer practices indicate a collective approach to managing surplus and scarcity, while farmers prefer advanced agricultural practices. Trading practices vary, highlighting the adaptable and diversified nature of trading activities. Food self-sufficiency of crops in the municipality is a major concern, meaning there is heavy reliance on commodities from other towns and provinces to support food shortage. The movement patterns of crops in Dinalupihan show a complex distribution chain that causes high vegetable prices due to multiple intermediaries. Household consumers have identified problems like continuous price increases of vegetables and quality concerns. On the other hand, farmers face challenges in machinery and water management, and economic burdens for farmers and traders. The proposed solutions contribute valuable insights for policymakers and stakeholders to enhance sustainable agricultural practices and market resilience in the town.

Keywords: Food Self- Sufficiency, Supply and Demand, High-Value Crops, Zero-Kilometer.

INTRODUCTION

High-value crops (HVCs) play a crucial role in the economic development of the Philippines, contributing significantly to economic growth, food security, and employment. However, supply and demand data challenges, non-systematic cropping periods, and irregular production have led to overproduction and shortages. The Municipality of Dinalupihan, Bataan, recognizing the impact on farmers and consumers, aims to address these challenges through a comprehensive research project. This project aligns with the goal of sustainable agricultural productivity and environmental sustainability, contributing to the overall development and resilience of the agriculture sector.

The following project objectives are multifaceted and collaboration is a cornerstone:1. Establish a comprehensive baseline by collecting data on the production and consumption cycle of HVCs;2.Increase the production of priority crops to meet the local demands; 3. Work closely with the Local Government Unit (LGU) through a joint project initiative to achieve the zero-kilometer food project vision; and 4. Propose interventions geared towards sustainable agricultural productivity and environmental sustainability. The research extends beyond data collection including assessing ecological, economic, and social aspects. Concurrently, the project is designed to provide policymakers with crucial insights, forming the fifth objective. These insights will empower policymakers to implement targeted interventions and activities to enhance local-level food production, thereby meeting the specific consumption needs of the community.

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The anticipated outcomes are diverse and impactful. Policymakers stand to benefit from data-driven decision-making processes, armed with reliable information to shape interventions that foster sustainable agriculture. The optimized production cycles, a result of the research's farmer-centric approach, are expected to contribute to improved incomes for farmers, addressing the longstanding issue of unrealized optimum income. Consumer welfare is a focal point, as the project aims to stabilize prices, mitigate fluctuations that adversely affect consumers, and benefit them with more stable and reasonable prices. Furthermore, the project envisions a significant contribution to local food sufficiency and security, ensuring that the implemented interventions align to meet the community's nutritional needs. Finally, the project seeks to fortify the region's agricultural sustainability by promoting inclusive and resilient responses to pressures across agricultural supply chains.

OBJECTIVES

This study analyzed the high-value crops' (HVCs) demand and supply structure. Specifically, it sought to answer the following: 1. profile the consumer households, farmer producers, and traders or wholesalers; 2. determine the top HVCs consumed, produced, and traded; 3. assess the practices of households on consumption pattern, producers, and traders; 4. analyze the food supply and demand performance; 5. trace the movement pattern of the commodities, and6. identify the problems of the key players in the market economy and suggest possible solutions to their problems.

LITERATURE REVIEW

What's Zero-Km?

The zero-kilometer economy is a type of trade in which the products are marketed in the same production area. The term "zero kilometers"

identifies an economic policy that favors local food guaranteed by the producer in its genuineness, as opposed to global food often of inadequately certified origin, and above all saving in the process of transporting the product, also in terms of pollution (Palazzolo, 2021).Another more recent meaning refers to agricultural products: in this case, by saying that a product is “zero kilometers” we mean that, to arrive from the place of production to that of sale and consumption, it has traveled as few kilometers as possible. The basic idea, in essence, is to reduce the environmental impact that the transport of a product entails, particularly the emission of carbon dioxide which increases the pollution level.

According to this philosophy, it is advantageous to consume local products as shortening distances means helping the environment, promoting the regional agri-food heritage, lowering prices, and guaranteeing fresh, healthy, and seasonal products. The “zero-kilometer” concept promotes buying food produced locally, which saves energy and reduces carbon emissions. This approach encourages consumers to reconnect with local flavors and traditions through regional dishes. Farmers can sell their fresh “0km” products directly to consumers making it easy to find and enjoy locally grown foods. A product can be called a“0km” when it has traveled less than 100 km and is produced ecologically and organically (Minimal Lifestyle EVS – 2020). The following are the benefits of 0-KM food: (1) Environmentally friendly for it does not involve importing food from foreign countries (by ship, train, or plane). (2) Tastes better because foods are fresher and of better quality (does not lose quality because of long storages or transportation). (3) Supports unique local food species to not being lost and (4) Makes producers more independent since they do not depend on global food players.

Food Value Chain Analysis in the Philippines

In a 2019 survey conducted by the Japan International Cooperation Agency (JICA) on the issues concerning the food value chain in the Philippines on vegetables from highland and lowland areas, major constraints in each aspect of the value chain from input procurement, vegetable processing, marketing aspect and the logistics of the crops from farm-to-market have been reflected in the analysis of the data gathered from Benguet and the Quezon Province. The said survey has shown that there is a lack of consumers awareness and access to safe, fresh, and reasonably priced vegetables in the market with the many layers of the vegetable value chain (JICA, 2019)

Subsequently, Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA) analyzed Philippines’ three (3) key fruits and vegetables – mango, onion, and tomato in a value chain analysis in 2022. Among these commodities, Region III ranked as the top producer of onion in the country accounting for a total of 68% in 2019,andis considered to have the third highest production share for tomato (14%). The study has shown a need to address the high labor cost and material inputs as these factors significantly reduce the farmers’ net returns and the concerns raised about post-harvest losses. Among the recommendations to address some of the challenges faced by the producers of these commodities include (1) the provision of training to improve the harvesting practices to reduce post-harvest losses (2) increase mechanization of harvesting and sorting, (3) establishment of a web-based market information platform to support and improve communication among the key players in the value chain, and (4) intensify the market matching or linkage (SEARCA, 2022).

METHODOLOGY

The study used a descriptive method, employing surveys and interviews to collect data. Questionnaires were designed to align with specific objectives and refined based on experts' feedback. Primary data were gathered from consumers, farmers, and sellers through random interviews using these questionnaires. Data collected for households included top weekly high-value crops (HVCs), quantity purchased, cost, marketplace, and transportation costs. For producers, the study gathered information on production volume, market outlet pricing, and capital investment. For traders, data included product source and destination, volume bought and sold by market type, and marketing costs and margins. Respondents also discussed challenges faced and potential solutions. On the other hand, secondary data on provincial and municipal production were gathered from government agencies such as the Philippine Statistics Authority (PSA), and the Food and Agricultural Organization (FAO). In addition, previous data on production from the Office of the Provincial Agriculturist was used to analyze the production trend. Descriptive statistical tools such as averages, frequency counts, percentages, were employed in describing the demographic profile, HVCs consumed, produced, and traded, the practices of the key players, problems encountered, and suggested solutions. In addition, the Food Self-Sufficiency Ratio (FSSR) formula, FSSR = (Total production/Total Consumption) X 100, was used to analyze the domestic food supply and demand performance.

Population and Sampling Technique

The Household Population of118,038 based on the 2020 Census of the Philippine Statistics Authority was used to determine the sample population using the Raosoft Sample Size Calculator. Out of household population, the computed sample of household respondents was 380. Stratified random sampling was utilized to determine the consumer- respondents of this research project. The locale (i.e. the municipality was strategically divided into different sites). On the other hand, snowball sampling was used for the farmer/producer and trader/ wholesaler– respondents.

Study Locale

This study focused on the Municipality of Dinalupihan, Bataan, Philippines with 46 Barangays. Dinalupihan is a landlocked municipality in the coastal province of Bataan. The town has a land area of 92.52 square kilometers or 35.72 square miles, constituting 6.74% of Bataan's total area. Its population as determined by the 2020 Census was 118,209. This represented 13.85% of the total population of Bataan province or 0.95% of the overall population of the Central Luzon region. These figures compute the population density at 1,278 inhabitants per square kilometer or 3,309 inhabitants per square mile.

Inclusion and Exclusion Criteria

This investigation focused on the supply and demand of high-value crops such as tomato, eggplant, lady finger, snow cabbage, stringed beans, hot chili, green chili pepper, banana, bitter gourd, and onion. It excludes other high-value crops and commodities like rice, corn, livestock, poultry, and marine products.

RESULTS AND DISCUSSION

I. Profile of the Key Players in the Market Economy

1. Household Consumers

Out of 380 household consumers, a notable sex distribution, with 74.7% female and 25.3% male with a diverse age range, and the age

class 51-60 got the highest percentage of 25.79%, with a median age of 47. Family sizes of 4-6 obtained the highest rate of 48.16%, the median family size is 4, 48.4% earn below 10,000 pesos, and 33.2 % have a family income of 10,000-14,999 pesos. Household respondents are predominantly female and belong to the middle adulthood stage. This means that the adult women in the households who responded to the survey are the ones who plan and prepare dishes for the family. Most earn below 15,000 pesos and belong to the "food poor" (OCTA Research, 2023). Poor families believe they need at least P15,000 per month for their household expenses to not feel less privileged, according to Social Weather Stations (SWS).This further implies that households following a budget-friendly and healthy food plan prioritize home cooking, emphasizing more fruits and vegetables while minimizing expenses on restaurants and fast food. This healthier eating pattern is linked to increased time spent on meal preparation at home (Monsivais *et al.,* 2014).

2. Farmer Producers

Among farmers, 43.75% are landowners,56.25% are farm workers, 81.25%are male farmers, and 18.75 are female farmers, with a median age of 51. Farmers' family size is 4, 2 family members engaged in farming, and 8 hours devoted to agricultural activities. This further reveals a balanced distribution as to land ownership type, dominated by male farmers, and they are experienced and seasoned vegetable growers in the farming community or aging farmers (Velsa *et al.,* 2023). They possess a wealth of knowledge and expertise that can be harnessed to drive sustainable agricultural practices and community development initiatives. The data show collaborative farming within the family units, indicating the shared responsibilities and contributions of the couples and their children to agricultural activities. They believed that farming culture could be passed on to the next generation, which is evident in the time spent, dedication, and commitment among families of farmers in optimizing productivity through strategic support and resource allocation.

3. Traders/Wholesalers

Traders/Wholesalers are predominantly males (63.6% males and 36.4% females). Most sellers are low-income earners with 43% below 10,000 PHP and 29% with 10,000 – 14,999 monthly family income. In addition, they reside outside Dinalupihan, Bataan, and other provinces. The median age is 35 with a small family size of 3. Notably, lower incomes are the vegetable wholesalers, while those engaged in trading exhibited higher earnings.

II. High-Value Crops Consumed, Produced and Traded

2.1 High-Value Crops Consumed

Table 1 reflects the average weekly consumption (kg), banana dominates consumption at 1.00 kg. Consistent consumption for most items including tomato, eggplant, bitter gourd, and onion has average weekly consumption values around 0.50kg. On the other hand, hot chili has the lowest consumption at 0.04 kg, indicating that it is consumed in smaller quantities than other items. Tomato and onion are expensive compared to other commodities with the highest average weekly costs at 70 Philippine pesos (Php). Hot chili has the lowest average weekly cost at Php 15 and has a larger Interquartile Rate (IQR). Lady's finger, snow cabbage, and green chili pepper have relatively lower average weekly costs, making them more economical for consumers.

The dominance of bananas underscores its significant role in overall consumption patterns, almost part of the daily meals available year-round. As of 2021, per capita banana consumption in the Philippines stood at 23.9 kg, based on Faostat data. The consistently moderate consumption of tomato, eggplant, bitter gourd, and onion around 0.50 kg indicates stable preferences. Onion and tomato are vital and cannot be omitted without affecting the overall quality of Filipino dishes. Likewise, eggplant and lady's finger, stewed or fried, or combined with other local vegetables, are parts of the household's weekly meal plan. The top-consumed high-value crops are nutrient-rich foods. Both banana and bitter gourd are excellent sources of vitamins, minerals, and dietary fibers. Bananas contribute to various health benefits, particularly for the heart and digestive system (Arnarson, 2023). Similarly, bitter gourd is noteworthy for containing over 60 phytomedicines, demonstrating efficacy against a diverse range of more than 30 diseases, including cancer and diabetes (Gayathry *et al.,* 2022). Lady's Finger offers health benefits for diabetes and certain cancers. The mucilage extracted from its immature pods proves valuable for industrial and medicinal purposes (Bawa *et al.,* 2016). Eggplant provides antioxidant compounds, glycoalkaloids, and vitamins (Gürbüz, *et al.,* 2018).

Table 1. Average Weekly HVC Consumption and Cost

HVC	Average Weekly Consumption (Kg)	IQR	Average Weekly Cost (Php)	IQR
Tomato (kamatis)	0.50	0.75	70	90
Eggplant (talong)	0.50	0.75	40	55
Lady's finger(okra)	0.25	0.50	20	30
Snow cabbage (pechay)	0.25	0.38	20	20
Stringed beans (sitaw)	0.25	0.50	25	50
Hot chili (silingtari)	0.04	0.25	15	32.50
Green chili pepper (silinghaba)	0.13	0.20	20	20
Banana (saging)	1.00	1.00	80	90
Bitter gourd (ampalaya)	0.50	0.75	40	50
Onion (sibuyas)	0.50	0.75	70	85

2.2 High-Value Crops Produced

Table 2 reveals a wide range of annual harvest quantities. Eggplant, tomato, and bitter gourd have notably high harvests. These are cited as major vegetables produced in the 3rd quarter of 2022 (Rivera, 2022). Crops like hot chili, green chili pepper, snow cabbage, and lady's finger have relatively lower annual harvests.

The average selling prices per kilo vary across different crops. Lady's finger commands a high price Php 80.00 per kilo, while hot chili has the highest selling price at Php 150.00 per kilo, a 25% decrease compared to the average wholesale price of Php 202.84 in 2022. The onion also has a relatively high average selling price of Php 85.00 per kilo, higher than the reported farm gate of 47 pesos per kilo in March 2023 (Cariaso, 2023). Crops like tomato, eggplant, green chili pepper, banana, bitter gourd, and snow cabbage have moderate selling prices, ranging from Php 15.00 to Php 50.00 per kilo. Despite a lower harvest quantity, Lady's Finger contributes significantly to total income due to its high selling price, resulting in a total income of Php 391,280. Tomato and bitter gourd also generate substantial income

from sales. Even with lower harvest quantities, crops like hot chili and green chili pepper contribute significantly to total income due to their high selling prices.

Table 2. Total annual harvest, average selling price, and total income from sales.

HVC	Total Annual Harvest (Kg)	Average Selling Price (Php per Kilo)	*Total Income from Sales
Tomato	46,030	20.00	715,000
Eggplant	50,160	15.00	867,600
Lady's finger	4,891	80.00	391,280
Snow cabbage	3,100	20.00	62,000
Stringed beans	12,787.50	50.00	255,525
Hot chili	1,142.50	150.00	365,100
Green chili pepper	2,857.50	40.00	131,400
Banana	3,300	40.00	143,250
Bitter gourd	17,100	50.00	720,000
Onion	10,000	85.00	850,000

**based on farmers' declared sales from variedfarm gate price ranges*

2.3 High-Value Crops Traded

It could be gleaned in Table 3 that onion has the highest quantity traded weekly at 1,740 kg, indicating a significant demand for this crop as a staple food to boost the flavor. Onions offer a spectrum of potential health benefits, ranging from mitigating the risk of various cancers to enhancing mood and supporting skin and hair health (Ware, 2023). Eggplant, bitter gourd, and banana also show substantial weekly quantities, while hot chili and green chili pepper have considerably lower quantities. As to farm gate price, hot chili stands out with the highest farm gate price at Php 200 per kilogram, which is 96% greater than the farm gate price of 102.21 in 2022 (Statistica, 2023). Onion and hot chili have relatively high farm gate prices, indicating potential profitability. However, Capiral *et al.,* (2023) discovered periodic fluctuations in onion supply driven by seasonal weather patterns, market demand, agricultural practices, and the impact of imports and exports.

The declared farm gate prices for specific crops such as Tomato, Eggplant, Snow cabbage, hot chili, green chili pepper, and Onion vary. Traders are quoting higher prices than farmers aiming to sell these crops at a premium and maximize their income. This indicates a notable disparity in pricing strategies between farmers and traders within the agricultural market.

Table 3. Description of HVC traded in terms of quantity purchased, farm gate price, and cost

HVC	Quantity Purchased weekly (Kg)	Farm Gate Price (Pesos)	**Total Cost (Pesos)
Tomato	85	75	7,500
Eggplant	950	52.50	48,000
*Lady's finger	200	30	6,000
Snow cabbage	325	52.50	4,750
Stringed beans	685	40	24,900
*Hot chili	30	200	6000
*Green chili pepper	20	60	1200
Banana	600	20	16,500
Bitter gourd	950	37.5	34,000
Onion	1,740	100	1,157,700

***based on traders' declared purchasing cost of crops from varied farm gate price ranges*

III. Practices of Households on Consumption Patterns, Producers, and Traders

3.1 Practices of Households on Consumption Patterns

Table 4 reflects the practices of households on consumption patterns. Most of the respondents shop once a week (35%), every other day (30%), or 6-7 times a week (29%), or almost every day, indicating a high frequency of shopping among household consumers. Fruits and vegetables are perishable and often regarded as one of the most wasted categories within the spectrum of food groups (Esguerra *et al.,* 2017). Shopping frequency depends on the distance of residence and the cost of transportation. Tricycles serve as the primary mode of transportation for residents traveling to Dinalupihan Public Market with round-trip fares ranging from Php 60 to Php 300. Those living near the roadside opt for jeepneys, paying Php 40 to Php 80. Residents in remote areas incur an additional tricycle fee of Php 100 to Php 200.

The respondents' purchases are sufficient (319), while a smaller proportion feels that their purchases are lacking. Some respondents have mixed feelings, indicating that sometimes their purchases are enough, and sometimes not. The most common response to a shortage is to buy more. This suggests respondents prefer to address shortages by purchasing additional items. Some respondents ask neighbors or rely on homegrown produce, others save money by being frugal when facing shortages, and give away excess items to deal with the surplus.

Table 4. Practices of Households on Consumption Patterns

Practices	Response	Frequency	Percentage
1. How often do you shop in a week?	Once a week	134	35
	2 – 3 times a week	112	30
	4 – 5 times a week	5	1
	6 – 7 times a week	110	29
	Others (twice a month)	19	5
	Total	380	100
2. Are the items purchased sufficient, insufficient, or excessive?	Insufficient	32	8
	Sufficient	319	84
	Sometimes sufficient/ sometimes insufficient	29	8
	Total	380	100
3. What do you do when the items are insufficient?	Buy more	268	70
	Ask from neighbors/ use homegrown produce	7	2
	Minimize consumption	105	28
	Total	380	100
4. Where do excess items go?	Given away	103	27
	Stored or kept	268	70
	Used as animal feed	5	2
	Nilulutoagad	4	1
	Total	380	100

3.2 Practices of Farmers as Producers

Table 5 reflects the practices of farmers as producers of high-value crops. All respondents indicated the use of hybrid seeds in planting for better harvest. Hybrid seeds exhibit improved fruit yield, prolonged shelf life, and disease resistance, and are harvested earlier than heirloom seeds (Solomon, 2023). Of the methods of soil cultivation, respondents used machinery for tilling (37%), manual tilling (25%), and combination methods (19%). As to watering the crops, respondents use a water pump for irrigation (50%), an irrigated system (18.75%), manual watering (18.75), drip fertigation (6.25%), and combination methods (6.25%).

Regarding fertilizer type, respondents used organic fertilizers (69%), and inorganic fertilizers (31%). Respondents used synthetic methods (94%), and organic methods (6%) for pest and disease control; removed weeds manually (75%), and used herbicides (25%) for weed control. In addition, most respondents incorporate poultry or livestock raising in their integrated farming practices and all used manual picking for harvesting.

Table 5. Practices of High-Value Crops Farmers

Practices	Response	Frequency	Percentage
1. What are the planting materials used?	Hybrid seeds	16	100
2. What tools/ equipment/ farm animals are used for soil cultivation?	machinery	6	37
	carabao	4	25
	manual	3	19
	combination	3	19
3. What is used for watering or irrigating the plants?	Water pump	8	50
	Irrigated	3	18.75
	Manual watering	3	18.75
	Drip irrigation	1	6.25
	Combination	1	6.25
4. What fertilizer or manure is used?	Organic	11	68.75
	Inorganic	5	31.25
5. What is used for pest and disease prevention or control in plants?	Synthetic	15	93.75
	Organic	1	6.25
6. What methods are used for removing weeds from the crops?	Manual weeding	12	75
	Herbicide	4	25
7. What integrated farming practices are applied?	Poultry/livestock raisers	11	68.75
	None	5	31.25
8. What methods are used for harvesting?	Manual Picking	16	100

3.3 Practices of Traders/Wholesalers

Table 6 shows the practices of traders/wholesalers as to the frequency of travel for importing commodities and the methods of acquiring and selling crops. Traders travel daily(20%) and weekly(80%)to acquire or transport goods. Wholesalers used methods for purchasing and selling goods by having traders bring the products (20%). The wholesalers buy in bulk and resell to retailers or consumers. Some traders use a vehicle to import vegetables (40%)and engage in trading and wholesaling (40%). Traders/wholesalers spend Php 2,000-3,000 for freight costs, Php 200 to less than Php 1,000 for fuel and labor expenses, and Php 250 to 500 stall rental fee daily, depending on the outlet size.

Table 6. Practices of Traders/ Wholesalers

Practices	Responses	Percentage
1. How many times a week do you travel to pick up or deliver goods?	Everyday	20
	Once a week	80
2. What are the methods of acquiring and selling goods?	Traders bring the products they sell. (wholesaling)	20
	A vehicle is used to transport vegetables to be sold to wholesalers. (trading)	40
	Imported goods are sold. (trading and wholesaling)	40

IV. Analysis of Food Supply and Demand Performance in the Municipality of Dinalupihan

Table 7 presents the food supply and demand performance analysis using the Food Self-Sufficiency Ratio (FSSR) for 2022 and 2023.The Food Self-Sufficiency Ratio (FSSR) measures a country's ability to produce enough food to meet its needs. It is calculated by dividing the total domestic food production by the total domestic food consumption. A country with an FSSR of 100% is self-sufficient in food production, while a country with an FSSR of less than 100% relies on food imports to meet its needs.

The reported Annual Domestic Production (ADP) of Banana in the Municipality of Dinalupihan, Bataan for 2023 has a total of 536.65 tons and the annual domestic consumption (ADC) of the same year is 1369 tons, which means the production is deficient with an FSSR of 39.2%. Similarly, tomatoes' ADP decreased from 30 tons in 2022 to 29.48 tons in 2023 with an ADC of 684 tons, and in 2023, it declined from 4.38% in 2022 to 4.31%, indicating a dwindling self-sufficiency ratio. The FSSR signifies that the town cannot produce the HVCs required to meet local demand. This collective inadequacy underscores a systemic issue wherein the municipality's crop production consistently fails with its consumption demands. The consequence of this deficit is a heavy reliance on neigh boring towns and provinces to bridge the gap and achieve a 100% FSSR, as evidenced by the prevalent practice of importing agricultural products to meet domestic demand. Likewise, the Philippine Statistics Authority (PSA) confirmed that the country is dependent on imported food supply based on the calculated self-sufficiency ratio (SSR) of 81.3 percent for the overall food products in the country in 2019. This implies that 81.3 percent of the food supply was derived from domestic production.

Table 7. Analysis of Food Supply and Demand Performance Using Food Self-Sufficiency Ratio

HVC	*Annual Domestic Production (2023) (ton)	*Annual Domestic Production (2022) (ton)	***Annual Domestic Consumption 2023 (ton)	FSSR (2023)	**FSSR (2022)
Tomato	29.48	30	684	4.31	4.38
Eggplant	49.59	15	684	7.25	2.19
Lady's finger	2.55	50	342	0.75	14.62
Snow cabbage	18.05	12	342	5.28	3.50
Stringed beans (Pole Stringed beans + Bush	12.5	32	342	3.65	9.36

Stringed beans)					
Hot chili	0.03	3	55	0.05	5.45
Green chili pepper	0.31	16	178	0.17	8.99
Banana (Saba 482.15 tons + Lakatan 54.5)	536.65	--	1369	39.20	--
Bitter gourd	5.48	26	684	0.80	3.80
Onion (red + yellow)	22.75	--	684	3.33	--

*based on Planting and Harvesting Report 2022 and 2023 from DA Province of Bataan

**assuming unchanged annual consumption

***Annual domestic consumption= (average weekly consumption/household x 28,513 households x 4 wks x 12 mos)

V. Movement Patterns of Commodities

Table 8 summarizes the responses from household consumers, farmers, and traders about the source of high-value crops, the marketing hub, and the product destination. Consumers primarily purchase goods from the Dinalupihan public market (49%), small wet market "*talipapa"* (29%), rolling stores (16%), and Olongapo Market (5%). Dinalupihan Public Market and *talipapa* are the primary locations where consumers purchase goods. Rolling stores also play a significant role because of easy access and convenience for households to buy commodities.

Farmers send their produce to the Trading Center "*Bagsakan*" (50%), public markets (25%), traders (12.5%), and engage in direct selling (12.5%). The Bagsakan Center appears to be a crucial point for farmers to sell their produce. Some farmers resort to trading directly with local traders due to the absence of vehicle transport options. As a result, the produce is delivered to the Bagsakan Center through these intermediary transactions.

The produced goods start from farmers and end up in the hands of consumers. Traders play a crucial role as mediators in this process. The *Bagsakan* Center stands out as the main hub, connecting farmers and traders, and ensuring a smooth flow of goods across different areas. The movement pattern of high-value crops presents the entire supply chain in Dinalupihan, and how products travel through various locations until the commodities reach household consumers in the municipality (Figure 2). Increased commodity mobility directly correlates with heightened commodity prices. This means that the longer the food distribution channel of vegetables from farmers to consumers, the higher the price. The involvement of intermediate distribution channels significantly impacted the prices of vegetables. In other words, the various steps and intermediaries involved in getting vegetables from farmers to consumers have a substantial influence on the final pricing of the produce (Praswati *et al.,* 2017).

Table 8. Movement Patten of High-Value Crops (Multiple Responses)

Questions	Responses	Frequency	Percentage
1. Household Consumers' Marketplace Saan namimili?	Bagsakan Center	2	1
	Olongapo market	19	5
	Rolling stores	61	16
	Talipapa	112	29
	Dinalupihan Public Market	186	49
2. Farmers' Marketing Channel Saan o kaninodinadala and ani?	Consumers	2	12.5
	Public market	4	25
	Trader	2	12.5
	Bagsakan Center	8	50
3. Traders/Wholesalers HVCs place of origin Saang farm galing ang kalakal?	Dinalupihan	11	100
	Nueva Ecija	5	45
	Zambales	5	45
	Baguio	3	27
	Nueva Viscaya	2	18
	Hermosa	1	9
	Pangasinan	1	9
	Imported from China	1	9
4. Traders HVCs destination Saan nakararating ang kalakal?	Pampanga	4	36
	Zambales	4	36
	Within Bataan	10	91

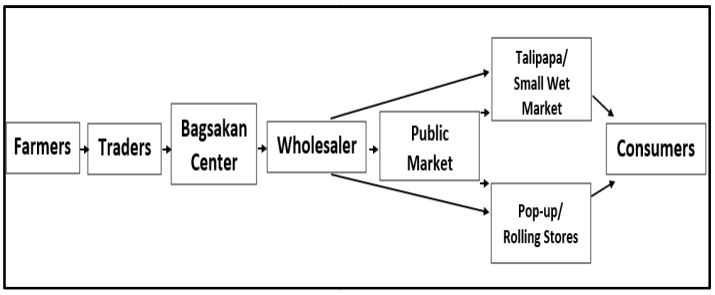

Figure 2. Movement Patterns of High-Value Crops

VI. Problems Encountered by the Key Players in the Market Economy and the Suggested Solutions.

Household consumers identified high vegetable costs (75%) as a major problem. The most common suggested solution is to lower vegetable prices (96%) and the need to prevent hoarding and manipulation of prices (13%). They also faced issues like rotten vegetables or mixed with fresh ones (22%). They suggested solutions such as seed subsidies promoting backyard gardening (99%), and buying directly from farmers (53%)

Farmers highlighted challenges like machinery and water management, indicating a need for technological and irrigation support (56%). They expressed concerns about pests affecting their crops suggesting seeking assistance from the Department of Agriculture for training, seed subsidies, and other farm inputs to address pest-related issues (100%). Likewise, they also reported financial challenges stating the need for capital or financial assistance to overcome financial constraints (19%) and uncertainty of the market or low prices indicating the importance of establishing a Barangay Association/ Cooperative to purchase farmers' harvests and/or having the Local Government Unit intervene in acquiring farmers' produce, addressing market-related challenges (88%).

Traders and wholesalers reported challenges related to the high cost of high-value crops (45%) suggesting lower vegetable prices (100%); issues on transportation costs (45%) stating the need for financial assistance, rotten vegetables (55%) indicating a potential need for interventions related to post-harvest handling, storage, or market access to prevent spoilage.

CONCLUSION

1. Most household respondents are females, middle-aged adults, living with a nuclear family, and low-income earners. Farmers show balanced land ownership, dominated by male, seasoned farmers, living with their immediate families and full-time farmers. Traders have varied profiles in terms of sex, age, family size, and place of residence.
2. The top HVCs consumed indicate stable household preferences; the highest-produced crops show farmers' expertise and the suitability of crops, and the topmost traded commodities exhibit consistent demand among consumers and signify profitability among traders
3. Dinalupihan households have varied consumption patterns in terms of shopping frequency depending on the residence and transportation costs. Farmers display good farming practices except for synthetic pesticide utilization in insect-pest management. Traders vary in acquisition and distribution rates and match the shopping frequency of consumers.
4. There is a gap between the supply and demand of HVCs in Dinalupihan.
5. High-value crops are expensive due to the longer food distribution channel.
6. The key players have provided responsive solutions to their respective challenges.

RECOMMENDATIONS

1. Implement financial literacy workshops. Subsidize modern machinery and irrigation programs to enhance productivity and sustainability. Prioritize skill development, access to resources, and networking initiatives.
2. Focus on enhancing the production and trade of economically viable crops. Implement a training program for farmers to optimize yields of high-profit crops.
3. Implement awareness campaigns promoting households' balanced consumption and minimizing excess purchases. Offer farmers training programs on integrated farming methods, organic pesticide, and fertilizer making, and utilization for sustainable and eco-friendly agriculture. Enhance the transportation infrastructure to reduce vehicle emissions, and facilitate efficient trade networks.
4. Start crop production projects with less supply. Teach farmers advanced farming methods, and help them sell their produce. Encourage collaboration, and plan to move crops efficiently from farmers to consumers.
5. Establish a coordinated logistics system to enhance transportation facilities for faster and safer commodity movement.
6. Consider adopting the suggested solutions of the household consumers, farmers, and traders/wholesalers.

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