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Economic appraisal and strategic analysis of the onion industry in the Philippines

Arjhel V. Domingo *

College of Management and Business Technology-Entrepreneurship Department, Nueva Ecija University of Science and Technology, Cabanatuan City, Philippines

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ABSTRACT

This research undertakes a comprehensive evaluation of the economic dynamics within the onion industry, concentrating specifically on the prolific "Onion Basket of the Philippines" and its extension throughout Southeast Asia. Employing the value chain model as a methodological scaffold, the study meticulously dissects the intricate fabric of activities within this sector, aiming to pinpoint the exact operations that confer amplified value and competitive edge to this agricultural commodity. Through a meticulous selection process encompassing 360 agrarian participants, primarily sourced from the preeminent onion-producing municipalities of Nueva Ecija—namely, Bongabon, Gabaldon, and Laur—this investigation orchestrates an exhaustive scrutiny of the financial implications and returns. By comparing analyses across both traditional post-harvest marketing and the integration of cold storage infrastructure, the study unveils pronounced differentials. Evidently, the incorporation of cold storage resources precipitates substantial revenue escalation for farmers, in stark contrast to immediate post-harvest sales. However, the accompanying capital outlay affiliated with cold storage mandates judicious deliberation. Given the considerable financial connotations, this research underscores the imperativeness of establishing rigorous regulatory frameworks governing onion cold storage practices. Furthermore, acknowledging the intricate mesh of interests embedded within the onion value chain, it advocates heightened vigilance and stringent oversight concerning stakeholders. This multifaceted investigation, beyond contributing empirical authenticity, serves as a clarion call for prudent stewardship of this pivotal agricultural domain.

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1. Introduction

The onion industry represents an indispensable facet within the global agricultural domain, conferring substantial fiscal sustenance to farmers and alimentary manufacturers on a worldwide scale. Onions, a culinary mainstay across diverse cuisines, have been irrevocably linked to a multitude of health-enhancing attributes. Within this exegesis, we embark on an exploration encompassing the historical underpinnings of the onion industry, its economic gravitas, intricate cultivation methodologies, and the contemporary quandaries confronting agriculturalists (Griffiths et al., 2002).

Of pivotal significance, the onion assumes a pivotal role within the agricultural tapestry of the Philippines, emerging as a fount of livelihood for myriad farmers and constituting an elemental bastion of the nation's alimentary security. Recent years have borne witness to an ascendant trajectory in Philippine onion cultivation, a phenomenon catalyzed by the assimilation of novel technological paradigms and the amelioration of cultivation techniques. Nonetheless, within this trajectory of growth, the underpinning concern of the industry's profitability assumes primacy; a considerable cohort of farmers grapples with the conundrum of securing sustainable remuneration from their onion harvests.

To elucidate, Department of Agriculture reports for 2014 manifest a recorded onion yield of 134,169.92 metric tons within the Philippines, with an average yield of 8.70 metric tons per hectare. Deeper insights culled from Provincial Government records unveil a partition of production: red shallots comprising approximately 5%, yellow granex constituting 12%, and the preponderant 82%

* Corresponding Author.
Email Address: arjheldomingo101@gmail.com
https://doi.org/10.21833/ijaas.2023.08.009
Corresponding author's ORCID profile:
https://orcid.org/0000-0001-7359-1022
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earmarked for red onions. Noteworthy is the concentration of onion production in the third district of Nueva Ecija, notably the triad of Bongabon, Gabaldon, and Laur, collectively acknowledged as the premier onion-generating municipalities. Adjunct to this, adjacent townships such as Gabaldon, Laur, Palayan, and Sto. Domingo and San Jose embrace onion cultivation as a secondary crop post rice-harvesting seasons. Collectively, these precincts collectively coalesce to etch an indelible mark as the preeminent producers of onions within the province (PRDP, 2014).

According to Ahmed and Kaikaus (2021), the study performs a situation analysis of the recent spike in onion prices that has occurred in Bangladesh and makes policy proposals to alleviate the problem. An empirical evaluation of the onion supply chain in Bangladesh, both before and after the COVID-19 epidemic, was carried out by Mila et al. (2022), with the purpose of identifying bottlenecks and potential areas for improvement. Ibáñez et al. (2017) performed a corporate water footprint case study of Gazpacho production, whereas Pósleman and García (2020) researched the water footprint of exportable agricultural products in San Juan Province. The study of Schyns and Hoekstra (2014) investigated the additional value of water footprint assessment for national water policy in Morocco. Whereas Hoekstra et al. (2012) investigated global monthly water scarcity. In addition, Schyns and Hoekstra (2014) examined the added value of water footprint assessment for national water policy in the United States. Liu et al. (2012) investigated historical patterns as well as potential developments in the greywater footprints of anthropogenic nitrogen and phosphorus inputs to major rivers throughout the world. While Hejduk and Hejduk (2019) researched the impact of runoff prediction on grey water footprint in a small agricultural catchment. On the other hand, Mekonnen and Hoekstra (2015) investigated the global gray water footprint and water pollution levels due to anthropogenic nitrogen loads to freshwater and global gray water footprint.

While Chukalla et al. (2018) investigated ways to reduce the greywater footprint in irrigated crop production, Kim and Kim (2019) analyzed the water footprint of the most important agricultural and livestock products produced in Korea. The study of Evangelou et al. (2016) analyzed the water footprint of commercial tomato cultivations in the Pinios River Basin. In addition, Alam et al. (2009) discussed implementing sovereignty bargains on water via the benefit-sharing concept and also explore executing sovereignty bargains on water through the benefit-sharing principle. Lastly, Hoekstra (2016) offered a critique of the water-scarcity weighted water footprint that is used in LCA, and Aldaya and Hoekstra (2010) computed the amount of water that is required for Italians to consume pasta and pizza. The purpose of these studies is to provide a complete picture of the onion business in Bangladesh, with a special emphasis on the water footprint and supply chain restrictions imposed by the crop.

The preceding statements encompass a range of pertinent research endeavors related to water footprints and their implications on agricultural production. Notably, these discussions encompass investigations into the water footprint associated with the production of gazpacho, the viability of agricultural exports from San Juan province, the cultivation of tomatoes in commercial settings within the Pinios River Basin, and the quantification of water demand tied to the consumption of pasta and pizza in Italy. Furthermore, this paragraph encapsulates inquiries into strategies for curtailing greywater usage in irrigated crop cultivation, the ramifications of runoff prediction on greywater utilization in modest-sized agricultural catchments, and investigations into global monthly water scarcity, the worldwide greywater footprint, and water pollution levels. Additionally, it delves into historical patterns and future projections concerning the greywater footprints linked to human-derived nitrogen and phosphorus inputs in major global river systems. The central goal of these scholarly undertakings is to engender a comprehensive comprehension of water utilization patterns and the constraints imposed by supply chains across diverse agricultural landscapes. In a specific illustration of these inquiries, Ahmed and Kaikaus (2021) presented an examination of the onion industry in Bangladesh, serving as a case study to elucidate their research. Onion, recognized as a high-value crop, has ascended to a position of prominence among the country's priority commodities in recent years. Nonetheless, the industry grapples with persistent challenges, including the escalating costs of production due to the continuous surge in farm input prices, competition from imported onions, illicit trade, pest infestations, and suspicions of price manipulation by major traders, particularly during the harvest season, among other issues. In the face of these multifaceted challenges, both the production and marketability of this crop have been plagued by instability over the preceding years. It is undeniable that, despite the nationwide recognition bestowed upon the province of Nueva Ecija for its significant contribution to onion production, our domestic onion industry remains in a state of struggle, beset by an array of problems encountered by local onion farmers. With the researcher being a native of Nueva Ecija, the impetus arose to comprehensively assess the onion industry within the province. A meticulous exploration of each facet of onion production becomes imperative, delving deep into the intricacies of the industry, spanning from input provisioning and cultivation to processing and eventual marketing. Employing a value chain analysis, the researcher endeavors to present an authentic panorama of the onion industry within Nueva Ecija. This study endeavors to conduct an exhaustive analysis of the onion industry in Nueva Ecija through the lens of value chain analysis. More specifically, the study aims to elucidate the multifarious dimensions of the onion industry encompassing input provisioning, production,

processing, marketing, and cost-return analysis. In doing so, it aspires to pinpoint the challenges and limitations encountered across these dimensions. Ultimately, the study aims to proffer a strategic action plan tailored to address the nuanced challenges that the onion industry in Nueva Ecija confronts.

This study was anchored thru value chain analysis (VCA). According to Porter (1985), the idea of the value chain is based on the process view of organizations, the idea of seeing a manufacturing (or service) organization as a system, made up of subsystems each with inputs, transformation processes, and outputs. Inputs, transformation processes, and outputs involve the acquisition and consumption of resources-money, labor, materials, equipment, buildings, land, administration, and management.

Porter (1985) wrote about value chain analysis in his book "Competitive Advantage." It is a strategy tool that helps organizations understand how they work internally and find ways to gain a competitive edge. The value chain is a series of things a company does to make a product or service and give it to customers. Porter (1985) put these things into two groups: The main things and the things that help the main things.

Primary activities are those that are directly involved in making and delivering the product or service, while support activities are those that are needed to make sure that the primary activities are done well and quickly. The main tasks are incoming logistics, management, outgoing logistics, marketing and sales, and customer service. Some of the support tasks are purchasing, developing technology, managing human resources, and building infrastructure.

The value chain analysis framework helps companies to understand how their internal operations create value for customers, and where they can improve their processes to gain a competitive advantage. By figuring out which activities are main and which are secondary, organizations can focus on the areas where they have a competitive edge and come up with plans to improve their overall performance.

The utilization of value chain analysis holds diverse applications for organizations, encompassing avenues to realize cost savings, enhance customer satisfaction, and innovate new products and services. This analytical framework finds extensive adoption across industries including manufacturing, retail, and the service sector, serving as a tool for organizations to strategically optimize their operational processes and attain a distinct competitive advantage.

In short, Michael Porter's value chain analysis (Porter, 1985) is a strategy tool that helps organizations understand how they work internally, find places where they can improve their processes, and come up with plans to get ahead of the competition. It is a useful framework for businesses to use when they look at how they run and try to find ways to improve.

Fig. 1 illustrates the delineation of four pivotal dimensions within the onion industry that contribute to its value addition. In the context of input provision, the acquisition of essential resources such as seeds, fertilizers, and pesticides has been elucidated. Concerning the production phase, comprehensive insight into the agricultural practices adopted by onion farmers, encompassing land preparation, planting, and ongoing farm maintenance, has been expounded. Within the processing realm, specific practices including harvesting, hauling, cleaning, bagging, and storage have been identified. Moreover, the marketing dimension encapsulates the pricing and selling strategies employed by farmers for their onion produce.

To evaluate the profitability of onion cultivation, a comprehensive cost and return analysis was conducted and meticulously analyzed. This analytical framework facilitated a granular comprehension of each operational facet, aiding in the identification of key stakeholders in the respective chains. These stakeholders play a pivotal role in evaluating the current status of the onion industry in Nueva Ecija. Through the utilization of Value Chain Analysis (VCA), underlying constraints were brought to the forefront, leading to informed interventions carried out via a proposed strategic action plan. The central objective of this study extends to making a substantial contribution to the forthcoming development and heightened competitiveness of the onion industry in the years to come.

2. Methods

The study adopted a descriptive research approach, characterized by its aim to acquire comprehensive information pertaining to the existing conditions and status within a given context. In addition, the research employed a value chain analysis with a specific focus on input provisioning and cost and return analysis. This analytical approach was instrumental in uncovering industry-related challenges and limitations. The outcomes of these analyses formed the foundational basis for devising a strategic action plan tailored to the onion industry in Nueva Ecija.

Bongabon, acknowledged as the primary onion producer in the Philippines, served as the focal point of investigation. The study site encompassed the contiguous municipalities of Laur and Gabaldon, which also hold prominent positions in onion production within the nation and the Southeast Asia (SEA) region. To capture a comprehensive understanding, the study engaged three distinct respondent groups: onion farmers, operators of cold storage facilities, and municipal agriculturists representing the relevant Local Government Units (LGUs), in addition to the provincial agriculturist of Nueva Ecija. A comprehensive breakdown of the respondent distribution is provided in Table 1.

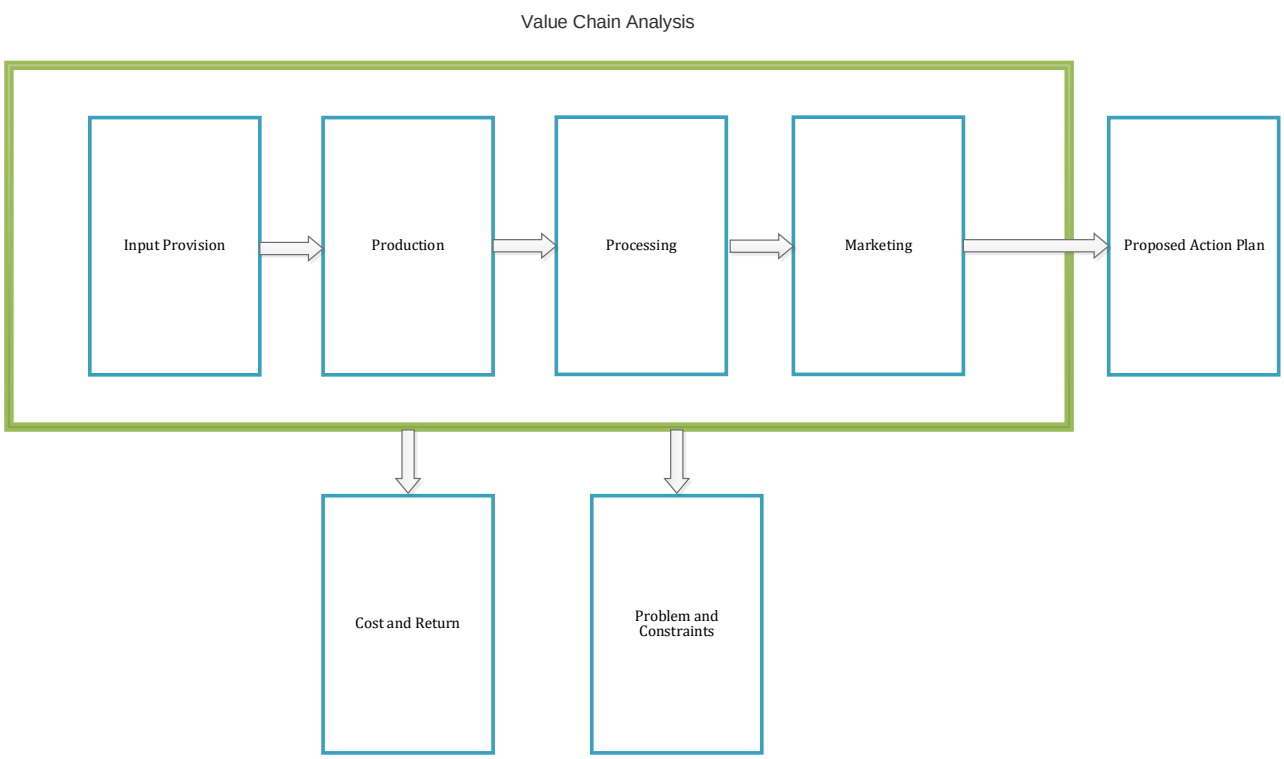

Fig. 1: Research paradigm

Table 1: Distribution of respondents by municipalities

Respondents	Sample
1. Onion farmers	
Bongabon	184
Gabaldon	151
Laur	25
Subtotal	360
2. Operators of cold storage facilities	9
3. Municipal/provincial agriculturists	4
Grand total	373

A comprehensive roster of 360 onion farmers hailing from the municipalities of Bongabon, Laur, and Gabaldon constituted the respondents within the category of onion farmers. To establish this sample size, a calculated figure of 360 onion farmers was extracted from an overarching population of 5,622, employing the Raosoft Statistical Software. The allocation of the sample size for each municipality followed the principles of a simple random technique and was scaled proportionally in accordance with the respective population. In a parallel vein, the entire cohort of nine operators of cold storage facilities located in the third district, along with the four incumbent Municipal/Provincial Agriculturists, was enlisted as participants in the study. Three distinct sets of questionnaires were meticulously crafted to align with the three distinct respondent groups, thus facilitating the data collection process. Additionally, an unstructured interview method was deployed to capture supplementary insights and verify the consistency of the responses. The questionnaire designed for onion farmers comprehensively encompassed the various dimensions of the onion industry, notably spanning input provision, production, processing, and marketing. The subsequent segment delved into the multifaceted challenges confronted by onion farmers across these distinct facets. On the other hand, the questionnaire tailored for operators of cold storage facilities meticulously explored aspects such as storage fees, warehouse capacity, and operational nuances. Correspondingly, the questionnaire crafted for municipal and provincial agriculturists engrossed itself in the elemental components underpinning the provision of inputs within the domain of onion cultivation.

To ensure the clarity, effectiveness, and pertinence of the instruments, they were rigorously tested amongst other onion farmers, cold storage facility operators, and municipal agriculturists from locales not directly involved in the study. Subsequent to this, the instruments were sanctioned through coordination with the mayors, municipal agriculturists, and barangay captains of Bongabon, Gabaldon, and Laur, thereby securing the requisite distribution channels. Furthermore, the endorsement was obtained from the barangay captains to enable access to the onion farmers.

From the enumerated list of onion farmers collated by the barangay captains, respondents were judiciously selected employing a simplified random sampling technique. The process of administering the questionnaire was personally undertaken by the researcher, supplemented by the cooperation of municipal councilors and purok leaders. Concurrently, interviews with onion farmers were conducted. Similarly, the questionnaires designated for the other respondent groups were directly overseen by the researcher. Following the survey and interview phases, the amassed data was meticulously organized utilizing Microsoft Excel spreadsheets. In terms of statistical presentation, analysis, and interpretation, the toolkit encompassed the application of Frequency, Weighted Mean, and Percentage computations.

3. Results and discussions

3.1. Onion industry aspects in Nueva Ecija's selected municipalities

3.1.1. Input provisions

The input provisions of the onion industry encompass aspects such as land ownership, seed requirements, fertilizer needs, pest and insect control measures, and the financial requisites of onion farmers. Tables 2-10 provide a comprehensive overview of the input provisions within the onion industry of Nueva Ecija. Based on the findings presented in Tables 2-10, it is evident that the majority of farmer respondents from the three onion-producing municipalities in Nueva Ecija possess tenanted land ownership. A significant proportion of onion farmers opt for the Red Pinoy variety of red creole, utilizing approximately 16 cans per cultivation cycle. In terms of fertilizers, onion farmers employ around 26 bags per cropping cycle and 30 bags of organic fertilizers every five years. They also rely on imported chemical insecticides and pesticides to counter pest infestations, which are associated with high costs due to their importation. Additionally, a significant number of farmer-respondents secure capital by borrowing, often from trader capitalists, and a substantial proportion of onion farmers settle their credit obligations with cash or through the exchange of their harvested produce.

3.1.2. Production

This aspect encompasses the processes of land preparation, planting activities, and farm maintenance tasks. The following section presents the production-related information pertaining to the onion industry in Nueva Ecija.

Table 2: Land ownership status of onion farmers by municipality

Land ownership status	Municipalities						Total	
	Bongabon		Gabaldon		Laur			
	F	%	F	%	F	%	f	%
Tenanted	113	61.41	98	64.90	15	60.00	226	62.78
Owned	49	26.63	38	25.17	7	28.00	94	26.11
Rented	22	11.96	15	9.93	3	12.00	40	11.11
Total	184	100.00%	151	100.00%	25	100.00%	360	100.00%

Table 3: Brand of seed used by onion growers

Municipality	Year	Seed brand/variety						Total	
		Red Pinoy		Super Pinoy		Red dragon			
		f	%	f	%	f	%	F	%
Bongabon	2016	119	64.67	44	23.91	21	11.41	184	100%
	2015	127	69.02	47	25.54	10	5.43	184	100%
	2014	141	76.63	40	21.74	3	1.63	184	100%
	2013	153	83.15	31	16.85	0	0.00	184	100%
	2012	154	83.70	30	16.30	0	0.00	184	100%
Gabaldon	2016	151	100.00	0	0.00	0	0.00	151	100%
	2015	151	100.00	0	0.00	0	0.00	151	100%
	2014	151	100.00	0	0.00	0	0.00	151	100%
	2013	151	100.00	0	0.00	0	0.00	151	100%
	2012	151	100.00	0	0.00	0	0.00	151	100%
Laur	2016	25	100.00	0	0.00	0	0.00	25	100%
	2015	25	100.00	0	0.00	0	0.00	25	100%
	2014	25	100.00	0	0.00	0	0.00	25	100%
	2013	25	100.00	0	0.00	0	0.00	25	100%
	2012	25	100.00	0	0.00	0	0.00	25	100%

Table 4: Cost per can, total number of cans, and cost of onion seeds per hectare

Year	Municipality								
	Bongabon			Gabaldon			Laur		
	Cost (Php)/Can	Total cans/Ha	Total cost (Php)/Ha	Cost (Php)/Can	Total cans/Ha	Total cost (Php)/Ha	Cost (Php)/Can	Total cans/Ha	Total cost (Php)/Ha
2016	1,820	16	29,120	1,826	16	29,216	1,820	16	29,120
2015	1,750	16	28,000	1,715	16	27,440	1,782	16	28,512
2014	1,700	16	27,200	1,579	16	25,264	1,754	16	28,064
2013	1,300	16	20,800	1,360	16	21,760	1,370	16	21,920
2012	1,400	16	22,400	1,370	16	21,920	1,370	16	21,920

Ha: Hectare; Php: Philippine peso

Table 5: Cost per bag, total number of bags, cost of inorganic fertilizers per hectare

Year	Municipality								
	Bongabon			Gabaldon			Laur		
	Cost (Php)/Bag	Total bags/Ha	Total cost (Php)/Ha	Cost (Php)/Bag	Total bags/Ha	Total cost (Php)/Ha	Cost (Php)/Bag	Total bags/Ha	Total cost (Php)/Ha
2016	1,000	26	26,000	1,159	26	30,134	1,017	26	26,442
2015	1,000	26	26,000	1,515	26	39,390	1,064	26	27,664
2014	1,000	26	26,000	1,139	26	29,614	1,068	26	27,768
2013	1,000	26	26,000	1,139	26	29,614	1,061	26	26,586
2012	1,000	26	26,000	1,139	26	29,614	1,072	26	27,872
Average total cost/Ha			26,000			31,637			27,266

Ha: Hectare; Php: Philippine peso

Table 6: Total cost of insecticide/pesticide per hectare

Year	Bongabon			Gabaldon			Laur		
	Insecticide/ Cost (Php)/Ha	Pesticide/ Cost (Php)/Ha	Total cost (Php)insecticide/Pesticide	Insecticide/ Cost (Php)/Ha	Pesticide/Cost (Php)/Ha	Total cost (Php) insecticide/ Pesticide	Insecticide/ Cost (Php)/Ha	Pesticide/ Cost (Php)/Ha	Total cost (Php) insecticide /Pesticide
2016	6,000	3,600	9,600	4,000	4,400	8,400	4,000	3,600	7,600
2015	5,700	3,400	9,100	4,000	4,400	8,400	4,000	3,400	7,400
2014	5,400	3,200	8,600	4,000	4,400	8,400	4,000	3,200	7,200
2013	5,400	3,200	8,600	4,000	4,400	8,400	4,000	3,200	7,200
2012	5,400	3,200	8,600	4,000	4,400	8,400	4,000	3,200	7,200
Average cost			8,900			8,400			7,320

Ha: Hectare; Php: Philippine peso

Table 7: Onion farmers' sources of financing

Source	Bongabon		Gabaldon		Laur		Total	
	F	%	F	%	F	%	F	Average
Fully financed by the owner	21	11.41	16	10.60	4	16.00	41	11.39
Borrowed capital	163	88.59	135	89.40	21	84.00	319	88.61
Total	184	100.00	151	100.00	25	100.00	360	100.00

Table 8: Financing sources of the onion farmers

Sources of financing	Bongabon		Gabaldon		Laur		Total	
	f	%	f	%	f	%	F	Average
Trader-capitalists	109	65.66	71	52.59	6	28.57	186	58.31
Banks and other financial institutions	11	6.63	7	5.19	5	23.81	23	7.21
Informal lending (private persons)	43	26.38	57	42.22	10	46.62	110	34.48
Total	163	100.00	135	100.00	21	100.00	319	100.00

Table 9: Farmers' payment modes to creditors

Mode of payment	Bongabon		Gabaldon		Laur		Total	
	F	%	F	%	f	%	F	Average
Cash or payment in exchange for farmer's produce upon harvest	109	65.66	71	52.59	6	28.57	186	58.31
installment or upon maturity payment (e.g., bank)	54	6.63	64	5.19	15	23.81	133	41.69
Total	163	100.00	135	100.00	21	100.00	319	100.00

Table 10: Data on the interest rate charged to onion farmers

Year	Bongabon			Gabaldon			Laur		
	Trader-capitalists (%)	Banks, etc. (%)	Informal lenders (%)	Trader-capitalists (%)	Banks, etc. (%)	Informal lenders (%)	Trader-capitalists (%)	Banks, etc. (%)	Informal lenders (%)
2016	3-5% /mo	7-9%/yr	5-10%/mo	3-5% /mo	7-9%/yr	5-10%/mo	3-5% /mo	7-9%/yr	5-10%/mo
2015	3-5% /mo	7-9%/yr	5-10%/mo	3-5% /mo	7-9%/yr	5-10%/mo	3-5% /mo	7-9%/yr	5-10%/mo
2014	3-5% /mo	7-9%/yr	5-10%/mo	3-5% /mo	7-9%/yr	5-10%/mo	3-5% /mo	7-9%/yr	5-10%/mo
2013	3-5% /mo	7-9%/yr	5-10%/mo	3-5% /mo	7-9%/yr	5-10%/mo	3-5% /mo	7-9%/yr	5-10%/mo
2012	3-5% /mo	7-9%/yr.	5-10%/mo	3-5% /mo	7-9%/yr	5-10%/mo	3-5% /mo	7-9%/yr	5-10%/mo

mo: months; yr: year

Tables 11-21 provide the production data. Concerning plowing expenses, onion farmers from Bongabon reported the highest costs. In terms of harrowing, both Bongabon and Gabaldon incurred the same expenses. Regarding seedbed preparation, Bongabon farmers paid the highest labor costs. A significant proportion of the farmer-respondents opted to rent farm machinery and equipment for land preparation. The majority of the respondents sourced their farm laborers locally within their respective municipalities. For tasks such as seedling pulling, transplanting, and weeding, Bongabon farmers recorded the highest labor expenses. With regard to irrigation, a considerable portion of onion farmers from the three municipalities utilized water pumps to fulfill their irrigation requirements.

3.1.3. Processing

Processing constitutes a pivotal component within the framework of value chain analysis. This phase encompasses activities such as harvesting and post-harvest procedures, including hauling, cleaning, sorting, bagging, and storage of agricultural produce. The ensuing Tables 22-30 provide insights into the processing dynamics of the onion industry in Nueva Ecija.

Table 11: Plowing cost per hectare

Year	Bongabon		Gabaldon		Laur	
	No. of laborers	Contract amount (Php)/Ha	No. of laborers	Contract amount (Php)/Ha	No. of laborers	Contract amount (Php)/Ha
2016	1-2	5,600.00	1-2	4,000.00	1-2	5,000.00
2015	1-2	5,600.00	1-2	4,000.00	1-2	5,000.00
2014	1-2	5,600.00	1-2	4,000.00	1-2	5,000.00
2013	1-2	5,600.00	1-2	4,000.00	1-2	5,000.00
2012	1-2	5,600.00	1-2	4,000.00	1-2	5,000.00
Average cost/Ha		5,600.00		4,000.00		5,000.00

Ha: Hectare; Php: Philippine peso

Table 12: Harrowing cost per hectare

Year	Bongabon		Gabaldon		Laur	
	No. of laborer	Contract amount (Php)	No. of laborers	Contract amount (Php)	No. of laborers	Contract amount (Php)
2016	2-3	4,800.00	2-3	2,000.00	2-3	4,800.00
2015	2-3	4,800.00	2-3	2,000.00	2-3	4,800.00
2014	2-3	4,800.00	2-3	2,000.00	2-3	4,800.00
2013	2-3	4,800.00	2-3	2,000.00	2-3	4,800.00
2012	2-3	4,800.00	2-3	2,000.00	2-3	4,800.00
Average total cost		4,800.00		2,000.00		4,800.00

Php: Philippine peso

Table 13: Cost of seedbed preparation

Year	Bongabon (Php)	Gabaldon (Php)	Laur (Php)
2016	1,750.00	1,000.00	1,000.00
2015	1,750.00	1,000.00	1,000.00
2014	1,750.00	1,000.00	1,000.00
2013	1,750.00	1,000.00	1,000.00
2012	1,750.00	1,000.00	1,000.00
Average cost	1,750.00	1,000.00	1,000.00

Php: Philippine peso

Table 14: Farm implements used by the onion farmers

Farm implements	Municipality						Total	
	Bongabon		Gabaldon		Laur			
	F	%	f	%	F	%	F	Ave.%
Farmall, hand tractors, rotavator, toner	171	92.93	146	96.69	18	72.00	335	93.06
Carabao	13	7.07	5	3.31	7	28.00	25	6.94
Total	184	100.00	151	100.00	25	100.00	360	100.00

Table 15: Farmers' ownership proportion for farm machines and equipment

Form of ownership	Bongabon		Gabaldon		Laur		Total	
	F	%	F	%	f	%	F	Average
Owned	76	44.44	45	30.82	10	55.56	131	39.10
Rented	95	55.56	101	69.18	8	44.44	204	60.90
Total	171	100.00	146	100.00	18	100.00	335	100.00

Table 16: Source of farm laborers during planting activities

Source	Bongabon	Gabaldon	Laur
	%	%	%
Within the area or municipality	70%	90%	90%
Outside the municipality	30%	10%	10%
Total	100%	100%	100%

Table 17: Labor requirements for pulling of seedlings

Year	Bongabon			Gabaldon			Laur		
	Area (Ha)	No. of laborers per Ha	Total no. of laborers employed	Area (Ha)	No. of laborers per Ha	Total no. of laborers employed	Area (Ha)	No. of laborers per Ha	Total no. of laborers employed
2016	2,339	5	11,695	1,255	5	6,275	284	5	1,420
2015	2,250	5	11,250	775	5	3,875	412	5	2,060
2014	3,503	5	17,515	1,007	5	5,035	608	5	3,040
2013	3,734	5	18,670	1,190	5	5,950	589	5	2,945
2012	2,644	5	13,220	1,174	5	5,870	484	5	2,420

Ha: Hectare

Table 18: Transplanting cost per hectare

Year	Bongabon (Php)	Gabaldon (Php)	Laur (Php)
2016	8,500	8,000	7,200
2015	8,500	8,000	7,200
2014	8,500	8,000	7,200
2013	8,500	8,000	6,000
2012	8,500	8,000	6,000
Average cost	8,500	8,000	6,720

Php: Philippine peso

Table 19: Weeding cost per hectare

Year	Bongabon (Php)	Gabaldon (Php)	Laur (Php)
2016	6,000	4,500	3,600
2015	6,000	4,500	3,600
2014	6,000	4,500	3,600
2013	6,000	4,500	3,600
2012	6,000	4,500	3,600
Average cost	6,000	4,500	3,600

Php: Philippine peso

Table 20: Farmers' sources of water irrigation

Source	Bongabon		Gabaldon		Laur		Total	
	F	%	F	%	f	%	f	Average
Irrigation incl. rivers, canals	54	29.35	50	33.11	25	100	129	54.15
Deepwell using pump	130	70.65	101	66.89	0	0	231	45.85
Total	184	100%	151	100%	25	100%	360	100%

Table 21: Cost of Fuel/Ha in one cropping when using a water pump for irrigating the farmland

Year	Bongabon (Php)	Gabaldon (Php)	Laur (Php)
2016	4,500.00	4,000.00	0.00
2015	4,300.00	3,700.00	0.00
2014	4,100.00	3,500.00	0.00
2013	4,100.00	3,400.00	0.00
2012	4,000.00	3,400.00	0.00

Php: Philippine peso

Drawing insights from Tables 22-30, it becomes evident that the farmgate prices of onion produce were notably influenced by the interplay of demand and supply within the local market, often subjected to manipulation by unscrupulous traders. Onion farmers encountered the highest farmgate prices for their produce in 2016, while the lowest prices were observed in 2014. The role of intermediaries, acting as agents, was evident as they played a pivotal role in consolidating onion produce and subsequently engaging with Chinese traders for sale.

Table 22: Average number of bags harvested per hectare in the three onion-producing municipalities

Year	Bongabon	Gabaldon	Laur
2016	314	291	296
2015	417	401	371
2014	454	422	412
2013	420	410	394
2012	403	385	359

Note: Average yield per hectare in Bags @ 25 kilos/bag

Table 23: Labor cost for harvesting onion per hectare

Year	Bongabon			Gabaldon			Laur		
	Labor cost (Php)/bag	Ave. yield/Ha	Total labor cost (Php)	Labor cost (Php)/bag	Ave. yield/Ha	Total labor cost (Php)	Labor cost (Php)/bag	Ave. yield/Ha	Total labor cost (Php)
2016	15	314	4,710	20	291	4,710	15	296	4,710
2015	15	417	6,225	20	401	8,020	15	371	5,565
2014	15	454	6,810	20	422	8,440	15	412	6,180
2013	15	420	6,300	20	410	8,200	15	394	5,910
2012	15	403	6,045	20	385	7,700	15	359	5,385

Ha: Hectare; Php: Philippine peso

Table 24: Labor cost for hauling onion produce

Year	Bongabon			Gabaldon			Laur		
	Labor cost (Php)/bag	Ave. Yield/Ha	Total labor cost (Php)	Labor cost (Php)/bag	Ave. yield/Ha	Total labor cost (Php)	Labor cost (Php)/bag	Ave. yield/Ha	Total labor cost (Php)
2016	10	314	3,140	10	291	2,910	10	296	2,960
2015	10	417	4,170	10	401	4,010	10	371	3,710
2014	10	454	4,540	10	422	4,220	10	412	4,120
2013	10	420	4,200	10	410	4,100	10	394	3,940
2012	10	403	4,030	10	385	3,850	10	359	3,590

Ha: Hectare; Php: Philippine peso

Table 25: Total sorting/cleaning labor cost per hectare

Year	Bongabon			Gabaldon			Laur		
	Labor cost (Php)/Bag	Ave. yield/Ha.	Total labor cost (Php)	Labor cost (Php)/Bag	Ave. yield/Ha.	Total labor cost (Php)	Labor cost (Php)/Bag	Ave. yield/Ha.	Total labor cost (Php)
2016	15	314	4,710	15	291	4,710	15	296	4,710
2015	15	417	6,225	15	401	8,020	15	371	5,565
2014	15	454	6,810	15	422	8,440	15	412	6,180
2013	15	420	6,300	15	410	8,200	15	394	5,910
2012	15	403	6,045	15	385	7,700	15	359	5,385

Ha: Hectare; Php: Philippine peso

Table 26: Percentage distribution of onion size by municipality

Quality classification	Bongabon (%)	Gabaldon (%)	Laur (%)	Average (%)
Good	79.27	79.21	80.84	79.77
Reject e.g., pickles, oversized	20.61	20.42	18.52	19.85

Table 27: Cold storage facilities in nueva ecija, their capacity (in bags), and amount of reservation

Name of cold storage company	Location	Capacity (bags)	Reservation required	Amount of reservation (Php)
1. Teresa Ilagan	Bongabon, N.E.	200,000	Required	20,000
2. KASAMNE	Palayan City	500,000	Required	20,000
3. Rivson	Palayan City	360,000	Required	20,000
4. Titan	Palayan City	360,000	Required	20,000
5. Odulio	Palayan City	360,000	Required	20,000
6. Argo	Palayan City	360,000	Required	20,000
7. NECOSIP	Cab. City	100,000	Required	20,000
8. Vergara	Cab. City	100,000	Required	20,000
9. Gapan Ice Plant	San Leonardo, NE	250,000	Required	20,000
Total		2,490,000		

Php: Philippine peso

Table 28: Cold storage, their maximum duration, and corresponding storage fees

Firm and/or location	Maximum duration of storage (months)	Corresponding fees (min. 5 months) Year 2016	Additional fees (Php) in excess of 5 months (monthly)
1. Teresa L. Ilagan, NE	5	220	35
2. KASAMNE, NE	5	220	35
3. Rivson, NE	5	220	35
4. Titan, NE	5	220	35
5. Odulio, NE	5	220	35
6. Argo, NE	5	220	35
7. NECOSIP, NE	5	220	35
8. Vergara, NE	5	220	35
9. Gapan Ice Plant, NE	5	220	35
10. Tarlac area	6	220	35
11. Manila area	5	220	35

Php: Philippine peso

Table 29: Storage fees per bag in cold storage facilities per year

Firm and/or location	Storage fees (Php) and year				
	2012	2013	2014	2015	2016
1. Teresa L. Ilagan, NE	200	210	210	210	220
2. KASAMNE, NE	200	210	210	210	220
3. Rivson, NE	200	210	210	210	220
4. Titan, NE	200	210	210	210	220
5. Odulio, NE	200	210	210	210	220
6. Argo, NE	200	210	210	210	220
7. NECOSIP, NE	200	210	210	210	220
8. Vergara, NE	200	210	210	210	220
9. Gapan Ice Plant, NE	200	210	210	210	220
10. Tarlac area	200	210	210	210	220
11. Manila area	200	210	210	210	220

Php: Philippine peso

3.1.4. Marketing

Marketing is the last phase in the value chain, which includes selling strategies and modes of payments practiced by buyers. Tables 31-38 present the marketing data of the onion industry of Nueva Ecija.

The pricing of onion produce at the farmgate was susceptible to fluctuations due to the interplay between the prevailing demand and supply dynamics within the local market, often subject to manipulation by unscrupulous traders. Onion cultivators encountered the peak farmgate price for their onion yield in the year 2016, while the nadir was witnessed in 2014. Acting as intermediaries, agents played a significant role in the consolidation of onion produce, facilitating subsequent transactions with Chinese traders.

3.1.5. Cost and return analysis

The profit and loss statement of onion production in the three municipalities for the years 2012-2016. Tables 32-38 show the cost return data of the onion industry in Nueva Ecija. From Tables 31-34, farmers generate bigger income when they place their onion produce in cold storage warehouses as compared to the income when they sell this after harvest.

3.2. Problems and constraints encountered by onion farmers

The farmgate price of onion harvests experienced fluctuation due to the dynamics of supply and demand within the local market. Moreover, the pricing was susceptible to manipulation by unscrupulous traders. Onion farmers observed the peak of farm-gate prices for their produce in 2016, with the lowest prices occurring in 2014. Acting as intermediaries, agents played a pivotal role in aggregating onion yields, subsequently facilitating sales to Chinese traders.

Table 30: Comparison of gross weight per bag and net weight per bag after storage

Storage gross weight per bag (kg)	Net weight per bag after storage	Percentage decrease
26.50 – 27.50	25.00 – 25.50	10%

Table 31: Farmgate price/kilo of onion from 2012-2016

Year	Bongabon (Php)	Gabaldon (Php)	Laur (Php)
2016	35.00	35.00	36.60
2015	22.00	25.00	16.40
2014	13.00	20.00	19.00
2013	25.00	16.00	28.40
2012	28.00	12.00	28.60

Php: Philippine peso

3.3. Implications of the findings

The implications derived from the study's findings are outlined as follows, shedding light on the significant ramifications these discoveries hold for various fields and offering invaluable insights that have the potential to reshape our understanding and approach to the subject matter:

- Farm Input Activities
  - Onion farmers in Bongabon and Gabaldon expressed concern regarding the elevated expenses associated with fertilizers and pesticides.
  - In contrast, farmers in Laur raised issues regarding the exorbitant costs of seeds and other essential farm inputs.

Table 32: Profit and loss statement of onion production years 2012-2016 (without storage)

Item description	Bongabon		Gabaldon		Laur	
	Amount (Php)	%	Amount (Php)	%	Amount (Php)	%
			2016			
Gross sales	274,750.00	100.0%	254,625.00	100.0%	270,840.00	100.00%
Farm inputs	66,970.00	24.37	70,000.00	27.49	65,412.00	24.20
Production	33,650.00	12.25	26,000.00	10.21	24,100.00	8.90
Processing	16,328.00	5.94	15,822.00	6.214	15,932.00	5.88
Total operating cost	116,948.00	42.60%	111,822.00	43.90%	105,444.00	38.90%
Net income	157,802.00	57.40%	142,803.00	56.10%	165,396.00	61.10%
			2015			
Gross sales	229,350.00	100.0%	250,625.00	100.0%	152,110.00	100.00%
Farm inputs	65,350.00	28.49	77,480.00	30.91	65,826.00	43.30
Production	33,450.00	14.58	25,700.00	10.25	24,100.00	15.80
Processing	21,624.00	9.42	24,862.00	9.92	19,292.00	12.70
Total operating cost	120,424.00	52.50%	128,042.00	51.10%	109,218.00	71.80%
Net income	108,926.00	47.50%	122,583.00	48.9%	42,892.00	28.20%
			2014			
Gross sales	147,550.00	100.00%	211,000.00	100.00%	195,700.00	100.00%
Farm inputs	64,050.00	43.41	65,528.00	31.06	65,282.00	33.40
Production	33,250.00	22.53	25,500.00	12.09	24,100.00	12.30
Processing	23,381.00	15.85	25,953.00	12.30	21,218.00	10.80
Total operating cost	120,681.00	81.80%	116,981.00	55.40%	110,600.00	56.50%
Net income	26,869.00	18.20%	94,019.00	44.60%	85,100.00	43.50%
			2013			
Gross sales	262,500.00	100.0%	164,000.00	100.0%	279,740.00	100.0%
Farm inputs	57,650.00	21.96	62,024.00	37.82	57,956.00	20.7
Production	33,250.00	12.67	25,400.00	15.49	22,900.00	8.19
Processing	21,210.00	8.08	24,805.00	15.13	19,897.00	7.11
Total operating cost	112,110.00	42.70%	112,229.00	68.40%	100,753.00	36.00%
Net income	150,390.00	57.30%	51,771.00	31.60%	178,987.00	64.00%
			2012			
Gross sales	282,100.00	100.0%	115,500.00	100.0%	256,685.00	100.00%
Farm inputs	59,250.00	21.00	62,184.00	53.84	59,242.00	23.10
Production	33,150.00	11.75	25,400.00	21.99	22,900.00	8.92
Processing	20,351.50	7.21	23,292.50	20.17	18,129.50	7.06
Total operating cost	112,751.50	40.00%	110,876.50	96.00%	100,271.50	39.10%
Net income	169,348.50	60.00%	4,623.50	4.00%	156,413.50	60.90%

Table 33: Profit and loss statement of onion production years 2012-2016 (with storage)

Item description	Bongabon		Gabaldon		Laur	
	Amount (Php)	%	Amount (Php)	%	Amount (Php)	%
			2016			
Gross sales	565,200.00	100.00%	523,800.00	100.00%	532,800.00	100.00%
Farm inputs	66,970.00	11.8	70,000.00	13.36	65,412.00	12.30
Production	33,650.00	5.95	26,000.00	4.964	24,100.00	4.52
Processing	16,328.00	2.89	15,822.00	3.021	15,932.00	2.99
Storage cost	69,080.00	12.20	64,020.00	12.22	65,120.00	12.20
Total operating cost	186,028.00	32.91%	175,842.00	33.57%	170,564.00	32.01%
Net income	379,172.00	67.09%	347,958.00	66.43%	362,236.00	67.99%
			2015			
Gross sales	750,600.00	100.00%	721,800.00	100.00%	667,800.00	100.00%
Farm inputs	65,350.00	8.71	77,480.00	10.73	65,826.00	9.86
Production	33,450.00	4.46	25,700.00	3.56	24,100.00	3.61
Processing	21,624.00	2.88	24,862.00	3.444	19,292.00	2.89
Storage cost	87,570.00	11.7	84,210.00	11.67	77,910.00	11.70
Total operating cost	207,994.00	27.71%	212,252.00	29.41%	187,128.00	28.02%
Net income	542,606.00	72.29%	509,548.00	70.59%	480,672.00	71.98%
			2014			
Gross sales	817,200.00	100.00%	759,600.00	100.00%	741,600.00	100.00%
Farm inputs	64,050.00	7.84	65,528.00	8.627	65,282.00	8.80
Production	33,250.00	4.07	25,500.00	3.357	24,100.00	3.25
Processing	23,381.00	2.86	25,953.00	3.417	21,218.00	2.86
Storage cost	95,340.00	11.7	88,620.00	11.67	86,520.00	11.7
Total operating cost	216,021.00	26.43%	205,601.00	27.07%	197,120.00	26.58%
Net income	601,179.00	73.57%	553,999.00	72.93%	544,480.00	73.42%
			2013			
Gross sales	756,000.00	100.00%	738,000.00	100.00%	709,200.00	100.00%
Farm inputs	57,650.00	7.63	62,024.00	8.404	57,956.00	8.17
Production	33,250.00	4.4	25,400.00	3.442	22,900.00	3.23
Processing	21,210.00	2.81	24,805.00	3.361	19,897.00	2.81
Storage cost	88,200.00	11.7	86,100.00	11.67	82,740.00	11.7
Total operating cost	200,310.00	26.50%	198,329.00	26.87%	183,493.00	25.87%
Net income	555,690.00	73.50%	539,671.00	73.13%	525,707.00	74.13%
			2012			
Gross sales	725,400.00	100.00%	693,000.00	100.00%	646,200.00	100.00%
Farm inputs	59,250.00	8.17	62,184.00	8.973	59,242.00	9.17
Production	33,150.00	4.57	25,400.00	3.665	22,900.00	3.54
Processing	20,351.50	2.81	23,292.50	3.361	18,129.50	2.81
Storage cost	80,600.00	11.1	77,000.00	11.11	71,800.00	11.1
Total operating cost	193,351.50	26.65%	187,876.50	27.11%	172,071.50	26.63%
Net income	532,048.50	73.35%	505,123.50	72.89%	474,128.50	73.37%

Table 34: Comparative cost and return analysis in three onion-producing municipalities years 2012-2016

Item description	Bongabon (%)		Gabaldon (%)		Laur (%)		Average (%)	
	Without storage	With Storage	Without storage	With Storage	Without storage	With Storage	Without storage	With Storage
2016								
	100.00	100.00	100.00	100.00	100.00	100.00	100.0	100.00
Operating costs	42.60	32.91	43.90	33.57	38.90	32.01	41.8	32.83
Net income	57.40	67.09	56.10	66.43	61.10	67.99	58.2	67.17
2015								
Gross sales	100.00	100.00	100.00	100.00	100.00	100.00	100.0	100.00
Operating costs	52.50	27.71	51.10	29.41	71.80	28.02	58.46	28.38
Net income	47.50	72.29	48.90	70.59	28.20	71.98	41.53	71.62
2014								
Gross sales	100.00	100.00	100.00	100.00	100.00	100.00	100.0	100.00
Operating costs	81.80	26.43	55.40	27.07	56.50	26.58	64.56	26.69
Net income	18.20	73.57	44.60	72.93	43.50	73.42	35.43	73.30
2013								
Gross sales	100.00	100.00	100.00	100.00	100.00	100.00	100.0	100.00
Operating costs	42.70	26.50	68.40	26.87	36.00	25.87	49.03	26.41
Net income	57.30	73.50	31.60	73.13	64.00	74.13	50.96	73.58
2012								
Gross sales	100.00	100.00	100.00	100.00	100.00	100.00	100.0	100.00
Operating costs	40.00	26.65	96.00	27.11	39.10	26.63	58.36	26.79
Net income	60.00	73.35	4.00	72.89	60.90	73.37	41.63	73.20

Table 35: Inputs provision problems

Problems	Bongabon			Gabaldon			Laur		
	f	%	Rank	f	%	Rank	f	%	Rank
High cost of seeds	151	82.00	2	120	79.40	2	23	92.00	1.5
Hoarding of seeds by unscrupulous traders	25	13.50	3	30	19.80	3	22	88.00	3
High cost of fertilizers, pesticides, insecticides, and herbicides	162	88.00	1	131	86.70	1	23	92.00	1.5

Table 36: Production problems

Problems	Bongabon			Gabaldon			Laur		
	f	%	Rank	f	%	Rank	f	%	Rank
Lack of support from government in terms of farm machinery and equipment	152	82.60	3	126	83.40	3	25	100.00	1.5
Lack of technological know-how on proper fertilizer management application	144	78.20	4	119	78.80	4	13	52.00	3.5
Lack of farm laborers	162	88.00	1	133	88.00	1	13	52.00	3.5
Pest infestation	160	86.90	2	130	86.00	2	25	100.00	1.5

Table 37: Processing problems

Problems	Bongabon			Gabaldon			Laur		
	f	%	Rank	f		Rank	f	%	Rank
Lack of access to storage and post-harvest facilities	174	94.50	1	141	93.38	1	21	84.00	2
High cost of storage fees	172	93.40	2	139	92.0	2	23	92.00	1
Lack of technology to process onion	143	77.70	3	119	78.8	3	2	8.00	3

Table 38: Marketing problems

Problems	Bongabon			Gabaldon			Laur		
	f	%	Rank	f		Rank	f	%	Rank
Poor farm-to-market roads	57	30.90	3	46	30.40	3	8	32.00	2.5
Price manipulation by unscrupulous traders	65	35.30	1	50	33.10	2	22	88.00	1
Unregulated onion importation, smuggling included	62	33.70	2	51	33.70	1	8	32.00	2.5

- Production
  - Bongabon and Gabaldon encountered a shortage of laborers, presenting a significant challenge to the production process.
  - Farmers in Laur encountered the detrimental impact of pest infestations, highlighting the need for effective pest management. They also emphasized the absence of government support, particularly the inadequate provision of essential farm machinery and equipment.
- Processing
  - In Bongabon and Gabaldon, a predominant concern revolved around the lack of accessibility to storage and post-harvest facilities, impeding efficient processing.
  - Conversely, in Laur, farmers expressed dissatisfaction with the elevated costs associated with storage fees.
- Marketing
  - Respondents from Bongabon and Laur raised concerns about price manipulation orchestrated by unscrupulous traders, negatively affecting their marketing endeavors.
  - Gabaldon farmers, on the other hand, criticized the unchecked importation and smuggling of onions, contributing to market instability.

3.4. Proposed strategic action plan for the onion industry in Nueva Ecija

In order to ensure the enduring viability and profitability of local onion production, it is imperative for the onion industry to enhance its competitive stance, both within domestic and export markets. To achieve this, the industry must deliver onions of superior quality, in optimal quantities and varieties, precisely timed, and at fair market prices.

3.4.1. Input provision

To address the issue of exorbitant farm input costs, it is recommended that the government consider subsidizing, either partially or entirely, the required inputs for onion farmers.

3.4.2. Production

Furthermore, the government should intensify its efforts in providing substantial subsidies and allocating additional resources to bolster support for farmers. Collaborative endeavors between the Department of Science and Technology and the Department of Agriculture are advised for conducting comprehensive soil testing analyses, thus enabling farmers to optimize fertilizer application. The Philippine Center for Postharvest Development and Mechanization (PhilMec) could pioneer innovative approaches to enhance production efficiency, effectively addressing the escalating labor expenses. In combating pest infestation, it is crucial for relevant governmental bodies to conduct further research and development aimed at identifying environmentally friendly interventions, distinct from harmful chemicals that pose threats to both human health and the environment.

3.4.3. Processing

To enhance the accessibility of storage facilities for onion farmers, the establishment of government-supported cold storage facilities and cooperative-managed onion storage hangers should be explored. To alleviate the financial burden on farmers, particularly during periods of low farmgate prices, avenues for collaboration with entities such as the Department of Trade and Industry (DTI) and the Department of Science and Technology (DOST) can be pursued. This could involve value-added processing, such as onion powder or pickles.

3.4.4. Marketing

The expansion and enhancement of infrastructure, including bridges and roadways, is recommended to reduce operational costs for onion farmers. To counteract price speculation during harvest seasons, the government could consider intervening through price subsidies and the implementation of a system for stocking onion bulbs via Food Trust Receipts, which may also be utilized as loans by farmers. In addressing potential misconduct by cooperatives involved in the sale of import permits, the enactment of legislation and the expeditious resolution of cases by the Department of Justice are essential deterrents.

4. Conclusion

The majority of onion farmers within the three onion-producing municipalities of Nueva Ecija operate as tenants. Their practices encompass the utilization of imported seeds, inorganic fertilizers, pesticides, and insecticides, all of which have witnessed consistent price escalation. A substantial portion of these farmers resort to borrowing capital from trader-capitalists to underwrite their agricultural requisites. Convergent production and processing methodologies are employed, albeit minor variations in labor costs are discernible. The quantum of onion harvest remains closely tethered to prevailing weather conditions and the severity of pest infestations. Over the past five years, the farmgate price of onions has exhibited pronounced volatility. Notably, onion farmers accrued greater returns by opting to store their produce rather than promptly selling upon harvest. Foremost challenges confronted by onion farmers encompass elevated costs of farm inputs, paucity of available farm laborers, pest infestations, steep storage fees, and the pernicious practice of price manipulation by unscrupulous traders. The following recommendations emerge from these findings:

1. Formulate a comprehensive and unified production and marketing strategy for the onion industry. This strategy should encompass technical support, the establishment of marketing facilities, and the creation of an onion credit fund facilitated through banking institutions or government backing.
2. Elevate government involvement in the assimilation of advanced technologies to augment onion quality, enhancing its competitiveness on the global stage.
3. Institute measures to stabilize onion prices, thereby mitigating the volatility experienced in recent years.
4. Enforce stringent penalties for errant government officials and unethical business entities involved in unfair trading practices.
5. Enhance regulatory oversight over onion cold storage facilities and bolster surveillance on onion industry stakeholders to deter illicit business conduct.
6. Advocate for representation of the Union of Onion Growers and Traders in the legislative body.
7. Provide support, possibly in the form of subsidies, to onion growers during the initial phases of ASEAN integration.
8. Promote diversification of crops among farmers, discouraging overreliance solely on onion cultivation.
9. Foster heightened and active participation of stakeholders in the governance of the onion industry.
10. Exploit the potential of electronic communication platforms to bolster transparency and integrity in onion trade transactions.
11. Initiate an intensified information dissemination campaign elucidating the repercussions of ASEAN integration, orchestrated by the government.

Compliance with ethical standards

Ethical consideration

All processes used to analyze data sets from a specific source complied with ethical guidelines. The data sources are properly credited and listed in the reference section.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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