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Assessing the Conditions of Small-Scale Lowland Vegetable Growers in Cagayan Province's Leading Municipalities: A Foundation for Science and Technology-Based Agricultural Interventions

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Abstract

This study profile of the lowland vegetable growers in the top three growing municipalities in Cagayan province as a basis for designing science and technology-based interventions. It aimed to analyze the socio-demographic profile, agricultural practices, and economic conditions of lowland vegetable growers in Cagayan's top three municipalities: Sto. Nino, Lal-lo, and Solana. The study involved 150 vegetable growers who had been engaged in production for at least three years, utilizing a structured questionnaire for data collection through personal interviews. In Cagayan province, most lowland vegetable growers are middle-aged males, married, and predominantly Roman Catholic, with most maintaining nuclear families. Nearly all are enrolled in the Registry System for Basic Sectors in Agriculture (RSBSA), yet only a third have crop insurance, and very few benefit from the Pantawid Pamilyang Pilipino Program (4Ps). Engaged in year-round vegetable farming on an average of half a hectare, they have been in the industry for nearly two decades. While they recognize various sources for technical information and farm inputs, most have not attended relevant training and rely on chemical-based practices rather than Good Agricultural Practices (GAP). These farmers face significant challenges, including damage from floods, typhoons, pests, and insufficient water supply, which contribute to low yields and minimal economic returns. They transport their products to market using hand tractors and set prices based on word-of-mouth and trader influence. Despite claiming sufficient capital, they incur low investments per hectare, resulting in limited profitability. The findings suggest that a Science and Technology-based interventions has been proposed as an intervention strategy to enhance lowland vegetable production in the region.

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Introduction

The Philippines has a total land area for vegetables of around 675,726 hectares (ha) in its three major islands. In 2022, the Philippines produced 3.1 million MT of vegetables, accounting for just 60 percent of the demand based on estimated per capita consumption, to address the supply shortage of vegetables, the country imported 160,000 MT of fresh vegetables and 405,000 MT of processed vegetables (USDA, 2023). In Cagayan Valley Region Lowland Vegetable Production challenges include more than 2 meters of rainfall per year, frequent typhoons, widespread insect pest and disease issues, poor access to modern vegetable varieties and cropping inputs, and low skill levels combined with poor distribution systems (Department of Agriculture, 2019). Vegetables are important items of diets in many Filipino homes, and they are valuable sources of nutrients especially in rural areas where they contribute substantially to protein, minerals, fiber, vitamins, and other nutrients (Borlongan, 2016). Vegetables contain important vitamins, minerals, and plant chemicals. A diet high in fruit and vegetables can help protect you against cancer, diabetes, and heart disease. Considering that water is the lifeblood of vegetable production, vegetable crops generally require more total water and more frequent irrigation than most other agronomic crops. However, vegetable supply shortage is often experienced in Cagayan province due to the fact that Cagayan province is visited by an average of 2-5 yearly strong typhoons that cause flooding in most parts of the province due to its geographical location as the catch basin for water from its surrounding mountain tributaries. Likewise, issues on food safety and security persist associated on vegetable production practices like chemical-based production technologies and oversupply of vegetable products during the peak season of harvest resulted to low market prices. Thus to address issues on vegetable food safety and security in Cagayan province, the Department of Science and Technology-Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (DOST-PCAARRD) in joint undertaking with Cagayan State University (CSU) established baseline information among vegetable growers in the top three (3) vegetable growing municipalities in Cagayan province as basis in designing Science and Technology (S&T) based farm interventions.

Generally, this research defined the profile of the lowland vegetable growers in the top three growing municipalities in Cagayan province as a basis for designing science and technology-based interventions. Specifically, this investigation intended to inquire on the following; (a) demographic profile of the vegetable growers in the top three growing municipalities in Cagayan province (b) actual vegetable growing practices of the respondents, (c) economic performance of lowland vegetable growing in the top three growing municipalities and designed a science and technology-based farm interventions aligned to food safety and security.

Science and Technology-Based Intervention Framework

This research recognized the food safety and security issues due to insufficient knowledge and skills on the application of recommended technologies in lowland vegetable production and the adverse effects of calamities and natural disasters. Thus interventions to up-scale lowland vegetable production include the following; 1) Application of Good Agricultural Practices (GAP) generated technologies for sustainable production of safe and quality lowland vegetables; 2) Design of appropriate planting calendar and to avail Crop Insurance to reduce calamities and natural disaster risks; 3) Forge Memorandum of Agreement (MOA) with agency partners like; DOST Region 02, Department of Agriculture, Department of Trade and Industry and Local Government Units (LGUs); 4) Provide technical training on GAP based vegetable production, social preparation, financial literacy, and other pertinent training; 5) Organize Vegetable grower Associations (1 per area); 6) Forge Memorandum of Understanding (MOUs) with assisted Vegetable Grower Associations and individuals and 7) Assist the growers in the promotion and marketing of safe and quality vegetable products.

The interventions will likely generate outputs and outcomes like; 1) Screened at least 75 lowland vegetable growers; 2) Establishing at least 24 hectare S&T based farm devoted to GAP-based lowland vegetable production; 3) Capacitated lowland vegetable growers; 4) Adopting GAP lowland vegetable production technology; 5) Increased production by at least 10% and income by at least 156% to reach the poverty threshold level; 6) Sustained supply of safe vegetables in Cagayan Province; 7) Sustained supply of vegetable seeds (seed to seed method) and 8) Registered and assisted lowland vegetable grower associations to concerned agencies like to DA, DTI, SEC, or CDA. The project will contribute to positive social impact by providing a safe and sustainable source of food in the target communities and developing technical skills in vegetable production aligned with GAP The economic impact of the intervention on the other hand will increase productivity on lowland vegetables and increased income among lowland vegetable growers.

Methodology

This research employed descriptive design, where all the variables utilized in the study were specifically described. It was conducted in the top three (3) vegetable growing municipalities in Cagayan province namely, Sto. Nino, Lal-lo, Solana, and Gonzaga with 150 vegetable growers who are engaged in vegetable production for the past three (3) years were chosen as respondents in this research study. A structured questionnaire was designed which inquired on the following: demographic profile, actual vegetable growing practices, and economic performance of lowland vegetable growing in the top four growing municipalities in Cagayan province.

A personal interview was conducted with the aid of an English-structured questionnaire and was translated into the dialect spoken by the respondents during the interview for clarity of understanding and to ensure that appropriate data and information were gathered. The descriptive statistical tools like frequency counts, percentages, means and standard deviation were utilized in the analysis of data gathered. Likewise, simple cost and return analysis and Return on Investment (ROI) were the economic tools employed to determine the economic performance of their current vegetable production operation. Analyzed and interpreted data were utilized in the design of science and technology-based interventions to address problems, issues, and concerns on lowland vegetable production with primordial concern on food safety and security in Cagayan province.

Results and discussions

A. Demographic Profile of Vegetable Growers in Cagayan Province

Table 1 shows the socio-demographic variables include age, sex, civil status, religion, ethnicity, highest educational attainment, type of family, and organizational membership.

Of the 150 respondents surveyed for this study, 82, or 54.67% of the respondents surveyed are male, while 68, or 45.33% are female. This aligns with findings from previous studies that suggest gender disparities in agricultural participation (FAO, 2011). Regarding the respondents' age, the 150 respondents are in their middle age with an average age of 48.91 and a standard deviation of 11.28. This mature demographic is likely to possess substantial experience in vegetable cultivation, which is consistent with research indicating that older farmers tend to have more extensive agricultural knowledge (Kassie *et al.*, 2015). Most respondents are married, 129 or 86%, while 13 or 8.67% are single, 6 or 4% are widowed, and 2 or 1.33% are separated.

Furthermore, the religious affiliations of the respondents reveal that a significant number are Roman Catholic, with 45 to 90% of the respondents. There are 5 (10%) individuals who identify themselves as Protestants in Sto. Nino. The religious affiliations of the Protestants include Jehovah's Witnesses, Born Again Christian, United Church of Christ in the Philippines, *Iglesia ti Dios, Iglesia ni Cristo*, Pentecost, and Muslim. Most (139 or 92.67%) of the vegetable grower respondents are Ilocano in their ethnicity, others are Tagalog and Igorots.

Likewise, religious homogeneity can foster strong community ties, which are crucial for collaborative farming efforts (Bennett, 2010).In terms of educational attainment, One-third (51 or 34%) of the respondents are high school graduates. Meanwhile, most (116 or 77.33%) of the respondents maintain a nuclear type of family. The remaining 34, or 22.67%, are part of extended families. Majority (80 or 53.33) are not members of any organization. This means that, organizational membership has been linked to improved access to resources and information (Pretty *et al.*, 2006).

Table 1. Demographic characteristics of lowland vegetable grower respondents.

Item	Frequency	Percent
Male	82	54.67
Age	Mean: 48.91	S.D. 11.28
Married	129	86.0
Roman Catholic	119	79.33
Ilocano	139	92.67
High School graduate	51	34.0
Nuclear Family	116	77.33
Not a member of organization	80	53.33

The data presented in Table 2 provide information on the agricultural practices of vegetable grower respondents.

There are 137 out of 150, or 91.33% of the respondents are enrolled in the Registry System for Basic Sectors in Agriculture (RSBSA). Moreover, around 36.67% of the respondents applied for crop insurance. However, around 6.67% of the respondents also reported that their family members are beneficiaries of the Pantawid Pamilyang Pilipino Program (4Ps).

Farming is the main livelihood or source of income of all the respondents. As to their land tenurial status, lands farmed by the respondents are owned by majority (103 or 68.67%) of them, 45 or 30% are tenants, followed by sharecropper with 7 respondents or 4.67%, and 1 or 0.67% is a leaseholder. Majority (103 or 68.67%) of the lowland vegetable grower respondents are engaged in all-year-round vegetable growing operations. They are already in vegetable farming for an average of 16.99 with a standard deviation of 12.10 with a mean area cultivated of 0.67 and a standard deviation of 0.63.

Table 2. Respondents' registration to RSBSA, crop insurance, beneficiaries of 4Ps, main source of income and tenurial status.

Item	Frequency	Percent
Registered to RSBSA	137	91.33
Not Availed Crop Insurance	95	63.33
Not member of 4Ps	140	93.33
Farming as main source of Income	150	100
Land Owner	103	68.67
Tenant	45	30.0
Lowland Vegetable Grower	150	100
Years in Vegetable Farming	Mean	S.D.
	16.99	12.10
All year round vegetable growing operation	103	68.67
Area cultivated	Mean	S.D.
	0.67	0.63

B. Practices of the Lowland Vegetable Grower Respondents

Agricultural Activities and Services Received of the Vegetable Grower Respondents

The data in table 3 provides an overview of the sources of agricultural information and services received. Respondents primarily rely on Barangay officials and employees for agricultural information, with an overall frequency of 123 or 82%. Municipal Agriculturists are the second most common source, while DA officials rank third at 48%. Mass media like television, radio and social media are significant information sources The Non-Government Organizations (NGOs), associations, cooperatives, and Private enterprises/agents are less frequently consulted, with only 12.67% and 10% of the respondent's respectively availed information from these sources. Concerning the goods and services received by respondents, seeds, and fertilizers are the items most frequently received, with most (129 or 86%) of respondents receiving seeds and 93 or 62% of respondents receiving fertilizers.

Table 3. Sources of technical information and type of services received.

Item	Frequency	Percent
Sources of Information		
Barangay officials and employees	123	82.0
NGO, Association, or Cooperative	19	12.67
Municipal Agriculturist	79	52.67
DA officials	72	48.0
Private enterprise/agent	15	10.0
TV/Radio/Social Media	54	36.0
TOTAL	362	
Type of Services received		
Seeds	129	86.0
Fertilizers	93	62.0
Biological control agents	24	16.0
Botanical Pesticides	7	4.67
Construction of farm production facilities	15	10.0
Technology demonstrations	14	9.33
Information, education, and communication (IEC) materials	33	22.0
TOTAL	315	

However, information, education, and communication (IEC) materials are the third most commonly received service confided by 22%, followed by biological control agents at 16%. Fewer services provided include technology demonstrations (9.33%), construction of farm production facilities (10%), and postharvest equipment and machinery (8%).

Biological pesticides and small-scale irrigation projects are the least received, with only 4.67% and 2% of respondents, respectively.

Table 4 covers the respondents' participation in training, sources of planting materials and vegetable varieties grown. The training and seminar attendance shows a low participation rate, most (111 or 74.0) of the respondents claimed to have not attended any training with only 39 or 26% out of 150 respondents. The data provided the sources of planting materials, respondents claimed that seeds and seedlings as their planting materials came from their own seeds and seedlings production by 61 or 40.67%, followed by agricultural suppliers with 130 or 86.67, Municipal Local Government Units by 16 or 10.6, Department of Agriculture by half (75 or 50.0%), Universities by only few (3 or 2.0%), NGOs by 6 or 4.0%, Cooperatives: by 4 or 2.67% and Online shop by 2 or 1.33%. As to the "Vegetable Varieties Grown," majority (77 or 51.33%) are planting hybrid varieties, both hybrid and open-pollinated variety (OPV) are grown by 61 or 40.67%. While OPV alone is planted by 12 or 8.0%.

Table 4. Respondents' attendance to trainings, sources of planting materials and vegetable varieties grown.

Item	Frequency	Percent
Did not attend training	111	74.0
Source of planting materials		
Own supply of seeds and seedlings	61	40.67
Agricultural Suppliers	130	86.67
Municipal Local Government Units	16	10.67
Department of Agriculture	75	50.0
Universities	3	2.0
NGOs	6	4.0
Cooperatives	4	2.67
Online shop	2	1.33
Vegetable Varieties Grown		
Hybrid	77	51.33
Both Hybrid and Open Pollinated Variety (OPV)	61	4.067
OPV	12	8.0
Total	150	100.0

Table 5 denotes the farm types and the source of irrigation and farm power used. The nature of vegetable farm the lowland vegetable grower respondents operates by 50 or 33.33% are irrigated, rainfed lowland by majority (78 or 52.0%) of them, rainfed upland by 77 or 14.67%.

As to their source of irrigation; water pump is utilized by 42 or 28.0% and availing the services of the National Irrigation Administration (NIA) by 2 or 1.33%. The most common farm power used by the respondents are Carabaos/Farm animals by 132 or 88.0%, Disc Harrow by 12 or 8.0%, Garden Tools (rake, shovel, trowel) by half (75 or 50.0%) of them, Mechanized machinery/Tractors by 56 or 37.33% and Rotavator is used by 10 or 20.0%.

Table 6 displays the practices of lowland vegetable growers on Good Agricultural Practices (GAP), fertilizer, and pesticide used by the respondents. Only 20 or 13.33% are actively practicing GAP among the 150 respondents.

Table 5. Nature of vegetable farm, source of irrigation and Farm power used.

Item	Frequency	Percent
Nature of Vegetable Farm		
Irrigated	50	33.33
Rainfed lowland	78	52.0
Rainfed upland	77	14.67
Total	150	100.0
Source of Irrigation		
Pump	42	28.0
National Irrigation Administration	2	1.33
TOTAL	44	29.33
Farm Power Used		
Carabaos/Farm animals	132	88.0
Disc Harrow	12	8.0
Garden Tools (rake, shovel, trowel)	75	50.0
Mechanized machinery/Tractors	56	37.33
Rotavator	10	20.0
TOTAL	285	
Multiple responses		

Meanwhile, in the use of fertilizers, both organic and inorganic fertilizers are most common to all vegetable grower respondents with 67 or 44.67%. Regarding pesticide use, respondents mainly apply chemical-based pesticides. The use of both biological and chemical-based pesticides is less common while biological pesticides are used by only few (13 or 8.67%) respondents. About 67 or 44.67% are using both organic and inorganic fertilizers and 7 or 4.67% are using only organic fertilizer. For pesticide use, more than half (99 or 66.0%) are using chemical-based pesticides, 38 or 25.33% are using both biological and chemical-based pesticides, and 13 or 8.67% are using only biological pesticides. Overall, the data shows that out of 150 respondents, the majority are using inorganic fertilizers and chemical-based pesticides, with a smaller percentage opting for organic fertilizers and biological pesticides.

Table 6. Respondents' as Good Agricultural Practice (GAP) practitioners, fertilizer and pesticide used.

Item	Frequency	Percent
Not GAP Practitioner	130	86.67
Fertilizer Used		
Both organic and inorganic fertilizer	67	44.67
Inorganic fertilizer	76	50.67
Organic fertilizer	7	4.67
Total	150	100.0
Pesticide Used		
Chemical based Pesticides	99	66.0
Both Biological and Chemical based Pesticides	38	25.33
Biological Pesticides	13	8.67
Total	150	100.0

Table 7. Source of fertilizer and pesticide application information, tools and equipment used, weeding and harvesting practices.

Item	Frequency	Percent
Source of Fertilizer and Pesticide Information		
Knowledge from experience and usual practice	104	69.33
Advice/recommendations from fellow farmers or neighbors	40	26.67
Technical advice from experts	33	22.0
Directions indicated on container/packaging	69	46.0
Based on crop sensor results	1	0.67
TOTAL	247	
Hand-held/portable sprayers/applicators	134	89.33
TOTAL	163	
Weeding Practices		
Manual	137	91.33
Herbicide application	111	74.0
Harvesting practices		
Manually	150	100.0
TOTAL	200	

For the source of fertilizer and pesticide application information presented in Table 7, the respondents apply their acquired "knowledge from experience and usual practice" by majority (104 or 69.33%) of them. While 40 or 26.67% adhere to the advice/recommendations from fellow farmers or neighbors, 33 or 22.0% follow technical advice from experts, almost half (69 or 46%) follow the directions indicated on container/packaging and 1 of 0.67% is guided based on crop sensor results.

Table 8. Total production cost in one cropping cycle per hectare.

Total Cost	Frequency	Percent
₱10,000.00 and below	83	55.33
₱10,001.00 to ₱20,000.00	44	29.33
₱20,001.00 to ₱30,000.00	11	7.33
₱30,001.00 to ₱40,000.00	3	2.0
₱40,001.00 to ₱50,000.00	9	6.0
Total	150	100.0
Mean	14,610.00	
SD	12,401.81	

Regarding the tools and equipment used the Hand-held/portable sprayers/applicators is used by most (134 or 89.33%) of them. Almost all of them (137 or 91.33%) practice manual weeding while most (111 or 74.0%) use chemical based herbicide application. On the other hand, all (150 or 100%) practice manual harvesting.

C. Economic Performance of Lowland Vegetable Growing in the Top Three Growing Municipalities

Out of the 150 respondents surveyed as exhibited in Table 8, it is evident that the majority of the total cost falls within the range of ₱10,000.00 and below, with a frequency of 83 or 55.33%. Followed by a range from ₱10,001.00 to ₱20,000.00, with a frequency of 44 or 29.33%. Costs incurred ranges of ₱20,001.00 to ₱30,000.00, ₱30,001.00 to ₱40,000.00, and ₱40,001.00 to ₱50,000.00 was incurred by 11, 3, and 9 respondents, making up 7.33%, 2.0%, and 6.0% respectively.

Table 9. Respondents' marketing practices, basis in setting market price, and mode of transporting harvested vegetable products from the farm.

Item	Frequency	Percent
Marketing Practices		
Public Market	84	56.0
Wholesaler	80	53.33
Community	36	24.0
TOTAL	200	
Basis of Setting Price		
Word-of-Mouth	87	58.0
Based on Cooperative/Association Pricing	12	8.0
Set by the trader/buyer	82	54.67
Farm Gate Price	5	3.33
Prevailing market price from internet	70	46.67
Mode of transporting harvested vegetable products		
Hand tractors	75	50.0
Total	290	

The mean production costs incurred by the lowland vegetable growers was ₱14, 610.00 with a standard deviation of Php12,401.81 which is much lower than the average costs ranging from Php30,000.00 to Php50,000.00 (Department of Agriculture 2018).

A. Marketing practices, basis in setting market price, and mode of transporting harvested vegetable products from the farm

In marketing their vegetable produce, majority (84 or 56%) of the respondents sell their products directly at the public market. However, intermediaries or middlemen are also a common channel for marketing, with 80 or 53.33% of respondents utilizing this method. Community-based sales are less frequent, with only 36 or 24% of respondents marketing their produce within local communities. The data provides the different factors influencing the setting of market prices and the mode of transporting harvested vegetable products.

Table 10. Respondents' sufficiency of capital to support vegetable production, savings to finance production and causes of production damages and registration to crop insurance.

Item	Frequency	Percent
Sufficient capital	113	75.33
Do not set aside money for production	88	58.67
Flood	140	93.33
Typhoon	118	78.67
Pest	74	49.33
Lack of Financial Resources for Operation	19	12.67
Drought	9	6.0
Insufficient water	16	10.67
Total	384	
Multiple responses		
Low yield	97	64.67
No harvest	53	35.33
TOTAL	150	100.0
Not registered to crop insurance	88	58.67
Total	150	100

The "Word-of-Mouth" is the most common basis for setting prices, with 87 or 58.0% of the respondents. The "Cooperative/Association Pricing" is the least common basis, with only 12 respondents representing 8.0%. The Prices set by "traders/buyers" accounted for 82 or 54.67% the "Farm Gate Price" was the basis for 5 or 3.33%. While "Prevailing market prices" sourced from the internet were selected by 70 or 46.67%. When it comes to the mode of transporting vegetable products, half (75 or 50.0%) indicated using hand tractors (Table 9). Regarding the sufficiency of capital to support vegetable production as displayed in table 10, it becomes evident that 75.33% of respondents possess adequate capital which they can able to provide the needed cost requirement of their farming operation. While 24.67% reported facing capital inadequacies. As to whether the respondents set aside part of their income to finance vegetable production operations, there are 41.33% said "Yes" while 58.67% said "No". The data illustrates varying attitudes towards financial management for production highlighting the need for targeted interventions or strategies based on local preferences and practices.

Table 11. Respondents' net income in lowland vegetable production per cropping cycle per hectare**.**

Item	Frequency	Percent
₱10,000.00 and below	49	32.67
₱10,001.00 to ₱20,000.00	29	19.33
₱20,001.00 to ₱30,000.00	38	25.33
₱30,001.00 to ₱40,000.00	13	8.67
₱40,001.00 to ₱50,000.00	10	6.67
₱50,001.00 to ₱60,000.00	5	3.33
₱60,001.00 to ₱70,000.00	2	1.33
₱70,001.00 to ₱80,000.00	3	2.0
₱80,000.00 and above	1	0.67
Total	150	100.0
Mean	23,859.33	
SD	19,191.43	

Same table provides the data for production damages caused by various factors. Flood appears to be the most common cause of production damages experienced by almost all (140 or 93.33%). Typhoon is identified as the second most common cause of production damages as mentioned by most (118 or 78.67%) of the respondents. Pest is another significant factor causing vegetable production damages, with a total of 74 or 49.33%.

Table 12. Problems encountered in lowland vegetable production**.**

Item	Frequency	Percent
Flood	98	65.33
Typhoon	129	86.0
Pest/Diseases	92	61.33
Lack of Financial Resources for Operation	37	24.66
Drought	26	17.33
Lack of water source	8	5.33
Low yield	112	74.66
No yield	38	25.33
Total	540	
Multiple responses		

The percentages of damages caused by pests are generally lower compared to floods and typhoons but still substantial. Insufficient financial resources for operation to purchase fertilizers and for pest and disease control is also a notable cause of vegetable production damages, with a total of 19 or 12.67%. Drought and insufficient water have relatively lower frequencies and percentages compared to the other causes of production damage. Insufficient water supply was also considered as cause of vegetable production damages by a total of 16 or 10.67%. Pertaining to the registration of respondents on crop insurance, less than half (62 or 41.33%) are registered while majority (88 or 58.67%) are not registered. In the survey of respondents' net income in lowland vegetable production per cropping cycle per hectare, the data in Table 11 shows that the majority of respondents fall within the lower income brackets. About one-third (49 or 32.67%) of respondents reported a net income of ₱10,000.00 and below per cropping cycle per hectare. About 29 or 19.33% of respondents reported a net income ranging from ₱10,001.00 to ₱20,000.00. One fourth (38 or 25.33%) reported a net income between ₱20,001.00 to ₱30,000.00. Meanwhile, 13 or 8.67% reported a net income between ₱30,001.00 to ₱40,000.00. Moreover, 10 or 6.67% reported a net income between ₱40,001.00 to ₱50,000.00. Further, there are only few (3 or 2.67%) who reported an income ranging from Php 70,000.00 to above Php80,000.00. Though there is a wide variability of income among respondents, the mean net income is calculated at ₱23,859.33 per cropping cycle per hectare, with a standard deviation of ₱19,191.43. The income generated by the respondents is way very low compared to the standard yield of 5.53 t/ha on lowland vegetables (Philippine Statistics Authority, 2019) with a calculated peso value of Php 250,000.00. Table 12 displays the data on the different problems encountered in lowland vegetable production in Cagayan province. The most commonly reported issue is “typhoons”, with a frequency of 129, accounting for 86.0%. This is followed by “floods”, with 98 or 65.33% experiencing the problem “Low yield” is reported as a concern by 112 respondents, making up 74.66%. “Pest and diseases” are reported by 92 or 61.33% of them. “Lack of financial resources for operation” is a problem for 37 or 24.66%. “Drought” is reported by 26 or 17.33%. “Lack of a water source” is a concern for 8 or 5.33%. Finally, “no yield “is reported by 38 or 25.33% as a problem encountered.

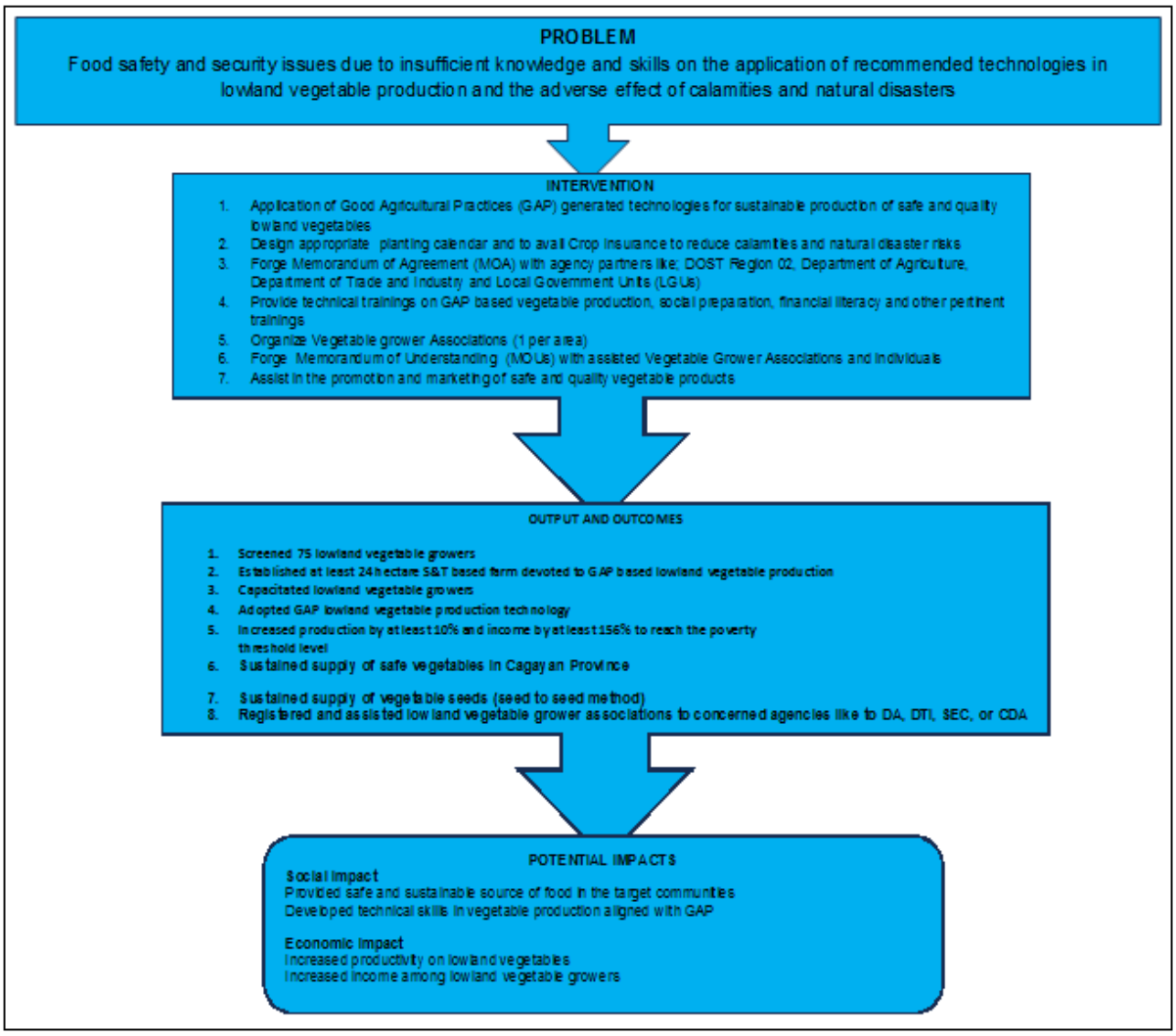

Fig. 1. Intervention Framework.

These data provide an overview of the most prevalent challenges faced in lowland vegetable production encountered by the respondents.

Conclusion

Based from the above findings the following were drawn: In Cagayan province, most lowland vegetable growers are middle-aged males, married, and predominantly Roman Catholic, with most maintaining nuclear families. Nearly all are enrolled in the Registry System for Basic Sectors in Agriculture (RSBSA), yet only a third have crop insurance, and very few benefit from the Pantawid Pamilyang Pilipino Program (4Ps). Engaged in year-round vegetable farming on an average of half a hectare, they have been in the industry for nearly two decades. While they recognize various sources for technical information and farm inputs, most have not attended relevant training and rely on chemical-based practices rather than Good Agricultural Practices (GAP). These farmers face significant challenges, including damage from floods, typhoons, pests, and insufficient water supply, which contribute to low yields and minimal economic returns. They transport their products to market using hand tractors and set prices based on word-of-mouth and trader influence. Despite claiming sufficient capital, they incur low investments per hectare, resulting in limited profitability. To address these issues, a Science and Technology-based Framework has been proposed as an intervention strategy to enhance lowland vegetable production in the region.

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