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Awareness of Local Farmers in the Use of Agricultural Drones

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Abstract:

Agricultural drones have emerged as a potential solution to address the issues of traditional farming and enhance agricultural productivity. Agriculture is a critical sector in the Philippines, contributing significantly to the country's economy and providing livelihoods for millions of Filipinos. Agricultural drones are now globally known because of their potential to collect valuable data, monitor crop health, and enable precision agriculture practices. The adoption of agricultural drones in the province of Iloilo would mean efficiency, sustainability, and competitiveness in the agricultural industry. This study analyzed the awareness among local farmers of the use of agricultural drones in the Province of Iloilo for the Calendar Year 2023. Quantitative data for this study was gathered from seventy (70) local farmer-respondents using a self-made questionnaire by the researcher that passed the validity and reliability testing. The variables included in this study are age, number of years in farming, highest educational attainment, and net income per cropping. The study is divided into four (4) areas, namely: training and education, access and availability, external influence and social factors, and long-term impact on farming practices or sustainability. The study results revealed that the overall level of awareness of local farmers in the use of agricultural drones in the areas of training and education, access and availability, external influence and social factors, and long-term impact on farming practices or sustainability were all very high.

Keywords: (agricultural drones, traditional farming, local farmers)

Introduction:

Nature of the Problem

Agriculture is a critical sector in the Philippines, contributing significantly to the country's economy and providing livelihoods for millions of Filipinos. However, the sector faces numerous challenges, including labor shortages, unpredictable weather patterns, and the need for sustainable agricultural practices to increase productivity and meet the demands of a growing population.

Agricultural drones have gained global attention for their potential to address these challenges effectively. Drones equipped with specialized sensors and cameras can collect valuable data, monitor crop health, and enable precision agriculture practices. By providing farmers with actionable insights, these drones can help optimize resource use, reduce operational costs, and improve overall crop yields.

The province of Iloilo, located in the Western Visayas region, is renowned for its diverse agricultural activities, including rice, sugarcane, and mango cultivation. In recent years, the agricultural sector has faced challenges such as labor shortages, unpredictable weather patterns, and the need for sustainable practices to boost yields. Agricultural drones have emerged as a potential solution to address these issues and enhance agricultural productivity.

The adoption of agricultural drones in Iloilo Province could revolutionize the local agricultural sector by enhancing its efficiency, sustainability, and competitiveness. However, before widespread implementation can occur, a comprehensive feasibility study is necessary to assess various aspects of drone technology integration, including technical, economic, regulatory, environmental, and social considerations.

The use of agricultural drones in farming has gained attention worldwide due to their ability to collect valuable data, monitor crop health, and apply precision agriculture techniques. Iloilo Province, with its rich agricultural heritage, stands to benefit significantly from the adoption of drone technology in farming. However, before widespread implementation can occur, a comprehensive feasibility study is required to assess the suitability and practicality of this technology within the local context.

Current State of Knowledge

Many great possibilities await the farmers if they are interested in receiving training to operate drones for agricultural purposes. Before taking to the controls, they should ensure they comprehend the fundamentals of drone flight principles, safety laws, and airspace constraints, regardless of their chosen training route (Yui, 2024).

Currently, many industries realize that there is a crucial need to address drone skill shortages to meet the growing demand for drone operators and geospatial experts. However, teaching with drones doesn't just serve the purpose of equipping people with the competitive edge needed to thrive in the jobs of today and the future (drones.gov.au/education-and-training).

Drones, also called Unmanned Aerial Vehicles (UAV), have witnessed a remarkable development in recent decades. In agriculture for example, they have changed farming practices by offering farmers increased operational efficiency, substantial cost savings and better profitability (Reheb et al., 2022). A drone that may be used for precision agriculture must meet the required capabilities, namely: the drone must fly according to the waypoints, the drone must control its height of flying, avoid obstacles during the flight, the drone must automatically land based on the state of the battery, and the acquired images must be stabilized (Paul et al., 2022).

Logistics is essential for the functioning of a certain area as a location with the greatest concentration of people and economic and social activities. Despite its potential advantages, the future of drones is still being determined due to several barriers such as regulations, legislation, a threat to privacy, security, public and psychological perception, and environmental, economic, and technical issues (Tadic et al., 2024). Delheimer (2023) said remote perception with drones offers a promising way to characterize landscapes, individual animals and plants, and their various stressors. However, a number of barriers have kept these drones from being widely used for agriculture and natural resources.

Furthermore, Sylvester (2018) added that Information and Communication Technologies (ICTs) play a significant role in addressing problems faced by agriculture. The challenges faced by agriculture due to climate change alone are enormous, and the need to adapt to new technologies and become resilient is key to feeding the world's growing population. Crop failure could be predicted ahead of time, and preventative measures could be taken through a combination of conventional farming practices with contemporary technologies, such as agricultural drones, to address the difficulties plaguing the agricultural sectors (Dutta et al., 2022).

Shalimov (2023) states that smart farming is data-driven, enabling farmers to take action based on accurate information on soil conditions. Extracting this data involves physical visits to the field and manually gathering the metrics. The soil gets prepared for planting, and the drone works to shoot the seeds in it rather than using outdated planting techniques. Since drones are equipped with smart agriculture sensors, the data is collected and delivered faster and more precisely.

The drones are focusing on implementing a variety of different and important approaches to increase farmers' income by raising production, making use of resources for reforming agriculture marketing, better irrigation, using nutrient inputs effectively, lowering post-harvest losses, adding value, reducing risk, and offering security and assistance (Singh et al., 2022). Drones are truly remarkable because they can provide farmers with real-time information on their crops' status, like the plants' height and the number of tillers. PhilRice has found ways to apply drones in crop management, application of farm inputs, seed planting, and even fish feeding (Umali, 2019). Drones do all the intervention needed for a good yield, which means that labor, time, and energy will be reduced. The sole translation of drone utilization, like mechanization, is lower production cost because including machines in operational farming reduces the cost of labor, which is the most expensive and intense part of the production system (Santua, 2021).

Ocheda (2023) said in her article that a lot of participants had the digital farmer's program training in Aklan, where they were introduced to various digital tools and technologies that will aid their farming activities, increase their production, and boost their income. Some of the activities they have undergone were formulating and presenting social media marketing plans and content and accessing numerous agricultural applications. The highlight of this training is the introduction and exposure to agricultural drone technology through a field demonstration. Truly, this training is beneficial to the people in the agriculture industry.

Theoretical Underpinnings

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This study was anchored in Fred Davis' Technology Acceptance Model. The Technology Acceptance Model (TAM) was developed by Fred Davis in 1986 and is based on the idea that attitudes toward technology are shaped by two key factors: perceived usefulness and perceived ease of use. Perceived usefulness refers to the extent to which one believes that using a technology may enhance performance or achieve goals, while perceived ease of use refers to the degree to which it is believed that using a technology may be effortless and straightforward. In other words, if it is perceived that technology is useful and easy to use, it is more likely to be adopted and used (James et al., 2023).

Jerotich (2021) also supports this study, stating that modern agricultural technology increases employment and efficiency in the production of food, saving time and reducing cost. Farmers gain significant benefits from high technological innovation. Satellites, drones, and aerial imaging are becoming advanced in taking high-quality farm images. This equipment aids the farmers to analyze the crops while they are in the comfort of their homes as if they are actually on the farm. They access crops' status from a distance.

The findings of this study may benefit the researcher in understanding the significance of agricultural technology used to describe equipment, genetic material, farming techniques, and agricultural inputs developed to improve agriculture's effectiveness. It would mean productivity, health, welfare, and sustainability outcomes.

Objectives of the Study

This study aimed to determine the level of awareness of local farmers in the use of agricultural drones in terms of the areas, Training and Education, Access and Availability, External Influence and Social factors and Long-Term Impact on Farming Practices or Sustainability of a Province in Panay Island in Central Philippines for the Calendar Year 2024.

Research Methodology:

Research Design

This study utilized the descriptive research design, which is believed to be appropriate in measuring the level of awareness of local farmers in the use of agricultural drones and whether a significant difference exists when grouped and compared according to the variables, age, number of years in farming, highest educational attainment, and net income per cropping.

Respondents of the Study

The study's respondents were 70 farmers of a Province in Panay Island in Central Philippines. Purposive sampling was used. Purposive sampling is a form of non-probability sampling in which researchers rely on their own judgment when choosing members of population to participate in the study. Researchers use purposive sampling when they want to access a particular subset of people, as all participants of a survey are selected because they fit a particular profile (Ames et al., 2019).

Instruments

A survey questionnaire was used in gathering the data to determine the level of awareness of local farmers in the use of agricultural drones where it was subjected to validity (4.85=excellent) and reliability (0.840=good). The questionnaire was divided into two parts wherein part I deals with the profile of respondents in terms of age, number of years in farming, highest educational attainment, and net income per cropping. Part 2 contained the questionnaire proper consisting of 24 items. There were 8 line items per area. The respondents were asked to rate each item using the five-point Likert scale, which contains the following scores: 5 – Always; 4 – Often; 3 – Sometimes; 2 – Rarely; and 1 – Almost Never.

Procedure

After establishing the validity and reliability of the instruments, the researcher administered the questionnaire to the respondents and gave instructions on how to complete the questionnaire objectively and honestly. The survey questionnaire was printed and distributed to the respondents. After answering, their responses were saved, retrieved, compiled, and then tabulated using statistical software.

Using the proper statistical methods, the data acquired from the respondents' responses were tallied and tabulated. The raw data were translated into numerical ratings. The data were presented in tabular presentations, statistical derivations, and computer processing systems. The data were processed, and various statistical data were generated.

Analysis

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A descriptive-analytical scheme was used to determine the level of awareness of local farmers in the use of agricultural drones with mean as the tool, while comparative analytical scheme was used to test the significant difference in the level of awareness of local farmers in the use of agricultural drones when grouped and compared according to the variables, age, number of years in farming, highest educational attainment, and net income per cropping with Mann-Whitney U test as the tool. Finally, the following rating scale and description was utilized in interpreting the results: 4.50-5.00=Very High Level; 3.50-4.49=High Level; 2.50-3.49=Moderate Level; 1.50-2.49=Low Level; 1.00-1.49=Very Low Level.

Ethical Consideration

The researcher ensures that respondents were given the free will to be involved in the study, their identity were not disclosed and they were assured of the confidentiality of the data gathered. After completion, all data stored in electronic gadgets were discarded in order to protect against unauthorized access or use of information.

Data Analysis and Statistical Treatment

The analysis of the data gathered employed the descriptive analytical scheme and comparative analytical scheme.

Objective No. 1 used the descriptive analytical scheme to determine the respondent's demographic profile in terms of age, number of years in farming, highest educational attainment, and net income per cropping.

Objective No. 2 used the descriptive analytical scheme to determine the level of awareness of local farmers in the use of agricultural drones in the areas of training and education, access and availability, external influence and social factors, and long-term impact on farming practices or sustainability.

Objective No. 3 used the comparative analytical scheme to determine if there is a significant difference in the level of awareness of local farmers in the use of agricultural drones when grouped and compared according to aforementioned variables.

Statistical Tools

The following statistical tools were used to analyzed the gathered data.

Objective No. 1 used frequency and percentage count to determine the profile of the respondents in terms of age, number of years in farming, highest educational attainment, and net income per cropping. A frequency distribution is an overview of all the distinct values in some variable and the number of times they occur. It tells how frequencies are distributed over values. Frequency distributions are mostly used for summarizing categorical variables (Van den Berg, 2022). The percentage is computed to determine the proportion of part to a whole, such as a given number of respondents about the entire population. Divide the target demographic by the entire population, then multiply the result by 100 to convert it to a percentage (Maloney, 2020).

Objective No. 2 used the mean to determine the level of awareness of local farmers in the use of agricultural drones in the areas of training and education, access and availability, external influence and social factors, and long-term impact on farming practices or sustainability. The mean, or average, is calculated by adding the scores and dividing the total by the number of scores. It is the arithmetic average of a set of given numbers (Cherry, 2020).

In interpreting the mean score range, the following were used:

Mean Score Range	Verbal Interpretation
4.50 – 5.00	Very High level
3.50 – 4.49	High level
2.50 – 3.49	Moderate level
1.50 – 2.49	Low level
1.00 – 1.49	Very low level

Objective No. 3 used the Mann-Whitney *U* test to determine if there is a significant difference in the level of awareness of local farmers in using agricultural drones when grouped and compared according to the aforementioned variables. The Mann-Whitney *U* test compares the differences between two independent groups when the dependent variable is ordinal or continuous but not normally distributed. It is often considered the non-parametric alternative to independent t-testing, although it is not always the case. This test allows the researcher to draw different conclusions about the data depending on the assumptions made about the data's distribution. These conclusions can range from simply stating whether the two populations differ to determining if there are differences in medians between groups (Lund et al., 2020). The computed *p*-value was interpreted using the

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following approach: Reject the null hypothesis if *the p*-value is less than or equal to 0.05 significance level. Accept null hypothesis if *p*-value is greater than 0.05 level of significance.

Results and Discussion:

This section presents the results pertaining to the objectives of the study.

Profile of the respondents in terms of Age, Number of Years in Farming, Highest Educational Attainment, and Net Income per Cropping

Table 1
Profile of Respondents

Variables	Categories	Frequency	Percentage
Age	Younger (below 63 years old)	35	50.00
	Older (63 years old and above)	35	50.00
	Total	**70**	**100**
Number of Years in Farming	Shorter (less than 40 years)	37	52.90
	Longer (40 years and more)	33	47.10
	Total	**70**	**100**
Highest Educational Attainment	Lower (Elementary and High School)	48	68.6
	Higher (Vocational)	22	31.4
	Total	**70**	**100**
Net Income Per Cropping	Lower (below P17 500)	34	48.60
	Higher (P17 500 and above)	36	51.40
	Total	**70**	**100**

Table 1 presents the frequency and percentage distribution of the seventy (70) local farmers in terms of age, number of years in farming, highest educational attainment, and net income per cropping in tabular form.

The respondents comprised of 32 younger farmers or 45.71% of the total population; same goes for older farmers as well. The table also shows that 52.90% of the farmers have spent less than 40 years in farming, while 47.10% of which were farmers who have been in the farming industry longer than 40 years. 68.6% of the respondents have gone through elementary and high school only, and 31.4% finished a vocational course. In addition, 48.60% of the respondents have a lower net income per cropping, while 51.40% received an income of P17,500 and above.

Level of Awareness of Local Farmers in the Use of Agricultural Drones in the Areas of Training and Education, Access and Availability, External Influence and Social Factors, and Long-Term Impact on Farming Practices or Sustainability

Table 2
Level of Awareness of Local Farmers in the Use of Agricultural Drones in the area of Training and Education

Items	Mean	Interpretation
1. I am familiar with the agricultural drone and how it works.	4.49	High Level
2. I know the fundamentals of drone flight principles and safety laws.	4.97	Very High Level
3. I have the capacity to be trained in the technology.	4.99	Very High Level
4. I understand the benefits that this technology will give me.	4.71	Very High Level
5. I have read and studied research articles and journals that developed my knowledge of the use of agricultural drones.	4.27	High Level
6. I have attended demonstrations on the use of agricultural drones.	5.00	Very High Level
7. The training and education provided shall enable me to acquire the necessary licenses and permits to operate agricultural drones.	4.71	Very High Level
8. There are enough seminars, symposiums, and trainings offered to advance farmers' knowledge and skills in the use of agricultural drones.	4.43	High Level
Overall Mean	**4.70**	**Very High Level**

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Table 2 shows the data on the level of awareness of local farmers in the use of agricultural drones in the area of training and education. The overall mean of 4.70, which is interpreted as a very high level, implies that the respondents have a very high level of awareness in this area of study.

The highest mean score in this area is found in item 6, which states, "I have attended demonstrations on the use of agricultural drones." It has a rating of 5.00 and is interpreted as a very high level. This means that the respondents are aware of how agricultural drones are to be used and how beneficial and effective they would be when applied in farming.

The lowest mean score can be found in item no. 5, which states that "I have read and studied research articles and journals that developed my knowledge on the use of agricultural drones." It has a rating of 4.27 and is interpreted as a high level. It implies that the local farmers may not have access to these reading materials to boost their knowledge of the use of this new technology in farming.

According to the article of Savage (2023), farmers network with their peers and exchange stories about what has or has not worked on their farms. They benefit greatly from the applied research conducted by their locality and extension resources. They commonly rely on trusted advisors known as agronomists and/or crop consultants who can take what is known about their fields and provide recommendations. It is a way to document examples of good advice and a way to learn from mistakes.

Table 3

Level of Awareness of Local Farmers in the Use of Agricultural Drones in the Area of Access and Availability

Items	Mean	Interpretation
1. Agricultural drones are readily available when needed for use in my locality.	4.61	Very High Level
2. There is a wide array of agricultural drones for us farmers to choose from.	4.94	Very High Level
3. Agricultural drones can be readily accessed when needed for use, even without prior connections.	4.83	Very High Level
4. I am aware that Local Government Units subsidize the purchase of agricultural drones by Farmers' Groups, Cooperatives, or Associations.	5.00	Very High Level
5. Transport services of the agricultural drone to and from the location of my farm, when needed for use, are readily available.	4.20	High Level
6. Farmers' Groups, Cooperatives or Associations assist in providing access to the use of agricultural drones to its members.	5.00	Very High Level
7. Technical support and assistance on the use of agricultural drones are available.	5.00	Very High Level
8. There are enough spare parts available in the market in cases of troubleshooting.	4.71	Very High Level
Overall Mean	**4.79**	**Very High Level**

Table 3 shows the level of awareness of local farmers in the use of agricultural drones in the area of access and availability. It indicated that the overall mean score is 4.79, which is interpreted as a very high level. This implies that the respondents have a very high level of awareness in the given area of study.

The highest mean scores of 5.00 can be found in both item no. 6, which states, "Farmers' Groups, Cooperatives or Associations assist in providing access to the use of agricultural drones to its members," and item no. 7, which states, "Technical support and assistance on the use of agricultural drones are available," and were interpreted as very high levels. This means that farmers have the support of the organizations in their industry in terms of easy access to modern mechanization as well as the availability of training and assistance in the proper use of this new technology.

The lowest mean score is found in item no. 5, which states, "Transport services of the agricultural drone to and from the location of my farm, when needed for use, is readily available" and is interpreted as high-level. It implies that there are local farmers who do needs the capacity or access to avail of these transport services for agricultural drones to be transported in their locations unless they are provided with the assistance of their cooperatives and pertinent organizations.

Logistics is essential for the functioning of a certain area as a location with the greatest concentration of people and economic and social activities. Despite its potential advantages, the future of drones is uncertain due to several barriers such as regulations, legislation, a threat to privacy, security, public and psychological perception, and environmental, economic, and technical issues (Tadic et al., 2024).

Table 4

Level of Awareness of Local Farmers in the Use of Agricultural Drones in the Area of External Influence and Social Factors

Items	Mean	Interpretation
1. Traditional forms of media (newspaper, radio, television) provide	5.00	Very High Level

adequate information to persuade me to use agricultural drones.		
2. The general public's perception of modern mechanization influences my view on the use of agricultural drones in farming.	5.00	Very High Level
3. International farming practices influence my decision to adopt modern agricultural mechanization on my farm.	4.61	Very High Level
4. The prevailing market price or cost of purchasing agricultural drones influences my decision to shift to modern agricultural mechanization.	4.94	Very High Level
5. Social media provides adequate information to persuade me to use agricultural drones.	4.94	Very High Level
6. The information given by the government regarding the benefits of agricultural drones influence me to use them on my farm.	4.87	Very High Level
7. My fellow farmers' experiences with agricultural drones help me in deciding whether or not to shift to modern mechanization.	5.00	Very High Level
8. Research and development play a big role in my awareness of the use of agricultural drones.	4.97	Very High Level
Overall Mean	**4.92**	**Very High Level**

Table 4 shows the level of awareness of local farmers regarding the use of agricultural drones in the area of external influence and social factors. The overall mean score, which is 4.92 and interpreted as a very high level, implies that the respondents have a very high level of awareness in this given area of study.

The three (3) highest means scores of 5.00 can be found in items no. 1, 2, and 7. It states that "Traditional forms of media (newspaper, radio, television) provide adequate information to persuade me to use agricultural drones," "The general public's perception of modern mechanization influences my view on the use of agricultural drones in farming," and "My fellow farmers' experiences with agricultural drones help me in deciding whether or not to shift to modern mechanization," respectively. The result of the study shows that any media platforms, articles, other publications, other people's experiences, and testimonies are a great help in pursuing the decision to use an agricultural drone in farming and to further discover how it benefits the agricultural industry now and in the years to come.

The lowest mean score of 4.61 is found in item no. 3, which states, "International farming practices influence my decision to adopt modern agricultural mechanization in my farm," and interpreted as a very high level. This implies that farmers nowadays are equipped with social media, and a lot of online resources are put to good use in terms of technology adaptation because it truly has made everyone's lives easier.

Farmer perspectives are relevant for understanding agricultural issues and formulating policies. Associated with the use of any technology is how people employ decision-making judgments, which are greatly rooted in how information is processed, learned, stored, and applied in social situations. This theory also shows how humans adapt and change based on the prevailing social system. The theory focuses on the internal and external aspects of decision-making, which have served as foundations in analyzing farmer decision-making (Gonzalvo et al., 2021).

Table 5

Level of Awareness of Local Farmers in the Use of Agricultural Drones in the Area of Long-Term Impact on Farming Practices or Sustainability

Items	Mean	Interpretation
1. I am aware of the positive impact of the use of agricultural drones on the environment in mitigating the effects of climate change.	4.99	Very High Level
2. The use of the product helps farmers become much more productive because they spend less time and energy on tedious tasks such as monitoring crops.	5.00	Very High Level
3. The use of agricultural drones promotes an increase in agricultural productivity and agricultural development in terms of increasing productivity in the work environment.	4.71	Very High Level
4. The agricultural drones cover large field block without causing soil compaction or damage to the physical structure because of its aerial nature.	5.00	Very High Level
5. The use of agricultural drones greatly reduces contamination and cross-contamination of the soil.	4.23	High Level
6. Drones are a great substitute for the traditional manpower we use in agriculture because it has a wider scope of vision on the crops.	5.00	Very High Level
7. The use of the drone lowers the production cost.	4.61	Very High Level
8. The drone is able to provide the needed interventions for a good yield because of its monitoring capabilities for the crops.	5.00	Very High Level
Overall Mean	**4.82**	**Very High Level**

Table 5 shows the level of awareness of local farmers in the use of agricultural drones in the area of long-term impact on farming practices or sustainability. The overall mean score of 4.82, which is interpreted as a very high level, indicates that the respondents' level of awareness in the area of long-term impact on farming practices or sustainability is very high.

The highest mean score of 5.00 is found in items no. 2, 4, 6, and 8, and all were interpreted as very high levels. It states that "The use of the product helps farmers become much more productive because they spend less time and energy on tedious tasks such as monitoring crops," "The agricultural drones cover large field block without causing soil compaction or damage to the physical structure because of its aerial nature," "Drones are a great substitute to the traditional manpower we use in agriculture because it has a wider scope of vision on the crops," "The drone is able to provide the needed interventions for a good yield because of its monitoring capabilities to the crops," respectively. This means that agricultural drones promote precision farming through modern technology that develops more crops and utilizes data to make speedier and superior decisions.

The lowest mean score is found in item 5, which states, "The use of agricultural drones greatly reduces contamination and cross-contamination of the soil, " and is interpreted as high level. This implies that to educate more of our farmers, we should further promote the use of agricultural drones in farming because their benefits are endless.

Drones will be able to do all the interventions needed for a good yield and reduce labor, time, and energy. The sole translation of drone utilization, like mechanization, is lower production cost because including machines in operational farming reduces the cost of labor, which is the most expensive and intense part of the production system (Santua, 2021).

Comparative Analysis of the Level of Awareness of Local Farmers in the Use of Agricultural Drones in Training and Education, Access and Availability, External Influence and Social Factors, and Long-Term Impact on Farming Practices or Sustainability when grouped and compared according to Age, Number of Years in Farming, Highest Educational Attainment, and Net Income per Cropping

Table 6
Difference in the Level of Awareness of Local Farmers in the Use of Agricultural Drones in the Area of Training and Education when grouped and compared according to variables

Variable	Category	N	Mean Rank	Mann Whitney U	p-value	*Sig. level*	Interpretation
Age	Younger	32	36.97	561.000	0.520	0.05	Not Significant
	Older	32	34.03				
Number of Years in Farming	Shorter	37	37.62	532.000	0.326		Not Significant
	Longer	33	33.12				
Highest Educational Attainment	Lower	48	35.19	513.000	0.840		Not Significant
	Higher	22	36.18				
Net Income Per Cropping	Lower	34	37.21	554.000	0.468		Not Significant
	Higher	36	33.89				

Table 6 presents the different comparative analyses of the level of awareness of local farmers in the area of training and education when grouped and compared to age, number of years in farming, highest educational attainment, and net income per cropping using the Mann Whitney *U* Test.

Based on the table, the computed mean score for age for younger and older respondents is 32 and 32, with a p-value of 0.520, which is interpreted as not significant.

In terms of the number of years in farming, the mean score for the shorter group is 37 and 33 for the longer group, with a p-value of 0.326 and interpreted as not significant.

In terms of highest educational attainment, the mean score for lower educational status group is 48 and 22 for higher educational status group, with a p-value of 0.840 and interpreted as not significant.

In terms of net income per cropping, the mean score for lower net income earner is 34 and 36 for higher net income earner, with a p-value of 0.468 and interpreted as not significant.

Hence, when the respondents were grouped according to age, number of years in farming, highest educational attainment, and net income per cropping, it achieved a p-value greater than 0.05 and was interpreted as not significant. Therefore, the null hypothesis that states, "There is no significant difference in the level of awareness of local farmers when grouped and compared according to the aforementioned variables," is accepted.

It implies that age, number of years in farming, highest educational attainment, and net income per cropping do not affect the level of awareness of local farmers in the area of training and education.

Ocheda (2023) said in her article that a lot of participants had the digital farmer's program training in Aklan, where they were introduced to various digital tools and technologies that will aid their farming activities, increase their production, and boost their income. Some of the activities they have undergone were accessing numerous agricultural applications and formulating and presenting social media marketing plans and content. The highlight of this training is the introduction and exposure to agricultural drone technology. I have witnessed the innovation through a field demonstration.

Table 7
Difference in the Level of Awareness of Local Farmers in the Use of Agricultural Drones in the Area of Access and Availability when grouped and compared according to variables

Variable	Category	N	Mean Rank	Mann Whitney U	p-value	*Sig. level*	Interpretation
Age	Younger	32	36.30	584.500	0.714	0.05	Not Significant
	Older	32	34.70				
Number of Years in Farming	Shorter	37	35.97	593.000	0.819		Not Significant
	Longer	33	34.97				
Highest Educational Attainment	Lower	48	35.39	522.500	0.938		Not Significant
	Higher	22	35.75				
Net Income Per Cropping	Lower	34	34.97	594.000	0.814		Not Significant
	Higher	36	36.00				

Table 7 presents the different comparative analyses of the level of awareness of local farmers in the area of access and availability when grouped and compared to age, number of years in farming, highest educational attainment, and net income per cropping using the Mann Whitney *U* Test.

Based on the table, the computed mean score in terms of age for younger and older respondents is 32 and 32, with a p-value of 0.714, which is interpreted as not significant.

In terms of number of years in farming, the mean score for shorter group is 37 and 33 for longer group, with a p-value of 0.819 and interpreted as not significant.

In terms of highest educational attainment, the mean score for lower educational status group is 48 and 22 for higher educational status group, with a p-value of 0.938 and interpreted as not significant.

In terms of net income per cropping, the mean score for lower net income earner is 34 and 36 for higher net income earner, with a p-value of 0.814 and interpreted as not significant.

Hence, when the respondents were grouped according to age, number of years in farming, highest educational attainment, and net income per cropping, it achieved a p-value greater than 0.05 and was interpreted as not significant. Therefore, the null hypothesis, "There is no significant difference in the level of awareness of local farmers when grouped and compared according to the aforementioned variables," is accepted.

It implies that age, number of years in farming, highest educational attainment, and net income per cropping do not affect the level of awareness of local farmers in the area of access and availability.

Matuszak (2024) said in her article that to transfer any agricultural commodities, whether conventional or mechanized, agricultural transport is necessary. In many parts of the world, farmers and producers live far from the places where their products are distributed. Road transportation plays a crucial role in bridging the gap between rural farming areas, processing facilities in industrial regions, and, ultimately, urban consumers and businesses, facilitating efficient crop distribution.

Table 8
Difference in the Level of Awareness of Local Farmers in the Use of Agricultural Drones in the Area of External Influence and Social Factors when grouped and compared according to variables

Variable	Category	N	Mean Rank	Mann Whitney U	p-value	*Sig. level*	Interpretation
Age	Younger	32	33.90	556.500	0.457	0.05	Not Significant
	Older	32	37.10				
Number of Years in Farming	Shorter	37	32.65	505.000	0.161		Not Significant
	Longer	33	38.70				
Highest Educational Attainment	Lower	48	36.59	475.500	0.453		Not Significant
	Higher	22	33.11				
Net Income Per Cropping	Lower	34	33.79	554.000	0.441		Not Significant
	Higher	36	37.11				

Table 8 presents the different comparative analyses of the level of awareness of local farmers in the area of external influence and social factors when grouped and compared to age, number of years in farming, highest educational attainment, and net income per cropping using the Mann Whitney *U* Test.

Based on the table, the computed mean score in terms of age for younger and older respondents is 32 and 32, with a p-value of 0.457, which is interpreted as not significant.

In terms of the number of years in farming, the mean score for the shorter group is 37 and 33 for the longer group, with a p-value of 0.161 and interpreted as not significant.

In terms of highest educational attainment, the mean score for lower educational status group is 48 and 22 for higher educational status group, with a p-value of 0.453 and interpreted as not significant.

In terms of net income per cropping, the mean score for lower net income earner is 34 and 36 for higher net income earner, with a p-value of 0.441 and interpreted as not significant.

Hence, when the respondents were grouped according to age, number of years in farming, highest educational attainment, and net income per cropping, it achieved a p-value greater than 0.05 and was interpreted as not significant. Therefore, the null hypothesis that states, "There is no significant difference in the level of awareness of local farmers when grouped and compared according to the aforementioned variables," is accepted.

It implies that age, number of years in farming, highest educational attainment, and net income per cropping do not affect the level of awareness of local farmers in the area of external influence and social factors.

Among such global challenges are population increase, urbanization, an increasingly degraded environment, an increasing trend toward consumption of animal proteins, changes in food preferences through aging population and migration, and climate change. More advanced agriculture needs to be set, characterized by the adoption of technologies and tools derived from scientific advances, research, and development activities (Daponte et al., 2022).

Table 9

Difference in the Level of Awareness of Local Farmers in the Use of Agricultural Drones in the Area of Long-Term Impact on Farming Practices or Sustainability when grouped and compared according to variables

Variable	Category	N	Mean Rank	Mann Whitney U	p-value	*Sig. level*	Interpretation
Age	Younger	32	35.84	600.500	0.881	0.05	Not Significant
	Older	32	35.16				
Number of Years in Farming	Shorter	37	35.89	596.000	0.856		Not Significant
	Longer	33	35.06				
Highest Educational Attainment	Lower	48	35.22	514.500	0.856		Not Significant
	Higher	22	36.11				
Net Income Per Cropping	Lower	34	35.07	597.500	0.856		Not Significant
	Higher	36	35.90				

Table 9 presents the different comparative analyses of the level of awareness of local farmers in the use of agricultural drones in the area of long-term impact on farming practices or sustainability when grouped and compared according to age, number of years in farming, highest educational attainment, and net income per cropping using the Mann Whitney *U* Test.

Based on the table, the computed mean score in terms of age for younger and older respondents is 32, with a p-value of 0.881, which is interpreted as not significant.

Hence, when the respondents are grouped according to age, the p-value is greater than 0.05 and interpreted as not significant.

Therefore, the null hypothesis that states, "There is no significant difference in the level of awareness of local farmers in the use of agricultural drones when grouped and compared according to age," is accepted.

In terms of the number of years in farming, the mean score for the group under the shorter number of years is 37, and 33 for the group under the longer number of years, with a p-value of 0.856, which is interpreted as not significant. In terms of highest educational attainment, the mean scores for lower educational status group are 48 and 22 for higher educational status group, with a p-value of 0.856 and interpreted as not significant. In terms of net income per cropping, the means scores of lower net income earner are 34 and 36 for higher net income earner, with a p-value of 0.856 and interpreted as not significant.

Hence, when the respondents were grouped according to the number of years in farming, highest educational attainment, and net income per cropping, it achieved a p-value greater than 0.05 and was interpreted as not significant.

Therefore, the null hypothesis, "There is no significant difference in the level of awareness of local farmers when grouped and compared according to number of years in farming, highest educational attainment, and net income per cropping," is accepted.

It implies that age, number of years in farming, highest educational attainment, and net income per cropping do not affect the level of awareness of local farmers in the use of agricultural drones in the area of long-term impact on farming practices or sustainability.

Smart farming is data-driven, enabling farmers to take action based on accurate information on soil conditions. Extracting this data had previously involved physical field visits and manually gathering metrics. The soil gets prepared for planting and a drone shoots seeds in it, rather than using outdated planting techniques. Equipped with smart agriculture sensors, drones can collect and deliver this data – needless to say, they can also do it faster and more precisely (Shalimov, 2023).

Drones as a technology would further mechanize the farm sector and cut the cost of production. PhilRice has found ways to apply drones in crop management, application of farm inputs, seed planting, and even fish feeding. The technology allows farmers to monitor different aspects of rice farming, such as growth rate, nutrient content, and pest incidence. This information could help them make necessary adjustments to improve their produce (Umali, 2019).

Conclusions

The findings of this study suggest the following conclusions.

The Province of Iloilo is renowned for its diverse agricultural activities, including rice, sugarcane, fruit, and vegetable cultivation. In recent years, the agricultural sector has faced challenges such as labor shortages, unpredictable weather patterns, and the need for sustainable practices to boost yields. Agricultural drones have emerged as a potential solution to address these issues and enhance agricultural productivity. There are still a lot of local farmers who are into the traditional farming methods that have been practiced for decades. However, farmers may have many great possibilities if they adapt to modern mechanization in the farming industry through the use of agricultural drones. International farming practices have influenced the people in our country to try new technology and discover for themselves what benefits and advantages it can offer.

In terms of training and education, local farmers were introduced to the basics and dynamics of agricultural drones. They were informed of its benefits, advantages, and disadvantages as well. Proper and complete demonstrations were shown to them by the LGUs in their locality. Other reading materials were distributed for further knowledge and awareness. They are being taught that this equipment will aid them in analyzing the crops in the comfort of their homes, as if they are actually on the farm.

In terms of access and availability, farmers in Iloilo and the Philippines have started using agricultural drones as chemical sprayers to lower costs, boost productivity, and stay competitive. Drone spraying is more efficient than a power-knapsack sprayer, and this technology ultimately reduces the need for agricultural labor. According to the Philippine Rice Research Institute, local farmers can only lower the production cost if they switch to modern mechanization. Iloilo is lucky to have a locally grown brand of agricultural drone. The owner is a licensed drone pilot who shares his knowledge and expertise with those who can benefit from this modern innovation the most. They have an office and showroom for the drones, they make sure that spare parts are readily available, and they can be asked about everything about agricultural drones. Farmers' Cooperatives and LGUs also promote the adoption of drone technology among farmers. Regulations that address concerns about data privacy and security are set to ensure more responsible use of drones.

In terms of external influence and social factors, numerous barriers have kept these drones from being widely used in farming processes. Climate change alone is the biggest factor to consider. Farming communities need to adapt to this modern technology and become more resilient because it is the key to surpassing these challenges and still feeding our growing population.

In terms of long-term impact on farming practices or sustainability, drones play a significant role in modern agriculture with their capacity for data collection, and unlike the traditional manual sprayers – drones cover a large field block without causing damage to the overall physical structure of the land. Drones have the power to detect things that are beyond the human's visible range of sight. It is real-time and more accurate, has so many sensors, and is more reliable regarding objective information.

References:

Agatep, P. (2018). Benguet Plans to Regulate Ownership, Operation of Drones

Agussabti et al., 2021. Aceh Farmer's Acceptance of Agricultural Technology

Ahirwar, S., et al. (2019). Application of drone in agriculture. International Journal of Current Microbiology and Applied Sciences, 8, 1, 2500–2505. doi:10.20546/ijcmas.2019.801.264.

Anthony, L. (2023). How To Price a Product

Aram et al., 2020. Use of Mobiles for Promoting Agriculture in Puducherry, India

Ariff et al., 2023. Application of Mechanization Technology in Malaysia's Agriculture Sector

Alegre, A., Alegre, J. M., & Maguate, G. (2023). Fish Wastewater and Fish Scale: A Corn Soil Enhancer. Valley International Journal Digital Library, 10-22.

Asis, ML. (2022). Drones' Promising Potential to Improve Food Production

Bayabil et al., 2022. Potential Impacts of Improper Irrigation System Deign

Beriya, A. (2022). Application of drones in Indian agriculture. CSD Working Paper Series: Towards a New Indian Model of Information and Communications Technology-Led Growth and Development.

Daponte et al., 2022. A Review on the Use of Drones for Precision Agriculture

Dublino, J. (2024). How To Set a Price for Your Service

Dunn, 2023. Hectare Definition, History, and Conversion

Dutta et al., 2022. Perspective Chapter: Digital Inclusion of the Farming Sector Using Drone Technology DOI: 10.5772/intechopen.108740

Dutta, G. & Guswami, P. (2020). Application of drone in agriculture: A review. International Journal of Chemical Studies.

Eakin et al., 2019. The Economic Benefits of Educational Attainment

Ebora,m R. (2022). Supporting the Sustainability of Agricultural Innovation Systems

Forsyth, L. (2023). Packaging in Marketing, Importance, Types and Reasons

Geroso, P. J. M. S., & Maguate, G. (2023). Sustainability of Cooperatives in One City in Negros Occidental. International Journal of Scientific Research and Management (IJSRM) 11(10), 5227-5238.

Gonzalvo et al., 2021. Farmer Decision-Making on the Concept of Coexistence: A Comparative Analysis between Organic and Biotech Farmers in the Philippines

Hayden et al., 2021. Sensemaking and the Influencing Factors on Farmer Decision-Making

Howe, S. (2024). University of Arkansas Program Helps Farmers Get the Most Out of Drone TechnologyJohnson, CJ. (2021). Drone technology in agriculture appraisal. All Graduate Plan B and other Reports. 1586.

Khofiyah, N. A., Hisjam, M. & Sutopo, W. (2021). Techno-economic feasibility analysis of agricultural drone business in Indonesia. Proceedings of the Second Asia Pacific International Conference on Industrial Engineering and Operations Management Surakarta, Indonesia, September 14-16, 2021.

Kurkute, S. (2018). Drones for smart agriculture: A technical report article. researchgate.net

Kushvaha, M., Jha, S., Kumar, S. (2021). Agriculture drone.

International Research Journal of Modernization in Engineering Technology and Science, 3, 4.

Lawlor, 2019. What is a Farmer?

Lund et al., (2020). Mann-Whitney U Test using SPSS Statistics

McCarthy et al., 2023. Can Drones Help Smallholder Farmers Improve Agriculture Efficiencies and Reduce Food Insecurity in Sub-Saharan Africa? Local Perceptions From Malawi

Moore, 2023. What is Nanotechnology and What Can It Do?

Ocheda, L. (2023). Training on Smart Agriculture Technologies Debuts in Western Visayas, Dron Technology Introduced

Peek, 2023. 6 Tips for Creating a Great Business Marketing Plan

Rani et al., 2019. Drone: The Green Technology for Future Agriculture

Refaai, M. A., et al. (2022). Application of IoT-based drones in precision agriculture for pest control. Hindawi Advances in Materials Science and Engineering, 2022, 1160258.

Reheb et al., 2022. Drones in Agriculture: A Review and Bibliometric Analysis

Reyes, E. (2018). Agricultural Drone: A Hovering Technology in the Philippine Rice Industry

Santua, JE. (2021). Agri Drones Sustainable

Singh et al., 2022. Drones as Vehicles to Increase Farmer Income: A Perspective from Indian Initiatives

Southerton, D. (2020). Time, Consumption, and the Coordination of Everyday Life

Sundar et al., 2023. Adoption of Drones in Agriculture: Social, Economic, and Personal Factors

Sylvester, G. (2018). E-Agriculture in Action: Drones for Agriculture

Tadic et al., 2024. Assessing Strategies to Overcome Barriers for Drone Usage in Last-Mile Logistics: A Novel Hybrid Fuzzy MCDM Model

Thomas et al., 2023. Understanding Technology Acceptance in Smart Agriculture: A Systematic Review of Empirical Research in Crop Production

Umali, T. (2019). Philippines Looks to Drones to Boost Farming

Watkin, 2020. Efficacy, Impact, and English Legal History

Wiemers et al., 2023. Agriculture and Drones-Building Student Skills for Future Careers