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DETERMINANTS OF FARMERS' WILLINGNESS TO CULTIVATE *MORINGA OLEIFERA*: THE CASE OF DIPACULAO, AURORA, PHILIPPINES

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ABSTRACT

Moringa oleifera, commonly known as “malunggay” or “marunggay” in the Philippines, is a native tree considered a miracle plant due to its multipurpose uses, especially in traditional medicine. However, despite its proven uses and adaptability to different climates, the species is still underutilized. This paper aims to provide evidence regarding the dominant perceptions of and willingness to cultivate moringa, especially among those working in the agriculture sector. This study employed a descriptive research design. Data were gathered from farmers in Dipaculao, Aurora, using a self-made questionnaire and were processed and analyzed using Statistical Package for the Social Sciences (SPSS) Version 23. The results showed that the majority of the farmers had positive perceptions of moringa and a willingness to cultivate it. Moreover, the farmers' age, sex, farm size, years engaged in farming, and number of household members did not affect their willingness to cultivate moringa. Furthermore, farmers highlighted factors that might affect their decision to cultivate moringa, including the knowledge and skills for moringa cultivation and management, necessary capital for planting materials, and equipment and facilities for cultivation and processing. Therefore, this study recommends that the concerned agencies provide the farmers with training and seminars, financial loans, machinery/tools, and farm inputs.

Contribution/Originality: This paper contributes new information about the factors limiting moringa oleifera cultivation in the Philippines. It examines the factors that affect farmers' decisions to cultivate moringa oleifera. The findings serve as a starting point to promote the species. This paper is the first step toward achieving the vision of making Aurora a Moringa Province in the Philippines.

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1. INTRODUCTION

Moringa oleifera, commonly known as “malunggay” or “marunggay” in the Philippines, is a native tree that originated in India (Animashaun & Toye, 2013). This species is highly appreciated because almost all its parts can be used, although the leaves are the most useful parts as they are used for food, cures for various diseases, oil, and food for livestock (Gandji et al., 2018). In fact, some consider moringa a potential solution to hunger. According to Thurber and Fahey (2009), *M. oleifera* is a good source of nutrients that is accessible to everyone. Its nutritional benefits allow communities to address hunger and nutrient deficiency problems directly.

Several parts of the tree are used in traditional medicines. According to Agoyi, Okou, Assogbadjo, and Sinsin (2017), leaves, roots, bark, and seeds are all used to cure various diseases, including malaria, fever, diabetes, sexual weakness, stomach pains, indigestion, sinusitis, and headaches. Jimenez, Almatrafi, and Fernandez (2017) noted that the bioactive components of *M. oleifera* have beneficial effects in combating chronic diseases such as fatty liver, heart

disease, diabetes, and even cancer. Furthermore, *M. oleifera* has been used as fencing, fodder, firewood, coagulant, and gum (Popoola & Obembe, 2013). At present, processed moringa oil and leaves are used as additives in food (e.g., bread, milk, noodles, and tea) and personal health care and cosmetics (e.g., shampoo, soap, perfume, and skincare) (Palada, 2017).

Economically, moringa has the potential to offer a good source of income. A feasibility analysis of moringa revealed that if managed within a plantation, it can yield a net profit of approximately 5,137 United States Dollars (USD) (246,945 pesos) annually from each hectare (Animashaun & Toye, 2013).

In the Philippines, the moringa industry has developed significantly in the past decade as the government has invested in research and development projects on this crop. In 2012, a United States Agency for International Development (USAID)-funded project suggested that the adaptability of moringa accessions from Thailand and India produced good yields under the conditions present in the Philippines (Patricio & Palada, 2017). The Department of Agriculture promotes moringa farming in the country by encouraging private sector businesses and agriculture enthusiasts to move into large-scale production from backyard enterprises (Vizcarra, 2019).

While moringa is slowly gaining popularity in the country, there is a need to provide evidence about the dominant perceptions of and willingness to cultivate moringa, especially among those working in the agriculture sector. Therefore, an investigation of the different factors driving farmers' adoption of the crop is very relevant. Adoption is not guaranteed, even if the gains and benefits are presented to them, because different socio-demographic factors also affect farmers' decisions to cultivate moringa (N'Danikou et al., 2015). This pioneering study on moringa in Aurora province gives us a better understanding of the different factors limiting the adoption of moringa cultivation. The findings serve as starting point to promote the cultivation of the species.

1.1. Statement of the Problem

The primary purpose of this study was to determine farmers' perceptions and acceptance of the cultivation of *M. oleifera* in Casiguran, Aurora, Philippines. The following questions guided this study:

1. How can we describe the prospective moringa farmers in terms of:
 - a. Socio-demographic profile?
 - b. Farm profile?
2. What are the farmers' sources of information regarding moringa cultivation?
3. What are the farmers' perceptions and acceptance levels of the cultivation of *M. oleifera*?
4. Is there a significant relationship between:
 - a. Farmers' socio-demographic profiles and their willingness to adopt moringa?
 - b. Farmers' farm profiles and their willingness to adopt moringa?
5. Which factors negatively affect farmers' willingness to adopt moringa cultivation?

2. REVIEW OF RELATED LITERATURE

This review provides a conceptual basis for the research by looking for different factors that hinder the proliferation of moringa cultivation in the Philippines, as well as the determinants of farmers' perceptions and acceptance of the cultivation of specific crops.

2.1. Factors that Hinder Proliferation of Moringa Cultivation in the Philippines

Despite the countless benefits of *M. oleifera*, it is still underutilized and its cultivation is still mainly part of intercropping systems (Gandji et al., 2018). Certain issues keep this industry from flourishing, such as a shortage of quality raw materials for moringa cultivation and a scarcity of planting materials (Palada, 2017). In addition, Dar (2017) cited problems with shifting from backyard to large-scale cultivation, financial investment for the production of moringa products, information dissemination for awareness and wider market access, effective methodologies and technologies, and obtaining international regulatory approval as the main challenges for the industrialization of moringa cultivation.

The works of Dar (2017) and Palada (2017) explained the issues and challenges facing the moringa industry. However, the problem of the under-cultivation of moringa is best examined if it is approached on a micro-level scale, focusing on the socio-economic factors that affect farmers' perceptions and acceptance of moringa cultivation.

2.2. Determinants of Farmers' Perceptions and Acceptance of the Cultivation of Certain Crops

2.2.1. Demographic Factors

Gender, age, family size, and ethnicity have been identified as variables correlated with farmers' willingness to cultivate certain crops. In a study in Pakistan, Ali and Rahut (2018) found that age was negatively correlated with farmers' willingness to adopt specific crops, indicating that younger farmers are more willing to adopt a new cash crop.

Several studies have concluded that gender is a key determinant of farmers' willingness to cultivate certain crops. There is a gender bias in crop cultivation, meaning that men are more willing to cultivate new crops (Gandji, Salako, Fandohan, Assogbadjo, & Glèlè Kakaï, 2018; N'Danikou et al., 2015; Torimiro, Odeyinka, Okorie, & Akinsuyi, 2009). Torimiro et al. (2009) also noted that there are differences in the level of awareness, perception, and propagation of *M. oleifera* when grouped according to gender.

Other demographic factors that affect farmers' willingness are family size and ethnicity. Ali and Rahut (2018) found that family size was positively correlated with willingness. In addition, membership in an ethnic group is considered a significant factor because some ethnic groups utilize moringa more than others (Gandji et al., 2018).

Income also plays a vital role in decision-making. Ali and Rahut (2018) pointed out that the family's annual income is positively correlated with their willingness to adopt a certain crop as wealthy farmers can afford to take the risk for the prospect of higher returns.

2.2.2. Human Capital

Education level is positively related to farmers' willingness to adopt because farmers with higher education levels are more likely to adopt new crops (Ali & Rahut, 2018). Similarly, N'Danikou et al. (2015) stated that women who were non-schooled or had dropped out of the education system were not willing to cultivate new crops, but those who had attended secondary or college education were more willing to cultivate them.

The number of family members engaged in farming also correlates positively with farmers' willingness. Families with more members to help on the farm are more likely to adopt the cultivation of new crops (Ali & Rahut, 2018).

2.2.3. Land Ownership

The size of land owned by farmers also determines their willingness to adopt. Farmers who own greater land areas are more likely to venture into new crops (Ali & Rahut, 2018). In addition, landowners are more willing to grow new crops than farmers who are tenants.

2.2.4. Access to Facilities

Ali and Rahut (2018) found that farmers who have access to credit institutions are more willing to grow new crops. Access to potential markets is also vital. Farmers who are proximate to markets are more likely to adopt since this gives them the opportunity to sell their crops (Ali & Rahut, 2018).

3. MATERIALS AND METHODS

3.1. Population and Locale of the Study

This study was conducted in Toytoyán, Dipaculao, Aurora, one of the municipalities in Central Aurora. This barangay was selected since this is where the Malunggay Production Project will be implemented. In Dipaculao, agriculture is one of the most significant sectors, and it has one of the largest agricultural land areas in the province, with 8,230 hectares.

In this study, Toytoyán farmers were the primary source of information. Only farmers registered with the Registry System for the Basic Sectors in Agriculture (RSBSA) program were included in the study.

3.2. Research Design

The study followed a descriptive research design, using a survey as the primary data-gathering technique and a correlational study for the analysis of the data. As a descriptive study, it examined farmers' socio-demographic characteristics, farm profiles, information sources, and perceptions and acceptance of moringa cultivation. As a correlational study, it explored the relationships between the dependent and independent variables as stated in the conceptual framework.

3.3. Data Collection Procedures

Preliminary data collection was conducted at the Municipal Agriculture Office of Dipaculao, Aurora, to secure a list of farmers. After determining the target respondents, the research team conducted a house-to-house survey. During all data collection phases, all health and safety protocols were followed strictly, starting from proper coordination with concerned entities up to the survey process. A 97% response rate was achieved through the data collection process.

3.4. Data Collection Instruments

A self-made questionnaire was used for the survey. The instrument consisted of three parts. The first part aimed to determine the respondents' socio-demographic and farm-related profiles. The second part, which consisted of Likert-type and yes-no questions, was concerned with farmers' perceptions and acceptance of the cultivation of *M. oleifera*. The last part, which consisted of open-ended questions, aimed to determine the factors that negatively affected the willingness of farmers to adopt moringa cultivation not covered by socio-demographic characteristics. The questionnaire was self-administered so it was designed to be simple and easy to understand; it was written in Tagalog.

3.5. Treatment of Data

Data were encoded and processed using International Business Machines (IBM) SPSS Version 28. Both descriptive and inferential statistics were used to answer the research questions. Frequencies, means, and percentages were used to describe the population. On the other hand, correlations were used to explore the relationships between the dependent and independent variables of the study.

In interpreting the mean values, the following guide was used:

Scale	Description
4.20-5.00	Strongly Agree
3.40-4.19	Agree
2.60-3.39	Neither agree nor disagree
1.80-2.59	Disagree

1.00-1.79

Strongly Disagree

4. RESULTS AND DISCUSSION

4.1. Socio-Demographic and Farming Profiles

Table 1 shows the socio-demographic profile of the Toytoyoyan farmers. It is apparent from the table that the majority of the Toytoyoyan farmers were aged 41-60 (48.4%), while only 16.1% of farmers were over 60. The mean age of the farmers was 46.37, which was lower than the average age of Filipino rice farmers (53.07) found by Palis (2020) and Moya et al. (2015). Nevertheless, this finding supports the study of Briones (2017), who found that there was a higher proportion of old workers than young workers in the agriculture sector.

When it comes to gender, most of the farmers were male (59.7%), while only 40.3% were female. A similar result was found by Palis (2020), who reported a 70-30 ratio of male to female farmers. The increasing participation of women in agriculture is an evident trend in Asia, including the Philippines (Moya et al., 2015).

The majority of the farmers had completed secondary education (54.8%). None of the farmers had completed tertiary or vocational education. This finding supports the previous research of Briones (2017), which stated that the agriculture sector had the least educated workforce compared to other industries. A report by the World Bank (2020) also revealed that the majority of Filipino farmers were elementary and high school graduates.

Regarding household size, 46.8% of the farmers had 4-6 household members, and 19.4% had 7-9 members. The study by Palis (2020) revealed an average household size of 4.61, which was almost the same as the Toytoyoyan farmers in this study, who had an average of 4.69 members per household.

Table 1. Socio-demographic characteristics of the respondents.

Socio-Demographic Profile	Frequency	Percentage
Age		
21-40 years old	22	35.5
41-60 years old	30	48.4
Over 60 years old	10	16.1
Sex		
Male	37	59.7
Female	25	40.3
Civil Status		
Singe	7	11.3
Married	51	82.3
Separated	1	1.6
Widowed	3	4.8
Educational Attainment		
Elementary School	28	45.2
High School	34	54.8
Number of Household Members		
1-3	21	33.9
4-6	29	46.8
7-9	12	19.4

Table 2 provides the farming profiles of the Toytoyoyan farmers. It shows that the majority of the farmers had been engaged in farming for no more than 15 years, 37.1%. Only one farmer had been farming for more than 46 years. Their average years of experience was 22.15, which was lower than Filipino farmers' average farming experience found by Palis (2020). The majority of the respondents received help from family members with farming activities, aside from 15% whose family members performed non-farm activities.

The table also shows that 45.2% of the farmers had 1-1.9 hectares of land. The average farm size of 1.79 hectares was suitable for a plantation. According to the Moringaling Philippines Foundation (2019), a 1-hectare farm is large enough to start a profitable moringa plantation. The feasibility study conducted by Animashaun and Toye (2013) also revealed that the potential net profit of a 1-hectare moringa plantation could reach up to 5,137 USD per year.

The table also shows the ownership type and description of the farms. Most of the farmers owned their farms (80.6%), which makes it easier for these farmers to decide independently whether they want to adopt moringa, compared to those who are tenants and caretakers. Furthermore, most of the farmers owned upland farms, and 30.6% had combined upland and lowland farms. Since moringa is a drought-resistant crop, it does not want to be waterlogged for long periods (Farm Africa, 2019). Therefore, upland farms are more suitable for moringa cultivation since they are not prone to water stagnation. In the case of Toytoyoyan, most farmers currently cultivate coconut, but according to Ponnuswami (2019), moringa can be successfully intercropped since it has few lateral roots that compete for nutrients with other crops.

Table 2. Respondents' farming profiles.

Farming Profiles	Frequency	Percentage
Years engaged in farming		
15 years and below	23	37.1
16-30 years	20	32.3
31-45 years	18	29.0
46 years and above	1	1.6
Number of family members involved in farming		
none	15	24.2
1	16	25.8
2	24	38.7
3	7	11.3
Farm Size		
1-1.9 hectares	28	45.2
2-2.9 hectares	19	30.6
More than 3 hectares	15	24.2
Ownership		
Caretaker	2	3.2
Combination	5	8.1
Owned	50	80.6
Tenant	5	8.1
Farm description		
Upland	34	54.8
Lowland	9	9
Combination	19	30.6

4.2. Farmers' Sources of Information

Table 3 shows that the farmers had minimal information about moringa. One notable result is that 45.16% of the farmers had no source of information about moringa whatsoever. This explains why farmers in the community use moringa to build fences despite its economic potential.

Farmers' top three sources of knowledge about moringa were government extension workers (19.35%), television and radio (17.74%), and agricultural suppliers (16.13%). The results support those of [Ngiwara and Majawa \(2017\)](#), who found that radio was among the top sources of information for farmers. However, this result does not support the findings of [Yaseen, Xu, Yu, and Hassan \(2016\)](#), who concluded that family, friends, and co-farmers were the primary sources of agricultural information. The table also shows that only 6.45% gained knowledge on moringa from social media, co-farmers, and printed materials, respectively. The limited use of social media was also reported by [Kanjina \(2021\)](#). The marginal use of social media as a source of information for farmers was due to connectivity problems among farmers ([Balkrishna & Deshmukh, 2017](#)).

Table 3. Source of information about moringa.

Information Source	Frequency	Percentage
Government employee/extension worker	12	19.35
Television/radio	11	17.74
Agricultural suppliers	10	16.13
Relatives	9	14.52
Training/seminars	7	11.3
Social media	4	6.45
Co-farmers	4	6.45
Pamphlets and brochures	4	6.45
No source at all	28	45.16

4.3. Farmers' Perceptions of Moringa Cultivation

Table 4 shows Toytoyian farmers' perceptions of moringa cultivation. As the table reveals, the farmers strongly agreed with all the perceptual statements they were presented with. The highest mean (4.55) was recorded for the perception that farmers should adopt moringa cultivation. Farmers also strongly agreed that the government should promote the cultivation of moringa. The lowest mean (4.21) was seen for the statement that money spent on moringa cultivation would be worth it. These findings align with those of [Maxwell \(2019\)](#), who revealed favorable perceptions of the economic and healthcare importance of moringa. In his study, he also discovered that even when people lack awareness of the economic benefits of moringa, they still have a favorable perception. This further supports the result of this study that even if Toytoyian farmers have limited sources of information about moringa, they have a positive perception of it.

Table 4. Perceptions of moringa cultivation.

Perceptual Statements	Mean	Interpretation
Moringa is of great economic and health importance.	4.44	Strongly Agree
Moringa cultivation is easy to adopt.	4.45	Strongly Agree
Money spent on moringa cultivation is worth it.	4.21	Strongly Agree
Farmers should adopt moringa cultivation	4.55	Strongly Agree
The government should promote the cultivation of moringa	4.53	Strongly Agree

Farmers' willingness to cultivate moringa is shown in Table 5. Almost all (97%) of the farmers expressed their willingness to cultivate moringa, while only 8.1% were undecided about whether to adopt moringa as their crop. None of the farmers was unwilling to cultivate moringa.

Table 5. Farmers' willingness to cultivate moringa.

Willingness	Frequency	Percentage
Yes	57	91.9
No	0	0
Not sure	3	8.1

When farmers were asked to rank their preference for moringa compared with other crops, they ranked it third, as shown in Table 6. Coconut and banana were still the preferred choices as these are crops that the farmers have cultivated for a long time. These are also the crops that the region has prioritized in terms of training and input assistance.

Table 6. Ranking of moringa among other crops.

Crops	Rank
Coconut	1
Banana	2
Moringa	3
Vegetables	4
Corn	5
Rice	6

4.4. Relationship Between Profiles and Farmers' Willingness to Cultivate Moringa

Table 7 and Table 8 show the summarized results of the correlation tests between socio-demographic and farm profiles, on the one hand, and the farmers' willingness to cultivate moringa. It was found that sex, civil status, educational attainment, and the number of household members had no association with the farmers' willingness to cultivate moringa. However, a weak association was recorded between age and farmers' willingness. These findings align with those of Ali and Rahut (2018), who revealed that age had a negative correlation with farmers' willingness to adopt a new crop, indicating that younger farmers are more willing to adopt a new cash crop.

Table 7. Correlation coefficients between socio-demographic profile and willingness to cultivate moringa.

Variable	Coefficient	Interpretation
Age	-0.219	Weak association
Sex	0.034	No association
Civil status	0.053	No association
Educational attainment	0.039	No association
Number of household members	-0.009	No association

In addition, no associations were found between the farm profiles and the farmers' willingness to cultivate moringa. This finding contradicts Ali and Rahut (2018), who found that farmers who owned a greater area of land were more likely to venture into new crops. In addition, they found that landowners were more willing to grow new crops than tenants.

Table 8. Correlation coefficients between farm profile and willingness to cultivate moringa.

Variable	Coefficient	Interpretation
Years engaged in farming	-0.100	No association
Number of household members engaged	0.078	No association
Farm size	0.022	No association
Farm ownership	0.152	No association
Farm description	0.053	No association

Table 9 presents the factors that prevent farmers from deciding to adopt moringa. Although farmers are willing to plant moringa, they report that there are factors that hold them back, including knowledge and skills in moringa

cultivation and management, capital needed for planting materials, and equipment and facilities for cultivation and processing.

Table 9. Factors that affect the decision to plant moringa.

Factors	Frequency	Percentage
Knowledge and skills	57	91.93
Capital	55	88.71
Equipment and machinery	44	70.97

5. CONCLUSION

This research has found that the majority of the farmers have positive perceptions of moringa and a willingness to cultivate it. It also found that farmers' age, sex, farm size, years engaged in farming, and number of household members had no relationship with their willingness to cultivate moringa. Furthermore, farmers considered a lack of knowledge and skills in moringa cultivation and management, capital needed for planting materials, and equipment and facilities for cultivation and processing to be factors that might affect their decision to cultivate moringa. Therefore, this study recommends that the concerned agencies provide the farmers with financial loans, machinery/tools, and farm inputs. The findings also suggest that to increase the cultivation of moringa, concerned agencies must promote and raise awareness of its importance as well as its economic viability. It is also important to enhance the links between farmers and potential markets for produced moringa so that the farmers are motivated to engage in large-scale production. Finally, it is equally important for the government to provide post-harvest facilities to enable the farmers to increase their profits.

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