Research on World Agricultural Economy
https://journals.nasspublishing.com/index.php/rwae

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Entrepreneurial Practices and Profitability of Smallholder Farmers in Nueva Ecija: A Business Perspective

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ABSTRACT

Smallholder farmers in Nueva Ecija play a vital role in Philippine agriculture, yet their profitability remains constrained by structural and operational challenges. This study investigates the entrepreneurial practices of smallholder farmers, including product diversification, customer engagement, cost control, and record-keeping, and their relationship to self-reported profitability. Using descriptive statistics and Pearson's r correlation, the study surveyed 59 purposively selected farmers. Results showed that product diversification and customer engagement had strong positive correlations with profitability, while cost control and record-keeping showed moderate but significant relationships. Demographic factors, such as age, gender, education, and years of farming experience, had a minimal influence on financial outcomes. Key challenges identified included limited capital access, inadequate market linkage, and insufficient agripreneurship training. Institutional support was present but uneven, with technical aid more available than digital and financial services. A localized action plan is proposed to address capacity-building, financial inclusion, digital literacy, and cooperative branding. This aligns with Entrepreneurial Orientation Theory and the Sustainable Livelihoods Framework, emphasizing that entrepreneurial behaviors supported by institutional mechanisms can enhance the resilience and profitability of smallholder farmers. The study recommends

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ARTICLE INFO
Received: 8 August 2025 | Revised: 10 September 2025 | Accepted: 29 Septembert 2025 | Published Online: 23 December 2025
DOI: https://doi.org/10.36956/rwae.v7i1.2606

CITATION
Taruc, R.G.D., 2026. Entrepreneurial Practices and Profitability of Smallholder Farmers in Nueva Ecija: A Business Perspective. Research on World Agricultural Economy. 7(1): 72–89. DOI: https://doi.org/10.36956/rwae.v7i1.2606

multi-stakeholder collaboration and scalable interventions to sustain inclusive agribusiness development in rural areas.

Keywords: Agripreneurship; Smallholder Farmers; Profitability; Entrepreneurial Practices; Financial Inclusion; Sustainable Livelihoods Framework; Nueva Ecija Agriculture

1. Introduction

Smallholder farmers in the Philippines, particularly in regions like Nueva Ecija, play a crucial role in agricultural production, contributing significantly to the national food supply and rural employment. However, their ability to thrive amidst increasing challenges is threatened by a combination of rising production costs, fluctuating market prices, restricted access to capital, and insufficient entrepreneurial support. These factors hinder their efforts to adopt more commercialized farming practices, which are essential for enhancing the profitability and sustainability of their livelihoods.

The impact of these challenges is evident in the landscape of smallholder farming in the Philippines. Smallholder farmers often depend on agriculture as their primary livelihood, making them vulnerable to adverse climatic events and market fluctuations. A study highlights this dependency, emphasizing the poverty and vulnerability faced by many smallholder farmers in the region [1]. This instability is exacerbated by inadequate government support and limited access to resources, which can significantly hinder their productivity and income opportunities [2].

Comparative insights from other regions suggest that achieving commercialization could be pivotal for smallholder farmers. Studies indicate that commercialization processes improve productivity and can lead to poverty alleviation [3, 4]. Inclusive trade practices have been proposed to enhance economic participation among smallholder farmers, suggesting that their integration into broader agricultural supply chains may yield both economic benefits and social equity [2]. Support systems, such as subsidized inputs or access initiatives, can lead to improvements in smallholders' production levels and income opportunities [5].

Innovative agricultural strategies, such as intercropping, provide smallholder farmers with opportunities to enhance their soil fertility and crop resilience, thereby potentially increasing profitability [6]. Techniques like rainwater harvesting have been shown to mitigate climate change impacts, helping smallholders sustain their production amidst increasing weather variability [7].

Entrepreneurship in agriculture has increasingly emerged as a strategic solution to the challenges faced by smallholder farmers in optimizing resources and achieving market-oriented production. Innovative practices such as diversification, value addition, and business planning offer farmers new avenues for income generation and resilience against economic shocks. Various studies emphasize that entrepreneurial activities significantly contribute to agricultural success by enhancing productivity and enabling farmers to adapt to market fluctuations [8–11].

For example, diversification not only augments farm income but also mitigates risks associated with market instability, making it a crucial strategy for smallholder farms [10]. Additionally, the promotion of direct-to-market strategies allows farmers to retain greater portions of their profits, which can considerably improve their financial stability [12, 13]. Evidence suggests that when well-implemented, these entrepreneurial practices lead to improved livelihoods and reduced dependency on traditional market structures, aligning with sustainability goals in agriculture [14, 15]. By fostering an entrepreneurial mindset and providing the necessary resources, such as access to capital and expertise, we can significantly enhance the capacity of smallholder farmers to thrive in competitive marketplaces [9, 14].

Nueva Ecija serves as a significant case study for investigating the entrepreneurial behaviors of farmers due to its rich agricultural diversity and the increasing presence of cooperatives and agribusiness initiatives. Farmers in this region face numerous challenges but also possess opportunities for entrepreneurship and innovation

through cooperative models. However, the impact of these entrepreneurial practices on profitability among smallholder farmers remains an under-researched area. The cooperative model enhances farmers' negotiating power and facilitates access to resources that are crucial for increasing agricultural productivity and technical efficiency. This model can also aid in correcting market failures that disadvantaged farmers often encounter [16]. Furthermore, the literature suggests that entrepreneurial activities, such as diversification and value addition, can enhance the income potential of these farmers as they adapt to market demands [5]. Despite national efforts to promote agripreneurship, localized studies measuring the actual business performance resulting from these practices in Nueva Ecija are limited. Comprehensive assessments are necessary to fully understand how these entrepreneurial strategies influence farm profitability and livelihoods.

Investigating entrepreneurial practices among smallholder farmers in Nueva Ecija is essential for understanding their impact on profitability and overall agribusiness viability. This study aims to delineate the demographics and business profiles of participating farmers while examining how specific practices such as product diversification, customer engagement, cost control, and record-keeping correlate with financial outcomes.

Existing literature underscores the significance of diversification and value addition as key determinants of profitability for smallholder farmers. For example, diversification not only enhances income streams but also serves as a risk mitigation strategy against economic fluctuations, thereby fostering resilience within farming communities [17]. Additionally, effective record-keeping and customer engagement strategies have been shown to facilitate better decision-making and market access, leading to improved financial performance [18, 19].

Despite the foundations laid by national efforts to promote agripreneurship, localized research that directly correlates these entrepreneurial practices with profitability outcomes in Nueva Ecija remains scarce [20]. Thus, this study's findings are anticipated to inform both policy interventions and training programs, bolstering strategies that enhance the viability of agricultural entrepreneurship in rural settings.

This study significantly contributes to the understanding of rural entrepreneurship by examining the entrepreneurial practices of smallholder farmers in Nueva Ecija, a province recognized for its agricultural productivity. The alignment of this research with national objectives to enhance rural livelihoods and its support for the international development agenda, notably the Sustainable Development Goals (SDGs), highlights its relevance in promoting inclusive economic growth and fostering innovation in agricultural sectors.

Empirical evidence indicates that gender-inclusive business models in agriculture can lead to sustainable development by benefiting low-income farmers while generating commercial returns [21]. Furthermore, the importance of collective marketing and participation in agricultural value chains is underscored in various studies, reflecting the trends in sustainable development across the agricultural sector [22–24]. This resonates with the notion that inclusive agricultural practices are critical for achieving long-term economic growth and addressing food security challenges faced by rural communities [25].

By focusing on the various practices adopted by farmers, such as diversification and customer engagement, the study aims to provide insights that may inform policy and training interventions. Through these efforts, it aims to support the agricultural transformation that is essential for achieving both local and global economic objectives, ultimately enhancing the resilience and profitability of rural farming communities [23, 26].

2. Theoretical and Literature Framework

This study is anchored in the Entrepreneurial Orientation Theory (EOT), which provides a strategic lens to understand how entrepreneurial behaviors influence the profitability of smallholder farmers in rural settings. EOT outlines five key dimensions of entrepreneurial behavior—innovativeness, proactiveness, risk-taking, competitive aggressiveness, and autonomy [27]. In the context of agribusiness, these dimensions manifest through practices such as product

diversification (innovativeness), customer engagement (proactiveness), cost control (risk-taking), and record-keeping (autonomy). By operationalizing these dimensions through measurable behaviors, this study investigates how they translate into farm-level profitability among smallholder farmers in Nueva Ecija.

Empirical studies have consistently shown that farmers who embrace an entrepreneurial mindset are more likely to pursue value-adding activities, adopt innovative techniques, and engage directly with markets [28]. For instance, innovativeness enables farmers to diversify their farm outputs, improving resilience and income streams [29]. Proactiveness, meanwhile, allows them to anticipate market trends and build stronger customer relationships, increasing their bargaining power and access to better prices. Risk-taking behavior, often reflected in strategic cost control and investment decisions, enhances farmers' ability to respond to changing input prices and market uncertainties. Autonomy, particularly through formal record-keeping, empowers farmers to make data-informed decisions, manage risks, and improve their eligibility for financing and cooperative participation [5, 20].

While entrepreneurial behavior contributes positively to economic outcomes, its impact can vary based on access to resources, local conditions, and institutional support [2]. This aligns with broader development goals, as fostering entrepreneurial capacity among farmers contributes to inclusive economic growth and rural transformation [30]. The integration of entrepreneurial behavior in smallholder agriculture has the potential to transition farmers from subsistence-level activities to more sustainable and market-oriented enterprises. This underscores the relevance of EOT in guiding both policy and training interventions aimed at improving agribusiness performance.

To complement this behavioral perspective, the study also draws from the Sustainable Livelihoods Framework (SLF). The SLF asserts that access to five types of assets—human, financial, social, physical, and natural—is critical for enhancing livelihoods. Entrepreneurial practices, when aligned with these assets, enhance the ability of smallholder farmers to adapt, innovate, and sustain their farming operations over time [31, 32]. For example, product diversification improves the use of natural assets and protects against climate and market shocks [33], while customer engagement strengthens social capital by fostering trust-based networks [32, 34]. Likewise, record-keeping and cost control practices enhance human and financial capital, enabling farmers to plan efficiently and access credit [35].

These two frameworks—EOT and SLF—converge on a shared understanding: that entrepreneurial behaviors and livelihood assets are interdependent in shaping economic outcomes in rural agriculture. Farmers who effectively mobilize these assets, underpinned by a strong entrepreneurial orientation, are more resilient and financially stable. As such, this study situates entrepreneurial behavior as both a driver and a product of sustainable livelihoods, offering a comprehensive lens to assess agribusiness viability in Nueva Ecija.

Furthermore, existing literature affirms that entrepreneurial strategies, such as farm diversification, customer relationship management, innovation in products, and cooperative participation, are central to improving smallholder profitability [36, 37]. These practices not only stabilize income but also support environmental sustainability and empower farmers to enter more competitive markets [37]. As the agricultural sector continues to face challenges such as price volatility and climate change, entrepreneurial strategies are increasingly vital for long-term success [38].

The literature also highlights that agricultural extension services, training programs, and digital tools significantly enhance farmers' capacity to implement entrepreneurial practices [37, 38]. In regions where such support systems are present, smallholders tend to perform better in terms of market access, profitability, and innovation adoption. In the Philippines, agripreneurship is now recognized as a key pillar for rural development, supported by both government and non-government initiatives [39–41]. However, gaps remain in terms of implementation consistency and impact measurement, particularly in agricultural provinces like Nueva Ecija.

Despite a rich body of research on farm productivity, localized empirical studies linking entrepreneurial behavior with profitability in the Philippine context re-

main scarce [42]. This gap justifies the present study, which aims to provide context-specific insights into how entrepreneurial practices influence financial success in rural farming. By focusing on Nueva Ecija, a province with both agricultural potential and structural challenges, this research seeks to inform the design of evidence-based policies, training modules, and cooperative strategies that support entrepreneurship-driven rural development.

Theoretical and Econometric Model

To systematically examine the relationship between entrepreneurial practices and profitability, this study *proposes* a theoretical model or conceptual framework informed jointly by Entrepreneurial Orientation Theory (EOT) and the Sustainable Livelihoods Framework (SLF). EOT provides the behavioral foundation, while SLF accounts for the enabling environment and resource mobilization. Together, these theories explain how entrepreneurial behaviors, when supported by adequate livelihood assets, lead to improved economic outcomes for smallholder farmers.

The proposed model posits that:

Profitability $=$ f(Product Diversification, Customer Engagement, Cost Control, Record-Keeping)

Each component of the model corresponds to a specific entrepreneurial practice grounded in EOT dimensions:

- Product diversification reflects innovativeness. It refers to the integration of multiple income-generating activities, such as combining crop farming, livestock, and value-added processing.
- Customer engagement represents proactiveness. This includes building long-term buyer relationships, seeking market feedback, and directly responding to demand trends.
- Cost control aligns with calculated risk-taking. It involves efficient resource management, budgeting, and minimizing waste in operations.
- Record-keeping signals autonomy and strategic planning. Farmers maintain financial and production data, enabling informed decision-making and access to loans.

We map cost control to the risk-taking dimension of Entrepreneurial Orientation, arguing that careful cost-management reflects a form of calculated risk (avoiding waste, adapting to input price fluctuation). Likewise, record-keeping is mapped to autonomy, as maintaining production and financial records allows farmers independent decision-making and planning. Although the dimension of competitive aggressiveness is part of EOT theory, this study did not collect specific data for it; therefore, 'competitive aggressiveness' is acknowledged in theory but not operationalized in this empirical work.

The study empirically tests this model using Pearson's correlation to determine the strength of association between each practice and self-reported profitability. Additionally, an Ordinary Least Squares (OLS) regression is used to estimate the predictive value of each entrepreneurial practice on profitability outcomes, as previously presented in the results section. Diagnostic checks confirmed the validity of parametric assumptions, and multicollinearity tests (VIF $<$ 2.0) ensured that the predictors operate independently.

This econometric formulation validates the central hypothesis [27, 28]: that entrepreneurial practices, when consistently applied, significantly enhance the profitability of smallholder farmers. By operationalizing EOT dimensions in this localized agricultural context and testing their relationship through empirical analysis, the model strengthens the theoretical foundation of the study while meeting the methodological rigor expected in development-oriented research.

In addition to correlation analysis (Pearson's r), this study employs an Ordinary Least Squares (OLS) regression model to estimate the association between entrepreneurial practices (product diversification, customer engagement, cost control, and record-keeping) and the profitability index. Note: given the cross-sectional and self-reported nature of data, all findings describe associations rather than definitive causal influence.

While prior studies have examined entrepreneurial orientation and livelihood assets in agricultural settings [28–40], few have empirically measured how specific business practices among smallholder farmers in Nueva

Ecija translate into profitability using both correlation and regression methods. This study's incremental contribution lies in quantifying these associations for four distinct entrepreneurial practices and integrating them with the Sustainable Livelihoods Framework in a regionally specific context, thereby providing locally grounded evidence to inform policy and capacity-building interventions.

3. Methodology

This study utilized a descriptive, quantitative, correlational research design to examine the relationship between entrepreneurial practices and profitability among smallholder farmers in Nueva Ecija. Descriptive research was used to establish the demographic and business characteristics of the respondents, while the correlational approach allowed for the assessment of potential associations between entrepreneurial behavior and financial performance outcomes. This methodological combination facilitated a holistic understanding of how specific business practices contribute to farm-level profitability without implying direct causation.

Figure 1 illustrates the location of Nueva Ecija, a key agricultural province in the Philippines. The study focused on selected municipalities where smallholder farmers actively participate in agribusiness activities. Nueva Ecija is known for its crop production and cooperative-based farming structures.

Figure 1. Map of Nueva Ecija, Philippines (study area).

A total of 59 smallholder farmers from selected municipalities in Nueva Ecija served as the respondents of the study. Purposive sampling was employed to ensure that only individuals who met the criteria of being actively engaged in agricultural production and having sole or shared management of farm business operations were included. Respondents were identified through referrals from local agricultural offices and community cooperatives. Their experience in farming, level of market participation, and engagement in entrepreneurial practices such as product diversification and record-keeping formed the basis of their selection.

The research instrument was a structured survey questionnaire divided into three parts: (1) demographic and business profile; (2) frequency and extent of entrepreneurial practices; and (3) self-reported profitability indicators. The instrument underwent pre-testing with twelve smallholder farmers from outside the sample area to ensure clarity and reliability. Cronbach's alpha coefficient was calculated to measure internal consistency, with the resulting values exceeding the acceptable threshold for social science research [18, 19]. Data collection was conducted through in-person interviews and field visits, with assistance from local agriculture extension workers to facilitate coordination and translation when necessary. Cronbach's alpha values for each entrepreneurial practice construct were: product diversification ($\alpha = 0.82$), customer engagement ($\alpha = 0.79$), cost control ($\alpha = 0.75$), record-keeping ($\alpha = 0.72$). The profitability index was constructed by averaging the scores of three self-reported items: income trend, farm revenue, and financial stability, each measured on a 5-point Likert scale; these were standardized (mean $= 0$, SD $=$ 1) before aggregation to ensure comparability.

The tool for measuring entrepreneurial behavior consisted of four key indicators: product diversification, customer engagement, cost control, and record-keeping. Each indicator was measured using a 5-point Likert scale ranging from 1 (Never) to 5 (Always), to capture the frequency of each practice. The dependent variable, profitability, was constructed as a composite score based on respondents' self-assessment of their income trend, farm revenue, and overall financial stability. These were measured on a 5-point Likert scale and aggregated into a single index. This method reflects best practices in smallholder studies where formal financial records may be un-

available.

Independent variables—product diversification, customer engagement, cost control, and record-keeping—were also measured through multiple Likert-based items and averaged to produce standardized scores. The reliability of these constructs was tested using Cronbach's alpha, with all exceeding the 0.70 threshold for internal consistency, indicating valid measurement across variables.

In particular, product diversification was assessed through specific items in the questionnaire that asked respondents about the number of different crops they planted, the combination of crop and livestock activities, and participation in value-added or agri-processing ventures. A composite score was generated to represent each respondent's level of diversification.

Data were collected during March 2025. Inclusion criteria for smallholder farmers were: (a) actively engaged in agricultural production; (b) managing farm business operations (solely or jointly); (c) residing in selected municipalities of Nueva Ecija. Because the sample is purposively selected and limited to 59 farmers in certain municipalities, findings may not be generalizable to all smallholders in Nueva Ecija or other regions; caution is advised in extrapolating results.

Descriptive statistics, such as frequency, percentage, and weighted mean, were used to summarize the profile and responses of the participants. Pearson's r correlation was applied to determine the strength and direction of the relationship between entrepreneurial practices and profitability indicators. These statistical tools provided meaningful insights into the association between business behavior and income outcomes among the farmer respondents.

Ethical principles were strictly observed throughout the study. To ensure the validity of statistical findings, diagnostic checks were conducted before analysis. The normality of aggregated scores was assessed using Shapiro-Wilk and skewness/kurtosis tests, confirming the suitability of parametric techniques. Multicollinearity was tested using Variance Inflation Factor (VIF), and all predictor variables showed VIF values below 2.0, indicating no multicollinearity issues.

The assumptions of linearity and homoscedasticity were verified through scatterplots of standardized residuals and normal probability plots. These checks confirmed that the data met the key assumptions for regression analysis. Additionally, demographic factors such as age, gender, education, and years of farming experience were initially included in exploratory models but were excluded from the final regression due to statistical insignificance.

The research adhered to the provisions of the Data Privacy Act of 2012 to ensure confidentiality and secure handling of personal data. Prior to participation, informed consent was secured from all respondents, who were also made aware of their right to decline or withdraw from the study at any point. The overall conduct of the study was guided by respect, transparency, and voluntary participation.

Because both entrepreneurial practices and profitability are self-reported from the same respondents at a single point in time, there is risk of common-method bias. Also, while we find associations between practices and profitability, the cross-sectional design precludes strong claims of causality—e.g., it is possible that more profitable farmers adopt more practices, rather than practices alone driving profits.

4. Results

The demographic profile of the 59 smallholder farmer respondents in Nueva Ecija is presented in **Table 1**. The data reveal that the majority of respondents fall within the 30–39 age group (32.20%), followed by 40–49 age group (23.73%), and the 20–29 age group (16.95%). Meanwhile, 13.56% were aged 50–59, and another 13.56% were 60 years and above. These findings highlight that entrepreneurial farming practices are most commonly observed among those in their economically active years, although a significant portion of older farmers continue to engage in agribusiness activities.

In terms of gender, 64.41% of respondents were male, while 35.59% were female. This reflects the traditional dominance of males in Philippine agriculture, while the growing number of female participants signifies an emerging trend toward gender-inclusive agribusiness practices, consistent with inclusive business models [21].

Table 1. Demographic and business profile of the respondents.

Demographic Profile	Frequency	Percentage (%)
Age		
20–29 years	10	16.95
30–39 years	19	32.20
40–49 years	14	23.73
50–59 years	8	13.56
60 years and above	8	13.56
Gender		
Male	38	64.41
Female	21	35.59
Educational Attainment		
No formal education	3	5.08
Elementary	12	20.34
High School	27	45.76
College	17	28.81
Years of Farming		
Less than 3 years	11	18.64
3–5 years	16	27.12
6–9 years	18	30.51
More than 10 years	14	23.73
Type of Agribusiness		
Crop Production	25	42.37
Livestock Farming	18	30.51
Mixed Farming	11	18.64
Agri-processing	5	8.47

Note: N = 59; SD = Standard Deviation.

Educational attainment data showed that 45.76% had completed high school, followed by 28.81% who were college graduates, 20.34% at elementary level, and only 5.08% with no formal education. Education plays a crucial role in entrepreneurial decision-making and financial literacy, as supported by human capital theories highlighting its influence on innovation and profitability [32].

Regarding farming experience, 30.51% of respondents had 6–9 years of experience, 27.12% had 3–5 years, 23.73% had more than 10 years, and 18.64% had less than 3 years. These results suggest a moderate to high level of experience among respondents, which could influence their capacity to adopt entrepreneurial strategies effectively [2].

In terms of agribusiness involvement, 42.37% of respondents were engaged in crop farming, followed by livestock farming (30.51%), mixed farming (18.64%), and agri-processing (8.47%). This confirms Nueva Ecija's identity as a leading crop-producing region, but also highlights the increasing presence of diversified and value-added activities [5, 16].

In addition to the demographic and business profiles presented in **Table 1**, the study implicitly captures several environmental and economic factors relevant to smallholder farming in Nueva Ecija. Climatic variability is acknowledged as a significant concern, with farmers facing increasing unpredictability in rainfall patterns. As a response, adaptive practices such as rainwater harvesting are cited as viable mitigation strategies [7]. The vulnerability of farmers to typhoons and droughts is also discussed in the introduction, underscoring the environmental risks that directly influence productivity and income. While specific crop yield figures are not quantified in the survey, the frequent practice of product diversification—rated "Often" by respondents—suggests the active cultivation of multiple crops as a strategy to stabilize farm income. Furthermore, income is assessed through self-reported profitability indicators, including income trends, revenue, and financial stability, as detailed in the methodology section. Beyond primary farming, **Table 1** shows that

many respondents engage in livestock, agri-processing, or mixed farming, indicating secondary sources of livelihood. Water access and irrigation practices are not measured directly, but the inclusion of rainwater harvesting practices points to a reliance on small-scale or natural irrigation methods. Together, these contextual elements contribute to a holistic understanding of the environmental and economic factors that shape entrepreneurial decision-making and farm-level profitability in the study area.

Table 2 summarizes the responses of the farmers regarding the frequency of their entrepreneurial practices. Product diversification had the highest weighted mean (3.45), followed by customer engagement (3.28), cost control (3.16), and record-keeping (3.02). These practices represent core dimensions of entrepreneurial orientation in farming and have been associated with improved productivity and business performance [9, 10].

Table 2. Entrepreneurial practices of smallholder farmers.

Entrepreneurial Practice	Weighted Mean	SD	Verbal Interpretation
Product Diversification	3.45	0.53	Often
Customer Engagement	3.28	0.50	Often
Cost Control	3.16	0.58	Often
Record-Keeping	3.02	0.60	Sometimes
Average	**3.23**		**Often**

Note: N = 59; SD = Standard Deviation.

Product diversification scored "Often," indicating that many farmers grow multiple crops or engage in both crops and livestock to stabilize income and manage risk. This aligns with previous findings emphasizing the role of diversification in promoting economic resilience [14]. Customer engagement, with a mean of 3.28, also scored "Often." Farmers reported using local relationships to maintain buyer loyalty and secure better prices. Cost control scored 3.16, suggesting frequent budgeting and spending monitoring. However, record-keeping, at 3.02 and only occasionally practiced, remains an area for improvement. Formal documentation systems enhance decision-making and profitability [18].

Table 3 shows that product diversification and customer engagement were practiced frequently by smallholder farmers and yielded strong positive correlations with self-reported profitability. This implies that farmers who diversify their outputs and maintain strong buyer relationships tend to perform better financially.

Cost control and record-keeping, while also associated with profitability, demonstrated moderate correlations. Notably, record-keeping had the lowest practice frequency and weakest correlation, suggesting it is a potential area for capacity-building interventions.

These results affirm that entrepreneurial practices are not only present but also meaningfully linked to farm-level profitability. Enhancing the consistency and depth of these practices, particularly in record-keeping, can further strengthen financial outcomes and long-term agribusiness viability.

As shown in **Table 4**, Pearson's r correlation analysis revealed that all entrepreneurial practices had a positive and statistically significant relationship with self-reported profitability.

Table 3. Status of profitability gained through entrepreneurial practices.

Entrepreneurial Practice	Weighted Mean Score	Verbal Frequency	Correlation with Profitability (r)	Significance Level	Interpretation
Product Diversification	3.45	Often	0.68	$p < 0.01$	Strong Positive
Customer Engagement	3.28	Often	0.61	$p < 0.01$	Strong Positive
Cost Control	3.16	Often	0.49	$p < 0.05$	Moderate Positive
Record-Keeping	3.02	Sometimes	0.42	$p < 0.05$	Moderate Positive

Note: N = 59. *$p < 0.01$; $p < 0.05$.

Table 4. Correlation between entrepreneurial practices and profitability.

Practice	Pearson's r	Significance Level	Interpretation
Product Diversification	0.68	$p < 0.01$	Strong positive
Customer Engagement	0.61	$p < 0.01$	Strong positive
Cost Control	0.49	$p < 0.05$	Moderate positive
Record-Keeping	0.42	$p < 0.05$	Moderate positive

Note: N = 59. *$p < 0.01$; $p < 0.05$.

Product diversification demonstrated the strongest positive correlation with profitability (r = 0.68, $p < 0.01$), indicating that farmers who grow multiple crops, combine crops with livestock, or engage in agri-processing experience higher income levels. This supports previous studies [17] that suggest multi-enterprise strategies reduce vulnerability to market and climate shocks, leading to enhanced income stability. The weighted mean score of 3.45, interpreted as "Often," shows that this practice is widely adopted by smallholder farmers in Nueva Ecija, contributing significantly to their financial resilience.

Customer engagement was also strongly correlated with profitability (r = 0.61, $p < 0.01$). Farmers who frequently interact with buyers, foster loyalty, and respond to market demands are better positioned to secure fairer prices and steady demand. This aligns with earlier findings emphasizing that buyer relationships, feedback loops, and informal networks enhance rural marketing efficiency and profitability [12]. The verbal interpretation of "Often" (mean = 3.28) confirms that many respondents already apply this practice consistently.

Cost control, while showing a moderate positive relationship (r = 0.49, $p < 0.05$), remains a vital entrepreneurial behavior. Farmers who regularly budget, monitor spending, and reduce production waste are more likely to retain profits and respond flexibly to price changes or crop failures. This finding affirms the importance of sound financial practices in agribusiness [15]. However, with a mean score of 3.16, further improvement is possible through targeted capacity-building initiatives, especially in financial literacy and planning.

Record-keeping showed a moderate but significant correlation (r = 0.42, $p < 0.05$) with profitability. Although less frequently practiced (mean = 3.02, interpreted as "Sometimes"), record-keeping remains crucial for evidence-based decision-making and long-term business sustainability. Formal records enhance access to loans, support operational efficiency, and increase transparency in cooperative systems [20]. The relatively low adoption signals a clear opportunity for intervention, especially through digital tools and farmer training.

Together, these findings affirm that entrepreneurial practices—especially when implemented in combination—are key to improving profitability and building the long-term resilience of smallholder farmers. Prior to finalizing the regression model, diagnostic tests confirmed that all major assumptions were satisfied. The Variance Inflation Factor (VIF) for all predictor variables was below 2.0, indicating no multicollinearity issues. Visual inspection of residual plots confirmed linearity and homoscedasticity. Additionally, demographic variables such as age, gender, education, and farming experience were tested but excluded from the model due to lack of statistical significance ($p > 0.1$). The results also support the theoretical underpinnings of the Entrepreneurial Orientation Theory and the Sustainable Livelihoods Framework, which emphasize innovation, risk management, and resource optimization as drivers of farm success [15, 20].

These findings confirm the theoretical link between entrepreneurial orientation and farm profitability as posited in the Entrepreneurial Orientation Theory [29]. Furthermore, they validate the Sustainable Livelihoods Framework by demonstrating how entrepreneurial strategies enhance financial outcomes through the leveraging of human and financial capital.

Overall, the results emphasize that while entrepreneurial practices are being adopted to varying degrees, consistent application—especially in record-keeping and cost control—could further elevate farm profitability and long-term viability in rural agribusiness sectors.

Table 5 presents the challenges faced by respondents in applying entrepreneurial practices. The highest-rated concern was limited access to capital (3.49), followed by lack of market linkage (3.32) and insufficient training opportunities (3.28). These findings reflect structural limitations that hinder the full implementation of entrepreneurial practices and echo constraints previously identified [26, 28].

Table 5. Challenges in implementing entrepreneurial practices.

Challenges	Weighted Mean	SD	Verbal Interpretation
Limited Access to Capital	3.49	0.58	Often
Lack of Market Linkage	3.32	0.52	Often
Insufficient Training on Agripreneurship	3.28	0.54	Often
Low Use of Digital Tools for Farm Records	3.10	0.60	Sometimes
Resistance to Change in Traditional Practices	2.94	0.59	Sometimes
Average	**3.23**		**Often**

4.1. Institutional Support Received

As shown in **Table 6**, the farmers identified technical assistance (3.42) and cooperative support systems (3.36) as the most accessible forms of institutional aid. However, access to e-commerce training (2.84) and start-up capital (2.75) remained low. This reveals the partial success of public-private interventions in reaching smallholders comprehensively.

4.2. Proposed Localized Action Plan

Grounded in the findings of this study, a localized action plan is proposed to address the key constraints affecting entrepreneurial development among smallholder farmers in Nueva Ecija. These include limited access to agripreneurial training, digital tools, organized market systems, and capital resources. The proposed interventions aim to enhance the farmers' entrepreneurial capacity, market integration, and business sustainability.

Table 7 outlines strategic focus areas aligned with the Sustainable Livelihoods Framework and Entrepreneurial Orientation Theory. By targeting human capital development, technological adaptation, market connectivity, and financial inclusion, this plan provides a roadmap for increasing the profitability and resilience of rural farming enterprises.

This action plan is designed to be multi-stakeholder, inclusive, and scalable. It seeks to empower smallholder farmers to transition from subsistence-based agriculture to enterprise-driven models. By leveraging institutional partnerships and localized implementation, it can serve as a replicable model for enhancing agripreneurship and achieving inclusive rural development.

The localized action plan proposed here should be understood as exploratory and context-specific, intended to guide policy and local interventions rather than universal prescriptions. Given the associative nature of our data, we avoid inferring causality; rather, we interpret significant correlations and regression coefficients as indicative of potential levers for intervention, subject to further validation in longitudinal or experimental studies.

Table 6. Institutional support received by respondents.

Support Type	Weighted Mean	SD	Verbal Interpretation
Technical Assistance from LGU/DA	3.42	0.47	High
Support from Cooperatives/Groups	3.36	0.51	High
Marketing Support and Promotion	3.10	0.56	Moderate
E-commerce or Digital Training	2.84	0.60	Low
Access to Start-up Capital/Subsidies	2.75	0.63	Low
Average	**3.09**		**Moderate**

Table 7. Proposed localized action plan to enhance agripreneurship.

Strategic Focus Area	Action Step	Responsible Unit	Timeline
Capacity Building	Conduct barangay-level agripreneurship and financial literacy workshops	LGU – MAO, DA – Agricultural Extension Office	Quarterly
Digital Literacy	Deliver training on digital record-keeping, mobile banking, and online sales	TESDA, DTI, SUCs (e.g., NEUST)	Semi-annually
Market Linkage	Develop and launch a Nueva Ecija "Farm-to-Table" e-commerce platform	Provincial Agriculture Office, DTI	Pilot rollout: Year 1
Financial Access	Facilitate microfinance and soft loan programs tailored for smallholders	LGUs, Rural Banks, Cooperative NGOs	Year-round
Cooperative Strengthening	Provide support for collective branding, packaging, and certification	CDA, Local Cooperative Federations	Bi-annual

Table 8 presents the results of an Ordinary Least Squares (OLS) regression, which examines how four entrepreneurial practices—product diversification, customer engagement, cost control, and record-keeping—affect the profits of smallholder farmers in Nueva Ecija. The model gives an adjusted R-squared value of 0.547, meaning that around 55% of the changes in profit can be explained by these four factors.

Table 8. Econometric estimation: impact of entrepreneurial practices on profitability (OLS regression model).

Variable	Coefficient (β)	Standard Error	t-Statistic	*p*-Value
Product Diversification	0.422	0.089	4.74	0.000**
Customer Engagement	0.371	0.095	3.91	0.001**
Cost Control	0.255	0.102	2.50	0.015*
Record-Keeping	0.198	0.106	1.87	0.067
Constant	1.203	0.312	3.85	0.000**

Note: N = 59. *$p < 0.01$; $p < 0.05$.

Among the four practices, product diversification has the strongest and most positive effect on profitability. This result confirms earlier findings and clearly demonstrates that diversification is a powerful strategy to increase income. Studies show that diversification not only helps protect farmers from risks but also serves as a key approach for maintaining a strong and profitable farming business [10, 17, 25]. Farmers who grow multiple crops or mix livestock with crops can adapt more easily when there are changes in the market or weather. The Sustainable Livelihoods Framework also supports this idea [32, 33]. These results agree with previous findings (**Table 4**) and show that having different crops leads to more income, better soil health, and reduced overall risk [6, 10].

Customer engagement comes second in terms of its positive impact on profit. This highlights the importance of building good relationships with buyers—such as loyal "suki" customers, fixed pricing, lower selling costs, and promotions through word-of-mouth [12, 18]. When farmers communicate with customers, ask for feedback, and adjust their products to match buyer preferences, they tend to earn more [9, 23]. Practices like advance ordering, maintaining good reputation, and offering flexible prices are consistent with the Entrepreneurial Orientation Theory, which emphasizes proactiveness and responsiveness to market needs [29].

Cost control also has a positive and statistically significant impact on profit, although its effect is not as strong as the first two. Farmers who properly budget, manage their inputs, and make smart spending decisions are more likely to save resources and grow their business [15, 28]. This supports the idea that financial literacy and careful spending are especially helpful during periods of high costs and limited government support[5]. The result also aligns with earlier observations—many farmers are already controlling costs (mean = 3.16); however, improved financial skills and use of dig-

ital tools could further enhance performance [24, 26].

Record-keeping shows a small but positive impact on profit, though the effect is not highly significant. When done correctly, however, it provides meaningful benefits. Evidence shows that keeping records helps farmers make informed decisions, apply for credit, and collaborate more effectively with cooperatives [18, 20]. Its relatively low usage (mean = 3.02), as shown in **Table 2**, may explain why the effect is weaker. Many farmers still do not use digital tools and remain hesitant to adopt new methods—an issue also reflected in **Table 5**. Training in digital record-keeping could significantly strengthen this practice [24, 26].

The regression results reinforce the earlier correlation findings and underscore that entrepreneurial behavior should play a stronger role in agricultural policy. Product diversification, customer engagement, and cost control all align with the principles of the Entrepreneurial Orientation Theory, which emphasizes innovativeness, proactiveness, and risk preparedness [29]. The Sustainable Livelihoods Framework likewise demonstrates that improvements in human capital (such as financial skills), social capital (such as buyer relationships), and financial capital (such as cost efficiency) enhance income generation [32–34].

Farmers should therefore receive training in financial management and cost control, be supported in using digital tools for record-keeping, and be provided with assistance in linking directly to markets [23, 26]. The OLS regression confirms that entrepreneurial practices have a meaningful effect on profitability: product diversification and customer engagement have the strongest influence, while cost control and record-keeping also contribute. These findings make clear the need to further support agri-entrepreneurship through targeted policies, capacity-building programs, and sustained institutional support for rural farmers.

5. Discussion

5.1. Microfinancing and Farmer Income

Microfinancing could improve the entrepreneurial capacity of smallholder farmers by enabling access to working capital. As identified in **Table 5**, limited capital is the most significant constraint to implementing agribusiness practices. With microfinance, farmers can invest in diversification, manage risks, and stabilize profitability. Cost control and record-keeping practices correlated with profitability (**Table 3**), could be improved through financial support and targeted technical training, especially in financial literacy and budgeting.

5.2. Marketing and External Linkages

The study highlights that customer engagement is strongly associated with profitability (**Table 3**). Extending market access beyond the local community could further increase income and resilience. By leveraging cooperative networks and digital platforms (**Table 6**), local products may be introduced to broader markets nationally and potentially internationally. This aligns with the proposed action plan's emphasis on cooperative branding, digital literacy, and the development of a localized "Farm-to-Table" e-commerce program that connects smallholder farmers to consumers beyond their immediate reach.

5.3. Role of Government Policies

The findings in **Table 6** indicate partial access to institutional support, with technical assistance and cooperative aid being more accessible than start-up capital and digital training. Government measures must therefore go beyond short-term assistance and address the structural barriers to agribusiness participation. Sustained support for entrepreneurship training, access to credit facilities, and integration of smallholders into value chains are essential policy interventions. These efforts can strengthen entrepreneurial orientation and foster long-term business viability among rural farmers.

5.4. Environmental and Pest Management Concerns

As agricultural practices expand and intensify, environmental risks, such as pest control and chemical input use, also increase. The need for sustainable pest management becomes more urgent, especially in the context of crop diversification. Environmentally friendly approaches, such as adsorption-based pesticide reduc-

tion techniques, have been shown to effectively minimize contamination risks. For example, resin-based adsorption methods can reduce pesticide residues in agricultural systems, offering a practical solution to balance productivity with ecological safety [43]. Integrating such techniques into extension services and training programs can contribute to the long-term sustainability of agribusiness development.

5.5. Land Use and Transformation

Nueva Ecija's shift from mono-cropping to diversified agribusiness (**Tables 1** and **2**) reflects broader transformations in land use. As more smallholder farmers engage in mixed farming and agri-processing, pressure on land resources and potential degradation may increase. These transitions must be accompanied by sustainable land use planning and conservation practices to prevent long-term productivity loss. Local development strategies should therefore incorporate environmental safeguards and land stewardship to ensure that profitability gains are aligned with sustainable agricultural practices.

6. Conclusion

While demographic factors such as age, gender, education level, and years of farming experience were found to have minimal influence on financial performance, the results of this study affirm the vital role of entrepreneurial practices in enhancing the profitability of smallholder farmers in Nueva Ecija. The findings strongly support the theoretical frameworks of Entrepreneurial Orientation Theory and the Sustainable Livelihoods Framework, which both posit that individual entrepreneurial behaviors and access to livelihood assets drive economic advancement in rural agribusiness.

The study found that product diversification and customer engagement were the most frequently practiced strategies and were significantly correlated with profitability. Cost control and record-keeping, while moderately practiced, also demonstrated meaningful relationships with financial performance. These entrepreneurial behaviors, when adopted consistently, provide critical leverage for smallholder farmers aiming to transition from subsistence-level operations to more profitable, market-oriented agribusiness models.

Despite these strengths, key institutional and structural challenges remain. Limited access to capital, weak market linkages, and a lack of agripreneurial training were the highest-rated barriers to implementing business practices effectively. Additionally, low adoption of digital tools for record-keeping and branding constraints further hinder competitiveness and sustainability.

These findings emphasize the need for a multi-stakeholder, locally grounded approach to agripreneurship development. Addressing these constraints through community-based interventions and institutional collaborations can significantly enhance the resilience and long-term viability of rural farming enterprises in Nueva Ecija. Capacity building, digital transformation, financial inclusion, and cooperative development should be prioritized to drive inclusive agricultural growth.

While this study does not test every aspect of the full EOT theoretical model (e.g., competitive aggressiveness), it does operationalize key dimensions in its empirical model.

7. Recommendations

Based on the findings of the study, it is recommended that a localized action plan be developed and institutionalized to promote entrepreneurial growth among smallholder farmers in Nueva Ecija. This plan should be guided by SMART criteria—Specific, Measurable, Attainable, Realistic, and Time-bound—to ensure feasibility and sustained impact. To address the challenge of limited access to capital, establishing community-based microfinance initiatives and seed fund schemes is suggested. These can empower farmers by improving their access to financing and are anticipated to result in a 25% increase in loan uptake within the first year of implementation. This effort should be supported by local government units (LGUs), rural banks, and non-governmental organizations.

To strengthen market linkages and improve farmgate prices, the study recommends the launch of a digital platform branded as the "Nueva Ecija Farm-to-Table"

program. This e-commerce initiative should be developed in collaboration with the Department of Trade and Industry (DTI) and the Department of Agriculture (DA) and aims to enable at least 50% of cooperatives in the province to sell directly online by the end of the first year.

Recognizing the limited entrepreneurial knowledge among smallholder farmers, it is crucial to implement regular barangay-level training workshops focused on agripreneurship, financial literacy, and business planning. These sessions, facilitated by municipal agriculture offices and agricultural extension workers, should train at least 300 farmers annually and be conducted quarterly beginning in the first quarter.

To address the low adoption of digital tools and inadequate record-keeping, mobile-based applications should be introduced and complemented by targeted tech orientation programs. Training and support can be provided by the Technical Education and Skills Development Authority (TESDA) and local state universities and colleges (SUCs), with the goal of having 60% of trained farmers adopt digital logs by the end of the second year.

Lastly, to enhance cooperative branding and market identity, packaging, labeling, and certification services should be provided through cooperative federations with support from the Cooperative Development Authority (CDA), Department of Science and Technology (DOST), and relevant marketing experts. The goal is to have at least 10 product lines certified and branded within 12 to 18 months.

These recommended actions emphasize the need for multi-stakeholder collaboration among local government agencies, cooperatives, financing bodies, and academic institutions. Such coordinated efforts can foster inclusive agribusiness development and help position Nueva Ecija as a replicable model for entrepreneurship-driven rural transformation in the Philippines. Future research is encouraged to evaluate the long-term outcomes of these interventions, especially in the domains of digital adoption, market integration, and climate-resilient farming.

Funding

This work received no external funding.

Institutional Review Board Statement

The study was conducted and approved by the Research Publication Office of the Nueva Ecija University of Science and Technology (protocol code RSD-F001-2025; date of approval: May 2025).

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The survey data contain personally identifiable information and are subject to privacy and ethical restrictions. A de-identified dataset and the survey instrument/codebook are available from the corresponding author on reasonable request.

Conflicts of Interest

The author declares that there is no conflict of interest.

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