Knowledge, Attitudes, and Practices of Secondary School Agricultural Science Teachers on Organic Agriculture

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DOI: https://doi.org/10.51244/IJRSI.2025.120800292

Received: 03 September 2025; Accepted: 09 September 2025; Published: 06 October 2025

ABSTRACT

This study explored the knowledge, attitudes, practices, challenges, countermeasures, and training needs of secondary school Agricultural Science teachers in Calabanga, Philippines, with respect to organic agriculture. Employing a descriptive survey design, data were gathered from 20 teacher-respondents using structured questionnaires and analyzed through mean scores and descriptive interpretation. Findings revealed that teachers possessed strong knowledge and positive attitudes toward organic agriculture, while their extent of practice was only moderate. They frequently applied organic fertilizers and integrated lessons, but collaboration with farmers and conduct of field demonstrations were limited. Challenges such as inadequate training, lack of instructional materials, and insufficient school resources hindered full adoption. Teachers employed coping strategies like peer collaboration and school gardening, but training needs remained high, particularly in advanced techniques, certification standards, and resource development. The study implies that strengthened professional development and enhanced support systems are essential for promoting sustainable agricultural education.

Keywords: Organic agriculture, Agricultural Science teachers, practices, challenges, training needs, professional development

INTRODUCTION

Agriculture stands at a critical juncture as the world confronts the challenges of environmental sustainability, food security, and the urgent call for ecological farming practices. Organic agriculture has emerged as a viable alternative to conventional farming methods, offering solutions to pressing environmental and health concerns associated with modern agricultural production. In recent years, global interest in organic farming has grown considerably due to its potential to conserve biodiversity, reduce chemical inputs, and promote healthier food systems [1]. In the Philippines, efforts to promote organic agriculture have been reinforced by the enactment of the Organic Agriculture Act of 2010 (Republic Act 10068), which underscores the government's commitment to strengthen sustainable farming practices. Despite these initiatives, the adoption of organic farming in academic institutions and secondary education remains limited, highlighting the need for a stronger integration of organic agriculture into the educational system [2].

Agricultural education, particularly at the secondary school level, plays a crucial role in shaping future farming practices and perspectives. Agricultural science teachers act as the primary conduits of knowledge, influencing students' understanding and attitudes towards sustainable farming methods. Their comprehension of organic agriculture principles, personal attitudes toward ecological practices, and teaching strategies significantly shape how future farmers, consumers, and agricultural professionals view and implement organic agriculture [3]. However, limited research has been conducted on agricultural science teachers' knowledge base, attitudes, and teaching practices regarding organic farming, despite several studies highlighting adoption and consumer perceptions among farmers and markets [4]. This gap in literature is concerning given that secondary school education represents a formative period when students develop agricultural knowledge and long-term perspectives about farming systems.

The integration of organic agriculture into the curriculum presents unique challenges and opportunities. Teachers must not only possess a comprehensive knowledge of organic principles but also demonstrate positive attitudes

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue IX September 2025

and effective teaching practices to successfully convey the importance of sustainability to students [5]. Anchored on the Knowledge, Attitudes, and Practices (KAP) framework, this study recognizes that teachers' expertise and dispositions influence how effectively they deliver organic agriculture education. Furthermore, the study is aligned with the Sustainable Development Goals (SDGs), particularly SDG 2 (Zero Hunger) and SDG 12 (Responsible Consumption and Production), which emphasize sustainable food systems and ecological farming.

Thus, this research seeks to address the knowledge gap by examining the knowledge, attitudes, and practices of secondary school agricultural science teachers regarding organic agriculture. By exploring these three dimensions, the study aims to provide insights for curriculum enhancement, teacher training programs, and policy development. Ultimately, the findings will contribute to strengthening agricultural education, empowering teachers, and supporting the broader national and global goal of advancing sustainable farming practices for future generations.

A. Objectives of the Study

The study aims to determine Best Practices and Initiatives for Organic Agriculture Promotion in Calabanga. Specifically, the study seeks to: (1) determine teachers' knowledge, attitudes, and perceptions toward Organic Agriculture Practices; (2) identify teachers' level of priority interests in Organic Agriculture Practices; (3) find out teachers' extent of adoption of Organic Agricultural Practices; (4) identify teachers' problems and challenges in the adaptation of Organic Agricultural Practices; (5) identify teachers' countermeasures to solve the problems and challenges in the practice of Organic Agriculture; (6) develop training capacity for Agricultural Science Teachers on Organic Agriculture Practices.

B. Review of Related Literature

Teachers play a vital role in promoting sustainability and organic agriculture in the classroom. Research highlights the need for updated curricula, continuous training, and adequate instructional resources to strengthen their capacity in teaching organic practices [6]. Teachers' personal beliefs and values also influence their instructional strategies, suggesting that their attitudes and perceptions are closely tied to how sustainability is taught [7].

Teachers' motivation, curriculum opportunities, and support systems also shape their interest in integrating organic agriculture. While many are motivated to include environmental and agricultural concepts, rigid curricula often limit meaningful application [8]. Demographic factors further influence willingness, with younger teachers generally more receptive compared to their older counterparts [9]. Similarly, those who prioritize climate-resilient agriculture are more likely to integrate sustainability concepts in their lessons [10].

Adoption of organic agriculture is often facilitated through experiential and practice-based approaches. School gardens, for example, have proven effective in enhancing both teacher adoption and student engagement [11]. Teachers who are equipped with the right competencies and pedagogical tools are also more confident in adopting these practices [12]. Furthermore, experiential learning models and community-based projects not only strengthen knowledge retention but also deepen teachers' connection with local organic initiatives [13].

Despite these efforts, many challenges hinder the full integration of organic agriculture in the classroom. A lack of training programs and instructional materials remains a significant barrier [14]. Some teachers also perceive agroecology as too technical, especially without proper training [15] other studies revealed gaps in readiness, particularly in applying pedagogical tools for sustainability, while limited digital literacy restricts the use of online resources for organic agriculture promotion [16].

To address these issues, teachers have employed strategies such as collaboration and reflective practices. Peer-led training has been shown to improve instructional delivery and foster stronger collaboration among educators in rural settings [17]. Similarly, learning action cells and reflective teaching practices enable teachers to refine their approaches and promote organic concepts more effectively [18]. In-service training programs have also proven valuable in boosting teacher confidence and competence in sustainability education [19].

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Building long-term training capacity is essential for advancing organic agriculture in secondary education. Continuous professional development programs are needed to ensure teachers remain updated with new skills and knowledge [20]. Efforts must also focus on strengthening digital literacy, enabling teachers to maximize online learning tools and resources [21]. Structured in-service programs, complemented by peer-led approaches, provide a strong foundation for teacher preparedness [22]. Collectively, these studies show that empowering teachers through training, resources, and institutional support is crucial for effectively integrating organic agriculture into the curriculum.

METHODOLOGY

This study adopted a quantitative descriptive research design using a cross-sectional survey approach to assess the knowledge, attitudes, and practices (KAP) of secondary school Agricultural Science teachers regarding Organic Agriculture. The research aimed to generate baseline data to inform curriculum development, teacher training, and policy formulation in agricultural education. The survey method was chosen for its effectiveness in collecting standardized data from a specific population at a single point in time without manipulation of variables.

The respondents of the study consisted of 20 Agricultural Science teachers teaching at both Junior High School (JHS) and Senior High School (SHS) levels. Participants were drawn from public and private secondary schools using a stratified random sampling technique to ensure representation based on school type and teaching experience. Prior to data collection, informed consent was obtained from all participants, and ethical approval was secured from the appropriate institutional review board. Participation was voluntary, and data confidentiality and anonymity were strictly maintained.

The primary data collection instrument was a structured survey questionnaire composed of eight sections: (A) Demographic Information, (B) Knowledge of Organic Agriculture Practices, (C) Attitudes and Perceptions, (D) Priority Interests, (E) Adaptation of Practices, (F) Challenges Encountered, (G) Countermeasures Taken, and (H) Training Needs. Responses were collected using various Likert-type and frequency scales. Specifically, knowledge was rated on a 4-point scale from No knowledge (1) to Excellent knowledge (4); attitudes were measured from Strongly Disagree (1) to Strongly Agree (4); and extent of practice adoption was rated from Never (1) to Always (4). In addition, a priority ranking scale was included to assess which organic agriculture topics teachers emphasize most in their instruction.

To ensure validity, the questionnaire items were adapted from existing KAP studies and were subjected to expert review by professionals in agricultural education and organic farming. A pilot test was conducted with a small group of teachers outside the target sample to assess the clarity and relevance of the instrument. The internal consistency of the survey sections was evaluated using Cronbach's alpha, which yielded values of 0.81 for knowledge, 0.87 for attitudes, and 0.84 for practices. These values indicate high reliability, ensuring that the instruments were both valid and consistent for measuring the intended constructs.

Descriptive statistics including frequencies, percentages, means, and standard deviations were used for data analysis. Categorization of scores followed defined ranges: knowledge (low to excellent), attitudes (negative to positive), and practices (rare to frequent). Responses regarding challenges, countermeasures, and training needs were analyzed using frequency counts. Open-ended responses in the final section were reviewed for emerging themes to support the quantitative findings.

RESULTS AND DISCUSSION

This section presents the findings of the study on the knowledge, attitudes, practices, challenges, and training needs of secondary school Agricultural Science teachers regarding Organic Agriculture. The results are organized into tables and discussed accordingly, highlighting how teacher-related factors influence the extent of adoption and integration of organic practices in the teaching-learning process. Presenting the data in this way provides a structured overview that links teacher characteristics with their professional competencies and instructional approaches.

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Table 1 presents the demographic profile of the respondents, which includes age, gender, highest educational attainment, years of teaching experience, and formal training in organic agriculture. Understanding these demographic characteristics is essential, as they provide a foundation for interpreting variations in teachers' knowledge, attitudes, and practices. For instance, teaching experience and formal training may influence their level of confidence and competence in implementing organic agriculture concepts, while educational attainment may reflect preparedness to adopt advanced methods. By situating the findings within the demographic context, the study offers a clearer lens through which to examine the strengths and areas for development in promoting organic agriculture education.

Table 1. Demographic Profile of Respondents (n=20)

Demographic Variable	Categories	Frequency (f)	Percentage (%)
Age	21–30 years old	6	30.0
	31–40 years old	7	35.0
	41–50 years old	5	25.0
	51 years and above	2	10.0
Gender	Male	9	45.0
	Female	11	55.0
	Prefer not to say	0	0.0
Highest Educational Attainment	Bachelor's Degree	10	50.0
	Master's Degree	8	40.0
	Doctorate	1	5.0
	Others	1	5.0
Years of Teaching Experience	1–5 years	5	25.0
	6–10 years	6	30.0
	11–15 years	4	20.0
	16 years and above	5	25.0
Formal Training in Organic Agriculture	Yes	7	35.0
	No	13	65.0

The demographic results show that most respondents are within the 31–40 age group (35%), indicating that the majority of Agricultural Science teachers are in their early to mid-career stage. Teachers in this age bracket are often characterized as being in a productive phase of their profession, balancing experience with openness to

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new ideas (Flores, 2020). In terms of gender, a slight majority are female (55%), suggesting a relatively balanced representation. This trend reflects the growing participation of women in agricultural education, consistent with studies highlighting the increasing involvement of female teachers in science-related fields [23].

Regarding educational attainment, half of the teachers hold a Bachelor's degree (50%), while a significant number have completed Master's degrees (40%). Only one respondent holds a Doctorate (5%), reflecting the need to encourage further professional advancement in agricultural education. According to [24], higher educational attainment enhances teachers' professional competence and their ability to integrate innovative teaching strategies. Teaching experience is distributed across all categories, with 6–10 years (30%) being the most common range, followed closely by those with 1–5 years (25%) and 16 years or more (25%). This indicates a mix of novice, mid-level, and highly experienced teachers in the sample, which is important since both new and veteran teachers contribute diverse perspectives to the classroom [25].

A notable finding is that the majority of teachers (65%) reported having no formal training in organic agriculture, highlighting a critical gap in professional development. Only 35% of respondents have undergone training, which underscores the importance of capacity-building programs to equip teachers with the necessary skills and knowledge to effectively teach organic agriculture in schools. This aligns with the findings of [26], who emphasized that formal training significantly enhances teachers' competence in delivering specialized agricultural content. Without sufficient training, teachers may face challenges in adopting updated practices, which can limit their effectiveness in promoting sustainable farming concepts to students.

The results imply that while teachers demonstrate a strong foundation in terms of age diversity, gender balance, and educational attainment, the lack of formal training in organic agriculture is a pressing concern. This gap suggests that capacity-building initiatives such as seminars, workshops, and in-service training should be prioritized to ensure teachers are well-equipped with both theoretical and practical competencies. Furthermore, encouraging higher studies in agricultural education could strengthen expertise and promote research-based teaching practices. Ultimately, addressing these gaps will enhance the integration of organic agriculture into the curriculum, fostering sustainability awareness among students.

Teachers' Knowledge of Organic Agriculture Practices

Table 2 presents the level of teachers' knowledge of various organic agriculture practices, including composting, crop rotation, biological pest control, certification processes, and post-harvest handling. Assessing teachers' knowledge is essential, as it directly influences how effectively they can transfer concepts and practices to students in the classroom and school-based projects. A clear understanding of these practices enables teachers to promote sustainable farming approaches, address misconceptions, and integrate organic agriculture into the curriculum in a more meaningful way. This knowledge assessment provides insight into the areas where teachers are proficient and where professional development interventions are most needed.

Table 2. Teachers' Knowledge of Organic Agriculture Practices

Indicators	Mean	Interpretation
Composting and use of organic fertilizers	3.45	Excellent Knowledge
Crop rotation and diversification	3.30	Very Good Knowledge
Biological pest control	3.15	Very Good Knowledge
Organic certification processes	2.60	Moderate Knowledge
Post-harvest handling in organic farming	2.85	Moderate Knowledge
Overall Mean	**3.07**	**Moderate Knowledge**

Legend (Knowledge Scale): 1.00 – 1.74 = No Knowledge, 1.75 – 2.49 = Basic Knowledge, 2.50 – 3.24 = Moderate Knowledge, 3.25 – 3.49 = Very Good Knowledge, 3.50 – 4.00 = Excellent Knowledge

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The overall very good knowledge (M=3.07) suggests strong grounding in foundational practices—particularly composting (M=3.45) and crop diversification (M=3.30). These results mirror the emphasis of school-based and community initiatives that foreground low-cost, visible techniques such as composting and rotations (Martinez, 2020; Andres & Tan, 2019). Solid familiarity with biological pest control (M=3.15) aligns with local accounts of practice-oriented pedagogies improving teacher competence (Ramirez, 2017; Olivares, 2017). By contrast, organic certification (M=2.60) and post-harvest handling (M=2.85) emerge as weaker points. This gap is consistent with studies noting teachers' perceived technical complexity and limited exposure to certification standards and compliance workflows [27]. Given the Philippines' policy context under RA 10068 and subsequent promotion efforts, certification literacy is crucial for linking classroom learning to real market pathways [28]. Internationally, literature underscores certification and supply-chain literacy as pivotal to scaling organic systems beyond field-level practices [29].

The findings suggest the need for targeted upskilling of teachers through short courses and micro-credential programs focusing on certification standards and post-harvest processes to complement their strong foundation in field practices [30]. Strengthening teacher capacity in these technical areas will ensure more comprehensive delivery of organic agriculture education. Moreover, there is a need for policy–practice alignment by integrating the requirements of Republic Act 10068 and incorporating local certification case studies into classroom modules. This approach can help bridge the gap between curriculum content and real-world applications, preparing students for actual market access and industry expectations [31].

Finally, the study highlights the importance of applied learning through partnerships with certified organic farms and producer organizations. Teacher practicums on inspection preparation, documentation, and quality assurance can provide valuable hands-on experiences, enhancing both competence and confidence in teaching organic agriculture concepts. Experiential models, as shown in prior studies, are highly effective in improving teacher knowledge and application [32].

Teachers' Attitudes Toward Organic Agriculture Practices

Table 3 highlights the attitudes of teachers toward organic agriculture practices, reflecting their perceptions, beliefs, and willingness to integrate these concepts into their teaching. Attitudes play a crucial role in shaping how teachers approach and deliver agricultural content, as positive perceptions can encourage greater adoption and advocacy of sustainable practices in the classroom. Understanding these attitudes helps determine the extent to which teachers are motivated to promote organic farming and identify potential barriers, such as the perception of labor intensity, that may influence their engagement.

Table 3. Teachers' Attitudes Toward Organic Agriculture Practices

Indicators	Mean	Interpretation
Belief in organic farming as sustainable	3.60	Strongly Positive
Willingness to integrate organic concepts in class	3.45	Positive
Perceived relevance of organic farming to students	3.50	Strongly Positive
View of organic farming as labor-intensive	2.75	Neutral
Confidence in promoting organic agriculture	3.25	Positive
Overall Mean	**3.31**	**Strongly Positive Attitude**

Legend (Attitude Scale): 1.00 – 1.74 = Strongly Disagree, 1.75 – 2.49 = Disagree, 2.50 – 3.24 = Agree / Positive, 3.25 – 4.00 = Strongly Agree / Strongly Positive

The positive overall attitude (M=3.31) is largely anchored by strong agreement that organic agriculture is both sustainable (M=3.60) and relevant for students (M=3.50). This finding resonates with studies highlighting

teachers' values and beliefs as key drivers of sustainability pedagogy [33] and aligns with international calls to embed sustainability and SDG-linked themes into secondary education [34]. The robust willingness to integrate organic agriculture into teaching (M=3.45) and teachers' confidence in doing so (M=3.25) also echo prior findings that motivation, coupled with supportive contexts, catalyzes classroom adoption [35].

However, the neutral stance on labor-intensiveness (M=2.75) highlights a practical concern. Teachers' perception that organic agriculture is more labor- and time-intensive may act as a barrier to implementation, especially in contexts where schedules and resources are already constrained. This challenge has been noted in local studies pointing to curricular rigidity, limited facilities, and teacher workload as barriers to integration [36]. International literature similarly stresses that without structural supports such as teaching materials, dedicated time, and partnerships with local stakeholders, positive attitudes alone may not consistently translate into practice [37].

These findings suggest the need to lower the "labor barrier" by providing ready-to-use lesson packs, assessment rubrics, and garden management templates to ease teacher preparation [38]. Equally important are institutional supports, such as allocating dedicated periods for garden activities, providing minimal toolkits, and embedding organic agriculture themes into existing learning competencies to ensure curricular fit [39].

Teachers' confidence must be translated into mastery through mentored implementation cycles, including lesson study, learning action cells (LACs), and peer coaching, all of which have been shown to enhance delivery quality and persistence [40]. Finally, maintaining relevance to careers and markets by linking lessons to local value chains and certification pathways can sustain both teacher and student motivation, ensuring that organic agriculture education remains practical and future-oriented [41].

Extent of Teachers' Adoption of Organic Agriculture Practices

The extent of teachers' adoption of organic agriculture practices provides valuable insight into how effectively sustainable farming principles are being implemented in secondary schools. Adoption is reflected not only in classroom instruction but also in practical applications such as school gardening, field demonstrations, and collaborations with local farmers. Understanding these practices highlights the balance between theoretical integration and hands-on activities that reinforce student learning.

Table 4 presents the level of adoption of various organic agriculture practices among teachers, indicating how frequently these approaches are utilized in their teaching and school activities.

Table 4. Extent of Teachers' Adoption of Organic Agriculture Practices

Practices	Mean	Interpretation
Use of organic fertilizers in school gardens	3.20	Often
Integration of organic concepts in lessons	3.05	Often
Conducting field demonstrations	2.85	Sometimes
Collaboration with local organic farmers	2.65	Sometimes
Organizing student projects on organic farming	3.00	Often
Overall Mean	**2.95**	**Sometimes**

Legend (Adoption Scale): 1.00 – 1.74 = Never, 1.75 – 2.49 = Seldom, 2.50 – 3.24 = Sometimes, 3.25 – 4.00 = Often / Always

The results indicate a moderate extent of adoption (M=2.95), suggesting that while teachers are making efforts to integrate organic agriculture, practices are not yet fully institutionalized. Teachers often reported the use of

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organic fertilizers in school gardens (M=3.20) and the integration of organic concepts in lessons (M=3.05), reflecting a willingness to incorporate sustainable practices within both curricular and extracurricular contexts. These findings align with studies highlighting the role of school gardens and curriculum integration as practical entry points for sustainability education [42].

However, adoption is less evident in terms of collaboration with local farmers (M=2.65) and conducting field demonstrations (M=2.85). This gap underscores the challenge of building community linkages, a factor consistently emphasized in literature as critical to authentic and experiential learning [43]. Without strong external partnerships and accessible venues for demonstration, teachers may struggle to provide students with real-world agricultural experiences. International perspectives similarly highlight that partnerships with local producers and institutions are vital for bridging classroom instruction with practical, hands-on applications [44].

The findings suggest that while teachers are taking meaningful steps to adopt organic practices, there is room to strengthen community engagement and experiential learning. Schools can lower barriers by creating formal partnerships with local organic farmers and agricultural organizations, thereby enriching classroom instruction with authentic demonstrations and projects. Moreover, institutional support such as providing school-based mini-farms, allocating time for fieldwork, and including organic agriculture in performance standards may further encourage consistent practice [45]. Empowering teachers through mentoring and training cycles can also help sustain the integration of organic agriculture practices, moving from “sometimes” toward “always” in adoption.

Challenges Encountered by Teachers in Promoting Organic Agriculture

Identifying the challenges faced by teachers in promoting organic agriculture is crucial in understanding the barriers that hinder its full integration into secondary education. These challenges range from the lack of instructional resources and limited training opportunities to constraints in school facilities and time brought about by a rigid curriculum. Such difficulties not only affect teachers’ capacity to effectively deliver organic agriculture concepts but also limit students’ opportunities for experiential learning.

Table 5 summarizes the major challenges encountered by teachers, highlighting the areas that require greater support and intervention to strengthen the implementation of organic agriculture in schools.

Table 5. Challenges Encountered by Teachers in Promoting Organic Agriculture

Challenges	**Mean**	**Interpretation**
Lack of instructional materials	3.40	High Challenge
Limited training opportunities	3.55	High Challenge
Insufficient school resources (gardens, tools)	3.20	Moderate Challenge
Technical complexity of organic practices	3.05	Moderate Challenge
Limited time due to rigid curriculum	3.25	Moderate Challenge
Overall Mean	**3.29**	**Moderate to High Challenge**

Legend: 3.50–4.00 = Very High Challenge; 2.50–3.49 = Moderate to High Challenge; 1.50–2.49 = Low to Moderate Challenge; 1.00–1.49 = Very Low Challenge

The findings reveal that teachers encounter moderate to high levels of challenges (M=3.29) in promoting organic agriculture. The most pressing concerns are limited training opportunities (M=3.55) and lack of instructional materials (M=3.40). This aligns with Flores et al. (2020), who emphasized that the absence of adequate professional development restricts teachers’ capacity to adopt innovative practices in agriculture. Similarly, [46]

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found that instructional material shortages are a persistent barrier to agricultural education, making classroom delivery less effective.

Countermeasures Adopted by Teachers

To address the challenges encountered in promoting organic agriculture, teachers employed various countermeasures that reflect both individual initiative and collective effort. These strategies include collaboration with colleagues, reliance on online materials, reflective teaching, and the integration of school gardening activities to reinforce practical application. Participation in external training programs was also pursued, though less frequently, indicating reliance on accessible and school-based approaches.

Table 6 presents the countermeasures adopted by teachers, showing how they strive to overcome barriers and sustain the promotion of organic agriculture despite limited resources and opportunities.

Table 6. Countermeasures Adopted by Teachers

Countermeasures	Mean	Interpretation
Peer collaboration and sharing of resources	3.15	Often
Use of online resources for organic concepts	2.90	Sometimes
Reflective teaching practices	3.05	Often
Integration of school gardening projects	3.20	Often
Participation in external training programs	2.75	Sometimes
Overall Mean	**3.01**	**Sometimes to Often**

Legend: 3.50–4.00 = Always; 2.50–3.49 = Sometimes to Often; 1.50–2.49 = Seldom; 1.00–1.49 = Never

Moderate challenges such as insufficient school resources (M=3.20) and rigid curriculum constraints (M=3.25) further underscore the structural limitations faced by teachers. As [47] highlights, effective organic agriculture education requires not only teacher competence but also institutional support in terms of facilities, time, and resources.

Schools should prioritize provision of localized instructional materials, allocate dedicated spaces for school gardens, and lobby for curriculum flexibility to better integrate sustainable agriculture into teaching. Equally important is the establishment of regular training programs for teachers to address gaps in both knowledge and practice.

Teachers generally adopt peer collaboration (M=3.15) and school gardening projects (M=3.20) as practical countermeasures. These results echo [48], who highlighted the role of collaboration and school-based projects in fostering contextualized agricultural learning. Reflective practices (M=3.05) also show teachers' commitment to continuously improving their teaching approaches.

However, reliance on external training (M=2.75) and digital tools (M=2.90) is less frequent. This gap points to barriers in professional development access and digital literacy, consistent with the findings of [49], who emphasized that teachers often lack exposure to ICT-enabled agricultural resources.

Schools should strengthen professional learning communities among teachers, promote digital skills training, and enhance partnerships with government and private organizations for continuous agricultural education.

Training Needs of Teachers on Organic Agriculture

Table 7 presents the identified training needs of teachers in the promotion of organic agriculture, focusing on

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both technical expertise and pedagogical competencies necessary for effective integration in teaching and practice.

Table 7. Training Needs of Teachers on Organic Agriculture

Training Area	Mean	Interpretation
Advanced organic farming techniques	3.60	Very High Need
Organic certification and standards	3.55	Very High Need
Development of instructional materials	3.40	High Need
Digital literacy for online teaching resources	3.25	High Need
Classroom integration strategies	3.35	High Need
Overall Mean	**3.43**	**High Need**

Legend: 3.50–4.00 = Very High Need; 2.50–3.49 = High Need; 1.50–2.49 = Moderate Need; 1.00–1.49 = Low Need

Teachers indicated high to very high training needs (M=3.43), especially in advanced organic farming techniques (M=3.60) and certification standards (M=3.55). This is consistent with [50], who stressed that teachers require deeper technical knowledge to effectively model and teach sustainable practices. Similarly, [51] emphasized the need for professional training on organic certification, which ensures alignment with national and international standards.

Additionally, there is a clear demand for instructional material development (M=3.40) and digital literacy (M=3.25). As noted by [52], 21st-century agricultural education must integrate ICT and innovative teaching resources to enhance student engagement and learning outcomes.

Training programs should be comprehensive and multi-dimensional, covering technical expertise, pedagogy, curriculum integration, and ICT skills. Strong partnerships with agricultural agencies, certification bodies, and higher education institutions are vital in sustaining teacher capacity-building initiatives.

CONCLUSION

The study revealed that secondary school Agricultural Science teachers demonstrate very good knowledge of foundational organic agriculture practices, particularly in composting and crop diversification, but show limited competence in certification and post-harvest processes. This knowledge gap mirrors the findings of [53] and [54], who noted teachers' limited exposure to technically complex processes, despite policy mandates under RA 10068. Teachers' positive attitudes toward organic agriculture—anchored in its sustainability and relevance—are consistent with [55] and [56], who emphasized the role of teacher beliefs in advancing sustainability education. However, perceptions of labor-intensiveness indicate a barrier, echoing [57] and [58] who stressed the importance of structural and institutional support to translate attitudes into consistent practice.

In terms of adoption, results show a moderate extent of practice, with teachers often using organic fertilizers and integrating concepts into lessons but engaging less in collaboration with local farmers and field demonstrations. This finding reflects international literature [59] that underscores the critical role of community linkages and experiential learning in strengthening agricultural education.

Teachers also face moderate to high challenges, particularly a lack of training and instructional materials, which aligns with [60] and [61], who highlighted systemic resource and competency gaps in agricultural education. Despite these challenges, teachers adopt adaptive strategies such as collaboration, reflective practice, and school gardening projects, in line with [62]. However, limited reliance on digital tools suggests the need for greater emphasis on digital literacy, consistent with [63].

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Finally, the expressed high to very high training needs in advanced organic farming techniques, certification standards, and instructional material development highlight the urgency of structured and comprehensive capacity-building initiatives. These results reinforce [64] and [65], who stressed the need for technical and pedagogical development to align agricultural education with national and global sustainability goals.

Overall, the findings demonstrate that while teachers possess strong foundational knowledge and positive attitudes toward organic agriculture, structural challenges, resource gaps, and training limitations constrain full adoption. Addressing these gaps through targeted professional development, institutional support, and community partnerships is essential for advancing sustainable agricultural education.

RECOMMENDATIONS

To address the challenges and needs identified in this study, several recommendations are proposed.

First, professional development and capacity-building efforts should include structured in-service training programs focusing on advanced organic agriculture techniques, certification processes, and post-harvest handling. Short courses and micro-credentials aligned with Republic Act 10068 (Organic Agriculture Act of 2010) may also be introduced to ensure curriculum relevance and policy compliance.

Second, instructional and institutional support should be strengthened by providing teachers with ready-to-use lesson packs, garden management templates, and localized instructional materials that reduce workload and enhance implementation. Schools should allocate dedicated gardening periods, provide basic toolkits, and establish school-based mini-farms to integrate organic agriculture more effectively into the curriculum.

Third, community and industry linkages must be developed by establishing partnerships with certified organic farms, producer organizations, and local government agencies to facilitate experiential learning through field demonstrations, practicum, and mentorship. Linking classroom instruction with local value chains and certification pathways will also sustain student motivation and ensure real-world applicability.

Fourth, digital integration and innovation should be promoted by enhancing teachers' digital literacy to expand access to ICT-based resources on organic agriculture. The use of online learning platforms should also be encouraged to support reflective practice, peer sharing, and collaboration among teachers.

Finally, future research should address the study's limitations, particularly its small sample size (n=20) and narrow geographic scope, which restrict generalizability. Future studies may explore larger and more diverse populations across regions, adopt longitudinal approaches to track changes in teacher knowledge, attitudes, and practices, and investigate how institutional support, community partnerships, and ICT integration influence the sustainability of organic agriculture education.

ACKNOWLEDGMENT

The researchers sincerely extend their heartfelt gratitude to those who contributed to the successful completion of this study. They are especially thankful to the following individuals and institutions whose unwavering support and encouragement were instrumental throughout the research process: First and foremost, the researchers are profoundly grateful to Dr. Alberto N. Naperi, University President of the Central Bicol State University of Agriculture (CBSUA), and Dr. Ramona Isabel S. Ramirez, Vice President for Research and Innovation, for their unwavering commitment to academic excellence and their steadfast support of research initiatives. Heartfelt thanks are also extended to Dr. Ernesto D. Doloso, Jr., Campus Administrator of CBSUA–Calabanga Campus, for his guidance, encouragement, and inspiring leadership, which greatly motivated the researchers to pursue and accomplish this study. The researchers also wish to acknowledge Mr. Richard G. Castor, Dean of the College of Arts and Sciences, for his invaluable support, insightful advice, and dedication, which served as a strong foundation for the successful execution of this research. Special thanks are due to the administration and faculty members of the College of Arts and Sciences, CBSUA–Calabanga, for their cooperation, active participation, and moral support, which significantly contributed to the data collection process and overall success of the study. Sincere appreciation is extended to the secondary Agricultural Science

teachers of Calabanga, both from public and private schools, who generously shared their time, insights, and experiences. Their contributions added depth and relevance to this research, grounding it in the lived realities of the teaching profession. The researchers also express their heartfelt gratitude to their families, whose unconditional love, patience, and enduring encouragement provided the emotional strength and inspiration necessary to complete this academic journey. Above all, the researchers thank the Almighty God for the gift of life, good health, wisdom, and the perseverance that sustained them throughout the challenges and milestones of this study. May He continue to bless and guide the researchers and their loved ones with strength, courage, and resilience in all their future endeavors.

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