

## Developing Accounting Knowledge in a Sustainable Local Agribusiness: Akuafarm in Kundasang, Sabah, Malaysia



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**ABSTRACT:** This paper explores the integration of accounting knowledge in the innovative context of aquaponics agribusiness, focusing on Akuafarm in Kundasang, Sabah, Malaysia. Aquaponics, a sustainable farming system that combines aquaculture and hydroponics, offers resource efficiency and environmental benefits by creating a closed-loop ecosystem where fish and plants support each other. Despite its potential, Akuafarm faces challenges in financial management, including inadequate cost tracking and unstructured accounting practices, which hinder its long-term sustainability. A community service programme facilitated by Universitas Pakuan and Universiti Malaysia Sabah was conducted to address these issues. Held at Akuafarm's premises, the programme emphasised on aligning accounting practices with the demands of aquaponics operations. Key focus areas included distinguishing fixed and variable costs, such as fish feed and equipment maintenance, and implementing a systematic method for recording income and expenses. Revenue streams, including vegetable sales and agritourism, were categorised to improve financial monitoring, while operational costs such as water use and system maintenance were tracked for better resource allocation.

**KEYWORDS:** Accounting Knowledge; Financial Recording; Financial Reporting; Sustainable Agribusiness; Aquaponics;

### I. INTRODUCTION

The agricultural sector in Malaysia, especially in rural areas, is undergoing a significant transformation as local businesses adopt innovative practices to increase productivity, foster environmental sustainability and promote economic growth (Ministry of Agriculture and Food Industry Malaysia, 2020). A notable example of this transformation is Akuafarm, a micro, small and medium enterprise (MSME) located in Kundasang, Sabah, Malaysia. Malaysian government standards classify MSMEs based on their revenue and number of employees, with micro-enterprises defined as those earning less than RM 300,000 per year and small enterprises as those with revenue between RM 300,000 and RM 3 million (SME Corp. Malaysia, 2021). With an estimated annual revenue of RM 120,000, Akuafarm falls under the micro enterprise category in Malaysia's sustainable agribusiness. This pioneering agribusiness uses Aquaponics as their main farming method.

Aquaponics is a forward-thinking, sustainable agribusiness model that combines fish farming (aquaculture) with soilless crop cultivation (hydroponics), creating an integrated and symbiotic production system (Bhanja et al., 2024). This approach enables fish and plants to grow in tandem within a closed-loop ecosystem, where each supports the health and productivity of the other. Fish waste, rich in nutrients, serves as a natural fertilizer for the plants, which, in turn, filter and clean the water, providing an optimal living environment for the fish (Bhanja et al., 2024). This interconnected system allows for efficient use of resources, particularly vital in regions with limited agricultural inputs. Central to the aquaponics system is the role of beneficial bacteria, which convert fish waste into nutrient forms readily absorbed by plants. This conversion process, often referred to as the nutrient cycle, is critical in sustaining the balance of nutrients necessary for both plant and fish health (Datta et al., 2018). By turning waste into a resource, aquaponics offers a sustainable alternative to conventional agriculture, minimizing waste while enhancing productivity.

Aquaponics has demonstrated notable economic and ecological potential, especially in areas with restricted land and water resources, presenting a scalable solution for sustainable food production (Joshi et al., 2022). Within this system, fish, plants, and bacteria are essential components, working together to form a cohesive ecosystem. While the primary outputs are fish and plants, managing the broader ecosystem is key to aquaponic success (Joshi et al., 2022). As a model for sustainable agribusiness, aquaponics exemplifies how resource-efficient, ecologically responsible systems can provide viable pathways for future food production, aligning with global sustainability goals and the demand for resilient agricultural practices. This innovative model offers many benefits: conserving water resources, reducing reliance on chemical fertilisers, and enabling sustainable crop production throughout the year (Aitwar & Ghurphale, 2023).

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In addition to its environmental benefits, Akuafarm which uses Aquaponics contributes to the socio-economic stability of their local community by creating local employment opportunities. This is particularly important for residents who may not have access to stable employment, thereby improving the quality of life and economic resilience in the region (Li et al., 2018). Moreover, aquaponics offers a sustainable way for cities and urban regions to adapt to growing food demands by cultivating fish and plants together in a self-sustaining ecosystem. (Suhl et al., 2016).

Furthermore, Aquaponics provides benefits beyond financial sustainability. Research shows that hydroponic vegetable cultivation within aquaponics systems can produce 40% higher yields than traditional hydroponic methods alone, particularly with crops such as lettuce, due to the nutrient-rich fish waste utilized in plant growth (Knaus et al., 2024). Aquaponics also addresses broader sustainable development goals (SDGs), particularly goals 1 and 2 (no poverty and zero hunger), by creating locally viable food production solutions that support economic stability and environmental sustainability (Zamnuri et al., 2024). The integrated approach minimizes the use of water and fertilizers, positioning Akuafarm as a model for resource-efficient, environmentally responsible agriculture.

The practice of Aquaponics by Akuafarm is in line with Malaysia's national goals of achieving food security and promoting sustainable agriculture, as outlined in the National Agrofood Policy 2.0 (Ministry of Agriculture and Food Industry Malaysia, 2021). NAP 2.0 aims to reduce Malaysia's dependence on imported food, increase local food production, and encourage environmentally-friendly agricultural practices. Akuafarm's aquaponics system, which integrates aquaculture and hydroponics, contributes to these goals by producing pesticide-free fish and vegetables in a resource-efficient closed-loop system. The symbiotic relationship between fish and plants minimizes water and soil use, reflecting NAP 2.0's goal of enhancing agricultural sustainability in response to resource constraints and climate change.

Akuafarm's location in Kundasang also offers several strategic advantages. The town lies along the main route between Kota Kinabalu and Sandakan, making it easily accessible to major markets and tourist traffic. Kundasang has critical infrastructure, including roads, electricity and communication networks, which support business operations. Being part of an established agricultural region allows for the sharing of farming-related knowledge and access to farm support services.

In Kundasang, the adoption of aquaponic systems is favourable due to several factors. The cool climate is beneficial for certain fish species and plant varieties that prefer lower temperatures, which helps to increase growth rates. The proximity to a natural water source from Mount Kinabalu ensures a consistent supply of clean water, which is important for maintaining water quality in aquaponics systems. Kundasang's status as a tourist destination opens up opportunities for agritourism, where visitors can visit the aquaponics facilities, learn about sustainable agriculture, and purchase fresh produce directly from the farm.

In addition to that, there is a growing demand for organic and sustainably produced food products in both rural and urban centers, including cities like Kota Kinabalu. This rising interest offers a ready market for aquaponic farming, making it a promising area for agribusinesses like Akuafarm. However, despite its market potential, Akuafarm faces significant challenges, such as intensive fish farming, such as in aquaculture, can demand up to 60% of costs for fish feed, making cost management essential (Abo-Taleb et al., 2021; Mabrouk et al., 2022; Goda et al., 2024) and also with ineffective financial accounting practices, a factor critical to the business's long-term sustainability. Limited financial literacy within the team may hinder Akuafarm's growth and contribute to operational inefficiencies, which is a common issue among rural agribusinesses (Abdul-Rahman et al., 2018).

Currently, Akuafarm's financial management falls primarily on a single permanent employee, who is responsible for maintaining financial records. The rest of the team consists of interns, who may lack the necessary experience and training in financial practices. Without a structured and knowledgeable financial team, Akuafarm faces difficulties in establishing accurate and reliable financial records, which is essential for tracking revenues, expenses, and cash flows. Inaccuracies in financial recording can lead to resource misallocation and preventing an effective budgeting, which are critical for Akuafarm's operational sustainability.

The lack of structured financial records is a major obstacle for Akuafarm, mirroring a trend among many community-led agribusinesses in Malaysia, where informal record-keeping practices are common. These practices often stem from a shortage of formal training in accounting and financial management among employees, which can lead to discrepancies in recorded transactions. (Ismail & Jorlah, 2019).

In addition to operational issues, Akuafarm's lack of structured financial record-keeping practices raises further complications regarding compliance with tax regulations. As a micro, small and medium enterprise (MSME), Akuafarm, although privately owned, is still subject to tax obligations and may be subject to periodic audits by the authorities. In Malaysia, MSMEs are required to keep accurate and transparent financial records to comply with tax policies outlined by the Internal Revenue Service (*Lembaga Pendapatan Dalam Negeri - LHDN*), which includes income tax reporting and Goods and Services Tax (GST) where applicable (Soh & Ahmad, 2017). However, inadequate financial documentation and limited accounting knowledge put Akuafarm at a disadvantage, potentially resulting in unreported income, missed deductible expenses, and difficulties in meeting audit requirements.

Non-compliance with tax regulations due to poor financial record keeping could expose Akuafarm to fines, interest on unpaid taxes, and the risk of a more intensive audit process, which is often costly and disruptive to business operations. Studies on MSMEs in Malaysia highlight that lack of compliance often stems from limited accounting skills and insufficient financial literacy, leading

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to errors in tax filings, underreported income and inefficient tax management (Sani et al., 2020). Therefore, MSMEs like Akuafarm, which struggle with financial competence, are at a higher risk of compliance issues, making it difficult for them to take advantage of tax incentives and deductions that could reduce their overall tax burden.

Based on the issues highlighted above, the community service initiative by Universitas Pakuan and Universiti Malaysia Sabah is mainly aimed to address Akuafarm's financial recording and reporting issues. The Malaysian and Indonesian governments mandate that universities support local MSMEs in improving financial literacy and operational sustainability, recognizing that these businesses are important contributors to the rural economy. Malaysia's National Policy on Higher Education and Indonesia's Community Service Guidelines emphasize that universities play a critical role in equipping MSMEs with the necessary skills to navigate taxation and financial reporting obligations, areas in which many rural businesses, such as Akuafarm, face significant gaps (Ministry of Higher Education Malaysia, 2018; Ministry of Education and Culture Indonesia, 2019).

### II. METHOD OF IMPLEMENTATION

The community service programme at Akuafarm was implemented through a one-day discussion facilitated by Universitas Pakuan and Universiti Malaysia Sabah held on 6th November 2024. The team for this international collaboration community service activity consists of lecturers and students from two universities, namely the Faculty of Economics and Business, Universitas Pakuan, and the Faculty of Business, Economics, and Accountancy, Universiti Malaysia Sabah. This approach is to address the gaps in Akuafarm's accounting knowledge by providing practical guidance for their aquaponics operations.

The programme begins with an initial questionnaire for Akuafarm team conducted directly at Akuafarm. Akuafarm financial team asked to describe how they currently track income and expenses, manage operational costs, and analyse financial performance. This hands-on exploration will allow to understand the Akuafarm's challenges, ensuring that the programme is directly relevant and practical. Then followed by discussing the fundamental accounting principles needed to resolve the identified gaps. Concepts such as distinguishing between fixed and variable costs, tracking operating expenses, etc will be explained accordingly, using examples specific to Akuafarm's operations, such as the costs of fish feed, water, and equipment maintenance.



Figure 1 Akuafarm's Aquaponics System

### III. RESULTS AND DISCUSSION

The programme at Akuafarm effectively addressed the gaps in the team's accounting knowledge, providing practical insights and specific context that could be applied directly to their daily operations. By holding the programme at Akuafarm's facilities, the team from Universiti Malaysia Sabah and Universitas Pakuan were able to immediately fully understand in the operational condition, ensuring that the discussions were aligned with Akuafarm's challenges and environment in regard to its accounting practices.

The discussion began with a detailed look at Akuafarm's current accounting practices, which allowed the teams from Universitas Pakuan and Universiti Malaysia Sabah to identify gaps in Akuafarm's understanding and application of accounting principles. Akuafarm financial team explained their difficulties in categorising income and expenses, and tracking operational costs. It was this that initiated further discussions that addressed these specific needs.

Then the discussion proceeds with an explanation of fixed versus variable costs and their implications in managing Akuafarm's financial operations. It highlighted that fish feed and water costs fluctuate based on production cycles and volumes, thus making them variable costs directly related to the amounts of fish and vegetables produced. On the other hand, equipment maintenance and aquaponic system maintenance, such as changing filters or maintaining pumps, are classified as fixed costs, as these costs are relatively stable regardless of production levels. This categorisation helped Akuafarm team understand how to distinguish between costs that change with the scale of operations and costs that are fixed.

To make these concepts more realistic, then it was provided practical examples. By explaining how increased fish feed costs due to higher production levels need to be offset by a corresponding increase in revenue to maintain profitability. Conversely, fixed



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costs, such as facility rentals or equipment depreciation, should be accounted for regardless of production output, emphasising the importance of covering these base costs through a consistent revenue stream. This demonstration allowed Akuafarm's team to see how accurate categorisation can help them better plan their resource allocation and pricing strategies.

In addition to that, the discussion expanded on methods to systematically record expenditures. Variable costs were identified as key costs that need to be recorded regularly. For instance, it was suggested that water usage can be recorded weekly, noting the volume consumed and the associated costs, while fish feed costs can be recorded after each purchase, with details on quantity and supplier.

The discussion then turned to a thorough discussion regarding methods for systematically tracking financial records. This process started with an explanation of how to methodically record revenue streams. It was suggested to Akuafarm's team that revenues from the sale of vegetables to the markets are categorised as an area where daily record-keeping would be beneficial. Each sale could be categorised by product type and date, with details such as the buyer's name and transaction amount included and income from agritourism, such as fees from garden tours or workshops, can be categorised separately, helping to distinguish between different sources of income. This categorisation will make it easier to assess which activities contribute the most to Akuafarm's overall income.

Thus, through these discussions, several practical insights and actionable recommendations were developed to address Akuafarm's accounting challenges. The programme successfully clarified the difference between fixed and variable costs, enabling the Akuafarm team to better categorise their expenses and understand how these affects the overall financial stability and by suggesting a clear categorisation of revenue streams-such as daily sales of vegetables and agritourism activities-the team now has the tools to monitor and analyse which revenue sources contribute most significantly to their overall income. Similarly, the emphasis on regularly recording variable costs and their breakdown ensures that operational costs are accurately recorded, allowing for better financial planning and resource allocation.



Figure 2 Discussion Activities

## CONCLUSIONS

The programme at Akuafarm successfully addressed a gap in accounting knowledge that is critical to ensuring sustainable financial accounting practices in the context of local agribusinesses. By focusing on improving the understanding and application of basic accounting principles, the initiative provided the Akuafarm team with the necessary tools to improve financial record-

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keeping, categorise costs effectively, and systematically track income and expenses. These skills are critical to developing a structured accounting framework that supports operational and strategic decision-making.

Key outcomes of the programme include a clear distinction between fixed and variable costs, which enables teams to better understand their financial obligations and optimise resource allocation. In addition, the introduction of a systematic method for recording income and expenses, with a focus on the categorisation of income from vegetable sales and agritourism, ensured more accurate financial tracking and analysis. These practices form the basis for creating reliable financial records, which are essential for monitoring performance and planning future growth.

By addressing the accounting issues directly at Akuafarm, the programme is aligned with the goal of encouraging sustainable agribusiness practices through improved financial literacy. These improvements position Akuafarm to effectively monitor its financial health, optimise the use of resources, and make strategic decisions that support long-term growth and profitability and by focusing on developing accounting knowledge, the programme highlights the importance of financial literacy as a foundation for sustainable agribusiness. Akuafarm's improved capacity to manage its finances not only addresses the challenges it currently faces but also sets an example for other small, medium and micro enterprises in the region. The lessons learnt and practices implemented through this initiative reinforce the critical role of accounting in driving sustainable growth, ensuring that Akuafarm remains a model for integrating financial precision with innovative agricultural practices.

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