

The Innovation of 3-in-1 'Bawing' Comprehensive Modules

Inovasi Modul Komprehensif Bawing 3-dalam-1

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ABSTRACT

The humanitarian crisis that has triggered boycott calls against several global brands, the declining involvement of youth, and the country's efforts to revitalise the agricultural sector are among the issues that drive this innovation idea. The 3-in-1 integrated module focused on the cultivation, innovation, and marketing of the local herb known as 'bawing'. Traditionally used to enhance the flavor and aroma of Sabah's ethnic cuisine, 'bawing' also holds untapped potential in the beauty, environmental, spiritual, health, and medicinal sectors. Despite its many benefits, its commercial value remains largely underrecognized by local communities. Developed under continuous research grants, the innovation is initiated to promote local herb, foster commercial agricultural culture and empower communities through the Knowledge-Attitude-Skills-Aspiration (KASA) framework. In this regard, this paper aims to examine the necessity of the cultivation, innovation, and marketing module development for 'bawing', as well as its significance and benefits to various parties. The modules are grounded in the *Cultivation, Innovation and Marketing Module Development Model (CIMM)*, synthesizing the ADDIE and Sidek Module Development (SMDM) models as well as a survey quantitative analysis. Empirical findings from the pilot test conducted among communities in Kota Belud, Sabah, East Malaysia, based on the KASA analysis indicate a significant need for the development of a targeted module related to 'bawing'. The post-KTP quantitative data also recorded positive effects, demonstrating that the programme and the module employed are effective and relevant for continued implementation. This multi-disciplinary, community-driven innovation supports local farmers, promotes indigenous herbs, and provides versatile materials for social transformation programs. The copyrighted and published modules offer scalable,



practical applications for both rural and urban contexts. They contribute significantly to the university's research excellence and serve the broader interests of stakeholders, including policymakers and government bodies. Aligned with the university's mission "leading towards innovative societies," the initiative supports national policies such as the *Sabah Maju Jaya* Development Plan (2021–2025), the Sustainable Development Goals (SDGs), and the Malaysia Madani framework.

Keywords: 3-in-1 'Bawing' Comprehensive Module Innovation; The Cultivation, Innovation and Marketing Module Development Model (CIMM); ADDIE; Sidek Module Development Model (SMDM); Knowledge-Attitude-Skill-Aspiration (KASA)

ABSTRAK

Krisis kemanusiaan yang menyebabkan isu boikot beberapa jenama dunia, penglibatan belia yang semakin merosot serta usaha negara untuk menggiatkan semula sektor pertanian adalah antara isu penggerak idea inovasi ini. Modul bersepadu 3-dalam-1 memfokuskan kepada penanaman, inovasi dan pemasaran herba tempatan yang dikenali sebagai bawing. Secara tradisional, bawing digunakan untuk menambah rasa dan aroma dalam masakan etnik di Sabah, namun herba ini juga mempunyai potensi besar dalam sektor kecantikan, persekitaran, kerohanian, kesihatan dan perubatan. Malangnya, nilai komersial bawing masih kurang disedari oleh masyarakat setempat. Dibangunkan melalui geran penyelidikan bersepadu, inovasi ini diinisiatifkan untuk mempromosikan herba tempatan, memupuk budaya pertanian komersial serta memperkasa komuniti melalui pendekatan Pengetahuan-Sikap-Kemahiran-Aspirasi (PSKA). Sehubungan itu, makalah ini bertujuan untuk mengkaji keperluan pembangunan modul penanaman, inovasi dan pemasaran 'bawing' serta keberkesanan dan manfaat modul berkenaan terhadap pelbagai pihak. Modul ini dibina berasaskan Model Pembangunan Modul Penanaman, Inovasi & Pemasaran (MPIP) 'bawing' yang menggabungkan Model Pembangunan Modul ADDIE dan Sidek serta analisis kuantitatif soal-selidik. Dapatan empirikal daripada ujian rintis berasaskan analisis KASA menunjukkan wujudnya keperluan signifikan untuk pembangunan modul khusus berhubung 'bawing'. Data kuantitatif pasca KTP turut mencatatkan kesan positif, membuktikan program dan modul yang digunakan berkesan serta relevan untuk diteruskan. Inovasi berasaskan komuniti dan rentas disiplin berkenaan menyokong petani tempatan, mempromosikan herba asli, serta menyediakan bahan yang boleh digunakan untuk program transformasi sosial. Modul yang telah diterbitkan dan berhak cipta ini mempunyai aplikasi yang praktikal serta boleh disesuaikan di kawasan luar bandar mahupun bandar. Ia turut menyumbang kepada pencapaian kecemerlangan penyelidikan dan memberi manfaat kepada pelbagai pihak berkepentingan termasuk pembuat dasar dan agensi kerajaan. Selaras dengan misi universiti "peneraju ke arah masyarakat berinovatif," inisiatif ini turut mendukung dasar nasional seperti Pelan Pembangunan Sabah Maju Jaya (2021–2025), Matlamat Pembangunan Mampan (SDG), dan konsep Malaysia Madani.

Kata kunci: Inovasi Modul Bersepadu 3-dalam-1; Model Pembangunan Modul Penanaman, Inovasi & Pemasaran (MPIP) Bawing; ADDIE; Model Pembangunan Modul Sidek; Pengetahuan-Sikap-Kemahiran-Aspirasi (PSKA)

INTRODUCTION

Module development has long been recognized as an effective pedagogical and instructional strategy that enhances teaching and learning across various disciplines, including agriculture. As a structured educational tool, it plays a pivotal role in strengthening learners' Knowledge, Attitudes, Skills, and Aspirations (KASA), thereby supporting both community capacity-building and learner empowerment. Within the agricultural sector, the development of modules particularly those focusing on product innovation has emerged as a strategic response to the persistent challenges of an aging farming population and diminishing interest in agriculture among younger generations. Global evidence indicates that the average age of farmers now ranges from the early 50s to 60s, underscoring the urgency of engaging youth in modern, commercial agricultural practices (Siti Fatimahwati Pehin et al., 2021). Encouraging youth participation is critical not only for ensuring national food security and sustaining the agricultural economy, but also for mitigating unemployment and strengthening long-term socio-economic stability. The Youth Empowerment and Organisation (Amendment) Bill 2019 further positions youth as key contributors to the nation's developmental trajectory, making the provision of agricultural and entrepreneurial education through structured modules both timely and essential.

Existing literature supports the transformative impact of module-based approaches on educational systems. A systematic review by Shaiful Hazmir and Irdayanti (2022) demonstrates that module-driven teaching significantly enhances the effectiveness of Technical and Vocational Education and Training (TVET), while also fostering innovation in teaching aids and learning materials. Their findings reflect an expanding recognition of module development as an important mechanism for advancing instructional quality and improving student outcomes.

To guide such development, numerous instructional design models have been developed to guide module creation, each offering unique perspectives, procedures, and advantages. Prominent models include the Sidek Module Development Model (SMDM) (Sidek, 2001; Sidek & Jamaluddin, 2005; Ahmad Razif et al., 2021), ADDIE (Imed Bouchrika, 2022; Amarumi & Arasinah, 2019), Dick and Carey (Zwawua Orfega, 2021), ASSURE (Patma Sopamena et al., 2022), Tazkiyat al-Nafs (Md Noor et al., 2016), Russell Model (Ros Eliana, 2014), as well as Design and Development Research Model (Parthiban et al., 2022), among others. Although differing in process and emphasis, these models share a collective aim: to produce high-quality, effective modules that enhance the teaching and learning experience.

Against this backdrop, the present study focuses on ‘bawing’ (*Ocimum basilicum* L.), a culturally significant herb from the Lamiaceae family. Known locally in Sabah as bawing, siwot, or limpodos and as *selasih* in Peninsular Malaysia, this herb holds diverse culinary, medicinal, spiritual, environmental, and commercial value. Indigenous communities such as the Bajau and Dusun have long used bawing as an aromatic ingredient, while scientific studies highlight health benefits including antibacterial, antioxidant, anti-inflammatory, anti-aging, antiseptic, and cardioprotective properties (Yuliani et al., 2022; Adithya Guntur et al., 2021). Additional research has explored its potential in managing stress, respiratory infections, COVID-19, cancer, digestive disorders, and skin conditions (Walton, 2021; Rahayu et al., 2017; Ramadanti et al., 2021). Beyond its biomedical and culinary applications, bawing is valued in the cosmetic industry, environmental landscaping, and spiritual traditions including Hinduism, Orthodox Christianity, and Islamic scholarship where it is attributed with symbolic, ritualistic, and healing qualities (Sheikh et al., 2015; Ahmad et al., 2019; Halina Sendera, 2025; Halina Sendera et al., 2024).

Despite its versatility and cultural relevance, bawing remains underutilized and insufficiently recognized among local communities. Limited knowledge dissemination has resulted in minimal commercial exploration, restricted innovation, and a lack of systematic cultivation practices. These gaps persist even as broader societal challenges including global boycott movements, declining agricultural engagement among youth, and national efforts to revitalize the agricultural sector highlight the need for initiatives that promote local resources and strengthen community resilience.

In response, this study undertakes the development of a comprehensive 3-in-1 module integrating ‘bawing’ cultivation, innovation, and marketing. This module aims to enhance community awareness, encourage youth participation in agricultural entrepreneurship, and support the commercialization of local herbs. By equipping learners and communities with structured knowledge and practical skills, this initiative contributes to national goals of empowering local industries, strengthening food security, and elevating the socioeconomic potential of rural communities in Sabah. Ultimately, the study seeks to position bawing as a strategic asset within Malaysia’s agricultural, cultural, and economic landscape.

In this regard, the objectives of this article are:

1. To examine the necessity for developing a cultivating, innovating, and marketable module for ‘bawing’.
2. To identify the significance and benefits arising from the module development.

METHODOLOGY: THE MODEL OF 3-IN-1 COMPREHENSIVE MODULES DEVELOPMENT

Research that connects module development with agricultural aspects remains relatively limited. A notable study by Amarumi and Arasinah (2019) demonstrated the application of the ADDIE development model in designing a green skills (GS) teaching module for primary education. Emphasizing the integration of green skills into technical and vocational education, their study aimed to instill environmental consciousness and ethical behavior among students. The ADDIE model comprising the stages of Analysis, Design, Development, Implementation, and Evaluation proved effective due to its systematic, learner-centered, and results-oriented approach.

Building upon the foundation established by Amarumi and Arasinah, the current study also employs the ADDIE model but integrates an additional framework: the Sidek Module Development Model (SMDM). This hybrid approach was adopted to guide the design of a comprehensive 3-in-1 module focusing on the cultivation, innovation, and marketing of 'bawing', a culturally and economically significant herb in Sabah, East Malaysia. Both ADDIE and SMDM models were selected for their compatibility with the research objective; to support future knowledge transfer programs (KTPs) targeting the transformation of Knowledge, Attitudes, Skills, and Aspirations (KASA) among participants.

Pilot Test & Post KTP Survey

Prior to the module development, a pilot test was administered among secondary students to ascertain and substantiate the need for a module centered on bawing cultivation, innovation, and marketing. This initiative is consistent with the ADDIE and SMDM frameworks. A total of 100 respondents, representing approximately 26% of Form 4 and Form 6 students (total = 385 students) from a secondary school in Kota Belud, Sabah participated in the study. The data collection process was carried out by distributing questionnaires to the students with the assistance of the school teachers. The students were gathered in the school hall and were given guidance on how to complete the questionnaire by the researcher. All students had an equal probability of being selected as respondents, and the 100 students chosen were selected randomly based on the availability of both teachers and students. The sampling was selected from upper secondary students only because the study focuses on the youth population. The school is the oldest school in Kota Belud and also one of the first five schools established in Sabah. The justification for selecting the research location aligns with the research focus on *bawing*, as well as other aspects such as sociocultural, geographical, and logistical factors. In this context, the majority of the district's population consists of the Bajau and Dusun ethnic groups, two ethnic communities in Sabah famously known for traditional dishes that use *bawing* to enhance aroma and taste. In addition, the district categorized as a

rural area fits the main aim of the study and innovation, which is to cultivate commercial agricultural culture among rural communities.

A structured questionnaire was administered to assess KASA dimensions among the participants. Each item was measured using a 5-point Likert Scale (1 = Strongly Disagree to 5 = Strongly Agree). Reliability tests revealed Cronbach's alpha values of: Knowledge (5 items) 0.90; Attitude (4 items) 0.80; Skill (4 items) 0.90; Aspiration (7 items) 0.80. These values exceed the 0.70 threshold recommended by Nunnally and Bernstein (1994), indicating high internal consistency. Response levels were categorized into high, medium, and low based on criteria adapted from Landell (as used by Atiqah Md Din & Ruslin Amir, 2016; Pei et al., 2018; Budi Anto Mohd Tamring, 2021; Budi Anto Mohd Tamring et al., 2023).

Apart from the pilot test, a brief survey was administered following the KTP implementation to evaluate the module's effectiveness. The survey comprised of five items which focused on the KASA dimensions and employed a 5-point Likert scale. The sampling for the post-KTP survey comprised of members from the Women Entrepreneurs Association (WEA), Small and Medium Enterprises (SME) in Kota Belud, Sabah. The KTP was implemented using one of the modules, namely the 'Bawing' Cultivation Module. A total of 23 WEA members participated in the KTP programme and responded to the survey.

The Cultivation, Innovation and Marketing Module Development Model (CIMM)

The modules were developed using a modified four-stage model adapted from ADDIE and SMDM, suitable for cultivating a commercial agricultural mindset among rural communities in Sabah:

1. Pre-Development: Goal setting and identification of KASA elements.
2. Development: Design and creation of module content integrating cognitive, affective, and psychomotor learning objectives.
3. Implementation: Delivery of modules using interactive and student-centered methods.
4. Post-Development: Evaluation of module effectiveness, assessment of KASA transformation, and planning for potential Malaysia Research Assessment (MyRA) and IPR (Intellectual Property Rights) contributions.

This dynamic and systematic process was tailored to support long-term knowledge transfer initiatives and sustainable agricultural innovation at the community level. *Figure 1* illustrates the conceptual framework of The Cultivation, Innovation and Marketing Module Development Model (CIMM) / *Model Pembangunan Modul Penanaman, Inovasi dan Pemasaran (MPIP)*, combining ADDIE and SMDM structures for the 'bawing' modules.

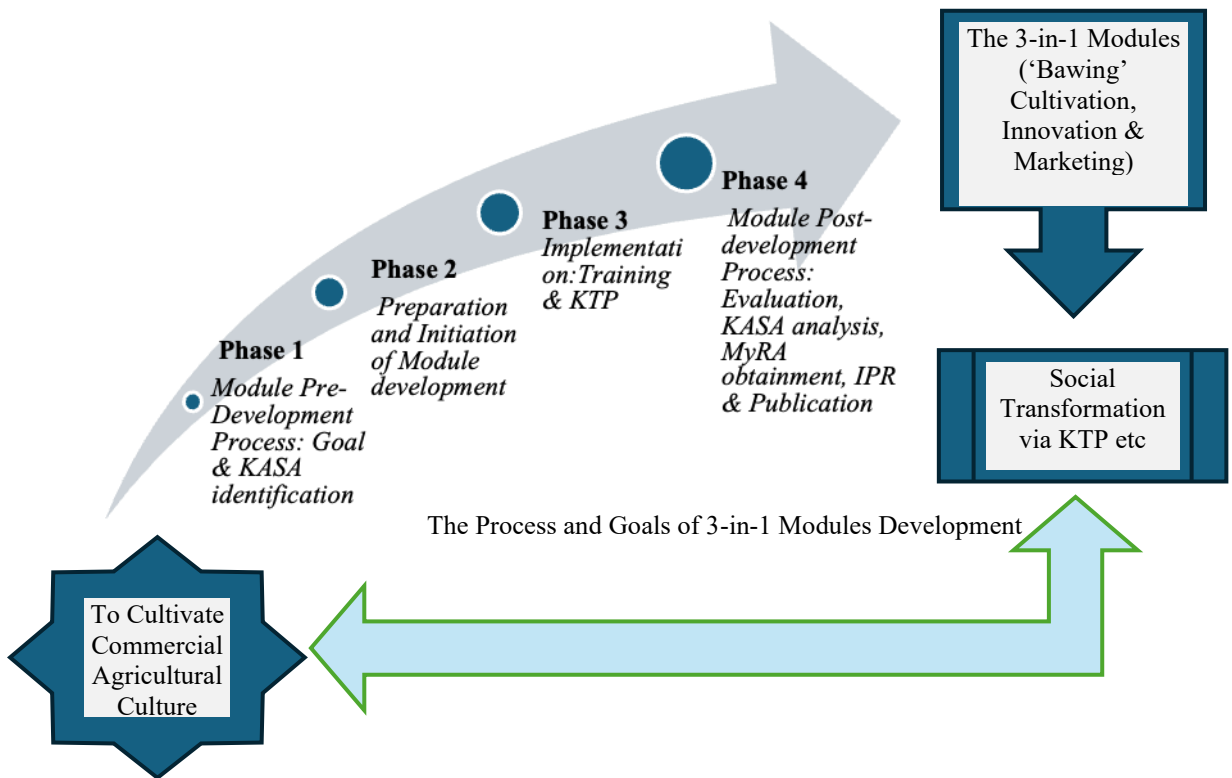


Figure 1: The Model of 3-in-1 'bawing' Comprehensive Modules Development

FINDINGS & DISCUSSION

The Necessity of Developing the 3-in-1 'Bawing' Comprehensive Module

Based on the pilot test, in the 'Knowledge' dimension, five items were developed as presented in Table 1. For Item 1, which concerns knowledge about the 'bawing' plant; Item 2, which concerns the cultivation of 'bawing'; Item 3, which concerns the uses of 'bawing'; Item 4, which concerns innovations related to 'bawing'; and Item 5, which concerns the marketing of 'bawing', the respondents demonstrated a moderate level. For the item related to the planting of 'bawing', more than half of the respondents (52%) selected STS (Strongly Disagree), indicating that they did not know how to cultivate 'bawing', and the score for this item was consequently low. In summary, the participants exhibited a moderate level of knowledge (mean score = 2.70) regarding the cultivation, innovation, and marketing of 'bawing'.

Pengetahuan	SDA	DA	LC	A	SA	Min
1. I recognize the bawing plant	17	22	19	22	20	3.06
2. I know how to plant bawing.	52	19	22	3	4	1.88
3. I have used products made from the bawing plant.	20	31	22	11	16	2.72
4. I know that bawing can be diversified in its uses and is not limited to food alone	25	14	26	24	11	2.82
5. I have seen bawing plants/products being sold in the market.	19	20	24	14	23	3.02
						2.70

Table 1: Knowledge Items on ‘bawing’ cultivation, innovation and marketing

Indicators: (1.00 – 2.33 = Low, 2.34 – 3.67 = moderate, 3.68 – 5.00 = High)

Source: Questionnaire Data

Sikap	SDA	DA	LC	A	SA	Min
1. I am interested in planting the bawing plant.	11	22	36	19	12	2.99
2. I am willing to learn the techniques of planting bawing.	4	18	32	25	21	3.41
3. I am interested in learning how to diversify (innovate) products related to bawing.	3	16	32	32	17	3.44
4. I am willing to learn how to market products related to the bawing plant.	12	15	34	26	13	3.13
						3.24

Table 2: Attitude Items towards ‘bawing’ Cultivation, Innovation and Marketing

Indicators: (1.00 – 2.33 = Low, 2.34 – 3.67 = moderate, 3.68 – 5.00 = High)

Source: Questionnaire Data

Kemahiran	SDA	DA	LC	A	SA	Min
1. I have the skills to grow bawing.	64	16	11	7	2	1.67
2. I have the skills to diversify the products from the bawing plant.	67	16	11	5	1	1.57
3. I have the skills to use bawing products in cooking/medicine/cosmetics.	42	19	19	16	4	2.21
4. I have the skills to market products from the bawing plant.	60	20	15	5	0	1.65

1.78

Table 3: Skills Items on 'bawing' cultivation, innovation and marketing

Indicators: (1.00 – 2.33 = Low, 2.34 – 3.67 = moderate, 3.68 – 5.00 = High)

Source: Questionnaire Data

Aspirasi	SDA	DA	LC	A	SA	Min
1. I have the desire to learn more in-depth about planting bawing.	3	21	39	21	16	3.26
2. I believe that planting bawing can generate income/profit.	0	6	22	30	42	4.08
3. I want to learn effective marketing methods for bawing.	7	17	31	23	22	3.36
4. I believe that bawing cultivation has the potential to grow to a higher level.	1	5	25	37	32	3.94
5. I hope that bawing cultivation can be developed through scientific and systematic technology.	0	2	15	42	41	4.22
6. I hope that bawing products can be diversified	0	0	16	35	49	4.33
7. I hope that bawing products can be commercialized.	0	1	19	31	49	4.28
						3.92

Table 4: Aspiration Items on 'bawing' cultivation, innovation and marketing

Indicators: (1.00 – 2.33 = Low, 2.34 – 3.67 = moderate, 3.68 – 5.00 = High)

Source: Questionnaire Data

The SPSS statistical analysis revealed the following findings: respondents demonstrated a moderate level of knowledge (mean = 2.70), a high level of aspiration (mean = 3.92), a positive attitude (mean = 3.24), and a low level of skill (mean = 1.78). These results highlight a clear gap between participants' enthusiasm and their practical abilities, indicating that while learners are motivated and receptive, they may lack the hands-on expertise required for effective implementation. Consequently, there is substantial potential for developing a bawing-based module that emphasizes practical skill development, innovative approaches, and marketing strategies. Such a module could bridge the gap between knowledge, aspiration, and competence, equipping participants with the tools and confidence to apply their learning effectively in real-world contexts.

This study successfully produced a set of 3-in-1 comprehensive modules focusing on the cultivation, innovation, and marketing of *bawing*, which were developed as part of an initiative to foster a commercial agricultural culture among local communities. These modules are both knowledge- and skill-based, constructed through a synergistic adaptation of the ADDIE Model and the SMDM. The

development process emphasized interdisciplinarity and collaboration, involving 13 co-researchers from Universiti Malaysia Sabah (UMS) with diverse areas of expertise including: Agriculture and plant sciences (biotechnology, taxonomy, agronomy, IoT in agriculture); Entrepreneurship and business (e-business, market research, consumer behavior, financial literacy, green practices); Communication and education (TESL, language studies, cultural studies, environmental education, ecotourism, parks and conservation)

The modules were created using Canva for Educators, a modern, user-friendly platform enabling both print (hardcopy) and digital (softcopy) formats. Designed with a semi-formal, semi-scientific, and practical approach, the modules integrate various multimedia elements and activity-based learning tools while preserving the integrity of the cognitive, affective, and psychomotor (CAP) learning domains.

Each module includes a sequence of assessments and interactive activities to be conducted before, during, and after the learning process. The module has been utilized in Knowledge Transfer Programmes (KTP) to promote community transformation through the enhancement of KASA (Knowledge, Attitudes, Skills, and Aspirations). The comprehensive 3-in-1 module has been officially published with Perpustakaan Negara Malaysia (PNM), copyrighted via the Intellectual Property Corporation of Malaysia (MyIPO) and evaluated to have reached Technology Readiness Level 9 (TRL9), indicating full system deployment and commercial potential. The TRL assessment was conducted under the Centre for Innovation and Commercialization Management (PPIP), UMS and is recognized by MyIPO.

The significance and impact of the module development

Based on a brief survey administered to 23 participants of the KTP, the evaluation of the 'bawing' cultivation module demonstrates highly positive outcomes across all KASA dimensions. The knowledge construct recorded a perfect score of 100% (Table 5), indicating comprehensive understanding and mastery of the content delivered. Meanwhile, the attitude, skills, and aspiration constructs each achieved an effectiveness level of 95.7% (Tables 6, 7, and 8), suggesting substantial shifts in participants' dispositions, competencies, and forward-looking motivations following their engagement with the module.

The post-programme reflections further reinforce these findings, with all respondents (Table 9) expressing a clear intention to participate in subsequent or expanded project initiatives. This unanimous interest highlights not only the immediate relevance of the programme but also its sustained influence in cultivating an innovation-oriented mindset among participants. Collectively, these outcomes signify the long-term potential of the KTP in strengthening community readiness for herbal-based entrepreneurship and in fostering a culture of continuous learning,

innovation and socio-economic empowerment through agricultural knowledge transfer and module development.

Sejauh manakah anda telah menimba ilmu pengetahuan melalui projek?
23 responses

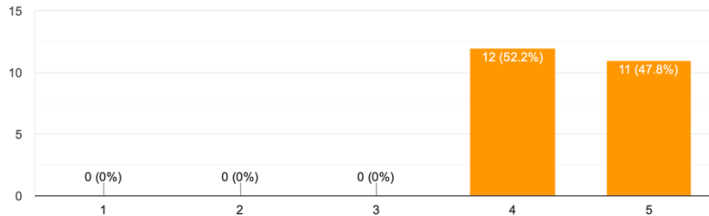


Table 5: Reflection of Knowledge
(To what extent have you gained knowledge through the project?)

Sejauh manakah ilmu yang disampaikan melalui projek ini memberi manfaat kepada anda?
23 responses

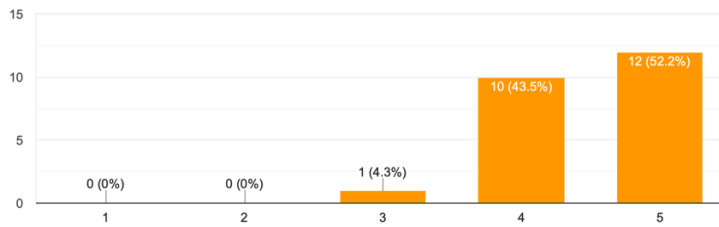


Table 6: Reflection of Attitude
(To what extent has the knowledge delivered through this project been beneficial to you?)

Sejauh manakah ilmu yang disampaikan melalui projek ini dapat memberi/menambah kemahiran anda?
23 responses

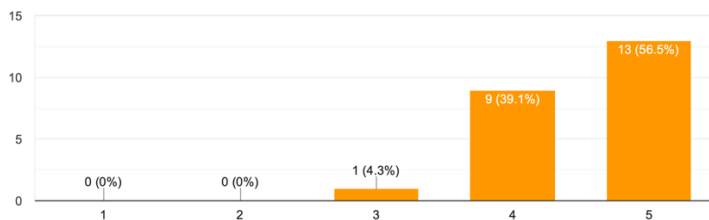


Table 7: Reflection of Skills
(To what extent has the knowledge delivered through this project enhanced or added to your skills?)

Sejauh manakah keinginan anda untuk meneruskan pelaksanaan ilmu yang berkaitan dengan projek ini?
23 responses

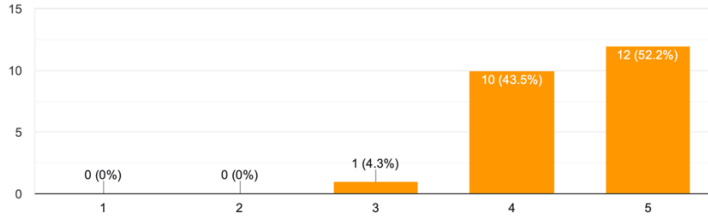


Table 8: Reflection of Aspiration
(To what extent do you wish to continue applying the knowledge related to this project?)

Sejauh manakah keinginan anda untuk mempertingkatkan ilmu pengetahuan berkenaan projek ini dengan menyertai projek lanjutan?
23 responses

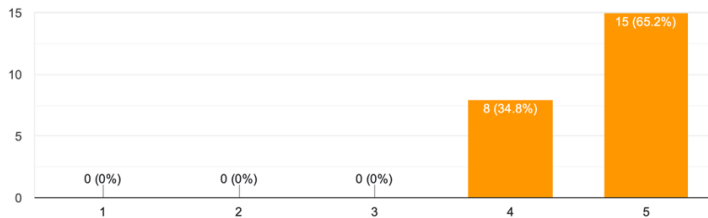


Table 9: Reflection of Aspirations on the Extended Project
(To what extent do you wish to enhance your knowledge about this project by participating in an advanced/follow-up project?)



Photo 1 & 2 : The KTP participants pictured alongside the module

The development and deployment of these multi-disciplinary, practical, and translational modules have demonstrated broad-reaching and multiplying impacts across several sectors:

I. Community Empowerment

The modules have proven highly effective in facilitating community-based programs such as KTP, Teaching and Learning (T&L), Training of Trainers (ToT), and community-led Research and Development (R&D) efforts. They encourage the production of bawing-based prototypes and commercial products, helping embed a culture of commercial agriculture and fostering transformation in KASA dimensions.

II. University Advancement

The module development initiative has reinforced the university's role as an agent of innovation and social engagement. It has facilitated academic collaboration, interdisciplinary research, and active partnerships with government agencies, industries, and local communities. Notably, it has contributed positively to MyRA (Malaysia Research Assessment) scoring, particularly in Sections B (Networking and Outreach), C (Research), E (Knowledge Transfer), F (Publication), and G (Innovation and Commercialization).

III. Economic Impact

This innovation aligns with three key economic thrusts in Malaysia (Agriculture, Tourism, and Industrialization) and supports the broader vision of the Madani Economy Framework, which emphasizes SCRIPT values (Sustainability, Courtesy, Respect, Innovation, Prosperity, and Trust). Through entrepreneurial activities and value-added herb-based product development, the modules promote rural economic development and agribusiness innovation.

IV. National Relevance

The modules provide strategic support for several national and regional development policies, including: Ministry of Education (MoE) in curricular enrichment and community education; Ministry of Domestic Trade and Costs of Living (KPDN) via local product development and market access; Ministry of Science, Technology, and Innovation (MOSTI/KSTI) through applied research and commercialization; Ministry of Agriculture and Food Security (MAFS) in supporting food sustainability and youth agro-involvement. Additionally, the modules contribute to key national agendas and frameworks such as New Industrial Master Plan 2030 (NIMP 2030); Sabah Maju Jaya Development Plan (2021–2025); Sustainable Development Goals (SDGs); Malaysia Madani Concept.

The 3-in-1 comprehensive modules on 'bawing' cultivation, innovation, and marketing serve as a transformative tool with academic, economic, social, and national significance. By bridging indigenous knowledge, scientific research, and

modern pedagogical strategies, the innovation fosters not only agricultural education but also community empowerment and socioeconomic development.

CONCLUSION

Empirical findings from the pilot test based on the KASA analysis indicated a clear need for the development of a specialised module related to the element of 'bawing'. The analysis confirms that participants' knowledge, attitudes, skills, and aspirations regarding the topic are not yet at an optimal level, thereby justifying the creation of a more systematic intervention module. In addition, post-KTP quantitative data showed positive effects on the programme and the module implemented. The increase in post-intervention scores suggested that the developed module was not only relevant but also functioned effectively in strengthening participants' KASA elements. Overall, these results reinforce the rationale for developing the 'bawing' module and support the implementation of a larger-scale programme in the future.

In terms of limitations, only one module had been tested for its effectiveness thus far due to constraints in time, manpower, and funding. It is hoped that all modules can be evaluated for their effectiveness in the future. Additionally, the respondents for the pilot test and the post-KTP survey were drawn from two different sampling groups, namely upper secondary students and members of an NGO association. The difficulty in engaging the same respondents stemmed from the extensive duration and multi-phase nature of the study and module development process. There were also challenges in securing access and arranging meetings with students, as applications must first be submitted to the Ministry of Education through the online EPRD system.

The development of the 3-in-1 *bawing* comprehensive modules designed using Canva and grounded in a hybrid of established models such as ADDIE and the SMDM represents a novel and interdisciplinary innovation. Created by a team of researchers from diverse epistemological backgrounds, these modules are uniquely tailored to foster a commercial agricultural culture among communities, especially in rural contexts. With a focus on the KASA domains (Knowledge, Attitude, Skills, and Aspirations), the modules have been successfully deployed in various community engagement programs, notably Knowledge Transfer Programmes (KTPs), contributing to tangible social transformation.

These copyrighted and nationally published modules demonstrated high practicality, commercial viability, and adaptability. Their relevance extends beyond rural and urban communities to encompass a broad range of stakeholders, including government agencies, policymakers, and industries linked to agriculture, tourism, and innovation. Most importantly, this initiative challenges prevailing stigmas and perceptions regarding the agricultural sector particularly the undervaluation of local

herbs such as *bawing* by showcasing its potential for economic return and sustainable development.

In light of the increasingly complex ecological challenges and volatile global economic landscape, such efforts are both timely and critical. By equipping communities with knowledge, entrepreneurial skills, and innovative agricultural tools, the modules serve as catalysts for transformation in productivity and socioeconomic resilience. Furthermore, they align with key national strategies such as the National Education Philosophy particularly the balance of JERIS (Jasmani, Emosi, Rohani, Intelek, Sosial) and support broader policy frameworks including the Malaysia MADANI Agenda, SDGs, and Sabah Maju Jaya Development Plan.

Looking ahead, future iterations of these modules could benefit from closer collaboration with industry players, non-governmental organizations (NGOs), and community representatives. Such partnerships would help integrate more grounded, practical elements into the modules, enhancing their applicability and impact. Additionally, further research is recommended to explore the barriers and challenges that hinder the adoption of commercial agricultural practices among rural populations. These insights will be valuable in refining the modules to ensure they remain responsive to community needs and sustainable in long-term implementation.

In summary, this multi-disciplinary, industry-engaged, and community-driven initiative exemplifies a meaningful and scalable model of translational innovation that not only enriches education but also strengthens Malaysia's agricultural, economic, and social development.

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