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Bridging Technology and Entrepreneurship: A Needs Analysis of Appropriate Technology Training for Farmers in Indonesia

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Abstract: This study presents a needs analysis for developing an entrepreneurship-based Appropriate Technology (AT) training model for farmers in Borisallo Village, Parangloe District, Gowa Regency, Indonesia. The study aims to identify farmers' entrepreneurial competencies, technology adoption readiness, and training requirements as the foundation for future training model development. A descriptive qualitative approach supported by quantitative data was employed involving 23 purposively selected farmers. Data were collected through observations, semi-structured interviews, and questionnaires, and analyzed using qualitative thematic analysis, descriptive statistics, and triangulation. The needs analysis revealed substantial gaps in entrepreneurial competencies, particularly in independence, work attitude, risk-taking, and problem-solving, alongside limited experience in using appropriate agricultural technologies. Most farmers had never participated in Appropriate Technology training and continued to rely on traditional farming practices. These findings indicate that farmers require an integrated training program combining technical competencies with entrepreneurship development. The study concludes that the results of this needs analysis provide an empirical foundation for designing an entrepreneurship-based Appropriate Technology training model that supports technology adoption, business development, and sustainable rural economic empowerment.

Keywords: Needs Analysis, Appropriate Technology, Entrepreneurship, Training Model

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INTRODUCTION

Community service at the Indonesian Muslim University (UMI) is a tangible contribution by the academic community, utilising science and technology to improve community welfare and educate the nation. This activity is not merely routine; it aims to deliver real solutions to the community's problems. The new paradigm of community service must be problem-solving, comprehensive, meaningful, thorough, and sustainable (Ministry of Higher Education and Culture, 2021). Therefore, universities are expected to contribute through the application of science and technology, the development of policy models, and research-based social engineering.

As times change, higher education institutions face more complex demands. They must not only produce knowledgeable graduates but also employ innovative teaching methods so that students develop the attitudes, knowledge, and skills needed for industry and society (Directorate General of Higher Education, 2020). The Merdeka Belajar Kampus Merdeka (MBKM) programme puts this policy into practice.

The implementation of MBKM (Merdeka Belajar-Kampus Merdeka) at UMI (Universitas Muslim Indonesia) is a concrete response to the demands of higher education. This programme encourages the creation of an autonomous, flexible, and innovative learning culture, enabling students to develop their potential in line with their interests and talents. There are eight forms of MBKM learning activities, namely: student exchanges, internships or work placements, teaching assistance, research, humanitarian projects, entrepreneurship, independent study, and thematic fieldwork lectures. One activity relevant to rural development is Village Development, or Thematic Fieldwork Lectures (KKNT, Kuliah Kerja Nyata Tematik), in which students work directly with the community to identify potential and formulate solutions.

UMI has run MBKM since 2019/2020. Since 1985, UMI has fostered 35 underdeveloped villages in Eastern Indonesia through the Education Zakat Programme and partnerships. Based on this, UMI started the Village Partner Development Programme (PPDM) to help communities prepare, design, and develop village potential (Yasa et al., 2021). PPDM has improved community welfare and created new economic growth centres, slowing urbanisation.

One concrete example of this community service is in Borisallo Village, Parangloe District, Gowa Regency**.** Through the Community Service Institute (LPkM), Universitas Muslim Indonesia (UMI) conducted outreach and training on the application of Appropriate Technology (Teknologi Tepat Guna, or TTG), meaning practical and locally adapted technology, in the form of gas-powered corn shelling machines. This activity involved lecturers from the Mechanical Engineering and Electrical Engineering Study Programs, with a focus on empowering farmer groups. This programme not only provides technology but also aims to strengthen entrepreneurship, micro, small, and medium enterprises (MSMEs), and the development of Village-Owned Enterprises (BUMDes, Badan Usaha Milik Desa) (Directorate General of Higher Education, 2020).

TTG is vital for crop processing, such as drying animal feed, which was once done traditionally. The training gives farmers technical and entrepreneurial skills. Entrepreneurship makes farmers more innovative, efficient, and able to add value to their products. It also creates jobs and improves rural welfare.

Borisallo Village covers 14.43 km^2. Most residents are farmers, traders, or labourers. Fertile land and a favourable climate allow the cultivation of rice, corn, sweet potatoes, and cassava, as well as the raising of cows, goats, chickens, and ducks. The village government supports productivity by providing high-quality seeds, fertilisers, and modern tools. However, residents face limited capital, poor access to technology, climate change, and restrictions in processing and marketing. These challenges show the need for entrepreneurship-based training to build independence and boost farmers' capacity (Harahap & Herman, 2018; Purnomo, 2022).

Entrepreneurship training builds confidence, a positive attitude, and sparks the intention to start a business (Soomro & Shah, 2022). Entrepreneurship education helps entrepreneurs carefully consider decisions and build resilience to overcome challenges (Nuraeni, 2022). Other studies show that entrepreneurial skills, such as innovation, creativity, commitment, and risk-taking, drive farmers' motivation (Burhanuddin et al., 2018). TTG training based on entrepreneurship builds independence, responsibility, risk-taking, skill, and creativity. Farmers need these values to grow knowledge, boost motivation, and strengthen their interest in creating businesses rooted in agriculture. An entrepreneurship-based TTG training model must fit the village's needs, socio-economic realities, and potential.

Although previous studies have highlighted the importance of entrepreneurship training and appropriate technology adoption in rural communities, most studies have examined these aspects separately. Limited research has explored how entrepreneurial competencies and technology adoption readiness interact within a single training framework for farmers. This study contributes theoretically by identifying the interrelationship between four entrepreneurial

dimensions—independence, work attitude, risk-taking, and cooperation—and farmers' readiness to adopt appropriate technology. The findings provide an empirical basis for developing an integrated entrepreneurship-based Appropriate Technology Training Model that combines technical competence development with entrepreneurial capacity building for sustainable rural development.

This study assumes that appropriate technology adoption alone is insufficient to improve farmers' welfare if it is not accompanied by entrepreneurial competencies. Technical skills enable farmers to operate and maintain agricultural technologies, while entrepreneurial competencies encourage opportunity recognition, innovation, risk-taking, and value-added production. The interaction between these two dimensions contributes to farmer empowerment by increasing productivity, strengthening local enterprises, and creating sustainable rural economic development. Consequently, entrepreneurship-based AT training should be viewed as an integrated empowerment strategy rather than as separate technical and business interventions.

Vocational Training

Vocational training is a systematic learning process designed to improve participants' knowledge, technical skills, work attitudes, and competencies required to perform specific tasks effectively (Sinambela, 2016; Kawiana, 2020). In agricultural communities, training not only enhances technical capabilities but also strengthens adaptive capacity and productivity by facilitating the adoption of new technologies. A fundamental stage in vocational training is needs assessment, which identifies performance gaps, target learners, and priority competencies before training is designed (Miller & Osinski, 2002). Therefore, conducting a needs analysis is essential to ensure that training content addresses actual problems experienced by participants rather than assumed needs. Training stages include: identifying needs, setting objectives, determining success criteria, choosing methods and try-outs, revising, implementing, and evaluating. Sudjana (2007:76) states that every training programme has certain stages to ensure effectiveness.

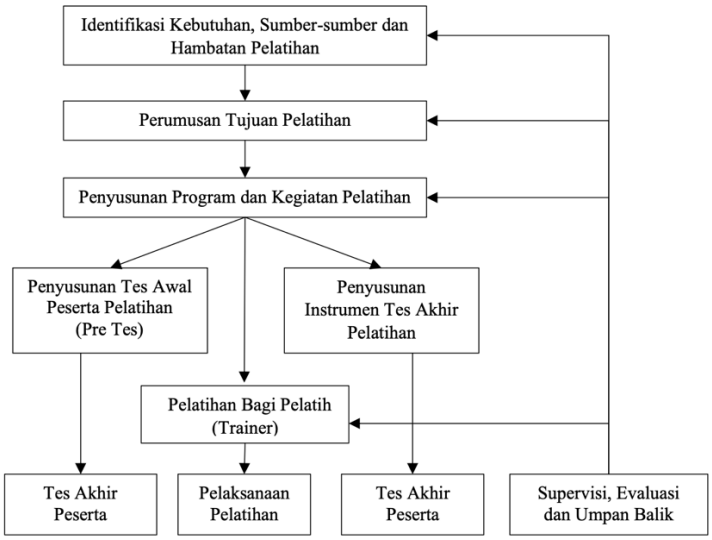

Figure 1. Training Stages
Source: Training Design Model (Sudjana, 2007)

Figure 1 explains that the training programme begins with needs identification and ends with supervision and evaluation. The evaluation is conducted on all components of the training, from the identification of needs, resources, and obstacles to the final test, which shows that training is a system with interrelated components. According to Miller & Osinski (2002:5-7), needs assessment is the process of gathering information about the organisation's needs, both explicit and implicit, that can be met through training. The main questions answered include: why training is necessary, who is involved, how performance deficiencies are corrected, what is the best way to implement it, and when the training takes place. The stages of needs assessment include: (1) gathering information through various types of analysis, (2) analysing and

interpreting information in a collaborative manner with stakeholders, and (3) developing a training plan based on the results of the analysis to address performance deficiencies. The method of developing this information is revealed through the following analysis:

Table 1. Needs Analysis

Type of Needs Analysis	What the Analysis Answers
Performance analysis or gap analysis	1. Is this problem a skills gap? 2. How can the deficiency be addressed? 3. Is training the appropriate way to address the deficiency?
Feasibility analysis	1. Why should this training be conducted? 2. Are the benefits of training greater than the current cost of the deficiency?
Needs versus wants analysis	1. Why should this training be conducted? 2. Are the deficiencies related to business needs?
Goal analysis	What specific behavioural improvements lie behind the vague desires?
Job/task analysis	1. What is the best and correct way to perform this task? 2. How can this job and task be broken down into teachable parts?
Target Population Analysis	1. Who is the target population for this training? 2. What is known about them to help design and tailor this training? 3. What might be useful for other populations from the training?
Contextual analysis	1. When will the training be delivered? 2. What other requirements are necessary to deliver the training successfully?

Source: Training Needs Assessment by Miller & Osinski (2002)

Based on the above definition, the job training model can be summarised as a conscious effort to facilitate learning for individuals or employees by utilising their experiences to develop skills and knowledge, thereby benefiting both themselves and the organisation. Kumar (2000:12) explains that although there are numerous models and theories of entrepreneurship, each attempts to identify and explain the impact of various attributes and personality traits on new businesses. They believe that behaviour is an important aspect in determining a person's entrepreneurial characteristics.

Learning in Training

Learning is a system that helps individuals learn and interact with learning resources and the environment (Winarto, 2016). Hunafi (2014) states that the learning process involves cognitive, affective, and psychomotor changes in students. Similarly, Holford (2003) states that learning is the process of acquiring knowledge, skills, attitudes, values, and emotions. Jusmawati et al. (2020) emphasise that learning is the interaction between learners and educators in a learning environment. According to behaviourist theory, learning is a change in behaviour due to stimulus-response. Thus, learning in training is an educational interaction that leads to positive behavioural and competency changes in participants.

Work Skills

Work skills are a series of cognitive and behavioural actions consistent with research-based knowledge, ethics, professionalism, core qualities, and social work objectives (Cournoyer, 2011). These skills are built through individual competencies, as defined by Mulyadi (2011) as knowledge, skills, and abilities that influence performance. In entrepreneurship, core competencies are creativity and innovation to create competitiveness. Busro (2018) views work skills as the ability of humans to meet business needs efficiently. Utomo (2019) emphasises that

work skills are the ability of individuals to optimally use work facilities in completing tasks through training and experience.

Entrepreneurship

Entrepreneurship is an integrated unity of spirit, values, principles, attitudes, and concrete actions that excel in developing businesses and providing the best services to customers and the community (Mulyadi, 2011). An entrepreneur is an individual who recognises opportunities, creates products, determines production methods, manages operations, markets, and manages capital (Prihadi, 2020; Iswanto, 2017). Hisrich et al. (2017) state that entrepreneurship involves introducing new goods, services, and methods to provide added value. Entrepreneurs must be able to manage capital, deal with uncertainty, and drive innovation (Firmansyah & Roosmawarni, 2019; Neck et al., 2018). Entrepreneurship is not just about creating a business, but also includes the courage to take risks, think creatively, and behave innovatively (Frederich et al., 2016; Mulyadi, 2011; Iswan, 2018). Added value is created through new technology, knowledge discovery, product improvement, or resource efficiency (Zimmerer, 1996). Entrepreneurial characteristics include the desire to achieve, responsibility, risk-taking, future orientation, skills, confidence, creativity, and self-leadership (Firmansyah & Roosmawarni, 2019; Hutagalung & Situmorang, 2008; Prihadi, 2020; Neck et al., 2018). Business opportunities arise from the entrepreneur's ability to turn challenges into opportunities by utilising their thoughts, insights, and imagination. Opportunities arise when competitors are less aggressive, technology is limited, market strategies are weak, and new companies can create products with certain advantages (Hutagalung & Situmorang, 2008). Thus, entrepreneurship is characterised by independence, hard work, courage to take risks, and the ability to create future opportunities.

Appropriate Technology

Appropriate Technology (AT) refers to technologies that are technically feasible, economically affordable, and compatible with local environmental and socio-cultural conditions (Hazeltine & Bull, 2003). In agriculture, AT enables farmers to increase productivity while reducing labour intensity and production costs. However, successful adoption depends not only on technology availability but also on farmers' entrepreneurial readiness.

Entrepreneurship Training Model

Entrepreneurship universally refers to the character, personality, and traits of individuals who are determined to create innovations in real business and develop them. Barringer & Ireland (2012) define entrepreneurship as the process of pursuing opportunities despite available resources. Firmansyah & Roosmawarni (2019) emphasise the courage to manage resources to generate added value. Creativity and innovation are the main foundations, as Levitt (1997) distinguishes between creativity (new thinking) and innovation (new actions). Sweasamidjaja (1980) and Suryana (2003) define entrepreneurship as the creative-innovative capacity to create something new, different, and of added value through the utilisation of resources in different ways. This added value is realised through technology, knowledge, or new production methods. In this research, entrepreneurship is also viewed as a driver of literacy and training, fostering motivation, creativity, risk-taking, courage, and future orientation. The development of an entrepreneurial mindset is important, especially for the younger generation, and its main strengths are honesty, responsibility, perseverance, and creative thinking.

METHOD

This study employed a descriptive qualitative approach supported by quantitative data to conduct a needs analysis for developing an entrepreneurship-based Appropriate Technology (AT) training model for farmers in Borisallo Village, Parangloe District, Gowa Regency, Indonesia. The primary objective of this study was to identify farmers' entrepreneurial competencies, technological readiness, and training requirements as the empirical basis for designing a future training model.

The participants consisted of 23 farmers selected through purposive sampling based on three criteria: (1) actively engaged in farming activities, (2) having at least five years of farming experience, and (3) willing to participate in the study. Data were collected using three

complementary techniques: observation, semi-structured interviews, and questionnaires. Observation was conducted to document participants' demographic characteristics, educational background, farming experience, and existing agricultural practices. Semi-structured interviews explored farmers' perceptions regarding independence, work attitude, willingness to take risks, cooperation, previous training experiences, and expectations toward appropriate technology training.

The questionnaire consisted of 28 statements representing four entrepreneurial dimensions: independence, work attitude, risk-taking, and cooperation. Responses were measured using a three-point Likert scale (1 = Not Appropriate, 2 = Less Appropriate, and 3 = Appropriate). The instrument was developed based on the entrepreneurship competency framework and training needs assessment literature. To ensure instrument quality, the interview guide and questionnaire were evaluated through expert judgment involving three experts in entrepreneurship education, vocational training, and agricultural extension. Their feedback was used to improve the clarity, relevance, and content validity of each instrument before data collection. Prior to data collection, all participants received an explanation regarding the objectives of the study, the voluntary nature of participation, confidentiality of responses, and their right to withdraw at any time. Written informed consent was obtained from every participant before interviews and questionnaire administration.

Qualitative interview data were analyzed using thematic analysis involving four stages: data familiarization, open coding, category development, and theme generation. The identified themes were then interpreted to determine farmers' competency gaps and training needs. Quantitative questionnaire data were analyzed descriptively using frequencies, percentages, means, and standard deviations to support and strengthen the qualitative findings. Finally, methodological triangulation was conducted by comparing findings from observations, interviews, and questionnaires to improve the credibility and trustworthiness of the results. The analytical focus of this study was not to evaluate a training program but to identify existing performance gaps, entrepreneurial limitations, and technological needs. Therefore, the findings of this needs analysis provide the empirical foundation for developing an entrepreneurship-based Appropriate Technology training model for farmers.

Research Results

Results of Farmer Background Observations

Observations of farmers' backgrounds were conducted to determine their basic educational qualifications as a basis for designing the requirements for an entrepreneurship-based appropriate technology training model. The results of the descriptive statistical analysis of farmers' backgrounds are shown in the following table.

Table 2. Farmers' Educational Background

Frequency			Percent	Valid Percent	Cumulative Percent
Valid	SD	11	47.8	47.8	47.8
	Junior High School	1	4.3	4.3	52.2
	High School	11	47.8	47.8	100.0
	Total	23	100.0	100.0	

Table 3. Farmers' Age Distribution

Frequency			Percent	Valid Percent	Cumulative Percent
Valid	20 - 30 years	3	13.0	13.0	13.0
	31–40 years old	5	21.7	21.7	34.8
	41–50 years old	4	17.4	17.4	52.2
	51–60 years old	6	26.1	26.1	78.3
	>61	5	21.7	21.7	100.0
	Total	23	100.0	100.0	

Table 4. Farmers' Farming Experience

Frequency			Percent	Valid Percent	Cumulative Percent
Valid	1 - 5 Years	3	13.0	13.0	13.0
	6 - 10 Years	4	17.4	17.4	30.4
	11–15 years	2	8.7	8.7	39.1
	16–20 years old	3	13.0	13.0	52.2
	21–25 years old	3	13.0	13.0	65.2
	26–30 years old	2	8.7	8.7	73.9
	>31	6	26.1	26.1	100.0
	Total	23	100.0	100.0	

Tables 2, 3 and 4 show that 47.8% have a high school diploma as their highest level of education. The average age of farmers is 51-60 years old and the longest work experience is over 31 years.

Farmer Interview Results

The purpose of these interviews was to obtain information directly from farmer informants regarding business opportunities in aspects including: independence, work ethic, risk-taking, and cooperation. Data collection for these four aspects was conducted qualitatively through semi-structured interviews with 23 farmer informants. The important data obtained from the interviews became material for the researchers to analyse the needs relevant to the research objectives. The data analysis process involved categorisation, reduction, and the drawing of conclusions from the interviews, which are recounted paragraph by paragraph below. The results of the interviews on independence showed that of the 23 farmers interviewed, 18 (78%) said they were unable to do any work independently or always asked others for help during the harvest. Only 5 (22%) stated they could do the work themselves. This was reinforced by twenty-two (97%) who said that they enjoyed discussing with others to establish cooperation. All farmers said they completed all assigned tasks, followed the rules, and learned something in their new jobs, even when the work was difficult.

In the interview on work attitude, of the 23 people interviewed, three (13%) did not pay much attention to applicable rules and regulations, lacked a strategy for solving work problems, and were unable to improve their own abilities in harvesting. However, all the reasons they gave for each statement were inconsistent with what they said. This suggests that almost all farmers have a poor work attitude. Some even said they could not commit to what had been agreed with other parties because farmers rarely communicated to reach agreements.

In interviews about risk-taking, 6 of 23 farmers (26%) said they enjoyed challenging work even though it was risky. In this case, they also said they could take the initiative to act rather than wait for something undesirable to happen. In contrast, 17 people (74%) said they did not enjoy challenging or risky work. The farmers said that they needed training so that they could take the initiative to act rather than wait for something undesirable to happen.

In the interview on cooperation, out of 23 farmers interviewed, two (8.7%) reported difficulties in demonstrating polite and respectful communication, while 21 farmers (91.3%) indicated positive interpersonal attitudes. In response to all of the above aspects, 20 out of 23 farmers (87%) said they had never attended training on how to shell corn, and Three farmers (13.0%) reported having participated in corn cultivation training. They said that corn shelling is still mostly done by hand by farmers. They actually need tools that can facilitate corn shelling. Most participants reported limited exposure to appropriate agricultural technologies and indicated that they had not received formal training in the use of modern farming equipment. On average, these farmers had experience in farming corn, rice and livestock. Eighteen people (79%) worked in corn farming, and five farmers (21.7%) reported experience in rice farming and livestock activities.

The aspect in which the farmers are relatively good is cooperation. However, this aspect still needs to be nurtured and improved through training that gives farmers the opportunity to learn to use shelling tools, thereby enhancing their skills and enabling them to create business opportunities. Furthermore, to strengthen the interview data, the researcher collected data

through a questionnaire. The aim was to obtain triangulation data alongside the interviews. Data collection was conducted using a farmer questionnaire. The questionnaire results are described using descriptive statistics in the following table:

Table 5. Descriptive Statistics of the Questionnaire Responses

Data	Number
Question Item	28
Valid N	23
Miss	0

Table 5 shows that 23 farmers provided valid data inputs. There are 28 questions with missing data, and 0 data processing errors were found.

The descriptive data analysis shown in the table below is presented and grouped by the 28 questions, with answers relevant to the research objectives. However, the researcher did not present all 28 questions. The questionnaire covers the following aspects: independent attitude, work attitude, willingness to take risks, and cooperation (the questionnaire data processing results are available in the appendix).

The independent attitude, where work is always done by oneself without asking others for help, is evident in the following table.

Table 6. Farmers' Independence

Frequency			Percent	Valid Percent	Cumulative Percent
Valid	Not Applicable	6	26.1	26.1	26.1
	Less Suitable	12	52.2	52.2	78.3
	Suitable	5	21.7	21.7	100.0
	Total	23	100.0	100.0	

Table 6 indicates that most farmers demonstrated limited independence in completing farming activities, with only a small proportion reporting that they consistently worked independently. This finding suggests that self-reliance remains one of the major competency gaps requiring intervention.

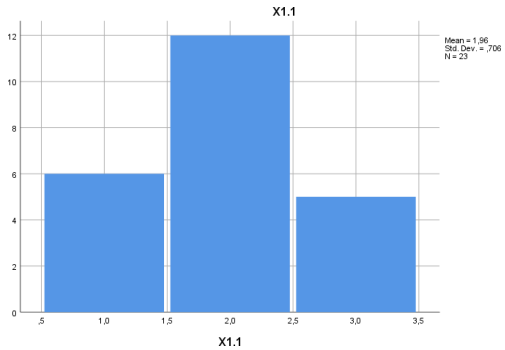

Figure 2. Histogram Graph of Farmer Questionnaire

Figure 2 shows that the mean of the data is 1.96 for n = 23 (23 farmers), with a standard deviation of 0.706. The data is normally distributed.

Regarding work attitude, they always work diligently despite many obstacles. The statistical description is shown in the following table.

Table 7. Farmers' Work Attitude

Frequency			Percent	Valid Percent	Cumulative Percent
Valid	Not Applicable	9	39.1	39.1	39.1
	Less Suitable	11	47.8	47.8	87
	Suitable	3	13.0	13.0	100.0
	Total	23	100.0	100.0	

Table 7 shows that 39.1% of farmers answered "not appropriate", 47.8% answered "less appropriate", and 13% answered "appropriate". This means that 87% of farmers did not really implement it despite many obstacles.

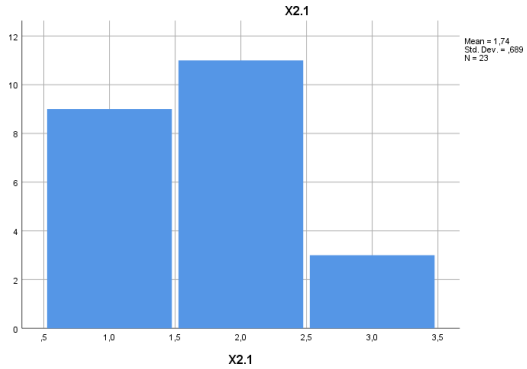

Figure 3. Histogram Graph of Farmer Questionnaire

Figure 3 shows that the mean of the data is 1.74 (n = 23, or 23 farmers), with a standard deviation of 0.689. The data is normally distributed.

Regarding the willingness to take risks and the enjoyment of challenging work despite those risks, the statistical description is shown in the following table.

Table 8. Farmers' Risk-Taking Attitude

Frequency			Percent	Valid Percent	Cumulative Percent
Valid	Not Applicable	6	26.1	26.1	26.1
	Less Suitable	14	60.9	60.9	87
	Suitable	3	13.0	13.0	100.0
	Total	23	100.0	100	

Table 8 shows that 26.1% of farmers answered "not appropriate", 60.9% answered "less appropriate", and 13% answered "appropriate". This means that 87% of farmers are not happy with the challenging and risky work.

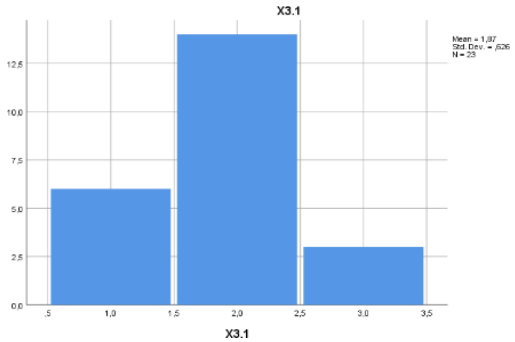

Figure 4. Histogram Graph of Farmer Questionnaire

Figure 4 shows that the mean of the data is 1.37 for n = 23 (23 farmers), with a standard deviation of 0.626. The data is normally distributed.

Regarding cooperation, being polite, friendly, and respectful to others is evident in the following table.

Table 9. Farmers' Cooperation Skills

Frequency			Percent	Valid Percent	Cumulative Percent
Valid	Not Applicable	2	8.7	8.7	8.7
	Less Suitable	13	56.5	56.5	65.2
	Suitable	8	34.8	34.8	100.0
	Total	23	100.0	100.0	

Table 9 shows that 8.7% of farmers answered "not appropriate", 56.5% answered "less appropriate", and 34.8% answered "appropriate". This means that 65.2% of farmers are unable to be polite, friendly and respectful when talking to others.

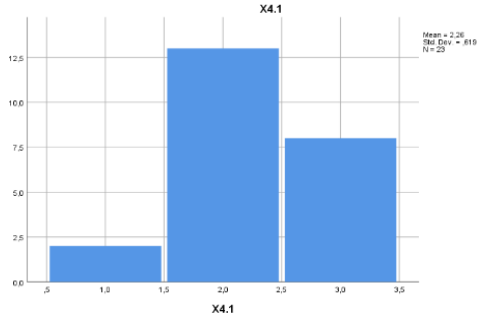

Figure 5. Histogram Graph of Farmer Questionnaire

Figure 5 shows that the mean of the data is 2.326 (n = 23, or 23 farmers), with a standard deviation of 0.619. The data is normally distributed.

Questionnaire Observation Results

Table 10 below summarises the results of the questionnaire completed by the farmers before the training.

Table 10. Summary of Entrepreneurial Competency Assessment

No	Aspect and Statement	Score (%)				
		DA	R	A	VA	Category
A	Independent Attitude					
1	When doing a task, I always do things myself without asking for help from others	26.1	52.2	21.7	0	Less Positive
2	I am always able to complete every task that is my responsibility and carry it out thoroughly	17.4	56.5	26.1	0	Less Positive
3	I can always do any kind of work, even if it is difficult, in various ways	26.1	52.2	21.7	0	Less positive
4	I enjoy discussing with others to establish cooperation	34.8	52.2	13	0	Less positive
5	I always work, think based on what I know beforehand before making a decision	21.7	52.2	26.1	0	Less positive
6	Before undertaking any task, I always study, observe and listen first	43.5	47.8	8.7	0	Less positive
B	Work Attitude					
7	In my work, I always carry it out diligently despite many obstacles	39.1	47.8	13	0	Less positive
8	In speaking, acting, and working, I am always honest	39.1	60.9	0	0	Less positive
9	I always obey and can comply with the rules and regulations in force	56.5	43.5	0	0	Less positive
10	I have a strategy for solving work problems	56.5	43	0	0	Less positive
11	I can always improve my own abilities	43.5	56.5	0	0	Less positive
12	I am always able to create job opportunities for myself and others	8.7	52.2	39.1	0	Less positive
13	I can always think of ways to complete tasks in my own way	21.7	60.9	17.4	0	Less positive

14	I always commit to what has been agreed upon by the other party	34.8	60.9	4.3	0	Less positive
C	Willing to take risks					
15	I enjoy challenging work even if it involves risks	26.1	60.9	13	0	Less positive
16	I always take the initiative to act rather than wait for something undesirable to happen	26.1	39.1	34.8	0	Less positive
17	I am willing to invest funds after obtaining a business opportunity	30.4	47.8	21.7	0	Less positive
18	I remain determined to run my business despite many challenges	21.7	52.2	26.1	0	Less positive
19	I am willing to incur costs at the beginning to gain profits at the end of the business	26.1	39.1	34.8	0	Less positive
20	Although there were initial business challenges, I persisted with the business diligently	21.7	52	26.1	0	Less positive
21	I am confident that if I take risks in my endeavours, I will succeed in the future	34.8	47.8	17.4	0	Less positive
D	Cooperation					
22	I can be polite, friendly and respectful when talking to others	8.7	56.5	34.8	0	Less Positive
23	I can appreciate differing opinions among discussion partners	0	47.8	52.2	0	Less positive
24	I can always show my happiness to the person I am talking to	13.0	56.5	30.4	0	Less positive
25	I easily understand how to get along with others	13.0	56.5	30.4	0	Less Positive
26	I am easy to reach an agreement to cooperate with others	34.8	65.2	0	0	Less positive
27	I am happy to receive suggestions and criticism from others	0	60.9	39.1	0	Less positive
28	I am always open with others about my shortcomings	4.3	69.6	26.1	0	Less Positive

Based on Table 10, the interviews across the four aspects described above, it is clear that farmers need training.

Problem Analysis Results

The problem analysis of the interview results described in the preliminary study at the definition stage is presented in the following table:

Table 11. Summary of Problems in the Definition Stage

No	Aspect	Findings
1	Independent attitude	1. Farmers are unable to do certain tasks by themselves or always ask for help from others
2	Work attitude	2. Farmers pay little attention to rules and regulations 3. Farmers do not have a strategy for solving work problems 4. Farmers are unable to improve their own skills in processing corn harvests
3	Willing to take risks	5. Farmers are not keen on challenging and risky work. 6. Farmers need training so that they 5. take initiative and be resourceful in solving problems
4	Cooperation	7. Farmers do not yet have a strategy for cooperation

Overall, both interview and questionnaire findings consistently indicate that farmers require entrepreneurship-based Appropriate Technology training, particularly to strengthen independence, work attitude, risk-taking, and collaborative competencies. These findings form the empirical basis for the subsequent needs analysis.

The low willingness to take risks identified among farmers may also reflect economic vulnerability rather than individual reluctance. For small-scale farmers, unsuccessful decisions may directly affect household income and food security. Therefore, risk avoidance can be interpreted as a rational response to uncertainty rather than merely a lack of entrepreneurial orientation. This finding highlights the importance of training programs that combine technical demonstrations, mentoring, and gradual business experimentation to build confidence and reduce perceived risks associated with innovation adoption.

Table 12. Learning Model Requirements and Improvement Actions

No	Results of Problem Identification and Model Requirements	
	Problem	Model Requirements
1	Farmers are unable to do things the work themselves or always ask for help from others	1. Formulating the content of the training module with basic entrepreneurship material
2	Farmers pay little attention to the rules and regulations in force	2. Formulate the content of the training module by designing a team-based job for making a piping tool, with the type of tool to be selected by the farmers themselves
3	Farmers do not have a strategy for solving work problems	3. Designing a job for farmers to make a corn sheller that must be done through a procedure by calculating the tool and material requirements
4	Farmers are unable to improve their own skills in harvesting corn harvest	4. Test the results of the threshing tool production for threshing corn so that farmers know their capabilities
5	Farmers are not satisfied with work that is challenging and risky.	
6	Farmers need training to enable them to take initiative and be resourceful in dealing with problems.	
7	Farmers do not yet have a strategy for cooperating	

Conceptual Implications for Entrepreneurship-Based Appropriate Technology Training

The findings suggest that barriers to appropriate technology adoption among farmers are not solely technical in nature but are strongly influenced by entrepreneurial competencies. Farmers who exhibit low levels of independence, weak work attitudes, and limited willingness to take risks also demonstrate lower readiness to adopt and utilise appropriate technology. This indicates that technology adoption and entrepreneurial development should not be treated as separate intervention domains. Instead, they should be integrated within a unified training framework. The study therefore proposes a conceptual model in which entrepreneurial competencies function as enabling factors that mediate farmers' readiness to adopt and utilise appropriate technology for productive and business-oriented purposes.

CONCLUSIONS

This study identified the training needs of farmers as the empirical foundation for developing an entrepreneurship-based Appropriate Technology (AT) training model. The needs analysis revealed that although most farmers possessed extensive farming experience, their entrepreneurial competencies—including independence, work attitude, risk-taking, and problem-solving—remained limited. In addition, most participants had little exposure to appropriate technology training, indicating a clear need for an integrated capacity-building program. The findings suggest that effective farmer empowerment should combine technical

training with entrepreneurship development rather than treating them as separate interventions. Such an approach can strengthen farmers' readiness to adopt appropriate technology, improve value-added agricultural activities, and enhance sustainable rural economic development. This study contributes conceptually by demonstrating that entrepreneurial competencies constitute a critical prerequisite for successful technology adoption among farmers. It also provides practical guidance for universities, local governments, agricultural extension services, and training providers in designing evidence-based, needs-oriented entrepreneurship and technology training programs for rural communities.

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