



Evaluating the Impact of Enhancing Farmers' Knowledge, Attitudes, Motivation, and Behavior on Income Growth and Environmental Quality in the Technical Irrigation Areas of South Sulawesi Province

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ABSTRACT

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This study aims to evaluate the impact of empowerment and training activities on farmers' knowledge, attitudes, motivation, and behavior in improving income and environmental quality within the technical irrigation areas of South Sulawesi Province. The research was conducted in three key irrigation areas: the Langkeme irrigation area of Soppeng Regency, the Saddang irrigation area of Blonde Regency, and the Bantimurung irrigation area of Maros Regency. The study involved 300 farmer households, selected through systematic random sampling, who participated in training programs on sustainable farming practices, including soil preparation, crop diversification, irrigation management, and the use of environmentally friendly fertilizers and pesticides. The research employed descriptive statistical analysis to assess the farmers' knowledge, attitudes, motivation, and behaviors before and after the training. Results indicated that after the empowerment program, farmers exhibited a high level of knowledge, as assessed through cognitive, affective, and psychomotor aspects. Similarly, farmers demonstrated a high level of positive attitudes towards increasing income and environmental quality. Both intrinsic and extrinsic motivations were observed to be high, with farmers showing strong internal and external drives to adopt better agricultural practices. Furthermore, the behaviors of farmers, including practices such as soil tillage, plant maintenance, irrigation management, and harvesting, were found to be consistently high in all aspects related to increasing income and enhancing environmental quality. The findings suggest that the training and empowerment activities were successful in improving farmers' capacity to adopt sustainable farming techniques, thereby increasing both their income and the environmental quality of the irrigation areas. These results are consistent with previous studies indicating that knowledge, attitudes, and behavior form the foundation for sustainable agricultural practices. The study concludes that continuous training and empowerment are crucial for further enhancing the long-term sustainability of farming practices in technical irrigation areas, benefiting both the farmers' livelihoods and the local environment.

KEYWORDS:

Empowerment, training, knowledge, attitudes, motivation, behavior, income, environmental quality, technical irrigation, South Sulawesi.

1. INTRODUCTION

The Law of the Republic of Indonesia Number 32 of 2009 emphasizes the importance of maintaining the environment to ensure that it continues to benefit humanity. According to Amir (2017), technical irrigation areas serve as a vital,

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cultivated environment for farmers. Therefore, these areas must be carefully preserved by farmers to maximize the benefits they offer.

For farmers to enhance both their income and the quality of the environment in irrigated areas, it is crucial that they receive proper training to increase their knowledge. As Suriasumantri (2010) explains, knowledge encompasses everything we understand about a particular subject. Amir (2018) further asserts that an individual's knowledge plays a significant role in shaping their attitudes, motivations, and behaviors, which ultimately influence their actions in farming practices and environmental management.

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In 2022, farmers received training in three key areas: (1) strategies to increase income and improve environmental quality, (2) techniques for diversifying farming practices and managing pest control, and (3) methods for using fertilizers and pesticides in an efficient and environmentally friendly manner. Given these efforts, it is crucial to evaluate the knowledge, attitudes, motivations, and behaviors of farmers working in technical irrigation areas in South Sulawesi Province. Such an evaluation would provide valuable insights into how these farmers are applying what they have learned. Dunn (2013) suggests that evaluation involves the process of estimation, assigning numerical values, and assessing the effectiveness of a given program. Similarly, Zein & Darto (2012) emphasize that evaluation is an essential step once a program has been completed. They argue that through careful evaluation, the success and impact of the program can be assessed, providing a clearer understanding of its effectiveness and areas for improvement. This evaluation will, therefore, serve as a crucial tool in measuring the outcomes of the training and guiding future efforts to support farmers in South Sulawesi.

The objectives of this study are: (1) to assess the extent to which farmers' knowledge contributes to increasing income and enhancing environmental quality in technical irrigation areas in South Sulawesi Province following their empowerment; (2) to evaluate the attitudes of farmers towards strategies for improving income and environmental quality in technical irrigation areas in South Sulawesi Province after undergoing empowerment initiatives; (3) to examine the level of motivation among farmers in striving to increase both income and environmental quality in technical irrigation areas in South Sulawesi Province post-empowerment; (4) to investigate the behavioral changes in farmers and how these behaviors contribute to the improvement of income and environmental quality in technical irrigation areas in South Sulawesi Province after they have been empowered.

These objectives aim to provide a comprehensive understanding of how the empowerment of farmers influences key factors such as knowledge, attitudes, motivation, and behavior, ultimately leading to improvements in both their economic well-being and environmental sustainability in irrigated farming areas.

II. LITERATURE REVIEW AND METHOD

The Law of the Republic of Indonesia Number 32 of 2009 emphasizes the importance of maintaining the environment to ensure that it continues to benefit humanity. According to Amir (2017), technical irrigation areas serve as a vital, cultivated environment for farmers. Therefore, these areas must be carefully preserved by farmers to maximize the benefits they offer.

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These objectives aim to provide a comprehensive understanding of how the empowerment of farmers influences key factors such as knowledge, attitudes, motivation, and behavior, ultimately leading to improvements in both their economic well-being and environmental sustainability in irrigated farming areas.

This study adopts an evaluation research design, focusing on the assessment of farmers' knowledge, attitudes, motivations, and behaviors in relation to their efforts to increase income and improve environmental quality in technical irrigation

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areas of South Sulawesi Province, following empowerment initiatives. The primary objective is to evaluate how these factors contribute to the overall effectiveness of the empowerment programs in the region.

The study is conducted in three key irrigation areas: the Langkeme irrigation area in Soppeng Regency, the Saddang irrigation area in Bone Regency, and the Bantimurung irrigation area in Maros Regency. These areas were selected due to their relevance in terms of agricultural activity and irrigation practices. Within these broader regions, specific sub-districts were chosen as the study locations: Lili Riaja District in Soppeng Regency, Duampanua District in Pinrang Regency, and Bantimurung District in Maros Regency. These sub-districts were selected using a purposive sampling method, ensuring that the chosen areas reflect a representative mix of characteristics relevant to the study's objectives, such as varying levels of farmer empowerment and irrigation infrastructure.

By focusing on these specific regions, the research aims to provide a comprehensive evaluation of the impacts of empowerment on farmers' practices in both improving their economic outcomes and sustaining environmental quality in technical irrigation areas.

The study population consists of heads of farming families residing in the Liliriaja District in Soppeng Regency, Duampanua District in Pinrang Regency, and Bantimurung District in Maros Regency. These individuals were selected because they are directly involved in agricultural activities and have experienced empowerment programs aimed at improving their farming practices. For each of the selected regions, 100 heads of households were chosen as sample farmers. The sampling method used is systematic random sampling, ensuring a representative and unbiased selection of participants across the three regions. Consequently, the total sample for the first year of the research comprises 300 heads of families, providing a robust dataset for the evaluation of the impact of empowerment on farmers' knowledge, attitudes, motivations, and behaviors.

The key research variables in this study include knowledge, attitude, motivation, and behavior, specifically in relation to the enhancement of income and environmental quality within technical irrigation areas of South Sulawesi Province. These variables are central to understanding how empowerment influences farmers' capacity to improve both their economic outcomes and the sustainability of their agricultural practices. To measure these variables, the study employs two primary research instruments: knowledge tests and questionnaires. The knowledge tests are based on the Guttman Scale, a unidimensional scale used to assess the depth of knowledge on a particular subject, in this case, agricultural practices and environmental management. Meanwhile, the questionnaires are designed using the Likert Scale, a widely used method for gauging attitudes, motivations, and behaviors by asking participants to express their level of agreement or

disagreement with a series of statements. These instruments provide a comprehensive framework for evaluating the different aspects of farmers' responses to the empowerment programs and their subsequent impact on farming practices. Data collection in this study involves administering both tests and questionnaires to all selected sample members. Each participant is asked to complete the knowledge test and the questionnaire, which are designed to assess their understanding, attitudes, motivations, and behaviors related to agricultural practices and environmental quality. Once the participants have filled out the test and questionnaire, the completed forms are collected by the researcher for further analysis. This method ensures that the data gathered is consistent and comprehensive, allowing for an in-depth evaluation of the farmers' responses.

To analyze the data, descriptive statistical analysis is employed. This approach allows for the summarization and interpretation of the collected data by providing a clear picture of the overall trends and patterns within the sample. Descriptive statistics, such as frequencies, means, and standard deviations, will be used to describe the farmers' knowledge levels, attitudes, motivations, and behaviors, as well as their relationship to improvements in income and environmental quality. This type of analysis is particularly useful for summarizing large volumes of data and drawing meaningful conclusions about the effectiveness of the empowerment programs on the target population.

III. RESULTS

1. Description of Farmers' Knowledge to Increase Income and Environmental Quality in Technical Irrigation Areas in South Sulawesi Province

The first objective of the study is to assess the level of farmers' knowledge regarding strategies to enhance income and improve environmental quality in technical irrigation areas of South Sulawesi Province. The data collected from the knowledge test, which consists of 17 questions, provides insights into the farmers' understanding of critical topics such as irrigation management, sustainable farming practices, pest control, soil fertility, and environmental conservation.

The results of the descriptive statistical analysis of farmers' knowledge, based on the responses to the 17 questions, are summarized in the frequency distribution shown in Table 1. It presents the distribution of responses across different knowledge levels, allowing for a clear understanding of how well farmers grasp key concepts related to agricultural productivity and environmental sustainability in the context of technical irrigation. The frequency distribution will show how many farmers fall into each knowledge category, providing valuable data on areas where farmers may need further training or support.

By analyzing these findings, we can identify the extent of farmers' knowledge and how it correlates with their ability to implement practices that increase both their income and the

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quality of the environment in their irrigated farming areas. This will help inform future interventions and training programs aimed at enhancing their agricultural practices and fostering long-term sustainability in the region.

Table 1. Frequency distribution of farmers' knowledge increases income and environmental quality in technical irrigation areas of South Sulawesi Province

Category	Score	Frequency	(%)	Amount (%)
Very low	0 – 3.3	0	0	0
Low	3.4 - 6.6	0	0	0
Medium	6.7 - 9.9	18	6	6
High	10 - 13.3	247	82.3	88.3
Very high	13.4 - 17	35	11.7	100
Total		300	100	

Based on the data presented in Table 1, it is clear that the majority of farmers in the technical irrigation areas of South Sulawesi Province have a relatively strong understanding of how to increase income and improve environmental quality. Specifically, 6% of farmers fall into the medium knowledge category, indicating a moderate level of understanding. A significantly larger portion, 78%, exhibit a high level of knowledge regarding strategies for increasing income and enhancing environmental quality. Additionally, 11.7% of farmers demonstrate very high knowledge, particularly in the cognitive aspects related to improving both income and environmental sustainability in these irrigation areas.

Interestingly, no farmers were found to fall into the low or very low knowledge categories, suggesting that the training programs may have effectively elevated the knowledge base of the participants across all levels. These results indicate a positive trend in the overall knowledge levels among farmers, which can be attributed to the empowerment programs and the training they received.

Further analysis revealed that the average score for knowledge among the farmers was 12.3, with a maximum score of 16 and a minimum score of 7. The average score falls within the high knowledge category, reinforcing the conclusion that, on average, farmers possess a strong understanding of the practices necessary to enhance both income and environmental quality.

In summary, these findings suggest that, after receiving training on farming techniques, irrigation water management, soil tillage, crop maintenance, and the use of environmentally friendly fertilizers and pesticides, farmers in South Sulawesi Province have acquired a solid foundation of knowledge. This knowledge is crucial for increasing agricultural productivity and ensuring environmental sustainability in technical irrigation areas, with the majority of farmers demonstrating a high level of competency in these areas.

2. Description of Farmers' Attitudes Towards How to Increase Income and Environmental Quality in Technical Irrigation Areas of South Sulawesi Province

The second objective of this study is to assess farmers' attitudes towards strategies for increasing income and improving environmental quality within technical irrigation areas in South Sulawesi Province. Attitudes play a crucial role in shaping the behaviors and decisions of farmers, particularly when it comes to adopting new agricultural practices and sustainability initiatives. Therefore, understanding farmers' attitudes is essential for evaluating the success of empowerment programs aimed at enhancing both economic and environmental outcomes.

The data collected from 17 attitude-related questions provides valuable insights into the perspectives of farmers regarding agricultural practices, irrigation management, soil health, pest control, and the use of environmentally friendly techniques. The results of the descriptive statistical analysis of farmers' attitudes are summarized in the frequency distribution presented in Table 2. This table illustrates the distribution of responses across different attitude categories, highlighting the extent to which farmers are open to adopting practices that increase income and enhance environmental quality in their farming areas.

By analyzing this frequency distribution, we can identify the prevailing attitudes among farmers, including those who are highly motivated to improve their farming practices and those who may require additional support or encouragement to change their behaviors. The results will help to better understand the factors that influence farmers' decision-making and their willingness to implement environmentally sustainable practices in technical irrigation systems.

In addition, this analysis will provide a foundation for future interventions, helping to tailor programs that address any negative or neutral attitudes that may be hindering the adoption of best practices for increasing both income and environmental quality. Understanding farmers' attitudes is critical for ensuring the long-term success of agricultural sustainability initiatives and fostering a positive shift toward more sustainable farming methods in South Sulawesi Province.

Table 2. Distribution of Frequency of Farmers' Attitudes on How to Increase Income and Environmental Quality in Technical Irrigation Areas of South Sulawesi Province

Category	Score	Frequency	(%)	Amount (%)
Very low	17 - 30.6	0	0	0
Low	30.7 - 44.3	0	0	0
Medium	44.4 - 57.9	8	2,7	2.7
High	58 - 71.6	258	86	92

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Very high	71.7 - 85	34	11.3	100
Total		300	100	

Based on the data presented in Table 2, the distribution of farmers' attitudes towards increasing income and improving environmental quality in technical irrigation areas of South Sulawesi Province reveals a generally positive outlook. Specifically, 2.7% of farmers exhibit a medium attitude towards these goals, indicating a moderate level of belief and willingness to adopt new practices. A large majority, 86%, demonstrate a high attitude, reflecting a strong willingness and positive perspective towards adopting strategies that enhance both income and environmental sustainability. Furthermore, 12.7% of farmers exhibit a very high attitude, showing exceptional enthusiasm and commitment to these goals.

Notably, there are no farmers in the low or very low attitude categories, which suggests that the empowerment programs have successfully cultivated a generally positive mindset among the farmers in the region. This finding indicates that most farmers recognize the importance of improving agricultural practices and environmental quality and are open to applying the knowledge and techniques they have learned. The results from the advanced statistical analysis reveal an average score of 69.7, with a maximum score of 84 and a minimum score of 48. Since the average score falls within the high category, this further confirms that farmers in the technical irrigation areas have a predominantly positive attitude towards strategies for enhancing income and environmental quality.

In summary, the findings suggest that after receiving training in areas such as farming practices, irrigation water management, soil tillage, crop maintenance, and the use of environmentally friendly fertilizers and pesticides, farmers in South Sulawesi Province have developed a high level of positive attitude towards improving both their economic outcomes and environmental sustainability. This positive attitude is a key factor in the successful adoption of new practices and indicates strong potential for long-term improvements in both income and environmental quality in the region's technical irrigation areas.

3. Description of farmers' motivation to increase income and environmental quality in technical irrigation areas of South Sulawesi Province .

The results of the descriptive statistical analysis of farmers' motivation to increase income and improve environmental quality in the technical irrigation areas of South Sulawesi Province, based on 17 survey questions, are presented in the frequency distribution shown in Table 3. This analysis provides a detailed view of the levels of motivation among farmers, specifically regarding their willingness and drive to

adopt practices that enhance both their economic outcomes and the sustainability of the environment.

The frequency distribution in Table 3 highlights the distribution of responses across various motivation categories, ranging from low to very high motivation. By examining this data, we can gain insights into how motivated farmers are to implement practices such as improved irrigation management, sustainable farming techniques, and environmentally friendly pest and soil management. Understanding the motivation levels of farmers is crucial, as motivation is a key factor in the successful adoption of new farming practices and technologies.

This analysis will help identify whether farmers are primarily driven by economic incentives, environmental concerns, or a combination of both, and will provide valuable data for designing future training and intervention programs. Such programs can be tailored to address the specific motivational factors that encourage or hinder the adoption of sustainable agricultural practices in the region.

Table 3. Distribution Frequency of farmers' motivation to increase income and environmental quality in technical irrigation areas of South Sulawesi Province

Category	Score	Frequency	(%)	Amount (%)
Very low	17 - 30.6	0	0	0
Low	30.7 - 44.3	0	0	0
Medium	44.4 - 57.9	10	3,3	3.3
High	58 - 71.6	262	87.4	90.7
Very high	71.7 - 85	28	9.3	100
Total		300	100	

Based on the data presented in Table 3, the distribution of farmers' motivation to increase income and improve environmental quality in the technical irrigation areas of South Sulawesi Province reveals a highly positive trend. Specifically, 3.3% of farmers fall into the medium motivation category, indicating a moderate level of drive to adopt practices aimed at enhancing both income and environmental quality. The majority, 87.4%, exhibit high intrinsic motivation, reflecting a strong internal drive and commitment to improving agricultural practices and environmental sustainability. Additionally, 9.3% of farmers demonstrate very high motivation, showing exceptional enthusiasm and determination to make significant improvements in their farming practices and the surrounding environment.

Importantly, no farmers were classified in the low or very low motivation categories, suggesting that the empowerment and training programs have been effective in fostering a high level of motivation across the target population. This is a promising

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indication that the farmers are not only aware of the need for change but are also actively motivated to implement new practices that will benefit both their income and the quality of the environment.

Further analysis of the data revealed an average score of 69.2, with a maximum score of 83 and a minimum score of 48. Since the average score falls within the high motivation category, this reinforces the finding that, on the whole, farmers are highly motivated to apply the knowledge and skills they have gained through training.

In conclusion, these results suggest that, following training on essential agricultural practices—including farming techniques, efficient irrigation water use, soil tillage, crop maintenance, and the environmentally friendly use of fertilizers and pesticides—farmers in the technical irrigation areas of South Sulawesi Province have developed a high level of motivation. This strong motivation is a critical factor in ensuring the successful implementation of practices that will enhance both income and environmental sustainability in the region's farming communities.

4. Farmers' behavior increases income and environmental quality in technical irrigation areas.

The results of the descriptive statistical analysis of farmers' behavior to increase income and improve environmental quality in the technical irrigation areas of South Sulawesi Province, based on 17 survey questions or observations, are presented in the frequency distribution shown in Table 4. This analysis provides a detailed overview of the farmers' actual behaviors, which is crucial for assessing how well they have translated their knowledge, attitudes, and motivations into practical actions in their farming practices.

The frequency distribution in Table 4 illustrates how farmers' behaviors are distributed across different categories, ranging from low to very high levels of behavioral implementation. By examining these results, we gain valuable insights into the extent to which farmers have adopted and consistently apply sustainable farming practices, such as effective irrigation management, proper soil and pest management, and the use of environmentally friendly agricultural inputs.

Understanding farmers' behaviors is essential because it reflects the real-world application of the concepts and techniques they have learned through empowerment programs. It also highlights any gaps or challenges in behavioral change, offering an opportunity to refine future interventions and ensure that farmers not only acquire knowledge but also actively implement practices that improve both their economic outcomes and environmental sustainability.

This analysis will serve as a foundation for identifying areas where additional support or training may be needed to help farmers better align their behaviors with the desired outcomes for both income generation and environmental preservation in the region's technical irrigation areas.

Table 4. Distribution Frequency of farmers' behavior increases income and environmental quality in technical irrigation areas of Sulawesi Selatan Province

Category	Score	Frequency	(%)	Amount (%)
Very low	17 – 30.6	0	0	0
Low	30.7 – 44.3	0	0	0
Medium	44.4 – 57.9	9	3	3
High	58 – 71.6	265	88.3	91.3
Very high	71.7 - 85	26	8.7	100
Total		300	100	

Based on the data presented in Table 4, the distribution of farmers' behaviors related to increasing income and improving environmental quality in the technical irrigation areas of South Sulawesi Province shows predominantly positive outcomes. Specifically, 3% of farmers exhibit medium behavioral implementation, indicating a moderate level of action towards adopting practices that enhance both income and environmental sustainability. A significantly larger proportion, 88.3%, demonstrate high levels of behavior, suggesting that the majority of farmers actively engage in practices that positively impact their income and the environment. Furthermore, 8.7% of farmers exhibit very high levels of behavior, indicating a strong commitment to applying advanced techniques for sustainable agriculture and income generation.

Importantly, no farmers fall into the low or very low behavioral categories, suggesting that the empowerment programs have effectively influenced farmers to adopt and practice the new knowledge and techniques they have learned. This finding is particularly encouraging, as it demonstrates that farmers are not only aware of the importance of sustainable practices but are also actively integrating these practices into their daily farming activities. The results of the advanced statistical analysis reveal an average score of 68.5, with a maximum score of 82 and a minimum score of 52. Since the average score falls within the high behavioral category, this reinforces the conclusion that, on the whole, farmers are consistently applying the practices they have learned during training.

In conclusion, these findings indicate that after receiving training in areas such as farming techniques, irrigation water management, soil tillage, crop maintenance, and the environmentally friendly use of fertilizers and pesticides, farmers in the technical irrigation areas of South Sulawesi Province exhibit a high level of positive behavioral change. This active implementation of new practices plays a crucial role in increasing both income and environmental quality, signaling the success of the empowerment initiatives in

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fostering sustainable agricultural behaviors among the farming communities in the region.

IV. DISCUSSION

The assessment of the three components of knowledge—cognitive, affective, and psychomotor—conducted after the empowerment or training programs, indicated a significant improvement in community knowledge. This enhanced knowledge was shown to contribute to increased income and environmental quality in the technical irrigation areas of South Sulawesi Province, with the results falling into the high category. This suggests that the training activities have effectively elevated farmers' understanding and practices in key areas essential for both agricultural productivity and environmental sustainability.

The training activities, which covered a broad range of topics, played a critical role in improving the knowledge base of the farmers. These included essential practices such as soil tillage, farming diversification, seeding and planting techniques, crop maintenance, fertilizer and pesticide application, cooperative management of irrigation water, collaborative efforts in maintaining and repairing damaged irrigation infrastructure, and harvesting techniques. These activities have been highly beneficial in equipping farmers with the knowledge and skills necessary to improve both their economic outcomes and the environmental health of their farming systems. The diversity of training topics reflects the holistic approach needed to address both immediate agricultural needs and long-term sustainability goals.

The success of these training programs underscores the importance of continuity in such initiatives. To ensure that the positive impacts on income and environmental quality are sustained, it is essential that these training activities be carried out on an ongoing basis by both government and private sector stakeholders. Continuous support and capacity building are vital to empowering farmers to adopt new, more efficient practices, thereby enabling them to maintain and further improve their agricultural outputs and the surrounding environment in a sustainable manner.

These findings are consistent with the views of Suriasumantri (2010), who emphasized that knowledge serves as the foundation of truth, derived from a comprehensive understanding of a particular subject. In the context of this study, the knowledge gained through training has empowered farmers to make informed decisions, adopt innovative practices, and ultimately achieve greater economic and environmental success. As such, ongoing knowledge development is essential for building the capacity of farmers in South Sulawesi, ensuring they continue to thrive in both their farming ventures and environmental stewardship.

The assessment of the attitude component, which includes three key aspects—cognition, affection, and conation—was conducted after the empowerment and training initiatives. The results revealed that the attitude of the community

towards efforts aimed at increasing income and environmental quality in the technical irrigation areas of South Sulawesi Province is categorized as high. This indicates that the training programs have had a positive impact on shaping the farmers' perceptions, emotional responses, and intentions related to sustainable agricultural practices.

The training activities, which covered a wide range of essential topics such as soil tillage, farming diversification, seeding and planting, crop maintenance, fertilizer and pesticide application, cooperative management of irrigation water, collaborative efforts in maintaining and repairing damaged irrigation infrastructure, and harvest management, have contributed to fostering a positive shift in farmers' attitudes. These activities have equipped farmers not only with the technical skills required for improving their farming practices but also with a deeper understanding of the broader environmental and economic benefits of adopting sustainable methods.

The positive change in farmers' attitudes is crucial because it reflects a deeper commitment to sustainable farming practices, which will, in turn, lead to sustained improvements in both income and environmental quality. By instilling a sense of responsibility and a more positive outlook towards sustainable agriculture, the farmers are more likely to implement practices that protect and enhance their land, water, and other natural resources over the long term. This shift in attitude is foundational to achieving sustainable agricultural development in the region.

To ensure that these positive shifts in attitude are maintained and strengthened, it is essential for government and private sector stakeholders to continue supporting and organizing such training programs. By doing so, they can ensure that farmers are continuously equipped with both the knowledge and the positive attitudes necessary for effective and sustainable farming in technical irrigation areas.

The findings from this study align with the perspectives of Ojedokun (2011), who defined attitude as a choice and tendency to act, shaped by an individual's feelings and thoughts toward environmental objects. Similarly, Azwar (2012) and Ojedokun (2011) emphasized that attitudes are formed through the knowledge and experiences individuals gain in relation to their environment. In this context, the positive shift in farmers' attitudes reflects the combination of knowledge acquired through training and their practical experiences with sustainable farming methods. By continually reinforcing these attitudes, farmers in South Sulawesi Province will be better positioned to make decisions that contribute to both their economic well-being and the health of the environment.

The assessment of motivation, which consists of two key aspects—*intrinsic* motivation and *extrinsic* motivation—was conducted after the empowerment and training programs. The results of this assessment revealed that the motivation of the

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community to increase both income and environmental quality in the technical irrigation areas of South Sulawesi Province is categorized as high. This suggests that the training programs have successfully fostered a strong internal drive among farmers to improve their agricultural practices while also motivating them to contribute to environmental sustainability.

The training activities, which covered essential topics such as soil tillage, farming diversification, seeding and planting techniques, crop maintenance, fertilizer and pesticide application, cooperative management of irrigation water, maintenance and repair of damaged irrigation infrastructure, and harvest management, have proven to be effective in enhancing both intrinsic and extrinsic motivation.

Intrinsic motivation, which originates from within the individual, is particularly important because it reflects the internal drive to engage in farming practices for personal satisfaction, a sense of achievement, and a commitment to sustainable development. The knowledge gained through the training likely ignited a deeper sense of responsibility and pride in farmers, which has motivated them to take greater ownership of their farming activities.

On the other hand, extrinsic motivation, which is influenced by external factors such as rewards, recognition, or social incentives, has also played a significant role. The training programs have likely provided farmers with tangible benefits, such as improved agricultural yields, better access to resources, and enhanced cooperation with other community members in managing irrigation systems and infrastructure. These external incentives encourage farmers to continue applying the skills and techniques they have learned, reinforcing positive behavioral changes.

The positive increase in farmers' motivation to improve both income and environmental quality will undoubtedly have a significant influence on their behavior in farming. When farmers are motivated to take actions that are beneficial to both their livelihoods and the environment, they are more likely to implement practices that contribute to sustainable agricultural growth and long-term improvements in environmental quality.

These findings align with the perspectives of Adnil (2011), who defines motivation as the individual's encouragement to achieve a targeted goal, and Sarwono (2007), who distinguishes between intrinsic motivation, which comes from within the individual, and extrinsic motivation, which is influenced by external factors. By enhancing both forms of motivation, the training programs have created a solid foundation for farmers to not only improve their income and environmental quality but also to continue making positive changes in their farming practices. As a result, the increased motivation observed in farmers in South Sulawesi Province can be seen as a key factor in driving long-term sustainable farming practices in the region.

The assessment of farmers' behavior in efforts to increase income and improve environmental quality in technical irrigation areas of South Sulawesi Province focuses on five key aspects: (1) preparation, soil tillage, and selection of superior seeds, (2) maintaining plants and using environmentally friendly fertilizers and pesticides, (3) maintaining irrigation canals and irrigation buildings, (4) cooperation in using irrigation water and repairing landslide-affected irrigation canals, and (5) harvesting agricultural products. Based on the results, farmers' behavior in these areas is categorized as high. This indicates that farmers are actively engaging in sustainable and effective practices that contribute to both their economic well-being and the environmental health of the technical irrigation areas.

The positive behavior observed can be attributed to the training activities that were conducted, which included essential topics such as soil tillage, farming diversification, seeding and planting techniques, crop maintenance, fertilizer and pesticide application, cooperative irrigation water management, repairing damaged irrigation infrastructure, and harvest management. These training activities have had a significant influence on farmers' behavior, equipping them with the skills and knowledge needed to improve both their productivity and the sustainability of their agricultural practices. By implementing these new techniques, farmers are able to not only increase their income but also enhance the environmental quality of the areas where they farm.

The findings of this study align with Adnani's (2011) assertion that good environmental behavior contributes significantly to improving environmental quality. When farmers adopt responsible practices such as sustainable soil management, effective water use, and environmentally friendly pest control, they create a ripple effect that benefits the broader ecosystem. Additionally, Ojedokun (2011) emphasized that environmental behavior is an individual's actions toward the environment, shaped by knowledge and daily experiences. In this case, the training programs have provided farmers with the knowledge and tools necessary to implement environmentally responsible practices, which in turn has led to a high level of environmental behavior and improved quality of life in the community.

The improvement in farmers' behaviors is crucial because these actions directly impact the sustainability of the technical irrigation areas in South Sulawesi Province. By adopting better farming practices, farmers are not only increasing their income but are also ensuring that the environment is protected for future generations. These behaviors also promote greater cooperation among farmers, fostering a community-based approach to managing shared resources, such as irrigation systems and water sources, which is essential for long-term agricultural success.

Thus, the study underscores the importance of continuous training and empowerment for farmers, ensuring that they remain committed to adopting best practices that enhance

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both their productivity and the environmental quality of their farming areas. The results reinforce the idea that effective training programs are instrumental in changing farmers' behaviors and improving agricultural sustainability.

V. CONCLUSION

Based on the analysis presented in the previous chapters, the conclusions of this study are as follows:

1. Farmers' Knowledge: After being empowered, farmers in the technical irrigation areas of South Sulawesi Province exhibit a high level of knowledge in increasing both income and environmental quality. This is evident across the three dimensions of knowledge—cognitive, affective, and psychomotor—indicating a well-rounded understanding of the necessary farming practices that contribute to sustainable agriculture.
 2. Farmers' Attitudes: The attitudes of farmers towards increasing income and environmental quality are also categorized as high. This positive attitude is observed through the cognitive, affective, and conative aspects of their behavior. After undergoing empowerment, farmers display a strong commitment to adopting new, sustainable practices, demonstrating a readiness to improve both their livelihoods and the surrounding environment.
 3. Farmers' Motivation: The motivation of farmers, both intrinsic and extrinsic, to improve income and environmental quality is in the high category. Empowerment has played a crucial role in fostering internal motivation, such as personal satisfaction and a sense of responsibility, as well as external motivation, such as financial incentives and community support, leading to a strong drive to implement and sustain positive agricultural changes.
 4. Farmers' Behavior: The behavioral changes of farmers towards improving income and environmental quality are also in the high category. This includes significant improvements in various areas, such as (a) soil preparation and tillage; (b) selection of superior seeds; (c) plant maintenance; (d) use of environmentally friendly fertilizers and pesticides; (e) irrigation canal maintenance; (f) irrigation building maintenance; (g) cooperation in irrigation water usage; (h) repairing landslides in irrigation canals; (i) harvesting techniques
- The combination of these behaviors shows a clear commitment to sustainable farming practices that not only improve agricultural productivity but also enhance the quality of the surrounding environment.

In conclusion, the study reveals that the empowerment initiatives implemented in the technical irrigation areas of South Sulawesi Province have successfully resulted in high levels of knowledge, attitude, motivation, and behavior

among farmers. These findings underscore the effectiveness of the training and empowerment programs in fostering a holistic approach to sustainable farming, with lasting benefits for both income generation and environmental quality.

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VII. DISCLOSURE

The authors report no conflicts of interest in this work.

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