International Journal of Innovation, Creativity and Change. www.ijicc.net
Volume 15, Issue 4, 2021

Improving Environmental Quality Through the Empowerment of Dryland Farmers: A Case Study in Walanae Watershed, South Sulawesi

Mithen Lullulangi[a], Faizal Amir[b], Bakhrani Abdul Rauf[c], Nurlita Pertiwi[d], Rahmansah Lecturer[e], [a,b,c,d], Lecturer Faculty of Engineering, Universitas Negeri Makassar, [e]Civil Engineering and Planning Universitas Negeri Makassar, Email: mithen@unm.ac.id, faizalamir64@unm.ac.id, bakhrani@unm.ac.id, nurlita.pertiwi@unm.ac.id, rahmansah@unm.ac.id

The aim of this research is to improve the environmental knowledge and attitudes of dryland farmers in the Walanae watershed. It was conducted using the Pre-test-Post-Test Control Group Design. A total of 40 respondents, consisting of 20 people each in the experimental and control groups, were selected by purposive random sampling. In addition, several experimental steps including (1) a preliminary test to determine the environmental knowledge and attitudes of the farmers before empowerment, (2) empowering them to improve those qualities, and (3) a final test to determine the level of improvement, were conducted in the experimental group. Furthermore, some other tests were performed for the control group, including (1) a preliminary examination to specify the attitudes and environmental knowledge of the members of the group, and (2) a final test to determine the level of those qualities in comparison to that of the experimental group. Data was analysed through descriptive and inferential statistical analysis, with the inferential model using the Paired-Sample T-Test. The results showed that the empowerment had a positive and significant effect on the farmers, as it improved their environmental knowledge and attitudes from an extremely low category to a high category. Furthermore, it could be a model for empowerment in other places. Improving the above qualities in farming communities can protect the environment, especially in Indonesia, one of the largest oxygen-producing countries in the world. In addition, it can reduce global warming for the interest of the international community.

Keywords: *Empowerment, Dryland, Farmers, Knowledge, Attitude, Environment*

INTRODUCTION

The environmental conditions in the Walanae watershed tend to experience degradation due to several factors including (1) processing of riverbanks for farming activities, (2) the use of land slopes meant for environmental conservation activities as farms and residential areas, and (3) the carrying out of farming activities, while ignoring the environmental damages they cause by the *tegalan* farming communities (December 2019 Survey). This tendency is presumably due to the lack of environmental knowledge and the attitudes of the farming communities, amongst others. Some forms of environmental damage due to human factors proposed by Tykronisilicus are 1) air, water, soil and sound pollution, 2) flooding as an impact of errors in watersheds maintenance, and forest damage, and 3) landslides as a direct impact of forest destruction. Nonetheless, these problems need to be solved (Z. Pinto, 2015).

According to A. Ramadhana, (2017), human indifference towards the environment occurs due to lack of knowledge and awareness of the importance of protecting it for all creatures. In this regard, humans need to increase their understanding and consciousness, and one way to do this is through empowerment.

Law Number 7 on 2004 of the Republic of Indonesia Concerning Watersheds (DAS) and Environmental Conservation explained that watershed management is a human effort to regulate the reciprocal relationship between natural resources and humans in the watershed, including all their activities. Furthermore, it is carried to achieve sustainability and harmony in the ecosystem and increase the benefits of these resources for humans sustainably. The Director-General of Watershed Management Agency of the Ministry of Forestry explained that DAS is a complex mega system built on physical, biological, and human systems. Furthermore, Asdak (2018), defined it as an area bounded by interconnected natural topography that channels water that falls into its enclosure through one main river. Katusiime (2020) explains that land resource management using watersheds as a spatial unit for the management of land, water, biota, humans and other resources aims to improve ecological, social and economic aspects.

Simon (1993) stated that empowerment can be interpreted as an assignment or power provision which provides a power hierarchy or a reflection activity, a process that can be initiated and maintained only by agents or subjects that seek strength or self-determination. Sulistiyani (2004) explained in more detail that, etymologically, it comes from the root word "Daya", which means strength or ability. In this regard, it is defined as a process of obtaining power, strength, or abilities from endowed parties and giving to the less empowered. In addition to being empowered in terms of knowledge and attitudes, empowering observers is also closely related to increasing production. As explained by Sarkar (2019), increasing agricultural productivity is one of the main challenges for the future. Global food demand is increasing as the population grows exponentially.

According to Syabra (2003), three entities need to be considered in community empowerment, namely: physical, human, and social capital. Meanwhile, Suharto and Yuliani (2005) stated that physical capital is a facility or asset used as a tool and the major support for the implementation of a business process or activity to achieve goals. It is also stated that social capital is a norm or value shared by the community, which can strengthen positive social or work networks, establish mutually beneficial cooperation, as well as increase awareness.

E. Novendi et al. (2019) stated that dryland is a form of agroforestry that has a considerable contribution to improve the economies of communities, especially for those around rural areas. Furthermore, anyone whose main job is to farm on its land is called a dryland farmer. In the Big Indonesian Dictionary (KBBI, 2008), it is defined as a broad and flat land planted with crops while depending on rain and not irrigation systems.

F. Amir et al. (2017) stated that environmental quality is a condition that can provide an optimal carrying capacity for humans in an area. It is characterised by an atmosphere that makes people feel comfortable living in a particular location. D. M. Brasington and D. Hite. (2005) explained it as a general term which can refer to varied characteristics such as air and water purity or pollution, noise, access to open space, the visual effects of buildings, and the potential effects such characteristics may have on physical and mental health. However, the quality of the environment can be damaged by human activity, as stated by Santoso, et al. (2020) that humans and the environment have an interrelated relationship. Even the destruction of human morals will have implications for environmental damage and vice versa.

L. W. Anderson and L. A. Sosniak. (1994) stated that knowledge is a recollection of various methods, processes and patterns. Furthermore, its aspects can be shared into three groups: knowledge of specific matters, how to deal with specific problems, and of universal rules. J. S. Sumantri. (2003) stated that it consists of three components: cognitive, affective and psychomotor. The cognitive component includes memory and understanding of various facts, the affective includes analysis and inference of objects, while the psychomotor carries the behaviour that is to be expressed. Therefore, it can be inferred that knowledge is all that is known and obtained from scientific reasoning or experience, and high levels of it will give birth to high motivation, attitudes, and behaviour. The opinion above is the understanding of knowledge in general and in particular, environmental knowledge. Hung lo (2003) defines environmental knowledge as the extent to which individuals know about environmental problems and general knowledge about facts, concepts, and relationships about ecosystems.

S. Azwar (2013) stated that attitude is a choice in terms of feelings, thoughts and predisposition of actions towards environmental objects. Furthermore, it consists of three components, namely, the cognitive, which talks about what is believed; the affective, which encompasses the felt emotions; and the conative, which is the tendency to act. Ojedokun (2011) stated that environmental attitudes are feelings to accept or reject issues related to the environment.

Positive attitudes need to be directed and enhanced in order for them to generate good behaviour, especially towards the environment which is a place for everyday business and life, including dryland farmers that are the object of this research.

METHODOLOGY

The objective of this experimental research is to improve the knowledge and attitudes of dryland farmers towards the environment in Walanae watershed. It was conducted in Paroto village, Lilirilau District, Soppeng Regency, and involved 20 dry farmers as an empowered group/Group P, and another 20 as a control group from another village, Bulu'e village, Marioriawa District, Soppeng Regency/K group. The sample consisted of 40 household heads selected by a random sampling method, while the variables considered were the environmental knowledge and the attitude of the farmers in improving environmental quality. Moreover, the experimental design used was the Pre-test-Post-test Control Group Design (M. D. Gall, 2014). The steps conducted are as follows: (1) carrying out a preliminary test/P^1 before empowerment to determine the initial knowledge and attitudes of the farmers, (2) conducting the empowerment with the aim of improving those qualities, and (3) conducting the final test/P^2 to determine the improvement. Furthermore, an initial/K^1 and final test/K^2 were conducted on the control group to find out their knowledge and attitudes towards the environment without empowerment, as a comparison to the first group. The inferential analysis model is Paired-Samples t-test.

FINDINGS AND DISCUSSION

A. Research Results

The results of the descriptive statistical analysis of 20 true-false questions showed the mean value of knowledge and attitudes towards the environment. Meanwhile, it was processed using SPSS software and can be seen in Table 1.

Table 1. SPSS processing result on knowledge and attitudes before and after the experiment

	N	Minimum	Maximum	Mean	Std. Deviation
Knowledge:					
Before empowerment (P^{1ek})	20	2,00	5,00	3,4000	1,23117
After empowerment (P^{2ek})	20	12,00	17,00	15,4000	1,56945
Before empowerment (K^{1ek})	20	2,00	5,00	3,1000	,96791
After empowerment (K^{2ek})	20	2,00	5,00	3,2500	,96655
Attitude :					
Before empowerment (P^{1ea})	20	20,00	36,00	25,6000	5,41343
After empowerment (P^{2ea})	20	67,00	85,00	75,5000	6,66096
Before empowerment (K^{1ea})	20	20,00	36,00	25,9500	5,29623
After empowerment (K^{2ea})	20	20,00	36,00	26,6000	5,08248
N Valid (listwise)	20				

Source: Data processing result

1. Description of Environmental Knowledge Before Empowerment

The environmental knowledge of both the empowerment/P and the control group/K before the empowerment can be seen in Table 2.

Table 2. Frequency distribution of respondents' environmental knowledge before empowerment

		Empowerment Group (P^{1ek})				Control Group (K^{1ek})		
No.	Category	Score	Frequency	Percentage (%)	Mean	Frequency	Percentage (%)	Mean
1	Very low	1 - 4	14	70	3,4	18	90	3,1
2	Low	5 - 8	6	30		2	10	
3	Moderate	9 - 12	0	0		0	0	
4	High	13 - 16	0	0		0	0	
5	Very high	17 - 20	0	0		0	0	
Total			20	100		20	100	

Source: Processed data

Table 2 shows the results of the descriptive statistical analysis of the 20 true and false questions given to the empowerment/P and the control group/K. Furthermore, it showed that the mean value before empowerment/P^{1ek} was 3.4, with a maximum and a minimum value of 20 and 1 respectively.

Based on the frequency distribution, the mean value was very low. Therefore, it can be concluded that the Tegalan farmers' environmental knowledge before empowerment was in the very low category. Similarly, the control group was also in this category, with the mean value/K^{1ek} of 3.1.

2. Description of Environmental Knowledge after Empowerment

The environmental knowledge of respondents in the empowerment/P and the control group/K after empowerment can be seen in Table 3.

Table 3. Frequency distribution of respondents' environmental knowledge after empowerment

		Empowerment Group (P^{2ek})				Control Group (K^{2ek})		
No.	Category	Score	Frequency	Percentage (%)	Mean	Frequency	Percentage (%)	Mean
1	Very low	1 - 4	0	0		18	90	3,25
2	Low	5 - 8	0	0		2	10	
3	Moderate	9 - 12	3	15		0	0	
4	High	13 - 16	14	70	15,4	0	0	
5	Very high	17 - 20	3	15		0	0	
Total			20	100		20	100	

Source: Processed data

Table 2 and 3 above not only show the results of the descriptive statistical analysis, they also showed that the mean value after empowerment/P^{2ek} was 15.4, with a maximum and a minimum of 20 and 1 respectively. Based on the frequency distribution, this value was high. Therefore, it can be inferred that the environmental knowledge of the farmers after empowerment improved to a high category. Whereas in the control group, the average value/K^{2ek} was 3.25 or it remained in the very low category.

3. Description of Environmental Attitudes Before Empowerment

Table 4 below shows the respondent's attitude towards the environment before empowerment.

Table 4. Frequency distribution of respondents' environmental attitudes before empowerment

		Empowerment group (P^{1ea})				Control group (K^{1ea})		
No.	Category	Score	Frequency	Percentage (%)	Mean	Frequency	Percentage (%)	Mean
1	Very low	20-35	17	85	25,6	18	90	25,95
2	Low	36-51	3	15		2	10	
3	Moderate	52-67	0	0		0	0	
4	High	68-83	0	0		0	0	
5	Very high	84-100	0	0		0	0	
	Total		20	100		20	100	

Source: Processed data

Table 4 above show that the mean value before empowerment/P^{1ea} was 25.6, with the maximum and the minimum being 100 and 20 respectively. Based on frequency distribution, it appears that this value was very low. Therefore, it can be concluded that the environmental attitudes of the farmers before empowerment were in the very low category. Likewise, the control group was also in this category, with the mean value/K^{1ea} of 25.95.

4. Description of Environmental Attitudes after Empowerment

After conducting the empowerment, the environmental attitudes of respondents can be seen in Table 5.

Table 5. Frequency distribution of respondents' environmental attitudes after empowerment

		Empowerment group (P^{1ea})				Control group (K^{1ea})		
No.	Category	Score	Frequency	Percentage (%)	Mean	Frequency	Percentage (%)	Mean
1	Very low	20-35	0	0		18	90	26,60
2	Low	36-51	0	0		2	10	
3	Moderate	52-67	3	15		0	0	
4	High	68-83	14	70	75,5	0	0	

5	Very high	84-100	3	15	0	0
Total			20	100	20	100

Source: Processed data

The results of the descriptive statistical analysis are presented in Table 5 above. It shows that the mean value after empowerment/P^{2ea} was 75.2, with the maximum and the minimum value being 100 and 20. Based on the frequency distribution, this value high. It indicated that the environmental attitude of the farmers after empowerment increased to the high category, while on the contrary, the control group was in the very low category, as it had a mean value/K^{2ea} of 26.60.

5. Effect of Empowerment in Improving Environmental Knowledge

The effect was determined using the t-test analysis, and the results are presented in Table 6 below.

Table 6. Results of the t-test analysis before and after empowerment

Paired Samples Test

Pair 1 P^{2ek} - K^{2ek}	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
R = .86	12,15000	1,92696	,43088	11,24816	13,05184	28,198	19	,000
R SQURE: .74								

Source: Processed data

Based on Table 6, it can be seen that the significance value t was 0.000 <α = 0.05. This means that the environmental knowledge before and after empowerment was significantly different. Moreover, the average value of environmental knowledge before/P^{1ek} and after empowerment/P^{2ek} was 3.4 and 15.4 respectively, while the correlation coefficient/R and the coefficient of determination/R^2 was 0.86 and 0.74 respectively. Therefore, the effect of empowerment on increasing environmental knowledge was 74%.

6. Effect of Empowerment on Environmental Attitudes Improvement

The effect was determined using the T-test analysis, and the results are presented in Table 7 below.

Table 7. T-test analysis result of environmental attitudes before and after empowerment

Paired Samples Test

Pair 1 P^{2ea} - K^{2ea}	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
R = .78	48,90000	8,49086	1,89861	44,92615	52,87385	25,756	19	,000
R SQUARE = .61	48,90000	8,49086	1,89861	44,92615	52,87385	25,756	19	,000

Source: Processed data

Based on Table 7, it can be seen that significance t was equal to 0.000 <α = 0.05. This means that the environmental attitudes of the farmers before and after empowerment are significantly different, with the mean value being 25.6 and 75.5 respectively. Moreover, the correlation coefficient/R and the coefficient of determination/R^2 were 0.78 and 0.61 respectively. Therefore, the effect of empowerment on improving environmental attitudes was 61%.

B. Discussion

The environmental knowledge of the farmers improved from the very low category to the high category after the empowerment, and this can be seen from the results of the t-test analysis. Furthermore, this improvement is due to the material provided and supported by the control of the testing, maturation, mortality, and situational effects.

The environmental attitudes of the farmers also improved from the very low to the high category after empowerment, as seen in the t-test analysis. It is also due to effect control testing, and the maturation, mortality, and situational effects.

The above results are supported by the research conducted by Ruhmawati, Karmini, & Tjahjani (2017) on the empowerment of families in Tamansari Village, Bandung City. They found that after empowerment, family knowledge and attitudes were 78.3% and 82.6%, respectively, which was very good. Furthermore, the results of their statistical analysis showed a significant difference in these qualities between before and after empowerment (p = 0.001 and p = 0.005). Alimuddin, Rauf, & Dirawan (2016) also conducted empowerment research, using a quasi-experimental method with a pre-test post-test control group design in Pulosaren Village, Kepil District, Wonosobo Regency. Their results showed a very significant increase in knowledge and practice (p <0.05) in the empowerment group. Therefore, it can be concluded that community empowerment can increase knowledge and attitudes, even in regards to the environment.

This research can be a model for community empowerment in the rural areas of Indonesia, since the country is tropical and overgrown with tropical forests, making it one of the largest oxygen-producing countries in the world, along with Brazil. Meanwhile, protected and maintained tropical forests can also control the greenhouse effect and global warming. As a result, rural communities that live in direct contact with these forests need to be provided with good environmental knowledge and improve their attitudes. Furthermore, they need to have awareness about the importance of protecting the environment in order to ensure that they are wiser in maintaining it. This maintenance is not only in their interests, as it also benefits both the rest of the countries' citizens and the international community. Supported by previous research above, this research has proven that community empowerment, including of the Tegalan farmers in the Walanae watershed, can improve environmental knowledge and attitudes. Therefore, it can be used as a model for empowering other community groups. Knowledge and attitudes towards the environment need to be improved in every society, even in neighbouring countries which have the characteristics of an agrarian population.

CONCLUSION

Based on the results of the research and discussion above, the following conclusions can be drawn: 1) To find out the knowledge and attitudes towards the environment of dryland farmers in the Walanae watershed before empowerment, a free test was carried out and the results were in the very low category. Based on the results of the free test, the researcher compiled a grid of empowerment materials and after conducting the empowerment by providing material knowledge about ecosystem knowledge, the need to carry out land conservation, how to cultivate sloping soil with a terracing system, and using environmentally friendly fertilizers directly in the field. After doing the post-test it can be seen that their knowledge and attitudes have increased to the high category; 2) The results of the analysis came from using the Faired-Samples T-Test t. It is proven that empowerment has a positive and very significant effect on increasing knowledge and attitudes towards the environment of dryland farmers in the Walanae watershed.

ACKNOWLEDGEMENT

The authors are grateful to the rector of the Makassar State University (UNM) for the policy of research funding provided as a form of guidance for UNM lecturers in conducting Higher Education Tridarma, in particular, the policy to prepare PNBP research funds for accelerating the progress of professors. The authors are also grateful to the government in Paroto Village, Lilirilau District, and Bulu'e Village, Marioriawa District, Soppeng Regency, for granting the permission for the research to be conducted in this area, as well as to the dryland farming community for their willingness to become respondents.

REFERENCES

A. M. Alimuddin, B. Rauf, and G. D. Dirawan, (2016). "The effect of the counseling method to improvement of knowledge and preserve the environment attitude in the coastal area of Makassar," *Int. J. Appl. Environ. Sci.*, vol. 11, no. 2, pp. 613–622.

A. Ramadhana. (2017). *Implementasi kesadaran kolektif masyarakat terhadap kebersihan lingkungan (tinjauan program MTR Makassar Ta'Tidak Rantasa di kelurahan Kassi-kassi kecamatan Rappocini kota Makassar)*.Gowa: Universitas Islam Negeri Alauddin Makassar.

A. T. Sulistiyani. (2004). *Kemitraan dan model-model pemberdayaan*. Gava Media.

C. Asdak. (2018). *Hidrologi dan pengelolaan daerah aliran sungai*. Yogyakarta : Gadjah Mada University Press.

D. M. Brasington and D. Hite. (2005). Demand for environmental quality: a spatial hedonic analysis," *Reg. Sci. Urban Econ.*, vol. 35, no. 1, pp. 57–82.

E. Novendi and A. J. Pitoyo. (2019). Kontribusi Pendapatan Usahatani Lahan Tegalan terhadap Total Pendapatan Rumah Tangga Petani di Desa Candirejo Kecamatan Semin, Kabupaten Gunungkidul. *J. Bumi Indones.*, vol. 8, no. 2.

E. Suharto, dan Mulyani. (2005). *Membangun Masyarakat Memberdayakan Rakyat Kajian Strategis Pembangunan Kesejahteraan Sosial dan Pekerjaan Sosial*. PT Refika Aditama.

F. Amir, H. Haruna, and S. Saharuna. (2017). Model Pembinaan Petani Meningkatkan Kualitas Lingkungan Hidup Secara Berkelanjutan pada Daerah Irigasi Langkemme Kabupaten Soppeng, in *Seminar Nasional LP2M UNM*, 2017, vol. 2, no. 1.

H. Simon. (1993). *Hutan jati dan kemakmuran: problematika dan strategi pemecahannya*. Aditya Media.

Hung Lo, Carlos Wing. (2003). The Influence of Environmental Knowledge and Values on Managerial Behaviours on Behalf of the Environment: An Empirical Examination of Managers in China. *Journal of Business Ethics,* Vol.46 No.1 August, 2003.

J. S. Sumantri. (2003). *Filsafat Ilmu Sebuah Pengantar Populer*. Jakarta: Pustaka Sinar Harapan.

Katussme, Juliet and Schutt, Brigitta. (2020). Review Linking Land Tenure and Integrated Watershed Management. *Sustainability* 2020, 12, 1667; doi:10.3390/su12041667. https://www.mdpi.com/journal/sustainability

L. W. Anderson and L. A. Sosniak. (1994). *Bloom's taxonomy*. Univ. Chicago Press Chicago, II.

M. D. Gall, J. P. Gall, and W. R. Borg, (2014). *Applying educational research: How to read, do, and use research to solve problems of practice*. Pearson Higher Ed.

O. Ojedokun. (2011). Attitude towards littering as a mediator of the relationship between personality attributes and responsible environmental behavior," *Waste Manag.*, vol. 31, no. 12, pp. 2601–2611.

R. Syahra/ (2003). Modal sosial: Konsep dan aplikasi. *J. Masy. dan Budaya*, vol. 5, no. 1, pp. 1–22.

S. Azwar. (2013). *Sikap manusia dan pengukurannya.* Yogyakarta : Pus. Belajar Offset.

SantosoTri, Safrudin Atfalusoleh, Hari Kusmanto, Nafron Hasjim, Ali Imron Al-Ma'ruf. (2020). The Relationship Between Humans And Natural Environment In Luka Perempuan Asap Novel By Nafi'ah Al-Ma'rab: Literature Ecocritics Review. *International Journal of Scientific @ Technology Research*. Vol.9 Issue 01. January 2020.

Sarkar, Amaresh and Majumber, Mrinmoy. (2019). Economic of low-cost multi-stack cubical and semi-cylindrical shape stacked protected farms on marginal lands. *CIGR Journal*. Vol.21 No.21, July 2019.

T. P. K. B. B. Indonesia. (2008). *Kamus besar bahasa Indonesia*. Jakarta: Balai Pustaka.

T. Ruhmawati, M. Karmini, and D. Tjahjani, (2017). "Peningkatan pengetahuan dan sikap kepala keluarga tentang pengelolaan sampah melalui pemberdayaan keluarga di Kelurahan Tamansari Kota bandung," *J. Kesehat. Lingkung. Indones.*, vol. 16, no. 1, pp. 1–7.

Z. Pinto. (2015). Kajian Perilaku Masyarakat Pesisir yang Mengakibatkan Kerusakan Lingkungan (Studi Kasus di Pantai Kuwaru, Desa Poncosari, Kecamatan Srandakan, Kabupaten Bantul, Provinsi DIY), *J. Wil. dan Lingkung.*, vol. 3, no. 3, pp. 163–174.