



The Capacity of Extension Workers and Demonstration Methods to Farmers' Behavior in Utilizing Yards with Vertical Vegetable Cultivation

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Abstract. Agricultural extension activities were carried out to encourage the use of the yard. To deal with the narrowness of the yard, a vertical vegetable cultivation technique was used. The demonstration extension method was chosen to set an example and encourage changes in farmer behavior in the use of yards. This study aimed to analyze the farmer's behavior of their yards usage in growing vegetables vertically, and to analyzed the capacity effect of extension agent and the demonstration method on the behavior of using their yards in growing vegetables vertically. The study conducted in Pangandaran, Indonesia from April to August 2020. The sample used was 60 people who were determined using the cluster random sampling technique. The independent variables of the study were individual characteristics, capacity of extension workers and demonstration extension methods. The dependent variable is behavior that includes knowledge, skills and attitudes of farmers in the use of yards with vertical vegetable cultivation techniques. The data analysis used in this research is descriptive statistical analysis, paired sample t-test, and multiple linear regression. The results showed that there had been an increase in farmer behavior between before and after the implementation of the extension. The capacity of the extension agent and the demonstration extension method were effective in increasing the behavior of the use of the yard for vertical cultivation vegetable cultivation in terms of indicators of knowledge, attitudes and skills. Farmers' age and education, capacity of extension agents and demonstration extension methods had a significant influence on farmers' behavior in cultivating vegetables using vertical techniques. Utilization of home yards for vertical vegetable cultivation can be increased through strengthening the capacity of extension workers and demonstration extension methods.

Keywords: Extension workers capacity · Demonstration method · Yard utilization

1 Introduction

To anticipate the Covid-19 pandemic, in Pangandaran Regency there is a policy regarding the anticipation of delays in the distribution and availability of food through increasing the planting of vegetable commodities in the environment around their respective residences to meet the family's nutritional intake and increase endurance. Vegetable cultivation in the yard of the house is another way of using land in the yard. According to Ashari, et al., [1], the function of the yard is to produce: food ingredients in addition to paddy fields; vegetables and fruits; spices, condiments; handicraft materials; firewood; and livestock or fish products. For housewives, vegetable cultivation in the yard can help meet household kitchen needs such as mustard greens, lettuce, kale, spinach and other short-lived vegetables.

However, the yard of the house usually has a narrow size. Therefore, it is necessary to find the right method of growing vegetables. The technique of growing vegetables vertically is one solution when you want to grow crops in narrow areas such as yards. The technique of planting in a cursive manner has advantages including saving land, water and fertilizers [2].

The role of extension workers in increasing the interest and motivation of farmers to be able to take advantage of their home gardens is very necessary. Extension activities in agricultural development act as a bridge that connects the practices carried out by farmers with agricultural knowledge and technology that is always evolving. Extension workers need to conduct extension on vegetable crop cultivation using the vertical method using appropriate and effective extension methods. The selection of the right method or approach greatly affects the success of extension. Thus, the extension workers must choose and determine the right method according to the situation and condition of the farmers, so that the information conveyed can be accepted and applied by the farmers [3].

Extension should be able to encourage changes in behavior in terms of knowledge, attitudes and skills. Therefore, the extension workers must choose the right extension method that can improve the three behavioral domains. Assistance activities for the use of the yard by planting vegetables vertically require an extension method that displays demonstrations and examples of real actions. The demonstration method was chosen as a solution so that participants were directly involved in practical activities. This study aimed to analyzed the farmer's behaviour of using their yards in growing vegetables vertically, and to analyze the capacity effect of extension agent and the demonstration method on the behaviour of using their yards in growing vegetables vertically.

2 Research Methods

The study was conducted in Pangandaran District, Pangandaran Regency from April to August 2020. The population of this study were members of farmer groups in Pangandaran District who were the target of assistance in utilizing home gardens by planting vegetables vertically. The research sample was determined intentionally with the following criteria: women, members of the Women Farmers Group, received an extension program regarding the Sustainable Food House Area, namely 60 people.

The primary data of the research was collected directly from the source, namely the respondents who were the target of the assistance. Data collection techniques were carried out by means of interviews and filling out questionnaires. To obtain more information, an in-depth interview was conducted. Secondary data were obtained through extension programs, Village Profiles and information from the Pangandaran Agricultural Extension Center.

The research variables consisted of individual characteristics of farmers (X1), agricultural extension capacity (X2), demonstration method (X3), and farmer's behaviour of using their yards in growing vegetables vertically (Y1). The instrument used in this activity is a questionnaire. The research instrument used has been through validity and reliability tests with valid and reliable results.

Data analysis used descriptive statistics, comparative test paired Sample T-test, effectiveness of extension and multiple regression test. Descriptive statistics were used to analyze the behavior of farmers before and after the implementation of the extension. Therefore, as a form of evaluation, pre-test and post-test were carried out. The effect of this extension was tested by conducting a comparative paired Sample T-test between the results of the pretest and posttest. Multiple regression test was used to find the effect of variable characteristics of individual farmers, agricultural extension capacity, and demonstration methods on the variables of farmer behavior in the use of home gardens by planting vegetables vertically. The effectiveness of extension is used to see how big the percentage change in farmer's behavior is between before and after the implementation of the extension.

3 Results and Discussion

3.1 Description of Research Variables

3.1.1 Farmer Individual Characteristics

The average age of farmers as research respondents is 43.3 years. This condition is understandable considering that most of the respondents are in the middle category (35–54) with a portion of 83.4%. When compared between the young age category (<35 years) and the elderly age category (>54) it was found that there were fewer young farmers than elderly farmers in line with the findings of previous studies [4, 5]. This finding found that it is necessary to regenerate farmers to produce young farmers in order to maintain the existence of the number of farmers. The description of individual farmer characteristics based on indicators can be seen in Table 1.

Most of the farmers have a formal high school education level. The condition of the respondents in this study based on the level of formal education is better, because most farmers in Indonesia have elementary school education. Education can describe the level of farmers' learning abilities in agricultural content, thereby describing the speed of increasing knowledge, skills, and changes in farmers' attitudes [6].

The length of the respondent's farming business in farming varies from 2 to 32 years. Mostly, they have been farming for 2 to 10 years. The duration of farming is directly proportional to farming experience. Relatively long experience in farming tends to be critical [7]. However, the experience of farming in the fields is not necessarily the same as the experience of using the yard of the house.

Table 1. Description of individual farmer characteristics based on indicators

No.	Category	Number of Respondents	Percentage (%)
Age of farmers			
1.	<35 years old	4	6.6
2.	35–54 years old	50	83.4
3.	>54 years old	6	10.0
Formal education			
1.	Not in school	4	6.7
2.	Primary school	14	23.3
3.	Junior high school	15	25.0
4.	Senior high school	25	41.7
5.	College	2	3.3
Farming time			
1.	2–10 years	24	40.0
2.	>10–17 years	20	33.3
3.	>17–24 years	10	16.7
4.	>24 years	6	10.0

3.1.2 Extension Workers Capacity

Submission of good material is one of the keys so that the message conveyed to farmers can be easily understood. Respondents considered that the agricultural extension workers in this mentoring activity already had the ability to transfer materials to the target (Table 2). Most of the respondents assessed that the instructor had the ability to transfer material in the medium category. This means that the material presented by the extension workers can already be understood by the farmers. However, there are still respondents who assess the ability of the instructor in delivering the material to be in the low category. This shows that the instructor should try to improve his skills in delivering the material. In the implementation of the extension, the extensionist inserts several games to the farmers so that the material presented becomes more interesting. This game turned out to be a motivation for farmers so that in participating in farmer activities they became enthusiastic.

Language is a tool to communicate with each other. The language used during the counseling is a national language mixed with regional languages, namely a mixture of Javanese and Sundanese. This was done because in Pangandaran District the two regional languages were used in a mixed manner. Respondents considered that the agricultural instructors in this mentoring activity already had sufficient language skills (Table 2). Most of the respondents assessed that the instructor had language skills in the medium category. This means that the language used by extension workers can be understood by farmers. However, there are still respondents who rate the instructor's ability to use

Table 2. Description of the capacity of agricultural extension workers based on indicators

No.	Category	Number of Respondents	Percentage (%)
Ability to Deliver Material			
1.	Low	10	16.7
2.	Medium	30	50.0
3.	High	20	33.3
Language Skills			
1.	Low	14	23.3
2.	Medium	34	56.7
3.	High	12	20.0
Technical Ability			
1.	Low	10	16.7
2.	Medium	34	56.7
3.	High	16	27.6

language in the low category. This shows that the instructor should try to improve his skills in speaking good language.

Extension workers are required to master the technical skills of agriculture. Most of the respondents considered that the extension workers had sufficient technical ability in utilizing the yard by planting vegetables vertically (Table 2). That is, the respondents considered that the instructor was competent enough to deliver the material. However, there are still respondents who assess the ability of the instructor in technical mastery to be in the low category. This shows that the instructor must try to improve his ability so that the instructor is at the expert level in mastering the material.

3.1.3 Demonstration Method

The demonstration method must be supported by the availability of adequate equipment and materials. Most of the respondents considered that the equipment and materials were readily available (Table 3). The equipment is provided independently by the farmers who are the target of the program. However, what often becomes an obstacle is the materials provided jointly by the organizers and farmers. Some materials sometimes already exist but are not ready for use.

Based on Table 3, it is known that most of the respondents considered the clarity of the procedure in the demonstration method to be adequate. Mentoring activities are a gradual and continuous process. Farmers can follow the process of these activities from start to finish. Some farmers stated that in this activity it was enough to follow the directions given by the extension worker. Then they are directly involved with other farmers. They do not only see but work and practice it directly. However, there are still some farmers who demand clearer procedures. They are farmers who have not much time to always join in every stage of extension, so they need more detailed written procedures.

Table 3. Description of the demonstration method based on indicators

No.	Category	Number of Respondents	Percentage (%)
Completeness of equipment and materials			
1.	Low	5	8.3
2.	Medium	25	41.7
3.	High	30	50.0
Procedure clarity			
1.	Low	10	16.7
2.	Medium	26	43.3
3.	High	24	40.0
Easy to be understood			
1.	Low	0	0
2.	Medium	34	56.7
3.	High	26	43.3
Time effectiveness			
1.	Low	8	13.3
2.	Medium	32	53.4
3.	High	20	33.3

Submission of material using the demonstration method according to farmers makes the material easier to understand. Some farmers said that this material was suitable to be delivered using the demonstration method. This material is related to agricultural technicalities so that every participant must be involved in the activity. Each participant can feel and get the experience of growing vegetables vertically, starting from preparation, introduction of tools and materials, seeding, planting, care and harvesting. Based on Table 3, it is known that most of the respondents considered that the material presented by the demonstration method was easier to understand. This is allegedly supported by the majority of respondents having a high school education, so they have good absorption in understanding the extension material delivered.

The timing of the extension is one of the things that must be considered by the extension worker. Time effectiveness relates to the accuracy, length of time used and the amount of material presented. Extension activities have been planned jointly between extension workers and farmers so that the time does not conflict with other activities. Counseling is also carried out not too long, about 2 to 3 h. This is to avoid boredom and interfere with farmers' time doing other activities. The material is delivered in stages with the hope that farmers can understand it more easily and more deeply. Based on Table 3, it is known that most of the farmers assess the effectiveness of extension time in the medium category with a percentage of 53.4%. This means that the counseling time according to the agreement has met the expectations of most of the respondents.

Table 4. Changes in farmer behavior

No.	Indicators	Farmer Behavior		Extension effectiveness	t-test (Sign.)
		Pre test	Post test	(%)	(Sign.)
1.	Knowledge	58.3	85.8	65.87	0.000
2.	Attitude	61.4	81.6	52.35	0.000
3.	Skill	25.0	96.9	95.83	0.000

3.1.4 Farmer’s Behaviour of Using Their Yards in Growing Vegetables Vertically

Based on Table 4, it can be seen that extension activities can significantly improve all indicators of farmer behavior. The highest increase was in the domain of skills with a very high effectiveness of counseling, namely 95.83%. This study proves that the demonstration method is very suitable for improving farmer behavior in the skill domain. It also shows that the demonstration method is compatible with the content of the material, namely the use of the yard by planting vegetables vertically. The demonstration method is also in accordance with the needs of farmers who prefer technical examples and are directly involved so that farmers’ technical skills become more trained.

Increased behavior of farmers in the use of home yards by planting vegetables vertically also occurs in the knowledge domain with the effectiveness of extension 65.87%. Prior to this activity, several farmers had used their yards but with ornamental plant commodities. In the past, the use of the yard of the house was more focused on the beauty of the house and its surroundings. With this activity, farmers know that the use of home gardens with vegetable plants has more benefits, namely being able to meet some of their food needs. Farmers also know that even narrow land can still be utilized by growing vegetables vertically.

Increased behavior of farmers in the use of home yards by planting vegetables vertically also occurred in the attitude domain with the effectiveness of extension 52.35%. Prior to this activity, some farmers were of the opinion that it was better to decorate the house with ornamental plants. Prior to this activity, some farmers were also of the opinion that it was impossible to use the narrow yard of their house. However, as time goes by and this activity is introduced and implemented, the attitude of farmers has changed to accept and agree that the yard can be utilized by planting vegetables vertically. Farmers also have a positive attitude that growing vegetables vertically is very suitable for narrow land.

3.2 Effect of Agricultural Extension Capacity and Demonstration Methods on Farmer Behavior

The behavior of farmers in using their yards by planting vegetables vertically is significantly influenced by the age of the farmers, the level of formal education, the capacity of the agricultural extension workers, and the demonstration method (Table 5). The influence of these variables is positive and forms an equation, namely:

$$Y = 0.750 + 0.943X_{11} + 0.701X_{12} + 0.587X_2 + 0, 895X_3 \tag{1}$$

Table 5. Results of multiple linear regression analysis

Variable	Coefficient	Sig.	Information
Constant	0.750	0.021	
X1.1	0.943	0.000	Significant
X1.2	0.701	0.030	Significant
X1.3	-0.069	0.765	Not Significant
X2	0.587	0.021	Significant
X3	0.895	0.000	Significant

Adjusted R Square: 0.723

The age of the farmer has a positive effect on changes in farmer behavior in the use of the yard by planting vegetables vertically. That is, as a person's age increases, his behavior increases both in his knowledge, attitude and skills. This result is different from the findings in the case of agriculture in general, where age is inversely related to adoption rates [3]. The higher the age, the less one's learning power [8]. However, in the case of using the yard of the house, the older a person is, the more responsible he is to manage his house. One farmer said that the activity of using the house by planting vegetables vertically could be a moment to organize and beautify his house.

The level of formal education has a positive effect on changes in farmers' behavior in the use of home yards by planting vegetables vertically. The higher a person's level of formal education, the knowledge, attitudes and skills increase. This happens because formal education changes a person's way of thinking to more quickly understand the surrounding phenomena [3]. Someone with higher education has an interest in making his home more beautiful. Therefore, when there is an opportunity to participate in home utilization assistance, they follow it enthusiastically like previous research reports [9, 10].

The capacity of agricultural extension workers affects the behavior of farmers in the use of home yards by planting vegetables vertically. The capacity of agricultural instructors in this study is the ability to convey material, the ability to speak well and technical skills. Farmers consider that extension workers have the ability to explain well about the use of home yards by planting vegetables vertically. Farmers understand that the yard that has not been used so far can actually be more useful if it is planted with vegetables. Usually, farmers grow vegetables in the fields. With a garden around the house, farmers' time becomes more efficient. For participants who usually don't have a vegetable garden, by planting vegetables in their yard, they can enjoy the harvest. Farmers also understand that growing vegetables vertically is very effective in utilizing the narrow area of the yard.

Farmers consider that the extension worker can speak well using words and sentences that are easy to understand. The extension worker in charge of mentoring has worked for at least 20 years. Thus, speaking in front of farmers is common practice. Between extension workers and farmers is a team that must work together. The agricultural extension worker in charge has a working area in the area, so they have actually

met often. However, these meetings are usually for agricultural purposes in the fields. Some farmers stated that being a participant in the content of using their home yards by planting vegetables vertically was a new thing. The agricultural instructor who served as a companion to the previous activity already had the technical capacity to grow vegetables vertically. They have previous experience in developing vertical farming. They have also attended technical guidance on the utilization of the yard by planting vegetables vertically. They also have experience assisting the same activities several years before because house use is an extension program that is often carried out [8, 11, 12].

The capacity of agricultural extension workers has a positive effect on the behavior of farmers in utilizing their home yards by planting vegetables vertically. That is, when the capacity of agricultural extension workers is getting better, the behavior of farmers will be higher. Based on the above equation, it can be interpreted that for every 1 additional unit of extension capacity, the behavior of farmers increases by 0.587 units. Thus, to improve the behavior of farmers in the use of home yards, it can be done by increasing the capacity of agricultural extension workers who accompany them.

The demonstration method used in agricultural extension activities affects the behavior of farmers in utilizing their home yards by planting vegetables vertically (Table 5). The demonstration method in this study has indicators of completeness of equipment and materials, clarity of procedures, ease of understanding, and time effectiveness. The equipment and materials at the time of the mentoring were available well, thanks to the support of the participants, the local agriculture office and the Bogor Agricultural Development Polytechnic. Especially for equipment, participants provide it, so there is no need to procure tools. Furthermore, for the materials, some were managed by the participants and some were assisted by the local agriculture office.

Farmers consider that the demonstration method used in assisting activities in the use of home yards by planting vegetables vertically has a clear procedure. Every step that must be prepared and carried out can be easily accepted by farmers. Starting from the tools that must be available, the materials that must be prepared, then what must be done. Farmers think that growing vegetables in their yards is not too difficult, they can even be creative to make them look more beautiful so that they beautify the home page.

The demonstration method for mentoring that uses the demonstration method on the use of the yard by planting vegetables vertically makes it easier for farmers to understand it. Farmers believe that growing vegetables can be done by anyone, even those who are just starting out. Utilization of the yard by planting vegetables can be a vehicle for introducing agriculture to children and other young generations. Children are stimulated to ask questions about what is being done, what plants to plant and arouse curiosity to join in and get involved. Introducing agriculture to the younger generation is an effort to support farmer regeneration [13–15]. Farmers assess the use of the demonstration method is more effective in the use of learning time. The demonstration method provides an example for farmers of what to do. This method makes farmers directly involved in activities. Thus, farmers feel there is an increase in knowledge, positive attitudes and skills.

The use of the demonstration method has a positive effect on the behavior of farmers in utilizing the yard by planting vegetables vertically. That is, when the demonstration method is getting better, the farmer's behavior will be higher. Based on the above

equation, it can be interpreted that for every 1 additional unit of extension capacity, the behavior of farmers increases by 0.895 units. Thus, to improve the behavior of farmers in the use of home yards, it can be done by optimizing the use of demonstration methods during mentoring.

The implications that can be put forward from the results of this study are to improve the behavior of farmers in utilizing their home yards by planting vegetables vertically as follows:

3.2.1 Optimizing the Use of the Extension Method with the Demonstration Method

The findings of this study are that there are significant behavioral changes in knowledge, skills and attitudes before and after the implementation of counseling. Therefore, the better use of demonstration methods will have an impact on improving farmer behavior. Some things that must be considered when using the demonstration method are the completeness of equipment and materials, clarity of procedures, ease of understanding, and time effectiveness.

3.2.2 Knowing the Individual Characteristics of Farmers

The research finding is that the individual characteristics of farmers, namely age and formal education, have a real influence on changes in farmer behavior. Therefore, the characteristics of the extension target, namely farmers, must be a concern. Agricultural extension workers must know the participants so that they can choose the appropriate method so that the information transfer process runs effectively.

3.2.3 Increasing the Capacity of Agricultural Extension Workers

Another research finding is that the capacity of extension workers has an effect on increasing the knowledge, attitudes and skills of farmers. This finding is an input for various parties dealing with agricultural human resources that increasing the capacity of extension workers is very important. Agricultural extension workers should be trained and nurtured in both technical content and extension methods.

4 Conclusion

The results of the study can be concluded that there was increasing in farmer behavior between before and after the implementation of the extension. The capacity of the extension agent and the demonstration method effectively increase the farmer's behavior of using their yards in growing vegetables vertically in knowledge, attitudes and skills indicators. Farmer's age, farmer's education, capacity of extension agents and demonstration methods have a significant influence on farmer's behaviour of using their yards in growing vegetables vertically.

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