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Farmer Capacity in Managing Enviromentally Friendly Paddy Farming in Central Sulawesi Indonesia

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Abstract

Efforts to increase the production of environmentally friendly farming can be well done by looking at various input, process, and output variables. Various input in farming activities, both internal and external factors included: characteristics of farmers, innovation, counseling level, supporting factors, and capacity of farmer should support each other. To run these efforts properly, a conduction of a review of the relationship between the various variables were needed. The research was conducted in Sigi and Parigi Moutong Districts, Central Sulawesi Province. Determination of research location is done purposively in the rice production centers area included district, sub-district, village and farmer group. Total responden was 174 farmers. The method of analysis used Rank Spearman correlation test, with data processing tool used Statistical Product and Service Solution (SPSS) software. The result showed that there was a significant and positive relationship between the characteristics of farmers with their capacity, asignificant and positive relationship between innovation level and capacity of farmer, asignificant and positive relationship between innovation conseling, and capacity of farmer, and a significant relationship between supporting factors with capacity of farmer.

Keywords: agriculture extension; agricultural; capacity of farmer; innovation level.

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1. Introduction

The non environmentally agricultural systems causes many problems such as; the decrease of agricultural productivity (leveling off), water pollution, nutrient and environmental destruction, and the occurrence of ecological disturbance of rice fields (loss of local native biota, unequal populations of predators/ parasites with insect pest populations, the occurrence of pest, and epidemics disease in rice plants with higher intensity [21]. Environmentally friendly farming is one of the alternatives to sustainability of farming. The implementation of eco-friendly farming produces innovations in cultivation techniques are oriented to yield quality, optimum production, and sustainment of the environment.

Such efforts are requiredto improve the capacity of farmers in implementing environmentally friendly innovations, because innovation is different from conventional. High capacity of farmers can manage their farming properly and sustainably in order to produce high competitiveness, quality and market preferences. The adoption of environmentally friendly agriculture innovations will maintain the productivity of land from time to time, improve the biophysical and socio-economic aspects of farmers. The capacity of farmers to be achieved is farmers who have high fighting ability to apply environmentally friendly innovation techniques therefore they can commit to sustainability of farming and have adaptive power to economic and environmental change. In addition, farmers should be able to design business goals, able to evaluate and solve problems that arise in the farming, and also the ability to build synergistic partnership.

This study has limitations in the case only choose two districts for representating Central Sulawesi regarding the availability time and acessibility of location. Furthermore strategies to improve the capacity of farmers themselves have not yet covered in this research thus further research is needed related to the physical environment such as the level of land damage, the area of arable land, and environmental awareness in an effort to improve the quality of the environment..

Achieving capacity of paddy field farmers among others can be done with awareness approach through the implementation of extension, the realization of the Law on Agricultural Extension of Fisheries and Forestry (SP3K) Number 16 of 2006 which prioritizes humans as the subject of agricultural development. The general strategy of the Ministry of Agriculture (2014-2019) also mentioned that to achieve the objectives and targets of agricultural development, it is necessary to increase the capacity of human resources (HR) of agriculture. In order for these efforts to be optimal, it is necessary to study the relationship between various variables that play a role in eco-friendly farming. In relation to the description, the objectives of this research are: (1) to analyze the level of farmers' capacity to manage environmentally friendly rice paddy and (2) to analyze factors related to farmers capacity in managing environmentally friendly rice paddy in Central Sulawesi.

2. Methodology

The study was focusedon Sigi and Parigi Moutong District Central Sulawesi Province. Data collection purposively covered in area of rice production centers, selected from district, sub-district, village, and farmer group. Data collection was conducted from August to November 2016.

The respondent of the study are the head of a farming family who were a member of farmer group of 556 peasants. Sample method using purposive sampling that determine the respondent in four categories, farmer group who has attended Integrated Crop Management Field School, Integrated Pest Management Field School, and the Biosafety Development. Samples were randomly selected from group's core administrators and group members (random sampling). The number of samples was determined by proportional random sampling obtained by 174 respondents. Table 1 showed the detailed description of the study sample and the study sites.

Table 1: Number of farmers sample at research location Year 2017

District	Sub-District	Number of Farmer's Group Members	Samples
Sigi	Biromaru	133	41
	Gumbasa	125	39
Parigi Moutong	Balinggi	129	40
	Parigi Selatan	169	54
		556	**174**

Collected data includes quantitative and qualitative data, continued by tabulation and data analysis using descriptive statistics and inferential statistics. Spearman Rank correlation test was used to know the correlation between variables, with tool of data processing using Statistical Product and Service Solution (SPSS) software. The formula as follows:

$$rs = 1 - \frac{6 \sum_{i-1}^{n} di^2}{n^3}$$

Description :
*r*s = Estimated coeffient of correlation
di = Difference in every pair of rank
n = Number of respondent

The hypothesis of the study are includes:

(1) Farmer's Characteristics (X1) have significant and positive correlation with Farmer Capacity (Y1)
(2) Level of Innovation (X2) has significant and positive correlation with Farmer Capacity (Y1)
(3) Innovation Extension (X3), has significant and positive correlation with Farmer Capacity (Y1)
(4) Factors supporting innovation (X4), has significant and positive correlation with Farmer Capacity (Y1).

3. Results and discussion

3.1. Farmer's Capacity Level Processing of Environmentally Friendly Rice Paddy

The capacity of farmers is a description of power or personal ability possessed by farmers in supporting of their

farming activities. Capacity or capability needs to be continuously improved by the time. This related with the philosophy of continuity in counseling which starts from the knowing, willingness, and ability. In general, the results of the analysis show that the capacity of environmentally friendly paddy rice farmers is in the medium category. Quantitatively the capacity of farmers is better, however qualitatively still not optimal. The capacity of farmers shows that there are three medium and two low category indicators. The average capacity of farmers in Parigi Moutong District is higher than rice farmers in Sigi District in the point of environmentally friendly rice paddymanagement. Low farmer capacity levels are shown in farming planning capacity and farmer-partnering ability in both districts (Table 2).

Table 2: Distribution of rice paddy farmers based on their capacity level at two research sites in Central Sulawesi

No.	Farmer Capacity	Category	District		Total	Test *Mann Whitney*
			Sigi n=78 %	Parigi n=96 %	n=174 %	
	Technical Ability (score)	Low(8-21.67)	28.2	5.2	15.5	
		Medium(21.68-35.34)	55.1	61.5	**58.6**	0.000**
1.	average= 29.60	High (35.35-49)	16.7	33.3	25.9	
2.	Solving problem (score)	Low (6-11.67)	15.4	4.2	9.2	
	average=16.32	Medium(11.68-17.34)	62.8	41.7	**51.2**	0.000**
		High (17.35-23)	21.8	54.2	39.7	
	Farming Planning (score)	Low (4-19)	69.2	54.2	**60.9**	
		Medium (19.1-34)	29.5	45.8	38.5	0.007
3.	average =16.52	High (34.1-49)	1.3	0.0	0.6	
	Evaluate Farming (score)	Low (4-10.67)	11.5	12.5	12.1	
		Medium(10.68-17.34)	52.6	43.8	**47.7**	0.065
4.	average =15.52	High (17.35-24)	35.9	43.8	40.2	
	Environmental Adaptability	Low (4-10.67)	12.8	6.3	9.2	
	Capabilities (score) average	Medium (10.68-17.34)	67.9	54.2	**60.3**	0.000**
5.	=15.22	High (17.35-24)	19.2	39.6	30.5	
	Partnering Ability (score)	Low (4-10.67)	30.8	18.8	**46.6**	
	average =13.45	Medium(10.68-17.34)	47.4	45.8	29.3	0.004*
6.		High (17.35-24)	21.8	35.4	24.1	

Description: * significant different at level 0.05

** very significant different at level 0.01

3.2. Relationship of characteristics and capacity of farmers

The relationship between the characteristics of the farmers and their capacity is a representation of the relationship between individual characteristics and their capacity.The first hypothesis is characteristics includes: experience, education, cosmopolitan, and land area have significant and positive relationships with capacity includes: technical capability, problem solving, planning, evaluating, adapting, and partnering. To see the relationship between the characteristics of farmers and their capacities, a correlation test was performed. The results of [35] research indicate that the level of formal education, age, experience of farming, and the courage to take risks significantly affect the capacity of farmers and the independence of rice farming. Similarly, the factors affecting the capacity of households of rice farmers in lebak are age and farming experience [42]. Here are the results of the correlation test between the characteristics of farmers and their capacity (Table 3).

Table 3: The value of coefficient of correlation between the characteristics of farmers with their capacity

Farmer Characteristic	Farmer Capacity					
	Technical Ability	Problem Solving	Planning Ability	Kemapuan Mengevaluasi	Kemampuan Beradaptasi	Kemampuan Bermitra
Farming experience	0,138	-0,005	**0,165***	0,119	0,083	0,078
Formal Education	-0,028	-0,072	-0,095	-0,045	-0,109	-0,142
Non Formal Education	**0,295****	**0,174***	0,082	0,132	0,131	**0,161***
Cosmopolitan	0,091	0,058	0,041	0,077	0,075	0,033
Land area	**0,248****	**0,271****	**0,287****	**0,224****	**0,328****	**0,232****

Description: * Significant correlated at α = 0,05

** Very significant correlated at α = 0,01

The result of correlation analysis shows that there is a significant and positive relationship between the characteristics of farmers and their capacity.It includes: a significant relationship between the experience of farming with the ability of planning, the significant relationship between non-formal education with technical skills, problem-solving skills and partnership ability, and significant relationships between the land areas owned by the capacity of farmers as a whole. The results of [28] indicate that all respondents have observed the upward trend in temperature, wind, and lack of adequate rainfall over the last 20 years, while in Indonesia farmers gave response to choose short-term plants as a major agricultural practice to minimize potential losses that can occur due to climate.

The experience of farming shows a significant and positive relationship with planning ability at α = 0.05 or significantly categorized. Reference [35] states that knowledge, attitudes and skills affect the capacity of farmers. In the sense that a person's farming experience will be very useful to the ability of planning. The more one's experience, especially in farming, the better the planning ability is done. Owned experience will be very helpful in planning future farming. This is also related with Theory Planned Behavior by [7] that farmers'

capacity can evolve through a learning process to change behavior. Furthermore, Bryan and his colleagues (2013) states that agricultural adaptation measures such as better use of crop varieties, tree planting, soil conservation, changes in cropping and irrigation dates are the most widely used adaptation strategies. Environmental factors, institutional, and economic structures are key drivers that influence farmers to choose more specific adaptation methods. [1] who examined the relationship between age and willingness to participate in conservation programs basically because of the farmer's many years of farming experience.

Non-formal education shows a tangible and positive relationship with technical ability, problem-solving ability and partnership ability at $\alpha = 0.01$ or categorized as very significant. It means that more and more farmers follow non-formal education, such as; training, field school, apprenticeship; the higher technical capability of environmentally friendly rice cultivation, and the higher of ability to overcome the problems and the ability in partnership. Non-formal education, defined as education gained outside the formal education level, is an effort to increase the capacity of individuals, such as; training, counseling, field schools and others. Reference [13] states that counseling is a complex process that encompasses problem-solving perspectives, nonformal educational processes aimed at rural communities, and provides advice and information to address problems, and the goal is to increase production, improve living standards, and efficiency of family businesses. Through non-formal education farmers can access information to help farmers make decisions on alternative solutions to their farming problems.

According to [40] the role of counseling can help farmers overcome their problems, providing information that can help farmers make the best decisions for themselves. According to [38] that the education level of respondents was positively and significantly correlated with farmer's decision to use SWC technology at 1% level of significance. This is because educated farmers have a better understanding of the consequences of soil erosion and the resulting soil conservation benefits. This motivates farmers to spend more time and money in the adoption of conservation technologies. Reference [10] mentions that young age and higher education tend to have the ability to implement the innovations introduced. Similar thing is found [6] that non-formal education can more quickly meet the practical needs of the community because the curriculum and learning system can be more flexible and adaptable (in accordance with the objectives of the learners/ objectives). Non-formal education proves to be effective because the curriculum combines technical/ business skills education with character development and social awareness (life skills) [14]. Meanwhile, according to [40], education is a means to form opinions and courage in decision-making management of his farm.

Land area shows a real and positive relation to technical ability, problem solving ability, planning ability, evaluation ability, adaptability and ability to partner at $\alpha = 0{,}01$ or very significant categorized. This means that the more land owned by farmers the higher the capacity of farmers. The size of the wetland farming area determines the farmers' ability to apply environmentally friendly rice paddy innovation. Farmers who own large lands feel the benefits of managing environmentally friendly rice fields compared to small farmers. Reference [9] states that the economic structure influences the choice of farmers' adaptation methods to climate change. Household size, income, education, accessibility to climate information via television and radio, belonging to farmer groups, land, crop varieties, access to formal and distance-to-market loans have significantly affected adaptation. Furthermore, Reference [16] mentioned that farmers who grow peanuts as the main crops to adapt to

climate change have a 94% probability compared to farmers who do not grow other crops whereas farmers who know climate change patterns through television and radio have a higher probability (94%) to climate change than those using other media. According to [12] that the impacts of climate change on agricultural production differ from country to country and some studies confirm that climate change has a negative impact.

Rural farmers are heavily influenced by climate change because they have a low adaptive capacity to climate change. Reference [34] states that the land area has a significant effect on the level of technology adoption. Reference [19] suggests that the more land that farmers manage, there is a tendency for the farmer owners to get information about farming from various sources because land tenure for farmers is one of the considerations in determining the adopter farmers. Reference [22] stated that one of the individual factors associated with the adoption of innovation is the area of farming land, the more rapid farming land the sooner adopt innovation. A large scale of business is likely to have a greater chance of increasing its capacity in a variety of ways.

3.3. Relationship of innovative level and farmer capacity

The relationship of innovation with the capacity of farmers is a representation of the relationship between individual characteristics, especially the level of innovation with capacity. The hypothesis is that the level of innovation owned by farmers has a significant relationship with their capacity, which includes; technical ability, problem solving ability, planning ability, evaluation ability, adaptability and partnering ability. The following is the result of the correlation analysis in Table 4.

Table 4: The value of correlation coefficient between innovation level and farmer capacity

Level inoovation	Kapasitas Petani					
	Technical Ability	Problem Solving	Planning Ability	Evaluation Ability	Adaptation Ability	Partnership Ability
Level of Economic's benefit	**0,158***	0,083	-0,020	0,091	0,075	0,046
Level of complexity of innovation	**0,229****	0,110	0,038	0,140	0,123	0,116
Level of compatibility innovation	**0,237****	0,119	0,014	0,119	0,110	0,088
Level of the ease of innovation to be try	**0,193***	0,058	-0,030	0,105	0,077	0,044
Level of the ease of innovation to be observed	**0,203****	0,069	-0,020	0,119	0,079	0,037

Description: * Significant correlated at $\alpha = 0,05$

** Signifcant correlated at α = 0,01

Correlation analysis results obtained that there is a significant and positive relationship between the level of innovation with the capacity of farmers, including; the real relationship between the economic advantages and technical capabilities, the apparent relationship between the complexity of the application and the technical capabilities, the apparent relationship between technological conformity with technical capability, the apparent relationship between easily of use with technical capabilities and the apparent relationship between easily observed ease and technical ability.

The level of economic benefits is significantly and positively correlated with technical ability at α = 0.05 is categorized as significant. This means that there is a significant influence between the level of economic benefits owned by farmers with technical ability. In the sense that the higher the level of economic benefits owned, the better the technical ability possessed. Similarly, the better the technical ability of the farmers, the better the level of economic benefits that can be obtained. These technical capabilities can be, in the selection of superior seeds, the ability to cultivate the land, the technical ability in handling pests and diseases to technical skills in harvesting and post-harvest handling.

The complexity of innovation is significantly and positively correlated with technical ability at α = 0.01 or very real categorized. This means that there is a very significant influence between the complexity of innovation and technical ability. In the sense that the higher the complexity of existing innovations, the higher the technical capability that must be possessed. In other words, the technical capabilities possessed by farmers especially in environmentally friendly rice field farming activities will be very helpful in solving the complexity of innovation. Various complexes commonly faced by farmers, especially in environmentally friendly rice farming, among others; in the selection of superior seeds, complexity in the manufacture of vegetable pesticides and organic fertilizer to the complexity in land processing especially related to water conservation and agricultural land.

The level of conformity of innovation is significantly and positively correlated with technical ability at α = 0.01 or very significant categorized. This means that there is a very significant influence between the level of conformity of innovation with technical ability. In the sense that the higher the level of conformity of existing innovations, the higher the technical ability that must be possessed. In other words, the technical capabilities of the farmers, especially in the environmentally friendly rice field agriculture will be very helpful in adjusting the innovation to the farmers. Eco-friendly rice paddy farming is an agricultural activity that applies many new innovations such as; superior seed innovation, pest and disease management innovations with vegetable pesticides and organic fertilizer use to harvesting techniques and post-harvest handling. Innovation of superior seeds and other innovations require high technical skills, in order to run well. Results of [26] suggests that the adoption of new technological innovations is relatively slow, but has the potential to improve over conventional technologies.

Level of ease of innovation to try were significantly and positively related with technical ability at level of α = 0,05 or categorized quite significant. This means that there is a significant influence from the level of ease of

innovation to try with technical capability. In the sense that the higher the level of ease of innovation to try, the better the technical ability possessed. Similarly, the better the technical ability of the farmer, the easier the innovation to try. These technical capabilities can be, in the selection of superior seeds, the ability to cultivate the land, the technical ability in handling pests and diseases to technical skills in harvesting and post-harvest handling.

The degree of simplicity of innovation to be observed is significantly and positively correlated with technical ability at $\alpha = 0.01$ or categorized as very significant. This means that there is a significant influence of the degree of innovation ease to be observed with technical capability. In the sense that the higher the level of ease of innovation to be observed, the better the technical ability possessed. Similarly, the better the technical ability of the farmers, the easier the innovation to observe. These technical capabilities can be, in the selection of superior seeds, the ability to cultivate the land, the technical ability in handling pests and diseases to technical skills in harvesting and post-harvest handling.

3.4. Extension counseling innovation and farmers capacity

The innovation counseling relationship with farmers capacity is a representation of the relationship between innovation counseling and the capacity of farmers. The innovation counseling module includes; extension materials, extension methods, extension intensity, and extension ability. Modifiers of farmers capacity include: technical capability, problem solving ability, planning ability, evaluation ability, adaptability, and partner ability. The hypotheses is that there is a relationship between innovation extension level and farmer capacity. The results of [3] suggest that overall, farmers in their research areas were found to have very poor access to extension services due to a combination of factors, partly due to institutional constraints, including very limited number of extension workers and lack of knowledge on how to deal with problems specific. Here are the results of the correlation test between the characteristics of farmers and their capacity.

Table 5: Value of correlation coefficient between innovation extension and farmer capacity

Innovation extension	Farmer's Capacity					
	Technical ability	Problem solving	Planning ability	Evaluation ability	Adaptation ability	Partnership ability
Extension material	**0,204****	0,077	-0,013	0,121	0,084	0,045
Extension methods	**0,226****	0,097	0,117	**0,222****	0,148	**0,154***
Extension intensity	**0,273****	0,113	**0,217****	**0,328****	0,140	**0,242****
Extension officer capability	**0,386****	**0,198****	**0,197****	**0,323****	**0,250****	**0,304****

Description: * Significant correlated at $\alpha = 0,05$

** Very significant correlatd at $\alpha = 0,01$

Correlation analysis results obtained that there is a significant and positive relationship between innovation counseling with the capacity of farmers, including; the significant relationship between extension materials with technical capability, the significant relationship between extension methods with evaluating ability and partnership ability, significant relationship between intensity of counseling with technical ability, planning ability, evaluation ability and partnership ability, signficant relationship between extension ability with ability technical, problem-solving skills, planning ability, evaluation ability, adaptability, and partnering ability.

The importance of innovation in improving the capacity of farmers is shown by the existence of relationships that significantly affect the capacity of farmers. This is apparent in the existence of a significant relationship between extension materials with technical skills. The apparent relation also appears in extension methods with technical capability, evaluation ability and partnering ability. Similarly, the intensity of counseling with technical skills, planning ability, ability to evaluate, and ability to partner. The apparent relationship is also evident in the ability of extension workers with technical capability, problem-solving ability, planning ability, evaluation ability, adaptability, and partnering ability. According to [2] that there is no difference between the production and income of olive farmers receiving public and other extension services with farmers who do not use the services. Similarly, Reference [11] argues that because of the ineffective pests, diseases and extension provided to farmers, the productivity of palm trees decreases in Balochistan, Pakistan, by 37%.

The extension material correlated significantly and positively with technical ability at $\alpha = 0.01$ or categorized as very significant. This means that extension materials affect the improvement of technical skills. Extension materials provided can be adapted to the problems that arise at that time or "up to date" as the emergence of pests and diseases, decreased production due to reduced nutrients in the soil, prevention of integrated or the use of assistive devices agriculture eg Color Chart Daun (BWD), Device Rice Soil test (PUTS), Fertilizer Test Device, Planting Calendar (Katam) and how to use the internet or mobile facilities to obtain market information and other information according to the needs of farmers. This is in line with the results of research states that the aspects of the technology needs to be improved significantly so that the implementation of integrated pest management (IPM) to be environmentally safer than the use of synthetic pesticides and the preservation of a healthy environment is maintained. Although the extension services offered to farmers, regardless of the size of agricultural land are inadequate (cramped), due to the reluctance of farmers to meet unmet extension/ and getting solution of specific needs of farmers [4].

The extension method correlated significantly and positively with technical capability, evaluating ability at $\alpha = 0,01$ or categorized as very significant and there is a real relationship between extension method with partner ability at $\alpha = 0,05$ or categorized quite significant. This means that extension methods affect the improvement of technical ability, evaluation ability and partnership ability. Teaching methods or extension methods that lead to more direct practice, such as; VUB rice demonstration method, demonstration of organic fertilizer making, and manufacture of vegetable pesticide. The method of direct practice is best perceived by the majority of farmers (98%), on the grounds that matter is more easily understood and can see and practice directly the way it is exhibited. Moreover, if related to information technology applications such as; the use of mobile phones and the internet to access information related to various innovations of rice farming that is environmentally friendly. According to [5, 29, 24, 4] that the extensionists themselves need to initiate a proactive approach, which will

require officials to visit farmers to familiarize themselves with the site-specific constraints of farmers and then extend the help needed to overcome farmer constraints.

The intensity of extension is significantly and positively correlated with technical ability, planning ability, evaluation ability and partnership ability at $\alpha = 0,01$ or categorized as very significant. This means that the intensity/frequency of counseling given is very influential on increasing the capacity of farmers. It understandable that the more extension activities are done, the farmers will have more ability in the management of environmentally friendly rice paddy. The relatively rare, unscheduled extension activities and the frequency of extensionist visits to villages are very low, resulting in low farmers' assessment of innovation extension. Communication between extension workers and farmers is intensified, for example; by increasing the extension's visit to the farmers group, making additional visits outside the routine schedule of extension activities and extension workers coming at all times to farmers facing problems in their farms. This communication becomes more optimal if the extension workers live in the local village, so farmers can convey a problem or something to the extension at any time.

According to [40], the extension workers should be local villagers, so they can understand the problems faced by farmers in the village. Further research by [3] mentions that overall, farmers in the study area were found to have very poor access to extension services due to a combination of factors, in part due to institutional constraints, including a very limited number of extension workers and lack of knowledge of how handle specific issues. Reference [43] mentioned that there is a positive and highly significant correlation ($P < 0.01$) between farmers' motivation to invest in SWC technology and their access to training, particularly related to land conservation and management. This shows that farmers who participate in the training are more aware of the conservation technology and its benefits than those who do not participate. Furthermore Nagassa [30] also mentioned that farmers' access to training and their participation in counseling/workshops improved their perceptions of soil erosion problems and facilitated the use of conservation technologies.

Extension ability is significantly and positively correlated with technical ability, problem solving ability, planning ability, evaluation ability, adaptability, and ability to partner at $\alpha = 0,01$ or categorized as very significant. Extension capability in carrying out extension role becomes more important to be improved, so farmer capacity can be improved. The role of extension workers perceived by farmers is still lacking, such as; what the farmers expect themselves to be. The learning process takes place according to the peasants' assessment in terms of providing materials and practice with more learning methods by meeting in village hall or rooms with lecture or discussion models, which tend to be "theoretical" and there is no direct practice. The role of extensionists in providing motivation or enthusiasm for applying innovation of environmentally friendly rice paddy still hesitant done extension worker. Likewise information or how to access more information there is no special coaching either on farmers who are still relatively young and have a mobile phone.

Extension workers help farmers to build cooperation with government and private sector including less categories. The role of extension workers in terms of cooperation with other parties, the majority of farmers stated that the extension agent does not cooperate with institutions associated with his business, either with the banking as a source of capital, marketing, research and input providers. Agricultural extension (PP) has a

strategic role in agricultural development considering the limitations that agricultural human resources still have in promoting the capacity of farmers. Reference [36] asserted that building farmers as the main perpetrators of reliable agriculture means building the independence of farmers. Some researchs [32,31,37] states that agricultural extensionists have lost meaning because success is measured only by increased production, while the development of the characteristics and capacities of farmers is marginalized and neglected. This condition arises because of the failure to build a participatory interaction, by giving the widest space to extension workers and farmers to capture togetherness in encouraging problem-solving skills. Furthermore, Mounder (1972) said that the role of extension agent other than as a change agent is also a liaison (facilitator) between research institutions and farmers as the main actors in applying farming technology and liaison between farmers and agribusiness in marketing agricultural products.

3.5. Relation of supporting factors and farmers capacity

The relationship of supporting factors and capacity of farmers is a representation of the linkages between factors supporting the innovation of environmentally friendly rice paddy with the increase of farmer capacity. Variable supporting factors include; farmer group support, local leader support, raw material availability support, market support, capital support, and information technology support. Moderate capacity of farmers covers; technical ability, problem solving ability, planning ability, evaluation ability, adaptability and partner ability. The hypotheses that is built is the relationship between supporting factors with the capacity of farmers. The following is the result of correlation test between the characteristics of farmers and their capacity in Table 6.

Table 6: Value of correlation coefficient between supporting factor and farmer capacity

Supporting factors	Farmer capacity					
	Technical ability	Problem solving ability	Planning ability	Evaluation ability	Adaptation ability	Partnership ability
Farmer Group	**0.285****	**0.311****	**0.291****	**0.449****	**0.288****	**0.393****
Local leader	**0.209****	**0.242****	**0.180***	**0.256****	0.116	**0.213****
Input availability	-0.003	0.086	0.031	0.137	0.085	0.111
Market	0-.076	**-0.187***	-0.135	-0.077	-0.132	-0.097
Capital support	0.055	-0.045	-0.039	-0.103	.018	-0.040
Technology information	**0.188***	0.103	**0.182***	**0.241****	0.106	**0.157***

Description: * Significant correlated at α = 0,05

** Very significant at α = 0,01

Generally it is found that there is a significant relationship between supporting factors with farmer capacity level. This is evident in the significant relationship between farmer group support with technical capability, problem-solving ability, planning ability, evaluation ability, adaptability and partnering ability. A

significantcorrelation also evident between the support of local leaders with technical skills, problem-solving skills, planning abilities, evaluating ability, and partnering abilities. There is also a clear relationship between market support and problem-solving skills, as well as the relationship between information technology support with technical capability, planning capability, evaluation ability, and partnering ability. The support of farmer groups is significantly and positively related to technical skills, problem-solving ability, planning ability, evaluation ability, adaptability and partnership ability at $\alpha = 0.01$ or categorized as very significant. This means that there is an effect of farmer group support on improving the capacity of farmers in general. The support of Farmer Group is the first or the strongest indicator that is very influential in reflecting the variables supporting the application of innovation. The activities and roles of farmer groups are still not felt by farmers in assisting the implementation of environmentally friendly innovations, such as; pest control or cultivation decisions tend to be individualized and not working in groups. Farmer groups are not yet function in decision making of disease pest control or other cultivation activity. This is generally the case, where the concentration of group development has not yet led to efforts to preserve the environment, especially the environment of rice fields that are still considered good or not contaminated, but more strived related to increased production, such as; the lack of support of the farmers to their members is related to the level of activity and the role of the low group. The activities of the farmers that occur, only if there are certain moments only, among others; acceptance of assistance or official visits during the harvest and during extension activities. While the roles of other farmer groups are still low, such as; the role of the group in partnership with outsiders, the role of groups in assisting marketing and capital as well as helping to access government aid programs. Groups as a means of obtaining capital assistance were not felt by farmers in both districts, although the group became a forum for various parties to channel aid from both the government and the private sector. Likewise the statement of the group's efforts to assist in marketing and capital is still less important. Marketing of farm and capital yields by majority of farmers is handed over to traders and mills. However, more assistance is felt only on the management of the farmers group. Local leaders' support is significantly and positively related to technical capacity, problem-solving ability, planning ability, evaluation ability and partnership ability at $\alpha = 0.01$ or very significant categorization. This means that there is an effect of local leaders' support on improving the capacity of farmers in general. Support of local leaders in capacity building of farmers is important and significant. This can be understood, where in some areas including in the location of research the existence of local leaders become very important and have a great influence in various dimensions of life, as well as in the implementation of various innovations of environmentally friendly rice paddy. Leadership is needed in the process of capacity building because leadership has a strong influence on society. Local leaders or so-called informal leaders conduct leadership based on the legitimacy received from their community. The leader is believed to be a strategic person or figure in conveying reformer ideas for community development because of his informal leadership has an emotional closeness and rapid influence on his followers [39, 20] stated that local leaders (informal leaders) have an influence on the empowerment of fishermen. It further mentioned that informal leaders have an important role to mediate the interests of the grassroots community. Similarly, informal leaders proved to be a link between indigenous (traditional) communities with knowledgeable outside researchers. Furthermore other researchs [15, 17] states that to change the behavior or educate the community needed the influence of community leaders or community leaders. The role of community leaders directly influences the frequency of community participation in improving the quality of the environment. Technological information support is

significantly and positively related to technical capability, planning ability, evaluation ability and partnership ability at $\alpha = 0.01$ or categorized as very significant. This means that there is an effect of technological information support on improving the capacity of farmers. Information technology support is an influential indicator in reflecting the variables supporting innovation implementation. The low level of information technology due to the low source and availability of information, accessibility, information conformity and the credibility of the information giver. According to [18] the source of information is the basis of use in the delivery of messages or information and used in order to strengthen the weight of the message itself that can be people, institutions, organizations, books, documents or the like. Furthermore, Reference [37] suggests that the institutions or stakeholders of each stakeholder, namely; research institutions, educational institutions, agribusiness institutions (business actors), service agencies and regulatory agencies have a communication network subsystem consisting of institutions that are under the coordination of each agency or who have equivalent functions in communication networks. Sources of information are generally still limited to fellow farmers, extension workers and saprodi traders, while information derived from print and electronic media is limited to broadcasting of agricultural information both in terms of type and time of broadcast. According to [25] that the source of information visited by many farmers are agricultural store, other farmers and extension workers. agricultural information from the internet is quite diverse, but farmers are regarded as relatively limited information because access and use are not known or used by farmers. This is in line with the results of [41], that the current issue of information availability is how to use information technology in order to have maximum benefit for socio-economic rural communities. Anwas and his colleagues (2010) states that the limited source of information provides necessary and inaccurate agricultural information. Medium according to [27] states that the process of seeking information by farmers is a consequence of the needs as users of information. Information on the cultivation of environmentally friendly paddy rice in general in both districts is obtained from extension workers (agriculture agency agencies, BPTP, NGOs) and Farmer Group Cooperation Board. Information on the cultivation of environmentally friendly rice paddy in Sigi District is still incomplete and deep, because the information obtained only when there are programs ICM-Field School, IPM-Field School, and SRI-Field School of organic rice. On the contrary, in Parigi Moutong District, beside information about the cultivation of environmentally friendly paddy rice obtained from SL activities, the farmers further obtain information from extension workers, Gapoktan board in cooperation with Parigi Moutong District Protection Agency which incentive to innovate the development of biological agents and the manufacture of organic fertilizers and self-regulating growth regulator.

4. Conclusion

Based on the results of analysis, the research obtained the following conclusions:

- The level of farmers' capacity to manage environmentally friendly rice paddy is in the medium category which means to be able to manage their farming in the environmentally friendly cultivation techniques, to overcome the problems of farming, to evaluate the farming, and to adapt to rice field environment. However farmers' capacity is low on the ability of planning and partnership. There is a significant difference in the capacity of paddy field farmers in Sigi and Parigi Moutong Districts.
- Capacity of farmers related to the characteristics of farmers include farming experience, non formal

education, and land area. Innovation levels include economic profitability, application complexity, technological conformity, ease of use, and ease of observation. Innovation of extensions are in the form of materials, methods, intensity of counseling, and extension ability. Lastly, supporting factors are in the form of farmer groups and local leaders and information technology. The recommendation based on the result of the research as follows:

- The extension factor of innovation as the dominant factor related to capacity building of farmers in managing environmentally friendly farming needs to be improved, hence this research recommends that capability training not only from agriculture technical aspect but also managerial aspect in the form of problem solving ability, planning and evaluation as well ability to partner synergistically.
- Provision of technological innovation especially environmentally friendly by Assessment Institute of Agricultural Technology (BPTP) should be focused on the condition of farmers with emphasis on applicable technology.

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