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**THE ROLE OF SOCIAL CAPITAL AND PARTICIPATION
ON THE TECHNICAL EFFECTIVENESS OF IRRIGATION MANAGEMENT:
A CASE STUDY OF NALAN DISTRICT IRRIGATION AREA**

Listiani Reyna

Graduate Program, Syiah Kuala University Banda Aceh Indonesia

Hamid Ahmad Humam, Kasimin Suyanti

Faculty of Agriculture, Syiah Kuala University Banda Aceh Indonesia

*E-mail: reyna.listiani84@gmail.com

ABSTRACT

Some of the most common challenges faced in irrigation systems are inefficient water usage because of damaged irrigation networks in various level and insufficient irrigation management. The objective of this study is to assess the role of social capital and participation towards technical effectiveness of irrigation management in Nalan Irrigation Area in Bireuen district. A common problem in the Nalan Irrigation Area is the large fluctuation of water discharge between the rainy and dry seasons. It is found that the existence of social capital will increase the participation in establishing the technical effectiveness of irrigation management.

KEY WORDS

Social capital, participation, technical effectiveness, irrigation, management.

Water is a basic resource that supports agricultural production activities. The existence of irrigation water and its system must be well-maintained and optimized in achieving food security. According to Hasan (2005), so far, the contribution of irrigation development to food security is quite big; it is 84% of national rice production is sourced from irrigation area. Some of the common challenges faced in irrigation systems are irrigation networks that have been damaged under several jurisdictions and the lack of optimum irrigation management resulting in water utilization inefficiency. According to *Direktorat Jenderal Sumber Daya Alam Kementerian Pekerjaan Umum* (2015) about 53, 89% of irrigation are in good condition, 13.30% in slightly damaged condition, at 16, 84% were moderately damaged and 15.97% in severely damaged condition. The 80% damaged irrigation is the irrigation under the Province and Regency authorities.

Various problems occurred in irrigation management led the Government continues reforming irrigation management policy. In 2015, the Government issued the Decree of *Peraturan Menteri PU dan Perumahan Rakyat* No: 30/PRT/M/2015 on Farmer/P3A/GP3A/IP3A's participation in irrigation management which strengthens the institutional presence of *Perkumpulan Petani Pemakai Air* (P3A) and the *Gabungan Perkumpulan Petani Pemakai Air* (GP3A), (*Direktorat Jenderal Sumber Daya Alam Kementerian Pekerjaan Umum*, 2015). In the diversity of the Indonesian people, the consideration of the specificity of each local community and region in irrigation management should receive the main attention. Therefore, the local wisdom of irrigation management institution will be maintained, such as *Subak* in Bali, *Lebak Lebung* in South Sumatra, *Tuwawa* in East Java, *Mitra Cai* in West Java and *Darma Tirta* in Central Java while overseas local wisdom related to irrigation network management which is quite famous like *Zanfera* in Philippines, *Shramadana* in India, and *Khageri* in Nepal.

Independent irrigation management by P3A is still constrained by the weak economic power both in the farmers' economic activities of and the implementation of irrigation management activities. The social capital in irrigation management that developed at P3A-level becomes the determining factor of irrigation management sustainability. The research

conducted by Rohmani et.al (2015) shows that social capital has a significant effect on the management of irrigation on the welfare of farmers in Sukoharjo District, Central Java Province. Alfiasari's research on social capital analysis in community-based business groups also shows the result that the adequacy of social capital affects the development of community-based economy in the form of groups (community).

According to Putnam (1995) the amount of social capital in a community has an influence on the improvement of various useful outputs to the community. According to Inayah (2012) the increased social capital will increase the community's participation in development programs and better local governance system. Increased community participation can be recognized by increasing public awareness of the surrounding environment and increased involvement in social organizations. According to Kasih (2007), a good social capital be able to establish good institutional performance as well. Kusumartono (2003) also stated that social capital plays a dominant role towards the implementation of optimal irrigation management. Social capital plays a role in regulating collective action and increasing participation in irrigation management. Farmer community participation / P3A in irrigation management will increase ownership, sense of responsibility and improve the ability of the community in establishing the technical effectiveness of irrigation management.

The most well-known irrigation area in Aceh is the Nalan Irrigation Area in Bireuen district. The Nalan Irrigation Area is an irrigation that becomes the authority of the Aceh Province with 2,130 acres land area. The challenges often faced in managing the Nalan Irrigation Area are the occurrence of large fluctuations between the rainy season and the dry season so that water rotation system should be applied in the dry season to meet the water for the planting area in this Irrigation Area. Farmers in Nalan irrigated areas plants two times a year and in the dry season the water discharge is decreasing and should do the applying the water rotation system per eight (8) hours to ensure the sufficient water availability to agricultural areas and social capital plays an important role here. Therefore, it is important to research the role of social capital and participation in the technical effectiveness of irrigation management in the Nalan District Irrigation Area Bireuen.

METHODS OF RESEARCH

The location of this research is located in the Nalan Irrigation area in Jeunieb Sub-District, Bireuen District and which is the under the authority of Regional Irrigation Authority in Aceh. The objective of this research is a member of the *Perkumpulan Petani Pemakai Air (P3A)* located in the Nalan Irrigation Area, Jeunieb Sub-district, Bireuen District. The scope of this study is limited to social capital and participation in the technical effectiveness of irrigation management. The population in this research is all members of *Perkumpulan Petani Pemakai Air (P3A)* of Nalan District Irrigation Area Bireuen. Nalan Irrigation Area has 2,130 acres land area with 30 members of *Perkumpulan Petani Pemakai Air (P3A)* in 30 villages. Each P3A in the upstream, middle and downstream areas were taken again as many as 10 respondents of P3A members who are in the upstream, middle, and downstream as well. So from each member of P3A in upstream are 40 respondents, P3A member in middle part is 40 respondents and member of P3A downstream of 38 respondents. So the total respondents in this study are 118 respondents.

Data collection was done by structured interview through questionnaires that provides multiple answers, this questionnaire is used to obtain following data as: *Social Capital* Variable with three aspects (1) Trust, (2) Social Networking, (3) Social Norms, *Participation* Variable and *Irrigation Technical Effectiveness* Variable. Respondents for data collection using questionnaires are farmers who are members of a *Perkumpulan Petani Pemakai Air (P3A)* in Nalan Irrigation Area, Bireuen District. Operational limitation of research variables consist of the *technical effectiveness of irrigation management* as the *dependent* variable, *participation* as an *intervening/mediating* variable, and *social capital* as an *independent* variable.

RESULTS AND DISCUSSION

The research was conducted in the Nalan Irrigation Area of Jeunieb Sub-district of Bireuen District which is geographically located at 4°54' - at 5°21' North Latitude and at 96°20' - at 97°21' East Longitude. Bireuen regency is adjacent to *Malaka* Strait in the north side, Bener Meriah and Central Aceh in the south side, North Aceh in the east side, and Pidie Jaya and Pidie in the west side. Nalan Irrigation Area is an irrigated area which has right and left *intake* which already has a main building (fixed weir), building site (tapped weir) and complementary buildings. Nalan Irrigation Area irrigating 2230 acres rice fields Jeunieb and Peulimbang sub-district. Nalan Irrigation Area takes water from the Nalan River and irrigates 30 villages including: Balee Daka, Tupin Panah, Matang Kule, Paloh Pupu, Lancak Bungo, Alue Seutui, Lhok Kulam, Ulee Blang, Uten Pupaleh, Blang Ruubok and Sampo Ajad. In Nalan Irrigation Area is hydrologically divided into three regions: upstream (*upper stream*), middle (*middle stream*), and downstream (*lower stream*).

Figure 1 – Bireuen District

According to *Badan Pusat Statistik* (2009), the age can be classified as follows: young (<39 years old), middle-age (39-51 years old), and elders (> 51 years old). The age distribution of farmers in this study can be seen in Table 1 below:

Table 1 – The Age Distribution of Respondents

No	Age	Cate- gory	Hydrological Areas			Hydrological Areas		
			Upstream (person)	Middle (person)	Down-stream (person)	Upstream (%)	Middle (%)	Down- stream (%)
1	25-38	Young	11	10	10	9.3	8.4	8.4
2	39-48	Adult	18	17	19	15.25	14.4	16.10
3	49-65	Old	11	13	9	9.3	11.01	7.6

Source: Primary Data Processed (2018).

Based on Table 1 above, it can be seen that the age of active farmers as *P3A* members is dominated by adult category (39-48 years) in upstream hydrological area consisted of 18 people or 18.25% percents, in middle hydrological area consisted of 17 people or 14,4 percent and in downstream hydrological areas consist of 19 people or 16.10 percent. The activeness in the adult category as the member of *P3A* is in accordance with Azwar (2016) which states that age has a direct effect on one's work productivity where the

the severity of duties and responsibilities of *P3A* members makes the community is dominated by members in adult category. The land area is crucial to be successful in farming. Sajogyo (1977) as well as *Badan Pusat Statistik* (2009) classifies farmers in Java into three categories according to land ownership: *small-scale farmers* with farmland area <0.5 acres, *medium scale* with farming area of 0.5-1.0 acres, and *large scale* of farmland area > 1.0 acres.

Table 2 – The Land Area Distribution of Respondents

No	Education	Category	Hydrological Areas			Hydrological Areas		
			Upstream (person)	Middle (person)	Down-stream (person)	Upstream (%)	Middle (%)	Down-stream (%)
1	<0.5 acres	Small	2	2	3	5	5	7.8
2	0.5-1 acres	Medium	25	20	25	62.5	50	65.7
3	> 1 acres	Large	13	18	10	32.5	45	26.3

Source: Primary Data Processed (2018).

The analysis of social capital and participation relations on the technical effectiveness of irrigation management is very important to be done to see how far the relationship between these variables affects each other.

Table 3 – Coefficient of Social Capital and Participation on Effectiveness Technical Management of Irrigation

No	Path	Unstandarized Beta	Standarized Beta	p-value	Decision
1	Social Capital towards Participation	0.086	0.269	0.003	Significant
2	Participation towards Effectiveness	0.415	0.355	0.000	Significant
3	Social Capital towards Effectiveness	0.048	0.129	0.163	NotSignificant
4	Social Capital through Participation towards Effectiveness	0.014 & 0.404	0.036 & 0.345	0.000	Significant
5	Trust towards Participation	0.178	0.209	0.023	Significant
6	Trust towards Effectiveness	0.102	0.267	0.267	NotSignificant
7	Trust through Participation towards Effectiveness	0.030 & 0.408	0.030 & 0.349	0.000	Significant
8	Network towards Participation	0.162	0.267	0.003	Significant
9	Network towards Effectiveness	0.042	0.060	0.520	NotSignificant
10	Network through Participation towards Effectiveness	-0.27 & 0.427	-0.38 & 0.365	0.000	Significant
11	Norms towards Participation	0.114	0.133	0.151	NotSignificant
12	Norms towards Effectiveness	0.158	0.158	0.088	Significant
13	Norm through Participation towards Effectiveness	0.113 & 0.398	0.113 & 0.340	0.000	Significant

Source: Primary Data Processed (2018).

Based on the analysis results in the table 3 above, it shows that *social capital* significantly influence the *participation* where the *p-value* is 0.003, so the hypothesis is accepted because *p-value* < 0.005. The effect in aggregate of *social capital* on *participation* can be seen from the value of *standardized coefficients B* that is 0.269. The value is used to see how much influence of *social capital* towards *participation*, where the influence of *social capital* in aggregate towards the *participation* is 26, 9%. This means that the participation variability can be explained by the of *social capital* variables in aggregate as big as 26, 9%. The relations of *participation* towards *technical effectiveness of irrigation management* according to the analysis results in the table above also shows that the *participation* give a significant effect on the *technical effectiveness of irrigation management* in which is the *p-value* is 0.000 < 0.005. The influence of *participation* towards *technical effectiveness of irrigation management* can be known from *standardized coefficients B* value that is equal to 0,355.

The value is used to see how big the influence of *participation* towards *technical effectiveness of irrigation management*, where the influence value given is as big as 35, 5 %.

The relationship of *social capital* in aggregate towards *technical effectiveness of irrigation management* showed no significant effect on *technical effectiveness of irrigation management* because its *p-value* is $> 0,05$ which is 0.163. The relationship analysis between *social capital* in aggregate through the *participation* towards *technical effectiveness of irrigation management* according to analysis results in the table above it shows that the in aggregate of *social capital* through *participation* significantly influence the *technical effectiveness of irrigation management* because its *p-value* is < 0.005 which is 0.000. The value of *standardized coefficients B* is used to determine the relationship between the studied variables. Based on the value of *standardized coefficient B* in the above table, it can be seen that the *standradized* value of *coefficients B* for *social capital* is 0.036 and *participation* is 0.345. Therefore, the increasing *social capital* it will also increase the *participation* towards *technical effectiveness of irrigation management*. An increase in *social capital* will increase the *participation* in *technical effectiveness of irrigation management*.

The increased *participation* contributed greatly towards *technical effectiveness of irrigation management* as big as 34, 5%. The result of this study indicates that there is no direct connection between the *social capital* towards *technical effectiveness of irrigation management*. The relationship of *social capital* towards *technical effectiveness of irrigation management* is mediated by the *participation* as an intervening variable. This is in accordance with Putnam (2000) arguments. He stated that *social capital* refers to the primary aspects of social organization such as *trust*, *norms* and *social networks* that allow the implementation of a more coordinated activities and community members can participate and cooperate effectively and efficiently to achieve common goals, and affect productivity individually or in groups.

Partial relations of *Social Capital* through *participation* towards *technical effectiveness of irrigation management* can be seen from the relationship of *social capital* aspects of *trust* towards *participation* which shows that *trust* gives significant effect towards *participation*. This is because *p-value* is $< 0,005$ which is 0,023. Based on the value of *coefficient B* in the table above, it can be seen that the value of *standradized coefficients B* for *social capital* with the aspect of *trust* is 0.209 which means a positive relationship, which with an increase in *social capital* aspects of *trust* will increase participation by 20.9%. The relationship of *social capital* dimension of *social network* also has significant effect towards *participation* with *p-value* $< 0,005$ which is 0,003. Based on the value of the *coefficient B* in the table above, it can be seen that the value of *stand a radized coefficients B* for *social capital* with *social network* aspects is 0.267 which means a positive relationship, which with an increase in social capital *social network* aspects will increase the *participation* by 26.7%.

Based on the results of this study, it can be seen that partial *social capital* which is the aspect of *social networks* can also directly affect the *participation*, but the amount of influence is smaller than the influence of *social capital* aggregate towards *participation*. The aspect of *social norms* has no significant effect towards *participation* in partial with its *p-value* > 0.005 which is 0.151. This indicates that *social norms* does not directly affect *participation* in partial but *social norms* along with the *trust* and *social networks* that establish *social capital* which contribute towards *participation*. Based on the results of this study, it can be seen that the partial *social capital* which is the aspect of *social norms* does not directly affect the *participation*. Based on the results of this study it can be seen that the partial *social capital* aspect which is *trust* can also have a direct effect on *participation*, but the amount of influence is smaller than the influence of *social capital* aggregate on *participation*.

The analysis of direct relationship between *social capital* aspects in aggregate towards *technical effectiveness of irrigation management* shows insignificancy. The analysis of the relation between partial social capital aspect which is *trust* is also insignificantly influence the *technical effectiveness of irrigation management* and *social network* also does not significantly influence the *technical effectiveness of irrigation management*. This is because *p-value* $>$ is 0.005 which is 0,520.

The aspect which is *norm* shows a significant effect on the technical *technical effectiveness of irrigation management* because its *p-value* is < 0.005 which is 0.088. From these results it can be seen that the *norms* can directly affect the *technical effectiveness of irrigation management*. *Norm* is one aspect of *social capital* and a source of cognitive *social capital* that can lead / guide people to take action by joining the irrigation management system. The result is consistent with Ostrom's opinion (1990) which states that the *norms* were awakened in the community led to the join resource management (*common resources*) more efficiently such as irrigation systems and rural land. From the value of *standardized Coefficients B* by 0.158 it can be seen that *social norms* directly affect the *technical effectiveness of irrigation management* with contribution by 15,8 %. The direct effect of the *norm* on the *technical effectiveness of irrigation management* is smaller when compared to the effect of social capital and participation on the *technical effectiveness of irrigation management*.

The aspect of *trust* and *participation* shows a significant influence towards *technical effectiveness of irrigation management* with its *p-value* $< 0,005$ which is 0.000. From the value of *standardized coefficients B* by 0.030 and 0.349 it can be seen how much influence of *trust* through *participation* affects the *technical effectiveness of irrigation management*. *Trust* gives effect of 3% towards *participation* and *participation* giving effect by 34,9% towards *technical effectivity of irrigation management*.

The analysis of *Social networking* aspect through the *participation* towards *technical effectiveness of irrigation management* showed a significant influence on the *effectiveness* towards *technical effectiveness of irrigation management* with its *p-value* is < 0.005 which is 0.000. The same thing also happened in the analysis of *social norms* through *participation* that has a significant effect on the *technical effectiveness of irrigation management* with *p-value* is < 0.005 which is 0.000. For indirect effect of *social norms* through *participation* can be seen from *standardized coefficient B* by 0,113 and 0,340. This indicates that *social capital* and *participation* can give a direct or indirect effect to the *technical effectiveness of irrigation management*. Nasdian (2011) also stated that the level of public participation can influence and be influenced by various things, one of which is *social capital*. The result of this study is in accordance with research conducted by Wicaksono (2016). He stated that *social capital* will be able to provide direct or indirect influence on an implementation of activities through collective action that will grow participation in individuals can also increase one's participation.

CONCLUSION

Social Capital and Participation of *Perkumpulan Petani Pemakai Air (P3A)* members in Nalan Irrigation Area play an important role in water rotation system for the fulfillment of water needs in tertiary irrigation networks in establishing technical effectiveness of irrigation management.

Social capital consists of three basic aspects: *trust*, *social networking*, and *social norms*. The level of trust and social norms are in the high category indicating that members of *P3A* in Nalan Irrigation Area still have a high trustworthiness and uphold the norm in conducting irrigation management activities, while social networks are classified as moderate because the *P3A* group has been long time vacant from institutional activities. The institutional revitalization must be carried out because there are members and group leaders who have passed away.

Social capital and participation can have a direct or indirect effect on the technical effectiveness of irrigation management. Social capital and participation are significantly related to the technical effectiveness of irrigation management. In accordance with the results of hypothesis testing it can be seen that social capital has a significant effect on participation with the value of *standardiezed coefficients B* is 0.269 and participation significantly influence the technical effectiveness of irrigation management with the value of *standardiezed coefficients B* is 0.355.

The relationship of social capital and participation to the technical effectiveness of irrigation management is *partially mediation*, which means that the existence of social capital will increase the participation in establishing the technical effectiveness of irrigation management.

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