FAKTOR-FAKTOR DALAM PENGEMBANGAN IRIGASI KECIL BERBASIS INVESTASI MASYARAKAT DI INDONESIA: KASUS NUSA TENGGARA BARAT

Factors on Community Investment-Based Small Scale Irrigation Development in Indonesia: Case of West Nusa Tenggara

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ABSTRACT

Community-based investment for small-scale irrigation (CISI) was one of the opportunities to increase food production, mainly rice, to support food security at household and national levels. Social capital played a crucial role in small irrigation management allowing all water distribution with appropriate criteria, amount and time for all farmers within the irrigation network. Therefore it was necessary to investigate various influencing factors on investment development and financial viability in a small irrigation system. The research used survey method with indepth group discussion. Data were analyzed descriptively. Government's ignorance and less wise for community self-help and social capital has caused a dependency to Government's aids. Water User's Association (WUA) institutional for small irrigation was definitely considered important in managing irrigation water. Social capital was formed and interacted with natural capital and human capital and framed in group social relationships. Leadership providing good exemplary, fair, honest, trustworthy, sincerity and well-being oriented was needed. WUA empowerment was necessary and crucial in order to get more fair irrigation water distribution. The CISI financial feasibility was strongly determined by benefits derived from the irrigation construction such as planted rice acreage increase. The CISI benefits were determined by community's ability to perform maintenance investment.

Keywords: community's investment-based, small scale irrigation system, social capital

ABSTRAK

Irigasi skala kecil berbasis investasi masyarakat (IKBIM) merupakan salah satu peluang untuk meningkatkan produksi pangan, terutama beras, untuk mendukung ketahanan pangan di tingkat rumah tangga dan nasional. Modal sosial memainkan peran penting dalam pengelolaan irigasi kecil yang memungkinkan semua distribusi air dengan kriteria, jumlah dan waktu yang tepat untuk semua petani di dalam jaringan irigasi. Oleh karena itu perlu dilakukan penelitian untuk mengetahui berbagai faktor yang mempengaruhi perkembangan investasi dan kelayakan finansial dalam sistem irigasi kecil. Penelitian menggunakan metode survei dengan diskusi kelompok secara mendalam. Data dianalisis secara deskriptif. Ketidaktahuan dan kekurangbijaksanaan pemerintah dan untuk swadaya masyarakat dan modal sosial telah menyebabkan ketergantungan petani pada bantuan Pemerintah. Perhimpunan Petani Pemakai Air (P3A) untuk irigasi kecil memang dianggap penting dalam pengelolaan air irigasi. Modal sosial dibentuk dan berinteraksi dengan modal alam dan modal manusia dan dibingkai dalam hubungan sosial kelompok. Kepemimpinan memberikan teladan, adil, jujur, dapat dipercaya, tulus dan berorientasi pada kebutuhan. Pemberdayaan P3A diperlukan dan penting untuk mendapatkan distribusi air irigasi yang lebih adil. Kelayakan finansial IKBIM sangat ditentukan oleh manfaat yang berasal dari konstruksi irigasi seperti kenaikan areal tanam padi. Manfaat IKBIM ditentukan oleh kemampuan masyarakat untuk melakukan investasi pemeliharaan.

Kata kunci: modal berbasis masyarakat, modal sosial, sistem irigasi skala kecil

INTRODUCTION

West Nusa Tenggara province has a fairly extensive irrigated lowland (sawah), that was 165,964 ha. The types of sawah by irrigation system were technical sawah, semi-technical sawah, simple irrigated sawah, rural irrigated sawah and rain-fed sawah. The size of each sawah type by type of irrigation system is presented in Table 1. Simple and rural irrigation systems are usually managed by the respective community. Smout and Shaw (1994) defined that small-scale irrigation usually occupies small plots, in which small-scale farmers should manage their owned irrigaton water by applying certain level of technology so that they can operate and maintain effectively. Therefore, small-scale irrigation is managed by farmers so that farmers must be involved in its design process particulary decisions on irrigation network and its construction. Of course, there are some small-scale irrigation systems serve an individual farm household, but mostly serve a group of farmers, typically comprising between five and 50 households. These kinds of small-scale irrigation systems determine the level of food production and, to a great extent, the state of the food security (Gebrehiwot *et al.*, 2015). This is also in accordance to Ducrot's (2014) opinion that: (1) the number of small-scale irrigation increases due to drought relief interventions or from regional development funds that in practice subsidize private irrigation and the poorest families are less likely to be served by collective irrigation assistance

while they do not have access to regional development funds due to the bias of the allocation mechanism. Bacha *et al*. (2011), Bagson and Kuuder (2013), Eneyew (2016), Bjornlund (2009) and Adeoti (2009) also share the same opinion of small scale contribution to overcome poverty and improve farmer's income. In the mean time, Iglesias and Garrote (2015), Frisvold and Bai (2016), and deFraiture and Giordano (2013) stated that small scale irrigation is also a coping strategy and adaptation on climate change, which intensifies the climate change risk.

As takes place in other regions of Indonesia, in Lombok, sawah land conversion into other purposes has continued to occur in areas with good irrigation and arable land, while others, newly irrigated lowland are majorly developed on sub-optimal areas. On the other hand, the development of irrigation network is so limited, even its irrigation water function has decreased. As a result of faster irrigation system damage rate than the rate of its rehabilitation, although Farming Level Irrigation System (Jitut) and Rural Irrigation System (Jides) Programs continues to be developed in various areas of rice development centers. This condition is one of the factors why the Ministry of Agriculture finds it difficult to maintain and improve food security and self-sufficiency program.

Table 1. Sawah Area by Irrigation System

Sawah type by Irrigation	District (ha)	West NT	(ha)
	East Lombok	West Lombok	
Technical	2,561	10,538	57,927
Semi-technical	21,075	554,000	46,904
Simple	1,847	399,000	8,773
Rural	3,696	1,537	16,043
Rain fed	645,000	3,726	36,317
Total	29,824	16,754	165,964

Source: Provincial Level Public Work Technical Service Office of NTT Province (2012)

Yihdego *et al*. (2015), claimed that usually farmers in poor areas have suffered from chronic poverty and severe food insecurity, in addition they have also been vulnerable to climatic changes and dependant on variable rainfall. This is mainly attributed to a low level of agricultural productivity. Such low productivity areas are characterized by persistent rural poverty, and increasing population pressure has often resulted in a vicious circle of poverty and environmental degradation.

Small irrigation investment can be regarded as one of the opportunities to increase food production (intensification and extension), agricultural diversification, as well as efforts to support food security at household and national levels. Small irrigation investment ability by private parties, farmer groups, or individual farmers needs to be encouraged and improved so as to play a role in supporting agricultural development areas.

Small irrigation system with water resources of river or ground water can overcome irrigation water shortage during drought. The low utilization of small irrigation with water source either from pumped irrigation or surface irrigation (rivers, lakes and springs) has a chance to be developed especially in rainfed agro-ecosystems.

In order to remain sustainable, small irrigation management requires an institutional manager that is a managerial board as well as members and various accompanying norms. In irrigation systems, social capital refers to something allowing all water distribution with appropriate criteria of appropriate in amount and time for all farmers in the irrigated system. Therefore it is necessary to investigate various influencing factors on investment development and financial viability in a small irrigation system.

Decreasing water resources capacity due to damage in the upstream watershed and plenty of damaged irrigation network conditions (broken line, shallow, leaky, permeable and embankment breaches) and also weak performance management of irrigation water leads to limited allocation of irrigation water to irrigated lowland. There are many cases found of irrigation water shortage on sawah land (pump, gravity or combination irrigation), especially in dry seasons. Water for agriculture often competes with water for other uses. Therefore, successful adaptation of water for agriculture often requires combined efforts from other sectors such as finance, rural development, trade, industry and environment.

The objective of the paper is to describe influencing factors on community investment-based small scale irrigation development in Indonesia, with the case of West Nusatenggara. According to Belay and Beyene (2013), managing a common pool resource (CPR) like the small scale irrigation system needs a degree of communication among users and it was very urgent in achieving cooperation in the CPR management. Such communication can be performed vertically and horizontally, vertically occurs between resource users and leaders whereas horizontally representing communication among members to induce trust and transparency.

METHODOLOGY

Survey with indepth group discussion was applied. Steps to collect data were as follows: visit and held discussion with Head Division of Infrastructure, WNT Provincial Level Agriculture and Horticulture Technical Service Office and Head Division and staff of Water Resource Management Section; WNT Public Work Provincial Level Technical Service Office. In addition, surveys were also conducted in West Lombok District and East Lombok District. In addition to farmers, some resource persons were also interviewed. The resource persons were The Head of Agriculture and Horticulture District Level Technical Service Office (East Lombok and West Lombok District). Villages samples were selected purposively, which had irrigation networks managed by respective community. The villages in West Lombok were: (1) Lembar Village, Lembar Sub-district; (2) Ombe Baru Village, Kediri Sub-district, and in East Lombok: (1) Sukaraja Village, Jerowaru Sub-district; (2) North Jenggik, Montong Gading Sub-district. The additional interviews with Farmer's Groups, WUA, community's key persons, village apparatus, extension workers and local government representatives were also conducted at the research sites.

Sociological Analysis of Water User's Association:

Social Structure, Network, Social Leadership and Gender Analysis

Condition and Management of Irrigation Channel of Lembar Village, Lembar Sub-district, West Lombok District

In Lembar Village, Farmer's Group (FG) Maju Bersama that had 76 members with sawah land size about 75 ha, had constructed an irrigation channel. Cropping patterns before the construction was only plant rice once in rainy season (RS) with productivity 2.5 - 3 tons/ha. Once the program was implemented, the cropping pattern was rice – rice – rice with a productivity of 4.5-5 ton/ha. The FG Maju Bersama was one of the group members within the WUA Seneng Balen, all of which were made up of seven FGs including one woman FG. The WUA Seneng Balen was formed with the initiative of District Level Agency for Development Planning (Bappeda) in 1996. Overall, the WUA Balen Seneng comprised 420 farmers with a service area of 324.82 ha.

Most sites of WUA Balen Seneng were at upper and middle drainage area that were often flooded during the rainy seasons, but also with frequent experience water shortages during dry seasons. With the initiative of Mr. Sainah (in 2006 he was Field Level Technical Water Distributor = *pekasih*, and when the research was conducted, he had been the head of Lembar Village), Mr. Marta Efffendi (Chairman of WUA Balen Seneng and at a time FG Maju Bersama), H. Mustafa, and H. Nurhidayat. Mr. H. Nurhidayat has about 30 hectares of arable land, and he was also a land realtor principled, if he thought that land could be irrigated, then the price would increase. Therefore, he was the most active in making the irrigation channel, among others, by contributing the most laborers accounted for 10 workers/ ha of the arable land.

The initiators had successfully mobilized the community for mutual cooperation in constructing water channels of 1,450 meters length to accommodate the mentioned above excess water disposal. In the fiscal year 2007/2008 the channel is concreted/lining by West Lombok Agriculture Technical Service Office using Jitut/Jides Program budget. Of the funds was not acknowledged by the farmers due to a third party contracted directly by the Ministry of Agriculture. With the irrigation channel existence, then about 60 hectares of land could be irrigated. However, only about 25 ha of the land planted with rice productivity of 2-3 tons/ha.

Implementation of the second channel major construction of 1,750 m in length was conducted independently by the community at the end of 2012. This channel could irrigate an area of 75 ha, cultivated by 76 farmers. Farmers could have had two planting season with a productivity of 4.5-5 ton/ha. Budget contribution of the Irrigation Division, Ministry of Public Works was IDR 9 millions, but it had resulted in irrigation channel construction value of IDR 40 millions. The rest of the budget was a non-governmental materials in the form of stone, sand and labor. Labor costs of about 10 persons/ ha/week with working hours of 06:00 AM to 12:00 PM. The channel was completed within 10 weeks, so the labor costs was approximately 75 x 10 x IDR 20,000,- = IDR 15,000,000,- plus consumption cost (potluck), everyone their own brings food and drink.

Social capital among FG, WUA and all community members let them obey what their leaders told them. The strong leadership allowed consciousness to take a part in such cooperative program, with the coordination of village leader and sub-district officials, as well as irrigation Chief WUA. The Chief of WUA, Marta Effendi who was still relatively young (36 years) with educational attainment of Junior High School, then made some contacts with related agencies (Bappeda, Public Works and Agriculture District Level Technical Service Offices). The belief in the individual, inter-member WUA strong enough, also confidence in the leadership. To be a leader WUA required a variety of criteria, among others: (1) hard worker; (2) honest; (3) healthy (young); and (4) he was also a farmer (knew exactly what really farmer's wants and needs).

Most land in Lembar Village was absentee land (75%), so that the farmers only existed as tenants. However, because regulations (*awig awig* = WUA's statutes and by laws) was run strictly and fair so that the program went well without any significant conflict. *Awig awig* was agreed to be always enforced, no one has ever violated. It was certainly not out of the spirit of the leadership of WUA, which was able to move the farmers as well as have extensive connections with outside parties.

Women do not directly take a part in the irrigation management. However, they do participate in hamlet or and village level activity such as collecting materials for irrigation channel construction, cleaning the irrigation channel, providing food for all labors taking a part in the activities. Women also participate in rice farming, mostly in planting and harvesting activity. Women also could get access and control of benefit of the irrigation channel construction , i.e. income from rice farming. Women also take control on food and non-food needs at household level. This finding is relevant to research results of Gebregziabher and Namara (2007), that farming income is more important to irrigating households than to non-irrigating households, while off-farm income is negatively related with access to irrigation.

Condition and Management of Water Reservoir at Ombe Baru Village, Kediri Sub-district, West Lombok District

In the management of irrigation water in the village of Ombe Baru carried out by WUA "Beriuk Pade Pacu" helped by *pekasih*. The WUA was officially established on December 3, 2007, although the group activities had been started since 1986. Total WUA's members was 306 persons and area size of 130 ha. The WUA basic formation is the familiarity, compatibility and common interest in utilizing water resources for the need to farm. The purpose of its formation, among others: (1) growing awareness of farmers to play an active role in the equitable distribution of water and equally among all members; (2) strengthening of water management through the WUA organization on the basis of the needs and common interests on the farm level; (3) improving the economic value of irrigation water and directly increase the income of farmer water users;

and (4) implement and improve the activities of maintenance, care, tertiary network security is at the farm level.

Water reservoir owned by WUA Beriuk Pade Pacu is 450 m^2 and the water never dried because water source such was a spring. Although initially there were approximately 15 percent of the members did not agree to use the water from the reservoir, however, initiators Mr. Nasri (Chairman WUA Beriuk Pade Pacu) and Mr. Rusni (Secretary WUA Beriuk Pade Pacu) finally made the agree to utilize the water reservoir. In 2006, approximately 75 members of WUA Beriuk Pade Pacu worked in a mutual cooperative manner. A total of 20-25 persons/day (half day) work continuously create reservoir for three months. Consumption for the working persons only a modest meal, or about IDR 50,000/day (US $ 3.5).

Funds for the dam wall brickwork depth of 2-3 was also obtained from the government amounted to IDR 50 million. The reservoir was located lower than the surface of the rice fields, so that the water should be pulled up using pumps. The WUA Beriuk Pade Pacu has five unit pumps that had been often used to draw the water during DS II. In addition, many members of WUA Beriuk Pade Pacu have dug shallow wells personally, either permanent or semi-permanent, in order to overcome the shortage of water, especially during the dry season.

In addition to irrigate farmland, the water reservoir were also used to rear some kind of fish such as pomfret, and tilapia. There were some caretakers of the reservoir namely Chairman: Mr. Syamsul; Secretary: Mr. Jilani and Treasurer: Mr Suhaemi. The fish yield value (four months) around IDR tree millions, and given IDR 500-600 thousand for reservoir maintenance cost, while the rest was left for the mosque development funds. It is in line to Kulshreshtha *et al*. (2016) opinion that a multi-use water storage reservoirs in addition to support agriculture, it also could serve societal benefits by providing recreation, hydropower generation, and water supply for habitat development, communities and industries.

In 2008, leaders and members of WUA Beriuk Pade Pacu also move the irrigation channels along the 400-m independently. The work was carried out for one month and 15-20 persons worked every day. The fund was independently spontaneously given by members during the work up to the completion. Likewise, the manufacture of the meeting hall, located on the edge of rice fields. If the calculated value, WUA meeting hall Beriuk Pade Pacu worth approximately IDR 20 million. In 2012 to repair the two building dividers. The first one is done by 10-15 persons for four days and the second was done by seven persons for two days. Materials used include 17 bags of cement (purchased), while sand and stone were taken from the river. Right Pengga network maintenance IN and IN Gebong (covering two sub-districts, the district of Kediri and Gerung Sub-districts) set out three times in one year, respectively before the planting season RS, Dry Season (DS) I and DS II.

East Lombok Regency

Water Reservoir Condition and Management in Sukaraja village, Jerowaru Sub-district, East Lombok District

Reservoir governmental organizations located in the hamlet Montong Sari, Sukaraja Village, Jerowaru Sub-district. The group that managed the reservoir was Dasan Baru II Group, which wase reorganized or formed again in 2008. Total members of the group was 54 persons of peasant families, whose members still have kinship ties. The existence of tree ha reservoirs in the village actually has been since 1945. It was built by their ancestors (at the beginning of time owned by four households). In addition to the large reservoir many smaller reservoirs were privately owned nearby. Almost every farmer landowners have small reservoirs covering approximately 30 percent of the land to hold water that could be used for irrigation or domestic purposes. Water requirements for crops, livestock and household makes the reservoir as the best alternative for water conservation in the region. Prior to the reservoirs construction, they often experienced dry land conditions, and wells also dry and hard to find water because it had to go up to the hill where there are springs. Testament given their ancestors who named Papu Rare is: “Reservoir the area of tree hectares only be used for agriculture, should not be divided as a legacy. Reservoirs to irrigate more than seven hectares of rice fields up to two times transplanting rice.”

Operational use of reservoirs made by mutual cooperation by farmer groups, such as dredge soil because of silting reservoirs conducted once every two years. Mutual aid groups must be done every two months as repair the dike around the reservoir. The mutual cooperation stir together usually with spontaneity, for example, there were other start was moved to participate. In urgent situations usually done with deliberation to. Farmer group meetings conducted regularly four times/ planting season. Reservoir water availability during dry season depends mainly on transfers of water from the reservoir Jurang Sati under the authority of the irrigation division. It needed IDR 500,000 to IDR 1,000,000 to ask *pekasih* to distribute water to the reservoir by gravity. The *pekasih* would be rewarded in kind rice of 50 kg/ ha/year if the harvest was successful.

The History of Condition and Dams in North Jenggik Village, Montong Gading Sub-district, East Lombok District

In the Village of North Jenggik, Montong Gading Sub-district team conducted a survey in locations that utilize the Jago reservoir. The reservoir was a non-governmental and government assistance that is located in the village of North Jenggik, District Montong Gading, East Lombok. Water capacity (gross volume) of Jago Reservoir was 62,000 m^3, while the effective volume of 56,000 m^3. The reservoir watered for 400 ha covered of North and Central Jenggik Villages. Farmer groups directly involved in the construction of dam was Sukamaju FG, which consisted of 162 persons, who live in two hamlets. Other FGs as beneficiaries were: 1). Tunas Ride, 2). Karang Garu, 3). Cerek, 4). Lagin Maju I and V). Lagin Maju II. Average land ownership of farmers ranged from 0.12 to 2.0 ha.

Reservoir development could not be separated from the larger role of religion/community leaders (Tuan Guru), namely: (1)

Table 2. Cropping Pattern*) and Farming Analysis/ha in West Lombok District, 2013

Description	Cropping Season Lembar Village, Lembar Sub-district				Cropping Season Ombe Baru Village, Kediri Sub-district			
	Rainy Season (RS)	Dry Season (DS) 1	Dry Season (DS) 2		Rainy Season (RS)	Dry Season (DS) 1	Dry Season (DS) 2	
Cropping pattern	Rice	Rice	Rice	Tobacco	Rice	Rice	Corn	Tomato
Variety	Ciliwung	Ciliwung	Perkutut	Virginia	Ciliwung, Pelita, IR64	Ciliwung, Pelita, IR64	Hybrid	Apple
Production cost	6,732	6,646	5,200	8,183	8,258	4,600	6,732	6,646
Yield (ton/ha)	5	4	**)	7.5	6.5	9	5	4
Value (IDR 000)	15,500	14,000	14,000	23,250	22,750	18,000	15,500	14,000
Profit	8,768	7,354	8,800	15,067	14,492	13,400	8,768	7,354
B/C Ratio	1.30	1.11	1.69	1.84	1.75	2.91	1.30	1.11

Notes:
*)Prior to irrigation channel construction, farmers only once time cultivated rice at rainy season, with productivity 2-3 ton/ha.
**)Most corn yield was sold young, as vegetable or to be grilled; production cost about IDR 5 millions/ha, so that the profit was about IDR 9 millions/ha, BCR =1,80

Mr. H. Abdul Karim Syukur, (2) Mr. Ha Fadly, (3) village officials. Jenggik communities lived in rural strong Islamic tradition. The behavior of its citizens still abiding by the norms and local customs. They are very respectful leaders, especially religious leaders.

Starting from the need of water for agriculture as considered by society more difficult. Although there were some reservoirs but not adequate to irrigate rice and other plants. The FGs then consulted to religious leaders to build the dam from the existing springs of the village. The ditches were once deep enough and the water used for irrigation only debits less. Then they sought an effort to increase the flow of water, which was chaired by H. Wirama as chairman of the Investment Commission of North Jenggik Village. Based on the results of consultation with the community and the village government as well as leaders of Islamic local boarding school (*pesantren*), it was decided to build a dam that the funds come from the public plus stimulant fund the government through Farmers Income Improvement Program Through Innovation Program (P4MI) amounted to IDR 186.3 millions.

In 2007 the village received funds from PNPM program of IDR 250 million for the construction of irrigation channels of the dam as far as 1.2 km, with the participation of the community in which ended in construction value of about IDR 500 mills. Up to the time of the survey, the community members still expect to get help again from the government to repair the damaged channels. In other part of the world such as Nepal, as stated by Lam (1996), that technological investments might aggravate the asymmetries of interests and endowments among users, which often lessens their incentives to contribute to the construction maintenance. In addition, users in agency-managed systems are usually given few incentives to engage in irrigation management. Their collective inaction often leads to low levels of performance. This opinion was supported by Norman *et al.* (2000) in West Africa, farmers exhibit less incentive to organize efficient and orderly rotation among parcels where access to water is less limited. Several organizational and design factors influence the degree to which farmers are both willing and able to organize functional water distribution among themselves. It seems that it was on the contrary to Ahmed and Habib (2015) opnion that farmers in Bangladesh, who managed successfully their owned irrigation system, although a small-scale one, usually get more access to political and social resources. The reservoir initial investment was IDR 235 million (from P4MI), coupled with a land area of 0.5 hectares of perpetual charity, equivalent to IDR 200 million. Dam construction was done by mutual cooperation for three months, with the deployment of an average workforce of 400 persons. For the maintenance of reservoirs, collected 50 kg rice/planting season, while the results in the form of fish reservoirs were sold equivalent to IDR 10 million/year, which contributed to orphans.

Cropping Pattern and Farming Analysis

Common cropping patterns in West Lombok District was rice - rice - secondary food crops (green beans, tobacco or soybeans). Almost all farmers could grow two times rice/year. In the second season rice crops often fail to harvest due to pest (rat) attacks. Green beans are predominantly planted in the third season. In the third season, the community members were requested to save water usage. If rain water was enough and came early, farmers could plant rice three times along the year. The service size of the water reservoir was 40 ha. Cropping pattern and farming analysis/ha in West Lombok District was presented in Table 2.

In East Lombok District, two examples of planting villages agreed and implemented resulted in more cultivation patterns of four harvests than those in West Lombok that could only be three times. The value of B/C ratio in the second village sample reached the value above two except in the dry season 1 (DS1) in the sample village 1, while the B/C value less than two in sample 2 village occurred at (DS3), as presented in Table 3.

From the above circumstances it could be seen that the management of water reservoirs and dams in East Lombok Regency was more promising in the development of agricultural

Table 3. Cropping Pattern and Farming Analysis/ha in East Lombok District, 2013

Description	Cropping Season, Sukaraja Village, Jerowaru Sub-district				Cropping Season, Jenggik Utara Village, Montong Gading Sub-district			
	Rainy Season (RS)	Dry Season (DS) 1	Dry Season (DS) 2		Rainy Season (RS)	Dry Season (DS) 1	Dry Season (DS) 2	
Cropping pattern	Rice	Rice	Rice	Tobacco	Rice	Rice	Corn	Tomato
Variety	Ciliwung	Ciliwung	Perkutut	Virginia	Ciliwung, Pelita, IR64	Ciliwung Pelita, IR64	Hybrid	Apel
Production cost	6,750	6,350	1,200	25,000	5,525	5,475	4,600	7,415
Yield (ton/ha)	6.0	4.0	0.8	2.5	7.0	5.0	4.0	14.6
Value (IDR 000)	21,000	14,000	4,000	75,000	24,500	17,500	10,000	24,000
Profit	14,250	7,650	2,800	50,000	18,975	12,025	5,400	16,585
B/C Ratio	2.1	1.2	2.3	2.0	3.43	2.20	1.17	2.23

business which is not limited to two commodities but could be three commodities grown. While in West Lombok regency which manage small irrigation on irrigation channel and water reservoir only can harvest two commodities that is rice and tobacco.

The all above evidences were in accordance to Asayehegn (2012) that small irrigation can improve farmers income level due to diversification and intensification of farming, expanding employment opportunities in farming, outside farming, feed sources, health improvement due to improved diet and access to health services, prevention of soil and environmental damage And the ownership of productive assets. Similarly, Mengistie and Kidane (2016) stated that the existence of small irrigation can increase farmers' income through diversification of crops producing agricultural production, increasing household income by almost 4.5 times, employment opportunities, participation in decision making at the community level.

As took place in West Lombok, women in East Lombok also do not directly take a part in the irrigation management. However, they also participate in hamlet or and village level activity such as collecting materials for water reservoir construction, cleaning the irrigation channel, providing food for whom taking a part in the activities.

Social Capital

According to Pretty (2003), social capital captures the idea that social bonds and norms are critical for sustainability. If social capital level is high in formalized groups, people have the confidence to invest in collective activities, knowing that others will do so too. Further more Pretty (2003) stated that social capital the effects of social cohession on regional incomes, civil society, and life expectancy. As social capital lowers the transaction costs of working together, it facilitates cooperation. As took place in West Lombok, a strong social capital in the community was also took place in East Lombok. When religion leaders called on the community members to help build dams through religious studies, mosques and community meetings, they welcome and move on immediately. The religion leaders were believed to make the CISI implementation went well with their kinship. In addition, persons utilizing reservoir always actively participate in the activities/social networks in the village, such as mutual aid, donations and others. Conditions still traditional society, yet many touches of government aid programs. Norms and sanctions were not explicitly exist and implemented, more to the unwritten rules and sanctions are not decisive. Galindo *et al*. (2016) also stated that people, who managed a common pooled resource such as water reservoir, should have technical knowledge on the reservoir as well as the social arrangements that allow the maintenance of the hydraulic infrastructure.

The religion leader, Tuan Guru Haji M. Fadli Fadil Tohir, the most respected figure in Central Lombok, immediately intervened and brought hundreds of his students who were assigned to volunteer. Every day about 600 persons worked together to build the dam, including women and children hauling sand, rocks and soil. The dam development took three months to finish with a value of IDR 708.5 million, - Organization of society, including the cost of land acquisition for the roads of 0.1 ha, while land to the dam area of 0.5 ha is the endowment of H. Fadli. This finding was propped by research results of Uphoff and Wijayaratna (2001); Baker (1998); Ostrom (2000); He and Luo (2006), and Wang *et al*. (2013).

The current conditions it appears easier to mobilize the community to work together to build mutual cooperation, but is now in line with the socio-economic development of society, the conditions were little changed. This is felt by leaders and FGs, which was rather difficult to sincerely invite the community in social activities that require the sacrifice of time, effort and treasures. Community social capital assessed has decreased because there are examples of dishonesty on the part of the persons and community leaders, and they were spoiled by various government programs with the wrong approach as direct cash transfer (BLT), labor intensive, Raskin (rice for the poor), Jitut, Jides etc. Those activities affected the

independence of the community who wanted continued support from the government.

Policy Implication

Given the state of Government's ignorance and less wisdom for community self-help and social capital has caused a dependency to Government's aids. This occurred because of less wise government policy in providing subsidy to community groups. The WUA Institutional for small irrigation was definitely important in managing irrigation water and in turn would contribute to food self-sufficiency bot in the household level and at national level. Then the necessary policy is that any program or giving stimulant fund should pass an investigation whether the beneficiaries or receiver candidates (FG, woman FG, WUA) would really take the benefit. It is better to apply gender analysis, so that all beneficiaries would get the benefit.

With social capital is formed and interacted with the natural capital and human capital and framed in group social relationships. A strong leadership providing good exemplary, fair, honest, trustworthy, sincerity and well-being oriented was badly needed. Strong internal relationships but separated from good norms and social values can threaten the group's social capital. Therefore, there were some policies need to be applied and developed by the government, especially the provincial and district level government, all activities should involve informal leaders such as religion leaders, culture leader etc.

CLOSING

Social capital is very decisive in the management and maintenance of small scale irrigation. The role of personal initiators and managers is crucial in the distribution and delivery of irrigation water and the application of rules and sanctions. From the sample villages, North Jenggik Village has a high profit compared to three other villages in applying the agreed cropping pattern. Getting the results of planting practices helped farmers a lot in improving their income thus contribute to improving food security in four sample villages.

To keep the existence of the common pool resources like dams and water reservoirs needs to be distributed evenly with the appropriate water delivery scheduling pattern and in accordance with the amount of water it needs. This needs an effective communication among the involved parties. Conflict prevention can be done with intense communication and fair service. For marketing can be done by group so that it can save the cost of transportation and other cost besides also can leave the bargaining value of sold commodities. In addition to social capital, if the model of succesful CPR management would be replicated in other areas, the following factors such as access to developed irrigation water resources, efficient marketing facilities, efficient technical and institutional support services, a relevant cultural background, and good security for the kit were important in the adoption process as offered by Kulecho and Weatherhead (2006), Frisvold and Deva (2012), and Amankwah and Ocloo (2012), Yihdego *et al.* (2015) stated that increasing adoption of more efficient water usage had something to do with feasible technological improvements and considerable financial improvements or subsidies.

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REFFERENCES

Adeoti, A.I. 2009. Factors influencing irrigation technology adoption and its impact on household poverty in Ghana. *Journal of Agriculture and Rural Development in the Tropics and Subtropics*. 109(1), pp.51-63.

Ahmed, Z., and Habib, A. 2015. The livelihoods approach and innovation of small-scale irrigation in Noakhali Char in Banglasdesh. *The Journal of Social Studies*. (147), Jul-Sept, pp. 19-30.

Amankwah, E., and Ocloo, T.O. 2012. Contribution of small-scale irrigated agriculture to food security in the upper west region of Ghana. *Journal of Developments in Sustainable Agriculture*. (7), pp.115-121.

Asayehegn, K. 2012. Irrigation versus rain-fed agriculture: Driving for households' income disparity, a study from Central Tigray, Ethiopia. *Agricultural Science Research Journal*. 2(1), pp. 20 -29.

Bacha, D., Namara, R., Bogale, A,. and Tesfaye, A. 2011. Impact of small-scale irrigation on household poverty: Empirical evidence from the Ambo District in Ethiopia. *J. Irrig. and Drain.* (60), pp. 1-10.

Bagson, E., and Kuuder, C.J.W. 2013. Assessment of a small-scale irrigation scheme on household food security and leisure in Kokoligu, Ghana. *Research on Humanities and Social Sciences*. 3(1), pp. 21-30.

Baker, J.M. 1998. The effect of community structure on social forestry outcomes: Insights from Chota Nagpur, India. *Mountain Research and Development*. 18(1), pp.51-62.

Belay, S., and Beyene, F. 2013. Small-scale irrigation and household income linkage: Evidence from Deder District, Ethiopia, *African Journal of Agricultural Research*. 4(4), pp. 217-228.

Bjornlun, H. 2009. Is water and land redistribution a driver of economic growth and poverty reduction? Lessons from Zimbabwe. *Journal Water Internatio-nal.* 34(2), pp. 217-229.

_____, Nicol, L., and Klein, K.K. 2009. The adoption of improved irrigation technology and management practices: A study of two irrigation districts in Alberta, Canada. *Agricultural Water Management*. (96), pp. 121-131.

deFraiture, C., and Giordano, M. 2013. Small private irrigation: A thriving but overlooked sector. agricultural water

management xxx. Contents lists available at Science. Direct/www.elsevier.com/locate /agwat. G Model, AGWAT-3708; No. of Pages 8.

Ducrot, R. 2014. Is Small-scale Irrigation an Efficient Pro-poor Strategy in the Upper Limpopo Basin in Mozambique? Paper presented in the 15th WaterNet/WARFSA/GWP-SA, Lilongwe, Malawi from 29th – 31st October 2014.

Eneyew, A., Aemu, E., Ayana, M., and Dananto, M. 2016. The role of small-scale irrigation in poverty reduction. *Journal of Development and Agricultural Economics*, 6(1): 12-21,

Frisvold, G.B., and Bai, T. 2016. Irrigation technology choice as adaptation to climate change in the Western United States. *Journal of Contemporary Water Research & Education*. 158, pp. 62-77.

_____., and Deva, S. 2012. Farm size, irrigation practices, and conservation program participation in the US Southwest. *J. Irrig. and Drain.* (61), pp. 569–582.

Galindo, E., Serrano, T., Rodarte, T., Hernández, T., and Manetta, A. 2016. Small non-conventional irrigation dams with open and elongated fields. *Journal of Water Resource and Protection*. 8, pp. 551-567. http://dx.doi.org/10.4236/jwarp. 2016.85046;

Gebregziabher, G., and Namara, R.E. 2007. Impact of Irrigation on Poverty and Environment in Ethiopia. [paper] Proceeding of the Symposium and Exhibition held at Ghion Hotel, Addis Ababa, Ethiopia, 27th -29th November.

Gebrehiwot, N.T., Mesfin, K.A., and Nyssen, J. 2015. Small-scale irrigation: The driver for promoting agricultural production and food security (The case of Tigray Regional State, Northern Ethiopia). *Irrigation Drainage System Engineering*. 4(141). http://dx.doi.org/10.4172/2168-9768.100014.

He, X., and Luo, X. 2006. "On the equilibrium of the rural public goods supply. *Economist.* 1, pp. 62-69.

Iglesias, A., and Garrote, L. 2015. Adaptation strategies for agricultural water management under climate change in Europe. *Agricultural Water Management* 155, pp. 113–124.

Lam, W.F. 1996. Improving the performance of small-scale irrigation systems: The effects of technological investments and governance structure on irrigation performance in Nepal. *World Development*. 24(8), pp. 1301-1315.

Kulecho, I.K., and Weatherhead, E.K. 2006. Adoption and experience of low-cost drip irrigation in Kenya. *J. Irrig. and Drain.* (55), 435-444. Published online in Wiley InterScience (www.interscience.wiley. com). doi: 10.1002/ird.261.

Kulshreshtha, S., Paterson, B., Hart, D., and Nicol, L. 2016. Irrigation and drainage system engineering. *J. Irrig. and Drain.* (65), pp. 1-6. http://dx.doi.org/10. 4172/2168-9768.1000156.

Mengistie, D., and Kidane, D. 2016. Assessment of the impact of small-scale irrigation on household livelihood improvement at Gubalafto District, North Wollo, Ethiopia. *Journal agriculture*. 6(27), 1-22. (www.mdpi.com/journal/agriculture). doi: 10.3390/agriculture6030027.

Norman, W.R., Walter, M.T., Walter, M.F., and Brooks, E.S. 2000. Water distribution management in small West African canal systems. *Journal of Irrigation and Drainage Engineering*. Sept/Oct, pp.304-313.

Ostrom, E. 2000. Collective action and the evolution of social norms. *Journal of Economic Perspectives*. 14(3), pp.137–158.

Pretty, J. 2003. Social capital and the collective management of resources. *Science*. 302, pp. 1912-1914. doi: 10.1126/science.1090847.

Smout, I., and Shaw, R. 1994. Small-scale irrigation design. Technical Brief No. 42. *Waterlines*. 13(2), pp.15-18.

Yihdego, A.G., Gebru, A.A., and Gelaye, M.T. 2015. The impact of small-scale irrigation on income of rural farm households: Evidence from Ahferom Woreda in Tigray, Ethiopia. *International Journal of Business and Economics Research*. 4(4), pp. 217-228.

Uphoff, N., and Wijayaratna, C.M. 2001. Demonstrated benefits from social capital: The productivity of farmer organization in Gal Oya, Sri Lanka. *World Development.* 28, pp.1-42.

Wang, X., McIntosh, C.S., Watson, P., Zhang, Z., and Lua, Q. 2013. Technical Efficiency in Small-scale Irrigation Cooperative and Its Determinants from the Perspective of Social Capital Heterogeneity-the Case of Northwestern China. Paper provided by Agricultural and Applied Economics Association in its series Annual Meeting, August 4-6, 2013, Washington D.C. with number 148070-File URL: http://purl.umn.edu/148070.-).