



## AVAILABILITY OF IRRIGATION WATER TO RICE FARMERS IN THE STA. CRUZ WATERSHED, LAGUNA, PHILIPPINES

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**ABSTRACT** – The watershed is a life-supporting ecosystem from which rainwater can drain as surface run-off through the river to the irrigation system. Irrigation necessitates sustainable watershed for availability of water to ensure food security. This descriptive research focused on the availability of water to irrigate rice farms. Methods used included household interview, key informant interview, focus group discussion, review of documents, and observation.

Results revealed that there were incidences of limited or absence of water especially during the dry season. Reasons for non-distribution of water included damaged canals, lack of water during the dry season and diversion of water to other farms. The absence of other bodies of water also drove other water users to access irrigation water freely resulting to competition in water resources. Farmers in the downstream areas resorted to the use of water pump to irrigate their fields. The irrigation system was well-managed by the National Irrigation Association (NIA) and Irrigators Association (IA). For irrigation water to be sustainable, the NIA regularly resorted to canalization to avoid water losses. The absence of other bodies of water as source of water was the primary factor for other users to use the irrigation water in their agricultural enterprises. Water was most of the time available but farmers still experienced water shortage during the dry season. The good management of irrigation system and healthy watershed can guarantee sustainability of water supply for future use.

*Keywords: irrigation water, water availability, Sta. Cruz River watershed*

## INTRODUCTION

Agriculture particularly irrigation, is the greatest consumer of water accounting for 88 percent of the total water withdrawals (Philippine Water Supply Sector Roadmap 2003). However, only 47 percent of the 3.16 million hectare potentially irrigable areas are irrigated. About 95 percent of the irrigated area is devoted to paddy rice while 70 percent of rice production comes from irrigated lands (Dayrit, 2001). Irrigation is always presented as the cornerstone of social and economic development in agrarian South East Asia (Chea et al. 2011). However, there are many problems associated with irrigation. One is the significant inequity in the distribution of water across irrigation systems (Hussain et al. 2004). This is more evident in

the Philippines being archipelagic in nature. Water supply levels differ by province depending on the population distribution, rainfall patterns, rate of groundwater recharge, and watershed quality (SEPO, 2011). Irrigation can also be affected by water scarcity attributed to the massive degradation of the country's watersheds (SEPO 2011). It is estimated that 1.5 million hectares of agricultural lands draw irrigation water from watersheds (Lasco et al. 2010). Hence, the importance of effective management of watersheds to ensure sustainability of water for irrigation cannot be overemphasized (Bantayan, n.d).

Experts project that by year 2025, water availability deficit would take place in several river basins in the country. Consequently, this will drastically affect rice production and food security in the country. As early as 2000, water crisis has already been identified as a result of crisis of governance. The Hague Ministerial Declaration in 2000 called to govern water wisely to ensure good governance where involvement of the public and the interests of all stakeholders are included in the management of water resources (Rogers & Hall, 2003). A decade has already passed but water insecurity still exists. In fact, according to Brisco (1997), the problem on water is most acute in developing countries. The problems associated with water can be attributed to lack of appropriate research that will address the water problem.

There is a paucity of studies done in the country on irrigation water. Hence, this exploratory study serves as a research initiative on water governance in relation to availability of water for sustainable use of the rice farmers. Specifically, the objectives were to identify the users of irrigation water; determine the availability of irrigation water; and assessed the sustainability of irrigation water. Through this undertaking, the concerns of water scholars and policy makers regarding the need for a new generation of research were addressed.

## **METHODOLOGY**

### **Study site**

The study was conducted in the municipalities of Sta. Cruz and Pila, Laguna within the Sta. Cruz River Watershed consisting of upstream, midstream and downstream communities. There are 26 IAs in the area wherein 19 were from Sta. Cruz and seven from Pila.

### **Research Design**

The descriptive study used eclectic methods to capture all the necessary information and triangulate or verify the results. These methods included farmer interviews, focus group discussions (FGD), key informant interviews (KII), and review of documents.

### **Respondents and Participants of the Study**

The respondents of the interviews were irrigated rice farmers who were members of the different IAs in Sta. Cruz and Pila, Laguna. On the other hand, the participants in the FGD were the officers and members of the IAs. Further, the key informants were composed of the key officials in National Irrigation Administration (NIA), water master, and President of the IAs.

### **Sampling Method**

The total population in the study sites was 1,808 farmers who were members of the IAs in Sta. Cruz and Pila, Laguna. Representative sample population was drawn from the two municipalities. After determining the sample sizes from each municipality which were 99 and 77 in Sta. Cruz and Pila,

respectively, stratified sampling was done among all the IAs. They were randomly selected to ensure well-representation of members from different IAs.

Six (6) FGDs were conducted with two FGDs in each of the three topographical zones: upstream, midstream, and downstream. Participants of FGD recommended by the key officials of NIA were ranging from eight (8) to 12.

### **Instrumentation**

A semi-structured interview schedule was designed for the farmers' interview to gather data on their socio-demographic and economic characteristics, water resources and water governance. The instrument was validated by experts and pre-tested with 20 farmer- respondents from Bay, Laguna. Bay has IAs with similar setting with that of the study sites. The FGD guide was likewise validated by experts.

### **Procedure**

Data on the list of all IAs for all barangays in the study sites, general membership, and name of the officers were secured from the NIA. The schedule of interview among respondents was coordinated with the Barangay Chairman and the President of the IAs. Interviews were held either in the barangay hall or in their respective houses while the FGD was conducted in the barangay hall and NIA satellite office.

### **Data Analysis**

Descriptive statistics such as frequency distribution and percentages of the variables considered were used to describe the data obtained from the interview of the farmer-members of the IAs. Data obtained from the FGD and key informant interview were categorized to supplement the quantitative data for an in-depth analysis.

## **RESULTS AND DISCUSSION**

### **Users of irrigation water**

As presented in Table 1, it was determined whether irrigation water was only available to officers and members of the IA. Half of the respondents claimed that irrigation of water was solely used by members and officers of IAs while the other half asserted that there were other users aside from them. About 49 percent of the respondents cited that even non-members of the IA can use it which included the neighboring farmers and duck raisers. Other users included fishpond owners, hog raisers, lanzones planters, honey dew farmers, vegetable farmers, and anybody can use the irrigation water.

The respondents belonging to the downstream areas usually used water pump not only during the dry season but occasionally during the wet season. The study of Rogers et al. (1998) in Haryana, India showed that the farmers spent large amounts of money for pumping groundwater to improve reliability and timeliness of water supply. Irrigation charges for surface water supplies were less than \$10 per hectare per year. The farmers spent \$90 per hectare per year for groundwater irrigation. This is equivalent to 20 percent of the net value of output from crops. Thus, the farmers were willing to pay for timely and reliable water supply.

The study done by the International Water Management Institute (IWMI) compared irrigated and rainfed areas with similar agro-climatic condition with in-depth analysis of incidence and severity of poverty using monetary and non-monetary indicators of poverty. The study provided strong empirical evidence that irrigation had a positive impact on food security. Areas without access to irrigation infrastructure and inadequate water supplies had the highest incidence, depth, and severity of income/monetary poverty. Areas with access to irrigation infrastructure generally had lower levels of chronic poverty and a higher proportion of non-poor. The average annual household food expenditures in areas with and without access to irrigation were found to be \$448 and \$343 annually, respectively (Hussain et al. 2004).

Table 1. Use of irrigation water by IA members and other users

PARTICULARS	STA. CRUZ (n=99)		PILA (n=77)		TOTAL (n=176)	
	F	%	F	%	F	%
Users of irrigation water						
Only members and officers of IAs	45	45.45	44	57.14	89	50.57
Not only IA members and officers	54	54.55	33	42.86	87	49.43
<b>Total</b>	99	100.00	77	100.00	176	100.00
<b>Other Users of Irrigation water</b>						
	<b>(n=13)</b>		<b>(n=8)</b>		<b>(n=21)</b>	
Lanzones plantation	1	7.69	1	12.50	2	9.52
Other neighboring farmers who are non-IA member	7	53.85	3	37.50	10	47.62
Anybody	1	7.69	0	0.00	1	4.76
Duck raisers	2	15.38	1	12.50	3	14.29
Fishpond owners	1	7.69	0	0.00	1	4.76
Honeydew farmers	1	7.69	0	0.00	1	4.76
Vegetable farmers	0	0.00	1	12.50	1	4.76
Hog raisers	0	0.00	2	25.00	2	9.52

\*multiple responses

#### Availability of water for farm use

Results in Table 2 revealed that up to 86 per cent of the respondents experienced water shortage. This included either having limited or absence of water supply to irrigate their farms once in a while. During the dry season, majority (59%) of the respondents from both municipalities mentioned that irrigation water was always available while 40 percent answered otherwise.

According to NIA (2013), the farmers consumed 22,080 m<sup>3</sup>/ha of water during dry season and 12,600 m<sup>3</sup>/ha during wet season. However, they can only supply 15,456 m<sup>3</sup>/ha during the dry season (Engr. Yorros of NIA, personal communication, 2013). Result of key informant interview with NIA officials revealed that the limited water supply during summer can be attributed to several factors such as evapotranspiration; lowering of the natural capacity of river; deforestation resulting to occurrence of surface water instead of water going to the aquifer; drying up of springs; climate change; and expansion of the river area due to soil erosion. The remaining water needed by the farmers during dry season amounting to 6,624 m<sup>3</sup>ha<sup>-1</sup> comes from the water pumps provided by NIA.

Ella et al. (2012) noted that in Albay, Bicol, there was inadequate water supply during the dry season due to poor watershed cover, less rainfall, and an increase in the water users. There were also disturbances in the watershed such as quarrying and illegal logging causing forest denudation which affected the supply of irrigation water. Measures are being done by NIA to address the problem on water scarcity. These included concreting of main canals, coordination with all the NIA-assisted canals and IAs to adopt the rotational irrigation scheme, planting other crops requiring less water in areas experiencing extreme water scarcity, and providing Shallow Tube Wells pumps and engine units to canals having critical water supply. In the case of Quezon, inadequate water supply during the dry season was attributed by NIA and the Office of the Provincial Agriculturist (OPag) to poor watershed management in the province.

Based from the study conducted in the Bicol region by Nguyen et al. (2012), there was scarcity of irrigation water specifically during the dry season. Hence, their team recommended the rehabilitation of watershed and implementation of a protection program in critical watersheds. Moreover, capacitating the Local Government Units (LGUs) and IAs was highly recommended particularly in planning, designing, and management of irrigation systems.

One of the findings in the study by Ella et al. (2012) was consistent with what has been mentioned by farmers in the FGDs. In one of the discussions Sonny (one of the farmers interviewed) said, "*Number one talaga nang problema ang quarrying dito. Sumobrana ang kuha nila ng mga buhangin at bato, lampas nasilasa lebel*" (The number one problem here is quarrying. They have already exceeded the limit in getting sand and gravel). He added that, "*Hindi gaya nung mga 1980 hanggang 1985, malakas ang tubig. Ngayon bumabanaang lebel ng tubig hindi katulad nung dati. Makikita mo punung-puno, parang ilog ang pasok ng tubig.*" (It is different now compared to the period from 1980 to 1985 wherein there was abundant water supply. Now, the water level is lower. Before, you can see that water was overflowing like a river.)

Table 2. Availability of water for farm use

PARTICULARS	STA. CRUZ (n=99)		PILA (n=77)		TOTAL (n=176)	
	F	%	F	%	F	%
<b>Availability of Water</b>						
Always available	69	69.70	62	80.52	131	74.43
Not always available	30	30.30	15	19.48	45	25.57
<b>Total</b>	99	100.00	77	100.00	176	100.00
<b>Occurrence Water Shortage</b>						
Yes	87	87.88	65	84.42	152	86.36
No	12	12.12	12	15.58	24	13.64
<b>Total</b>	99	100.00	77	100.00	176	100.00
<b>Availability of Water During Dry Season</b>						
		(n=87)		(n=65)		(n=152)
Always available	48	48.48	56	72.73	104	59.09
Not always available	50	50.51	21	27.27	71	40.34
No response	1	1.01	0	0.00	1	0.57
<b>Total</b>	99	100.00	77	100.00	176	100.00

#### Non-distribution of water

As summarized in Table 3, majority (74%) of the respondents witnessed non-distribution of irrigation water while the rest were not. Among the significant reasons cited for the non-distribution of water included damaged dam/irrigation canals (54%) lack of water due to dry season (18%) and diversion of irrigation water (17%). Other reasons were limited water supply from the dam, insufficient water supply, distance of farms from the source, control box was destroyed, obstruction in the irrigation canal, poor maintenance of irrigation canal, and no assigned ditch tender in their area. Result of the key

informant interview showed that the non-distribution of water was caused by the illegal closure of the control structure in the area due to illegal fishing activities using electric currents and also because of the presence of informal settlers near the dam site and in the Sta. Cruz River watershed.

Mohammed and Kelly (2005) stressed that the problem in existing irrigated areas lies on the inability to supply irrigation to all service areas particularly during the dry season. From the case study conducted by IFAD (2004), international development agencies and water managers agree that the water crisis did not lie on the crisis of resource availability but mainly on governance. Hence improving water governance is considered the most effective means to meet the Millennium Development Goals.

Gum'a (2004) reported that both over and under-utilization, which were generally considered as misuse of water, were the main cause of conflict among water users. Prohibition of over-appropriation and diversion of water to irrigate other farms were used as measures to avoid conflict among farmers and ineffective use of water.

Table 3. Occurrence of non-distribution of water

PARTICULARS	STA. CRUZ (n=99)		PILA (n=77)		TOTAL (n=176)	
	F	%	F	%	F	%
<b>Occurrence of Non-distribution</b>						
Yes	79	79.80	52	67.53	131	74.43
No	20	20.20	25	32.47	45	25.57
<b>Total</b>	99	100.00	77	100.00	176	100.00
<b>Reasons for Non-distribution*</b>						
Far from the source	2	2.53	2	3.85	4	3.05
Dam/canal was damaged	39	49.37	32	61.54	71	54.20
Control box was destroyed	1	1.27	0	0.00	1	0.76
Limited water supply from the dam	8	10.13	4	7.69	12	9.16
Diverting water to irrigate their farms	16	20.25	6	11.54	22	16.79
Dry season	17	21.52	6	11.54	23	17.56
Water nor enough to many farmers	4	5.06	3	5.77	7	5.34
Blockage in irrigation canal	0	0.00	1	1.92	1	0.76

Table 3. Occurrence of non-distribution of water (Continuation).

PARTICULARS	STA. CRUZ (n=99)		PILA (n=77)		TOTAL (n=176)	
	F	%	F	%	F	%
<b>Reasons for Non-distribution*</b>						
Poor maintenance of irrigation canal	1	1.27	0	0.00	1	0.76
No assigned ditch tender	0	0.00	1	1.92	1	0.76
No answer	1	1.27	2	3.85	3	2.29
<b>Total</b>	<b>89</b>	<b>100.00</b>	<b>57</b>	<b>100.00</b>	<b>146</b>	<b>100.00</b>

\*multiple responses

#### Availability of natural sources of irrigation water

More than half (65%) of the respondents answered that water was always available while another 27 percent said that it was only available sometimes as presented in Table 4. Hussain et al. (2004) revealed that infrastructure development and availability of water are important factors to achieve food security. Inadequate water supply can lead to poverty despite the presence of a well-developed infrastructure. Poor maintenance will result in reduced water supply and will negate any positive impact on poverty reduction. Lack of water serves as a constraint to food security. Hence, it should be given utmost importance (Rijsberman, 2004).

The use of irrigation water can be associated to social capital among the farmer-respondents. The basic idea of social capital is that individuals invest, access, and use resources embedded in social networks to gain returns (Lin, 2001). The farmer-respondents may have access to water to irrigate their rice farms. However, water as a resource is being controlled by institutions like the IAs assisted by the NIA.

Farming serves as the primary occupation of the respondents wherein they get returns in the form of rice for their household consumption. In excess of their food, rice is being sold to earn some income that would be used to buy their other household needs and to pay for their debts to traders, cooperatives and other financial institutions where they borrow capital.

When asked if they had other sources of water for farm use aside from the irrigation water provided by NIA, majority (63%) of the respondents answered no and the other 37 percent said yes. More than 80 percent of those with other sources of water use pumps to irrigate their rice fields.



Table 4. Availability of natural sources of irrigation water

PARTICULARS	STA. CRUZ (n=99)		PILA (n=77)		TOTAL (n=176)	
	F	%	F	%	F	%
<b>Availability of Natural Source of Irrigation Water</b>						
Always	52	52.53	63	81.82	115	65.34
Sometimes	36	36.36	11	14.29	47	26.70
Rare	10	10.10	3	3.90	13	7.39
Frequent	1	1.01	0	0.00	1	0.57
<b>Total</b>	99	100.00	77	100.00	176	100.00
<b>Other Source Other than Irrigation Water</b>						
Yes	34	34.34	31	40.26	65	36.93
No	65	65.66	46	59.74	111	63.07
<b>Total</b>	99	100.00	77	100.00	176	100.00
<b>Water Sources*</b>						
Rainwater	4	11.76	6	19.35	10	15.38
Water pump	31	91.18	22	70.97	53	83.23
Spring	1	2.94	1	3.23	2	3.08
River	0	0.00	2	6.45	2	3.08
Deep well	1	2.94	1	3.23	2	3.08
<b>Total</b>	34	100.00	31	100.00	65	100.00

\*multiple responses

#### **Sustainable management of irrigation**

Table 5 revealed the survey finding wherein majority (72%) of the respondents believed that irrigation water can be sustainably managed by NIA and their IA while 27 percent perceived otherwise. Key informant interview with NIA officials likewise revealed that water for irrigation can be sustainably managed. Considering the imminent effects of climate change, NIA practiced regular canalization to

avoid water losses. They also re-used drainage water and highly recommended to the farmers the application of alternate wet and dry technique in irrigating their paddy fields. To protect their water source, they also forged a partnership with the Department of Environment and Natural Resources (DENR) in reforesting Sta. Cruz River watershed.

Aside from the measures done by the NIA, SAI (2010) stressed that irrigation can be sustained by taking into account predicted rainfall and evapotranspiration by using daily rainfall records or weather forecasts, regular checking of meteorological forecasts, maintaining a water management logbook that records precipitation, rainfall, and evaporation, and time and amounts of irrigation applied to understand long-term trends in water use.

Table 5. Assessment of irrigation water sustainability.

SUSTAINABILITY OF IRRIGATION WATER	STA. CRUZ (n=99)		PILA (n=77)		TOTAL (n=176)	
	F	%	F	%	F	%
Yes	64	64.65	62	80.52	126	71.59
No	33	33.33	14	18.18	47	26.70
Not aware	2	2.02	1	1.30	3	1.70
<b>Total</b>	99	100.00	77	100.00	176	100.00

## CONCLUSIONS

The absence of other bodies of water as source of irrigation, was the driving factor for other users or free riders to use the irrigation water for their other economic activities. They used irrigation water for free to reduce costs and gain more profit in their agricultural enterprises.

Water was most of the time available to irrigate the farms; however, the farmers still experienced water shortage especially during the dry season. The free access of non-members of the IAs to irrigation water resulted to competition in water resources aggravating the situation during the dry season when there was limited water supply. Despite high expense, farmers in the downstream areas resort to the use of water pumps to ensure rice security for their household consumption.

A good management of irrigation system and healthy watershed can guarantee sustainability of water supply for future use. There is an urgent need to enhance the surrounding watershed to ensure sustained supply of water to both the communities and the rice farms.

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## **STATEMENT OF AUTHORSHIP**

The first author conceptualized the research, conducted the literature search to support the findings, identified thematic points, formulated recommendations, and initiated the writing of the manuscript. Other authors identified some issues and provide valuable suggestions.

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