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Comparison of Financial Sustainability between Self-Governance and Jointly-Governance Irrigation System in Nepal

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Abstract

Water resources are globally shrinking and becoming scarce resources for agricultural development. Its management is crucial to meet the demand for human being use. Its efficient management to meet the increasing demand is becoming one of the important issues for the future. Irrigation plays a dynamic role to boost the agriculture production and productivity. Water is a strategic natural resource to drive change. Many countries of the developing world, including Nepal, have made the transition to faster economic growth. Development of agriculture depends on the availability of irrigation facilities and its financial sustainability. About 65.6 percent of Nepalese people depend on agriculture, where only 21 percent of land is cultivated in the country. Nepal has massive water resources for surface irrigation development, but Nepal is making use of less than 8.0 percent of its water resources potential. It is estimated that about 69 percent of the total cultivated land could be irrigated if the potential water resources are properly utilized. The financial sustainability is to measure the sustainability of the irrigation institutions in terms of performance. The efficiency of revenue, efficiency of cost, effectiveness of fee collection and financial self-sufficiency are higher in self-governed irrigation system than jointly-governed irrigation system. Due to sole responsibility of farmers, they felt the canal of their own canal and they had generated their ownership in order to collect a good amount of water taxes and perform all the maintenance tasks in a cost effective manner in self-governed irrigation systems in comparison to jointly-governed irrigation systems.

Key Words: Financial self-sufficiency, Efficiency of revenue, Efficiency of cost, Effectiveness of fee collection

Introduction

Water is a strategic natural resource to drive change (Upadhayay, 2012: 1). Water is an essential resource for all life span. Water consumption is steadily increasing due to fast population growth, global warming and industrial development. Irrigation plays a vital role to boost the agriculture produces. Water is a strategic natural resource to drive change (Upadhayay, 2012: 1). Water resources are globally shrinking and becoming scarce resources for agricultural development. Asia faces a daunting water crisis that threatens its economic growth (Chellaney, 2011:1). Its management is crucial to meet the demand for human being

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use. Its efficient management to meet the increasing demand is becoming one of the important issues for the future. Many countries of the developing world, including Nepal, have made the transition to faster economic growth. Development of agriculture depends on the availability of irrigation facilities and its proper management (DoI, 2016). According to Statistical Information on Nepalese Agriculture (2008/09), only 65.6percent of people depend on agriculture. In the country, 21percent of land is cultivated (DoI, 2016).Nepal has massive water resources for surface irrigation development, but Nepal is making use of less than 8.0percent of its water resources potential (APROSC& John Mellor Associates, Inc., 1995). It is estimated that about 69 percent of the total cultivated land could be irrigated if the potential water resources are properly utilized (Yoder, 1994). In the country, now, total land area under irrigation is 5,572,623 ha (DoI, 2016). Of the 5,572,623 ha, 56.96 percent belongs joint/agency-governed irrigation system (jointly-managed irrigation system (JMIS)/ agency-managed irrigation system (AMIS), 14.47 percent self-governed irrigation system and 28.57 percent ground water irrigation system (DoI, 2016).

The idea of 'sustainable development' is an integrating idea, and a bridge between conservation and development. Water is a finite and irreplaceable resource that is vital to human well-being. Water can pose a challenge to sustainable development, but managed efficiently and equitably, water can play an enabling role in strengthening the resilience of social, economic and environmental systems in the light of rapid and unpredictable ups and downs (DoI, 2016).The sustainability of irrigation systems will depend mainly on the farmers' capacity for operation and maintenance. The sustainability is influenced by the water ends user farmers in the design, implementation and operational stages of the irrigation system. It is a dynamic self-regulating system that comprises its elements of operation mode of physical, financial and institutional activities. It is paving the way for a greater role of WUA (DoI, 2016). As the policy shift and the new approach of water resources management focuses on demand-led development of water services and decentralizes irrigation application techniques in the field. As a result, services from these expensive capital investments do not match community demand, and users view the services as neither reliable nor easily accessible. Throughout history, water resources and irrigation development have played a major role in human development. Irrigation development, however, introduces major changes in the environmental and socioeconomic conditions of these areas. Questions have arisen whether irrigation is capable of continuing the high level of agricultural production in the long term without damaging the environment or not (Pereira, Gillies, Jensen, Feddes & LeSaffre, 1996:1-16).

Statement of the Problem

There is none or limited academic research on water governance and sustainability in comparative studies in the two different types of irrigation management systems. In other words, there are array of governance and sustainability problems. Governance mechanisms and level of sustainability in irrigation development and management in Nepal which has been characterized by the poor performances of the existing irrigation management systems, poor system efficiency, under-utilization of canal water, weak participation of WUA, low service fee collected to cover the operation and maintenance in a timely manner. When the irrigation system is damaged during summer, it often takes long time to fix it due to weak institutional capacity, weak linkages between farmers and WUA with the DoI and continuation of subsistence agriculture practices (DoI, 2016).

It is recognized that water is a scarce resource and it will continue to be a limited resource

in the future (DoI, 2016). Many agencies intervened in jointly-governed canals, but both categories of irrigation systems suffered from chronic mismanagement, poor governance mechanisms, and poor physical, financial and institutional sustainability. Only the government effort will not be enough for adequate management of the irrigation systems. For this reason, it is necessary to manage existing irrigation management systems, focusing irrigation governance mechanisms and sustainability in order to boost the operation and maintenance of irrigation system, both in self-governed irrigation systems and jointly-governed irrigation systems in Nepal. There is a lack of the research in comparison between the governance and sustainability of self-governed PIS and jointly-governed KIS in Tarai of Nepal. Hence, the researcher posed this as a research topic.

Research Questions

Against the above backdrop, the key research question of this study is as of:

How do proper operation and maintenance practices lead to the financial sustainability of the self-governed irrigation systems and jointly-governed irrigation systems?

Objectives of the Study

The general objective of this study is to make a comparative study of the financial sustainability of irrigation systems of Chitwan. The specific objective of this study is to analyze the financial sustainability of the self-governed irrigation systems and jointly-governed irrigation systems?

Rationale of the Study

The scope for additional increases in area under irrigation at a reasonable cost is not very high. Also, allowing the present state of affairs to continue for long may have a bearing on the long-term sustainability of irrigation system. The conviction is spreading that a major breakthrough in as irrigated agriculture is possible only through the handover irrigation systems to WUA. It exists practices after diagnosing the causes through performance analysis (DoI, 2016). There has not been significant and rigorous academic research on financial sustainability for operation and maintenance. The findings of this research may help to seek out and improve financial sustainability for operation and maintenance. Hence, this study was conducted to compare the financial sustainability between self-governed irrigation systems and jointly-governed irrigation systems.

Research Methodology

The study began with a research question: under which governance arrangements, do the farmers have the best financial sustainability of self-governed irrigation systems and jointly-governed irrigation systems? This study used both descriptive and analytical research design. Quantitative information were adopted to investigate the problems or issues by reviewing the audit report, meeting minutes, WUA constitution and bylaws documents.

Efficiency of Revenue

ISF pay is necessary for farmers get water services. The rate of ISF will fix based on the type and area of crop grown with different rates in different seasons. With the subsequent reduction in recovery of the ISF, the actual operation and maintenance cost of the infrastructure leading to deterioration of the asset as well as declining service levels. In this regard Table 1 summarizes the fee collection rate of the systems.

Table 1: Fee Collection Rate of the Irrigation Systems

SN	Item	Self-governed PIS	Jointly-governed KIS
1	Entrance Membership Fee	NPR 500 per Household	NPR 30 per ha
2	Renewable Membership Fee	NPR 10 per Household	NPR 10 per ha
3	Main Canal operation and maintenance Fee	NPR 600 per ha	The tasks is allocated under DoI function in the case of jointly-governed system.
4	Branch Canal operation and maintenance Fee	NPR 600 per ha	Not decided. Only in emergency cases. Operation and maintenance of Branch Canal are decided from emergency meeting.
5	ISF/Water fee (crop wise or annual)	NPR 300 for spring season (spring paddy per ha but NPR 150 for winter and summer crop per ha (wheat, summer paddy other crops.	NPR 300 per ha annually for all crops

Source: Field Study, 2016

The membership entry fee of NPR 500 per household was levied at the beginning in self-governed PIS whereas in jointly-governed KIS, NPR 30 per ha was levied only once based on land size. The annual renewal fee NPR10 per household was taken at the beginning in self-governed PIS whereas in jointly-governed KIS, NPR 10 per ha was levied. Fee for main canal operation and maintenance was NPR 600 per haper year in self-governed PIS whereas in jointly-governed KIS, it varied yearly as per the tasks is allocated under DoI function. Fee for branch canal operation and maintenance was reported NPR600 per haper year in self-governed PIS whereas in jointly-governed KIS, it was not decided. It has provision to decide only in emergency cases. Operation and maintenance of branch canal are decided from emergency meeting. There was the existence of various penalty systems and rate of fine taken in both of the system. In self-governed PIS, the ISF were NPR 300 for spring paddy but for summer paddy, wheat, maize, others was only NPR150 per haper year, whereas in jointly-governed KIS, there was one fixed rate of NPR 300 per year for all types of crops. Furthermore, the ISF collected by the jointly-governed is very low, resulting in reduced budgetary provisions for operation and maintenance. This, in turn, has triggered deferred maintenance and reduced irrigated areas. On the other hand, as soon as the irrigation schemes were completed, operation and maintenance were neglected and the system in a little while lapsed to the conditions prevailing before the schemes were started.

Farmers shared the view that collected money is spent fairly. Both MC and BCs submit their income and expenditure to the concerned GA in both irrigation systems. There was no annual maintenance plan, the maintenance was so far only for canal cleaning and there is no need to plan for it. For the main canal, the DoI allocation was not based on what was needed on the system. Though the engineer looking after the jointly-governed KIS told that he makes the plan to the WUA before submitting the budget proposal to the government, the amount they get is always less that they asked for. The financial expenditure of the WUA here to be audited by the registered auditor and its report made public at GA meetings. In the observations, during the field study, it was never heard of any financial irregularities inside the WUA in both the systems. The efforts should be made to involved farmers progressively in various aspects of management of irrigation systems, particularly in water distribution and collection of water rates. Assistance of Association Organizers, DoA field staff, other irrigation concern stakeholders should be enlisted and mobilized in educating the farmers in efficient water use and water management.

The rate of collection of water fee is often used as an indicator of the financial sustainability of a transferred scheme to cover operation and maintenance costs. When government agencies were struggling because of lack of resources, costs raise the quality of operation and maintenance to a satisfactory level. This would also explain why the cost of operation and maintenance to farmers has increased in many schemes. In some cases, maintenance is still being deferred, and financial problems have arisen in various terms. The financial viability of WUA is another critical value for the sustainability of the organizations themselves and the irrigation infrastructure. The WUA should be able to raise enough resources to cover the relatively high cost for necessary operation and maintenance.

In the course of the discussions with the FGD and KII, they expressed that all the financial resource was collected and an asset management plan was developed for operation and maintenance for the entire system. It was mutually agreed upon between the WUA and the DoI. This plan was formed based on the commitment by the DoI to fund for the operation and maintenance and other essential structure improvement works. The WUA was committed to collect the required amount of money through the ISF and other sources. The respective contributions were monitored by the WUA especially Treasurer. The WUA had access to various financial resources viz. membership entry fee, renewable fee, ISF, penalty and others. Many farmers who irrigate from the trench (water which was not directly from the canal) were reluctant to pay the ISF. Also, some of the farmers on the low lying fields in the command area to get benefit from the canal system but were reluctant to join the WUA institution.

The Efficiency of Revenue operation (regular internal) income over the expenditure is important aspects for the financial sufficiency of the irrigation system. The financial sustainability of the irrigation system can be possible if the total annual current income covers the total annual expenditure in the irrigation systems which are shown in the following formula (Sener, Yuksel & Konukcu, 2007).

$$\text{Efficiency of Revenue} = \frac{\text{Total Operating Income}}{\text{Total Command Area}}$$

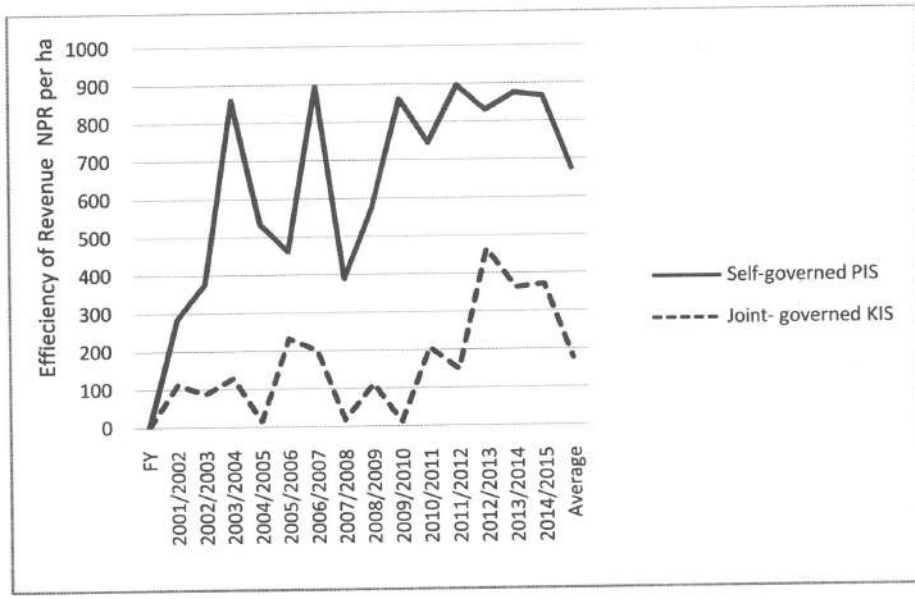
Table 2: Efficiency of Revenue (NPR per ha)

FY	Self-governed PIS			Jointly-governed KIS		
	Total Operating Income (NPR)	Total Command Area (ha)	Efficiency of Revenue (NPR per ha)	Total Operating Income (NPR)	Total Command Area (ha)	Efficiency of Revenue (NPR per ha)
2001/02	170,401.50	600	284.00	435,905.79	3900	111.77
2002/03	225,752.92	600	376.25	341,300.50	3900	87.51
2003/04	516,186.63	600	860.31	501,321.64	3900	128.54
2004/05	319,325.83	600	532.21	59,569.00	3900	15.27
2005/06	276,938.40	600	461.56	902,534.79	3900	231.42
2006/07	536,766.77	600	894.61	781,315.00	3900	200.34
2007/08	233,689.00	600	389.48	67,860.98	3900	17.04
2008/09	346,836.50	600	578.06	435,905.79	3900	111.77
2009/10	516,186.63	600	860.31	48,202.00	3900	12.36
2010/11	446,864.68	600	744.77	801,133.00	3900	205.42
2011/12	537,440.63	600	895.73	579,055.29	3900	148.48
2012/13	498,281.68	600	830.47	1,806,999.91	3900	463.33
2013/14	525,439.68	600	875.73	1,414,020.00	3900	362.57
2014/15	519,625.55	600	866.04	1,446,000.00	3900	370.77
Average	404,981.17	600	674.97	687,223.12	3900	176.21

Source: Field Study, 2016

From table 2, the efficiency of revenue NPR895.73per ha was the highest of the self-governed PIS in FY 2011/12 while in jointly-governed KIS, NPR463.33 per ha was the highest in FY 2012/13. The average efficiency of revenue NPR674.97 per ha was found in self-governed PIS while jointly-governed KIS, it was found NPR176.21 per ha. It shows that the efficiency of revenue percent was better in the self-governed PIS than the jointly-governed KIS. Figure 1 displays the trend of the efficiency of revenue of both irrigation systems.

Figure 1: Trends of Efficiency of Revenue (NPR per ha)



Source: Field Study, 2016

Figure 1 shows the trend in the efficiency of revenue of both irrigation systems. The average efficiency of revenue was found higher (NPR674.97 per ha) of the self-governed PIS than the jointly-governed KIS (NPR176.21per ha).It shows the efficiency of revenue was better in the self-governed PIS in comparison to the jointly-governed KIS.

Efficiency of Cost

The efficiency of cost is shown in the following formula (Sener, Yuksel & Konukcu, 2007).

$$\text{Efficiency of Cost} = \frac{\text{Total Operating Expenses}}{\text{Total Command Area}}$$

Throughout the field study key informants were inquiring about the efficiency of the cost of the systems and in this regard, their response is summarized in Table 3.

Table 3: Efficiency of Cost (NPR per ha)

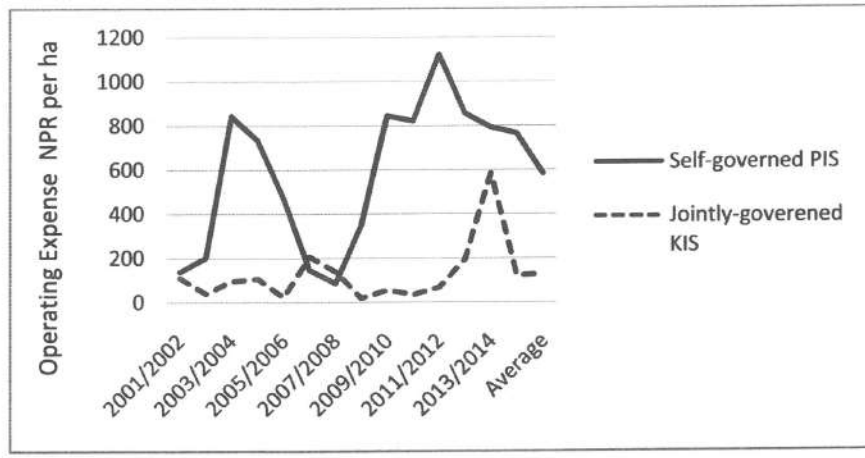
FY	Self-governed PIS			Jointly-governed KIS		
	Total Operating Expenses (NPR)	Total Command Area (ha)	Efficiency of Cost (Percent)	Total Operating Expenses(NPR)	Total Command Area (ha)	Efficiency of Cost (NPR per ha)
2001/02	82,403.00	600	137.34	429,644.43	3900	110.17
2002/03	120,667.53	600	201.11	151,415.57	3900	38.82
2003/04	506,168	600	843.61	370,980.08	3900	95.12
2004/05	439,609.46	600	732.68	414,539.30	3900	106.29
2005/06	282,989.00	600	471.65	93,407.00	3900	23.95
2006/07	87,764.00	600	146.27	804,023.00	3900	206.16
2007/08	51,411.00	600	85.69	540,591.00	3900	138.61
2008/09	209,536.00	600	349.23	73,981.00	3900	18.97
2009/10	506,168.00	600	843.61	216,628.00	3900	55.55
2010/11	492,026.00	600	820.04	134,448.00	3900	34.47
2011/12	672,623.00	600	1,121.04	266,554.00	3900	68.35
2012/13	512,890.00	600	854.82	760,336.00	3900	194.96
2013/14	475,069.00	600	791.78	2,276,998.00	3900	583.85
2014/15	458,988.00	600	764.98	466,628.00	3900	119.65
Average	349,879.00	600	583.13	500,012.38	3900	128.21

Source: Field Study, 2016

From Table 3, FY 2012/13 was the highest efficiency of cost NPR854.82 per ha in self-governed PIS whereas in jointly-governed KIS, the highest efficiency of cost was 583.85percent.

The average efficiency of cost was found NPR 583.13 per ha in self-governed PIS whereas in jointly-governed KIS, it was found NPR 128.21 per ha. The average efficiency of cost was higher in self-governed PIS in comparison of jointly-governed KIS. Figure 7.3displays the trend of the efficiency of the cost of the irrigation systems.

Figure 2: Efficiency of Cost (NPR per ha)



Source: Field Study, 2016

From Table 3, FY 2012/13 was the highest efficiency of cost NPR 854.82 per ha in self-governed PIS whereas in jointly-governed KIS, the highest efficiency of cost was

NPR583.85per ha. The average efficiency of cost was found NPR583.13 per ha in self-governed PIS whereas in jointly-governed KIS, it was found NPR 128.21per ha. The average efficiency of cost was higher in self-governed PIS in the comparison of jointly-governed KIS.

Effectiveness of Fee Collection

Economic indicators deal with how much fee collected from farmers, yearly maintenance and operation expenditure and whether system self-sufficient or not (Sener, Yuksel & Konukcu, 2007). Effectiveness of fee collection represents how a portion of fees collected from water users, whereas financial self-sufficiency represents the collected fees from water users either sufficient or insufficient for operation and maintenance cost in each year. Sener, Yuksel and Konukcu (2007) stated that the effectiveness of fee collection is calculated, dividing the total collected fee by total fee to be collected as the succeeding procedure:

$$\text{Effectiveness of Free Collection} = \frac{\text{Total Collected Fee}}{\text{Total Fee to be Collected}} \times 100$$

In field studies, about the effectiveness of fee collection systems, inquiry was done from key informants, in this regard; their response is summarized in table 4.

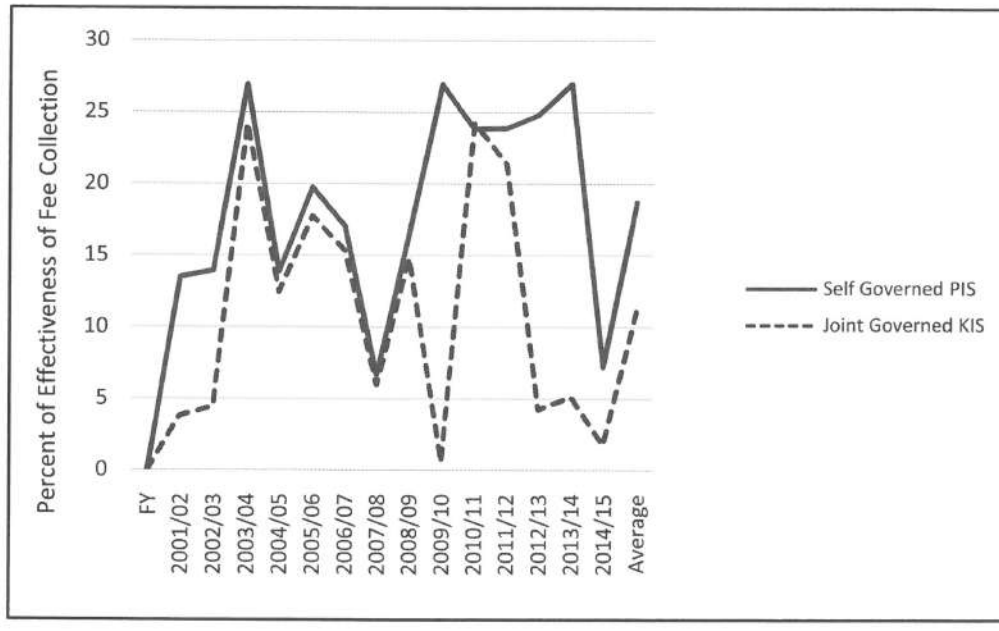
Table 4: Effectiveness of Fee Collection (Percent)

FY	Self-governed PIS			Jointly-governed KIS		
	Total Collected Fee (NPR)	Total Fee to be Collected (NPR)	Effectiveness Fee Collection (Percent)	Total Collected Fee (NPR)	Total Fee to be Collected (NPR)	Effectiveness Fee Collection (Percent)
2001/02	170,401.50	1,086,000.00	15.69	435,905.79	1,209,000.00	36.06
2002/03	225,752.92	1,086,000.00	20.79	341,300.50	1,209,000.00	28.23
2003/04	516,186.63	1,086,000.00	47.53	501,321.64	1,209,000.00	41.47
2004/05	319,325.83	1,086,000.00	29.40	59,569.00	1,209,000.00	4.93
2005/06	276,938.40	1,086,000.00	25.50	902,534.79	1,209,000.00	74.65
2006/07	536,766.77	1,086,000.00	49.43	781,315.00	1,209,000.00	64.62
2007/08	233,689.00	1,086,000.00	21.52	67,860.98	1,209,000.00	5.61
2008/09	346,836.50	1,086,000.00	31.94	435,905.79	1,209,000.00	36.06
2009/10	516,186.63	1,086,000.00	47.53	48,202.00	1,209,000.00	3.99
2010/11	446,864.68	1,086,000.00	41.15	801,133.00	1,209,000.00	66.26
2011/12	537,440.63	1,086,000.00	49.49	579,055.29	1,209,000.00	47.90
2012/13	498,281.68	1,086,000.00	45.88	1,806,999.91	1,209,000.00	149.46
2013/14	525,439.68	1,086,000.00	48.38	1,414,020.00	1,209,000.00	116.96
2014/15	519,625.55	1,086,000.00	47.85	1,446,000.00	1,209,000.00	119.60
Average	404,981.17	1,086,000.00	37.29	134,722.32	1,209,000.00	11.14

Source: Field Study, 2016

The effectiveness of fee collection of self-governed PIS was found 37.29 percent, whereas in jointly-governed KIS, it was found 11.14 percent. The effectiveness of fee collection of self-governed PIS was found better than the jointly-governed KIS. So, the water tax was also collected better in self-governed PIS than the jointly-governed KIS. Trends in the effectiveness of fee collection of the two irrigation systems are demonstrated in Figure 3.

Figure 3: Effectiveness of Fee Collection (Percent)



As shown in figure 3, the effectiveness of the fee collection percent was higher in self-governed PIS from 2001/02 to 2014/15 FY than the jointly-governed KIS. Obviously there was fluctuation in fee collection. As the water tax was collected better in self-governed PIS than the jointly-governed KIS, the effectiveness of fee collection of self-governed PIS was found better in comparison to the jointly-governed KIS. The maintenance fee was separated from the ISF. It would be used for the cleaning and maintenance of the main canal. The canal maintenance fee was introduced so that the WUA could clean and maintain the main canal by employing/hiring labors expecting better quality of work. However, the WUA decided that the labors would be hired only from among the member farmers. By this provision needy farmers would benefit from this policy. So, that money would remain within the farming community. Outside labors were to be hired only if the local farmers were not available skilled labors.

Despite the problem of fee collection during the summer season the changes in fee collection were encouraging. The question now was what makes the farmers agree to pay more for irrigation? The main reason was the increase in the irrigated area in spring season, especially spring paddy, before the system transfer, they used to grow maize in rain fed. Second, the canal maintenance activities were carried out by hiring the labors from within the member community. Thus the needy farmers can work and take back and even earn more. The third reason was the transparency maintained by the WUA. The income and expenditure of the WUA were always present and discussed in the GA meeting once in a year. Likewise, the annual maintenance plans were also discussed and passed by the GA meeting. Though there was not much discussion or question on the agenda prepared by the MC, this process has made farmers believe that things were going well within the WUA. There was also an annual auditing by an external auditor whose report was made open in GA meeting.

Financial Self-Sufficiency

Financial indicators deal with how much fee collected from water user, yearly operation and maintenance expenditure and whether system financially sufficient or not. Sener, Yuksel & Konukcu (2007) stated that the financial self-sufficiency indicates the revenue from the irrigation over the expenditure for operation and maintenance is calculated by using the following formula:

$$\text{Financial Self-Sufficiency} = \frac{\text{Total Annual Fee Revenue}}{\text{Total Annual Expenditure}} \times 100$$

In field studies key informants were inquiring about the financial self-sufficiency (effectiveness of fee collected) percent of the systems, their response is summarized in table 5.

The financial self-sufficiency percent of the self-governed PIS was found 115.75 percent, whereas in the jointly-governed KIS, it was found lower (24.05 percent). It indicated that the self-governed PIS was more financially sufficient than the jointly-governed KIS. Due to sole responsibility of farmers and more ownership bearing in self-governed PIS, they were able to collect a good amount of water taxes. It was also found that they perform all the operation and maintenance tasks in minimum cost in economized ways, whereas in jointly-governed KIS they were found dependent on DoI due to joint management of DoI and WUA whether the self-governed PIS is financially self-sustaining to carry out future O&M activities or not.

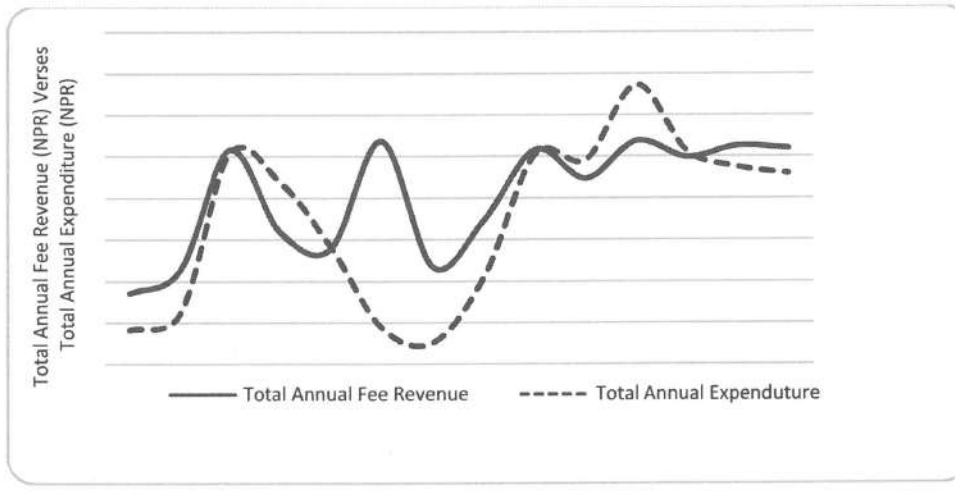
Table 5:Financial Self-Sufficiency (in Percent)

FY	Self-governed PIS			Jointly-governed KIS		
	Total Annual Fee Revenue (NPR)	Total Annual Expenditure (NPR)	Self-Sufficiency(Percent)	Total Annual Fee Revenue (NPR)	Total Annual Expenditure (NPR)	Self-Sufficiency(Percent)
2001/02	170,401.50	82,403.00	206.79	435,905.79	16,628.00	2621.52
2002/03	225,752.92	120,667.53	187.09	341,300.50	414,142.94	82.411
2003/04	516,186.63	506,168.00	101.98	501,321.64	355,506.78	141.02
2004/05	319,325.83	439,609.46	72.64	59,569.00	395,905.78	15.046
2005/06	276,938.40	282,989.00	97.86	902,534.79	804,022.50	112.25
2006/07	536,766.77	87,764.00	611.60	781,315.00	540,591.00	144.53
2007/08	233,689.00	51,411.00	454.55	67,860.98	73,981.00	91.73
2008/09	346,836.50	209,536.00	165.53	435,905.79	216,628.00	201.22
2009/10	516,186.63	506,168.00	101.98	48,202.00	134,448.00	35.85
2010/11	446,864.68	492,026.00	90.82	801,133.00	266,554.00	300.55
2011/12	537,440.63	672,623.00	79.90	579,055.29	1,118,500.00	51.77
2012/13	498,281.68	512,890.00	97.15	1,806,999.91	760,336.00	237.66
2013/14	525,439.68	475,069.00	110.60	1,414,020.00	2,276,998.00	62.10
2014/15	519,625.55	458,988.00	113.21	1,446,000.00	466,628.00	309.88
Average	404,981.17	349,879.43	115.75	134,722.32	560,062.14	24.05

Source: Field Study, 2016

DoI (1997) stated that if the WUA rate is able to increase the ISF collection, efficiency of summer paddy then its current rate can be decreased. If the rate is kept constant and the efficiency is increased, the WUA would be in a position to finance the part of the rehabilitation cost in the future. Trends in the financial self-sufficiency of self-governed PIS are demonstrated in figure 4.

Figure 4: Status of the Financial Self-Sufficiency of Self-Governed PIS

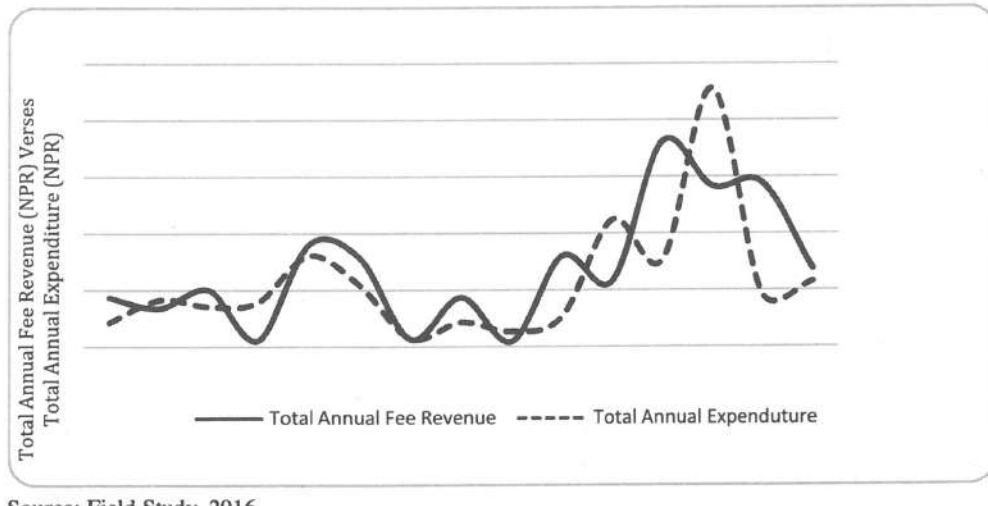


Source: Field Study, 2016

The sufficiency level was in decreasing trend due to the land plotting for gharedi (land allocated for the purpose of houses), change occupation and reluctant with farming jobs in the self-governed PIS and jointly-governed KIS. As the financial viability of WUA was critically valued for the sustainability of the institution, the WUA raised enough resources to cover the operating expenses.

WUA raised enough resources in the self-governed PIS in comparison to the jointly-governed KIS. Self-governed PIS to cover the operating expenses was relatively better than the jointly-governed KIS for necessary operation and maintenance cost. Trends in the financial self-sufficiency of jointly-governed KIS are demonstrated in figure 5.

Figure 5: Status of the Financial Self-Sufficiency of Jointly-Governed KIS



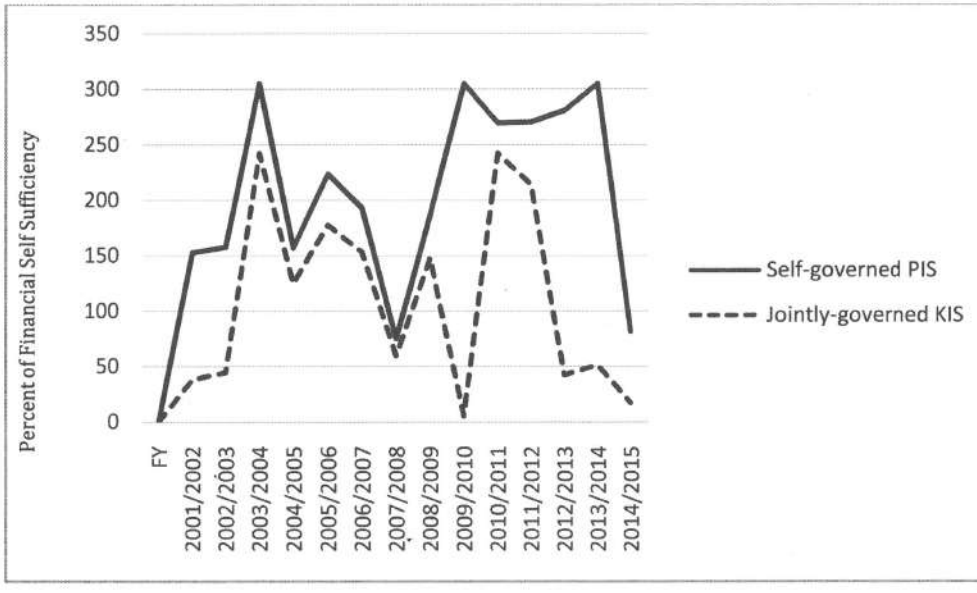
Source: Field Study, 2016

The collection of ISF in the jointly-governed KIS was low, resulting in reduced budgetary provisions for operation and maintenance. Thus, in turn, has triggered deferred maintenance and unreliable irrigation. It covers the operation and maintenance cost of the infrastructure leading to deterioration of the asset and declining service levels with subsequent reduction in recovery of ISF.

The ISF and other aspects such as the collection efficiency, the mode of calculation and degree to which an ISF can cover normal operational costs in self-governed PIS. The financial resources are collected well in self-governed PIS than jointly-governed KIS. Thus, self-governed PIS were found more financially self-sufficient in the comparison to jointly-governed KIS. Often it seems to be assumed that if the fee is computed to exceed the operation costs, a reserve fund will accumulate, and the organization will be able to undertake capital investments of its own after a few years or take support from DoI in the case of jointly-governed KIS.

A WUA after management handover is a type of WUA and should be evaluated as such. A WUA knows that the excess of income over expenditure, while it is a necessary condition of WUA success, is not sufficient. Without adequate capital, a WUA will always be weak and struggling and unable to generate enough activity or perform enough services to maintain the support of its own stakeholders. It is just the same with an irrigator's institution as with any form of WUA activity. Trends in the financial self-sufficiency are given in figure 6.

Figure 6: Financial Self-Sufficiency of Irrigation Systems (Percent)



Source: Field Study, 2016

At the present, in self-governed PIS, there was strong and effective WUA. Financially also the resources is generated by the WUA for its regular operation and maintenance expenses whereas before the system handover, whole of the operation and maintenance and administrative expenditure was borne by DoI. The WUA of self-governed PIS was able to

secure financial support for operation and maintenance. All the operation and maintenance mechanisms have been carried out by WUA using own collected resources.

At the moment, in jointly-governed KIS, dam, headwork and main canal was maintained by the DoI where all the operation and maintenance activities was depended upon subsidy from DoI and the WUA was generated enough resources to maintain the branch canals structures. Still some weakness in WUA has been noticed regarding the communication between MC and BCs, and BCs with the FCs whereas before system handover to WUA, it was found big communication gap between farmers and DoI in jointly-governed KIS.

When government agencies were struggling because of lack of resources, cost was raised to maintain the quality of operation and maintenance of the system at a satisfactory level. In some cases, maintenance is still being deferred, and financial problem was arisen in various terms. The financial viability of WUA is a critical value for the sustainability of the organizations themselves and the irrigation infrastructure. The WUA should be able to raise enough resources to cover the relatively high cost for necessary operation and maintenance. The rate of water fee collection is often used as an indicator of the financial sustainability to cover operation and maintenance cost.

The financial resource was collected and an asset management plan was developed mutually agreed upon between the WUA and the DoI for the operation and maintenance of the entire system. These plans were formed based on the commitment by the DoI to fund for the operation and maintenance and other essential structure improvement works. The WUA was committed to collect the required amount of money through the ISF and other sources. The respective contributions were monitored by the WUA especially Treasurer. The WUA had access to various financial resources, viz., membership/entry fee, and renewable fee, ISF, penalty, and others.

The efficiency of revenue was found higher the water tax collection, higher was the efficiency of revenue. It showed that the efficiency of revenue was better in the self-governed PIS than the jointly-governed KIS.

The efficiency of cost was found higher in self-governed PIS in comparison to jointly-governed KIS. Failure to pay the ISF the WUA can easily apply sanctions to the farmers by totally stop water delivery. So, water cannot use without pay the ISF to the WUA Office. Many farmers in the summer paddy evade paying ISF saying that they do not use the canal water because of the good rainfall.

In early days the system used to run on faith and trust with each other, but after the intervention, capital instead of labor contribution increases and hence the need of a transparent accounting system was felt. Therefore, in many systems bank account and water charge collection system have been adopted. Similarly the agriculture extension services and local market have been explored for marketing of agricultural products, especially concentrating to pay the water tax on time. The economic condition of the people in the command area has gradually changed. Significant changes were observed in the farmers' renewable membership and activeness to pay the water tax after the WUA intervention. Some changes were observed in the cropping intensity and cropping pattern after the WUA intervention. The farmers are more interested toward high value crops after the availability of irrigation facility.

In financing arrangements, a detailed inventory of the assets of the irrigation system is carried out and an asset management plan is prepared. These plans will define the operation

and maintenance needs of the entire system to be agreed upon between the WUA and the DoI. These will form a basis of fund commitment by the agency for operation and maintenance works, which the WUA will commit to collect the requirements through their cash contribution. The respective contributions will be monitored by the WUA. With timely payment of the water charges are their key activities that govern the efficient functioning of the irrigation system. Individual end users, and the WUA as a whole, must be active and aware towards the functioning of their system. The DoI and the WUA's are to be co-partners in the implementation and execution of the operation and maintenance of the irrigation system. Key indicators for their roles include maintaining the financial arrangements.

The financial sustainability is to measure the sustainability of the irrigation institutions in terms of performance. One also as an additional target their own capital to slickly operation and maintenance of the systems. The financial sustainability can be used to plan what to do at that moment in the days to come. The financial sustainability is measured for assessing the efficiency of an institution. This is used to determine the income of each period so as to note the financial performance of the irrigation institutions to conduct its operation and maintenance or not. In order to obtain higher income, irrigation institutions should try to do water fee collection activities that support the irrigation institutions' income rate. Destination of irrigation institutions to generate huge amount of income is to achieve the returns themselves. This means that an irrigation institution will operate more effectively if the irrigation institutions were able to maintain good performance and try to reduce the risks that exist. The financial sustainability consists of two components, namely revenue and expenses of the irrigation institutions. The financial sustainability is an irrigation institutions' ability to compare all the income and expenditure costs. The financial sustainability is said well if its income must be greater than the total costs. In the case of irrigation systems, besides financial viability, other benefits such as employment generation, improved nutritional standards of people and improved market activities associated with forward and backward linkages are common.

Based on above findings, in conclusion, the efficiency of revenue was found NPR674.97per ha of self-governed PIS whereas in jointly-governed KIS, it was found NPR 176.2 per ha. The efficiency of revenue was found better in self-governed PIS than jointly-governed KIS. The efficiency of cost was found NPR583.13 per ha in self-governed PIS whereas in jointly-governed KIS, it was found NPR 128.21 per ha. The cost efficiency was also found better in self-governed PIS than jointly-governed KIS. The effectiveness of fee collection of self-governed PIS was found 211.54 percent whereas in jointly-governed KIS, it was found only 111.43 percent. The effectiveness of fee collection of self-governed PIS was found almost double than jointly-governed KIS, as a result, the water tax was raised better in self-governed PIS than jointly-governed KIS. The financial self-sufficiency of the self-governed PIS was found 177.98 percent whereas in jointly-governed KIS, it was found lower, i.e., 141.95 percent. It indicated that self-governed PIS enjoyed more financial sufficiency than jointly-governed KIS. Due to solely responsibility of farmers and more ownership bearing in self-governed PIS, they were able to collect appropriate amount of water taxes. The financial self-sufficiency level was found decreasing in trend due to the reluctant with farming jobs. As the financial viability of WUA was critical valued for the sustainability of the institution, the WUA was a raised enough resource to cover the relatively high cost for necessary operation and maintenance cost in self-governed PIS than jointly-governed KIS. The government burden is decreased to pay salary of guards, supervisors and other staff by involving farmers. The costs of irrigation systems is reduced

by reducing DoI staffing, cost-saving and increase in fee collection, so, the benefit of WUA development has received the greatest attention.

The efficiency of revenue, efficiency of cost, effectiveness of fee collection and financial self-sufficiency are higher in self-governed irrigation system than jointly-governed irrigation system. Due to sole responsibility of farmers, they felt the canal of their own canal and they had generated their ownership in order to collect a good amount of water taxes and perform all the maintenance tasks in a cost effective manner in self-governed irrigation systems in comparison to jointly-governed irrigation systems. For overall strengthening of the system, the operation and maintenance works are carried out in a timely manner by WUA using own collected and secured financial sources in case of self-governed irrigation systems, but jointly-governed irrigation systems were solely dependent on DoI and other agencies.

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