

# Financial Self-Sufficiency in “Self-Governed” and “Jointly-Governed” Irrigation System in Inner Terai of Nepal

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## Abstract

Water resource is considered strategic natural resource for change. It is globally shrinking and becoming scarce resources to meet the demand for human utilization. The efficient management to meet the increasing demand is currently one of the important issues. Irrigation is a major source of water supply for agricultural production as it boosts agricultural productivity and faster economic growth. 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. In this context, a research was conducted in June 2018 as partial fulfillment of PhD in Rural Development (Dissertation on Governance and Sustainability of Irrigation Systems). The financial self-sustainability intends to measure the sustainability of the irrigation institutions in terms of performance. The research findings imply that of self-governed irrigation systems generated revenues from water taxes and performed all the maintenance tasks in a cost effective manner compared to the jointly-governed irrigation systems canals. The research concludes that financial self-sufficiency is higher in self-governed irrigation systems in comparison to jointly-governed irrigation systems.

**Keywords:** self-sufficiency, Efficiency of revenue, Efficiency of cost, Finance

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## 1. Background of the Study

Water consumption is steadily increasing due to fast population growth, global warming, industrial development, faster economic growth, boost agriculture produces. Establishment of a sound governance mechanism is a must to utilize the available stock of water. Water is a strategic natural resource to drive change

(Upadhyay, 2012). Water is an essential resource for all life span. Water resources are globally shrinking and becoming scarce resources for development. Asia faces a daunting water crisis that threatens its economic growth (Chellaney, 2011). The efficient management of water resource to meet the increasing demand

is currently becoming one of the important issues. Agricultural production depends on the availability of irrigation facilities and its proper management (DoI, 2016). 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).

A large number of studies have been conducted on irrigation management, but it has not been studied the comparison between governance and sustainability of irrigation systems. Hence, this study was conducted to compare the governance and sustainability between self-governed and jointly-governed irrigation systems. Hence, the researcher posed this as a research topic. Against the above backdrop, the research question is: How do proper operation and maintenance practices lead to the financial self-sustainability of the irrigation systems?

## 2. Objective

This academic research intends to address the following objective: compare the financial self-sustainability of the self-

managed and jointly managed irrigation systems.

## 3. Methodology

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

## 3. Results and Discussion

### 3.1 Financial Efficiency of Revenue

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 is shown in the following formula (Serier, Yüksel & Konukcu, 2007).

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

Table 1: Efficiency of Revenue (NPR per ha)

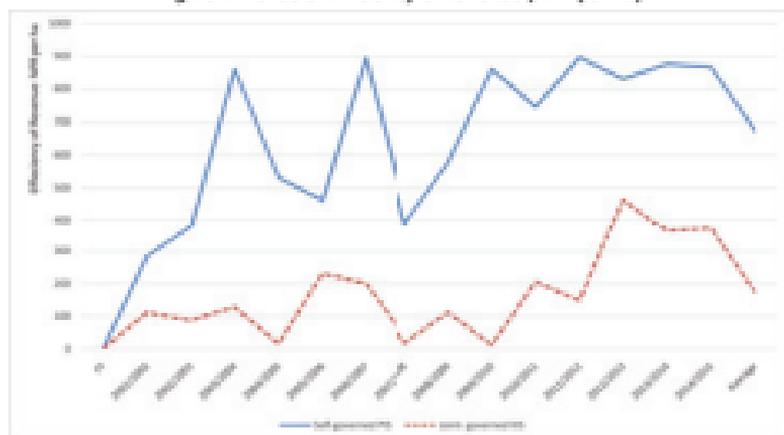
FY	Self-governed Panchakanya Irrigation System (PKS)			Jointly-governed Khageri Irrigation System (KS)		
	Total Operating Income (NPR)	Total Command Area (ha)	Efficiency of Revenue (NPR per ha)	Total Operating Income (NPR)	Total Command Area (ha)	Efficiency of Revenue (NPR per ha)
2001/02	170,401.50	600	284	435,905.79	3900	111.77
2002/03	225,752.93	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	536,796.77	600	894.61	781,315.00	3900	200.34
2007/08	233,689.00	600	389.48	67,860.98	3900	17.4
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	801333.00	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	1,806,969.91	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

Field Study, 2016

Table 1 shows that the average efficiency of Revenue was found to be NPR 674.97 per ha in self-governed PIS while jointly-governed KIS, it was found to be NPR 176.21 per ha. Figure 1 displays the trend of the efficiency of revenue of both irrigation systems.

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



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 (NPR 674.97 per ha) of the self-governed PIS than the jointly-governed KIS (NPR 176.21 per ha). It shows the efficiency of revenue was better in the self-governed PIS in comparison to the jointly-governed KIS.

### 3.2 Efficiency of Cost

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

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

Throughout the field study key informants were inquired about the efficiency of the cost of the systems and in this regard, their response is summarized in Table 2.

**Table 2: 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	600	137.34	429,644.43	3000	143.17
2002/03	120,667.53	600	201.11	151,415.57	3000	50.82
2003/04	506,368	600	843.61	370,980.08	3000	95.12
2004/05	439,609.46	600	732.68	414,539.30	3000	106.29
2005/06	282,989.00	600	471.65	93,407.00	3000	23.95
2006/07	87764.00	600	146.27	804,023	3000	266.36
2007/08	51,481.00	600	85.69	540,591	3000	138.61
2008/09	209,536.00	600	349.23	73,981	3000	18.97
2009/10	506,368.00	600	843.61	216,628	3000	55.55
2010/11	492,026.00	600	820.04	134,448	3000	34.47
2011/12	672,623.00	600	1,121.04	266,554	3000	68.35
2012/13	512,890.00	600	854.82	760,336	3000	194.96
2013/14	475,069.00	600	791.78	2,276,998	3000	583.85
2014/15	458,988.00	600	764.98	466,628	3000	155.65
Average	349,879	600	583.13	500,012.38	3000	128.21

Field Study, 2016

Table 2 shows that the highest efficiency is the cost NPR 854.82 per ha in the self-governed PIS in FY 2012/13 whereas in jointly-governed KIS, the highest efficiency of cost was 583.85 percent.

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 7.3 displays the trend of the efficiency of the cost of the irrigation systems.

Figure 2: Efficiency of Cost (NPR per ha)

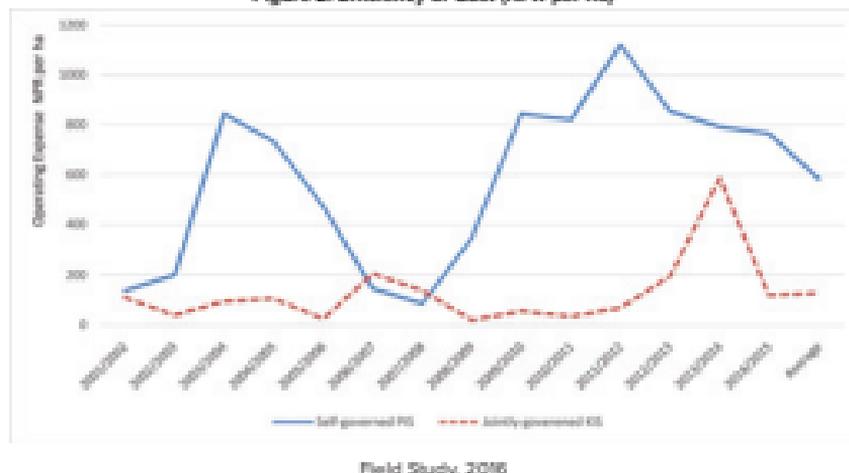


Table 2 shows that the highest efficiency is the cost NPR 854.82 per ha in self-governed PS in FY 2012/13 whereas in jointly-governed KIS, it was NPR 583.85 per ha. The average efficiency of cost was higher (NPR 583.13 per ha) in self-governed PS whereas in jointly-governed KIS, it was NPR 128.21 per ha.

### 3.3 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, Yüksel & 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, Yüksel 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:

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

In field studies, about the effectiveness of fee collection systems, key informants were enquired, and their response is summarized in the Table 3.

Table 3: Effectiveness of Fee Collection (Percent)

FY	Self-governed PS			Jointly-governed KIS		
	Total Collected Fee (NPR)	Total Fee to be Collected (NPR)	Effective-ness Fee Collection (Percent)	Total Collected Fee (NPR)	Total Fee to be Collected (NPR)	Effective-ness 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

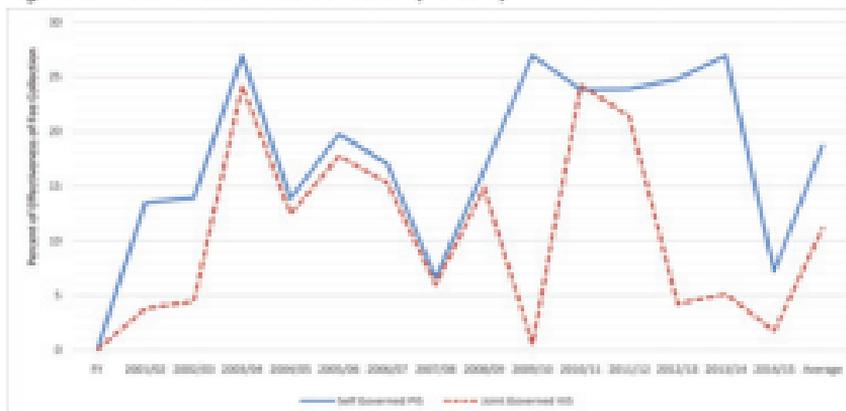
2004/05	379,325.83	1,086,000.00	29.40	59,569.00	1,209,000.00	4.93
2005/06	276,938.40	1,086,000.00	25.50	902,534.79	1,209,000.00	74.65
2006/07	536,766.77	1,086,000.00	49.43	781,315.00	1,209,000.00	64.62
2007/08	231,689.00	1,086,000.00	21.32	67,860.98	1,209,000.00	5.61
2008/09	346,836.50	1,086,000.00	31.94	439,905.79	1,209,000.00	36.06
2009/10	516,896.63	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	801,333.00	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

Field Study, 2016

The effectiveness of fee collection and water tax of self-governed PIS was 37.29 percent which is better than the jointly-governed KIS, i.e., 11.14 percent. 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 better in self-governed PIS from 2001/02 to 2014/15 FY than the jointly-governed KIS.

### 3.4 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:

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

Regarding the financial self-sufficiency, it indicated that the self-governed PIS was more financially sufficient (15.75 percent) than the jointly-governed KIS (24.05 percent). 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. In field studies key informants were inquired about the financial self-sufficiency (effectiveness of fee collected) of the systems, their response is summarized in Table 4.

**Table 4: Financial Self-Sufficiency (in Percent)**

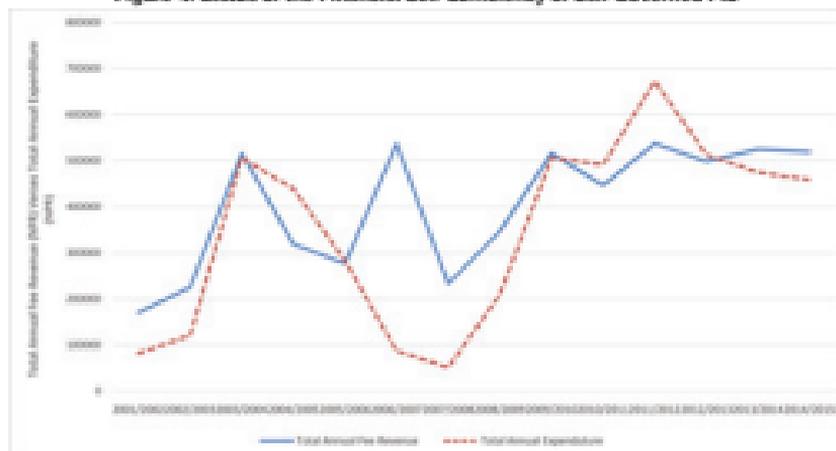
FY	Self-governed PIS			Jointly-governed KIS		
	Total Annual Fee Revenue (NPR)	Total Annual Expenditure (NPR)	Self-Sufficiency (Percent)	Total Annual Fee Revenue (NPR)	Total Annual Expenditure (NPR)	Self-Sufficiency (Percent)
2001/02	170,401.50	82,403.00	206.79	435,905.79	16,628.00	2621.52
2002/03	325,792.92	130,667.93	187.09	341,300.50	414,942.94	82.48
2003/04	516,386.63	506,168.00	101.98	501,321.64	355,506.78	141.02
2004/05	319,325.83	439,609.46	72.64	50,569.00	395,905.78	15.046
2005/06	276,938.40	282,989.00	97.86	902,534.79	804,032.50	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	516,386.63	506,168.00	101.98	48,202.00	134,448.00	35.85
2010/11	446,864.68	482,026.00	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	498,381.68	512,890.00	97.15	1,806,998.91	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	404,98117	349,879.43	115.75	134,722.32	560,062.14	24.05

Field Study, 2016

Dol (1997) stated that if the WUA rate is able to increase the Irrigation Service Fee (ISF) collection, efficiency of summer paddy is ensured, then its current rate

can be decreased. Trends in the financial self-sufficiency of self-governed PIS is demonstrated in Figure 4.

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

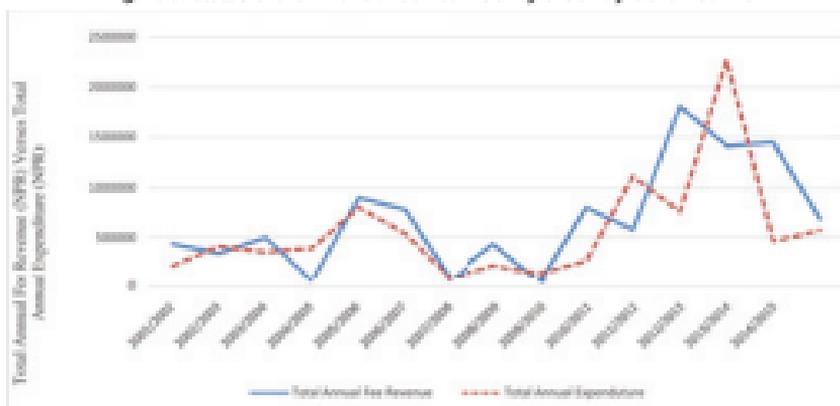


Field Study, 2016

The sufficiency level was decreasing 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. Trends in the financial self-sufficiency of jointly-governed KIS is demonstrated in Figure 5.

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

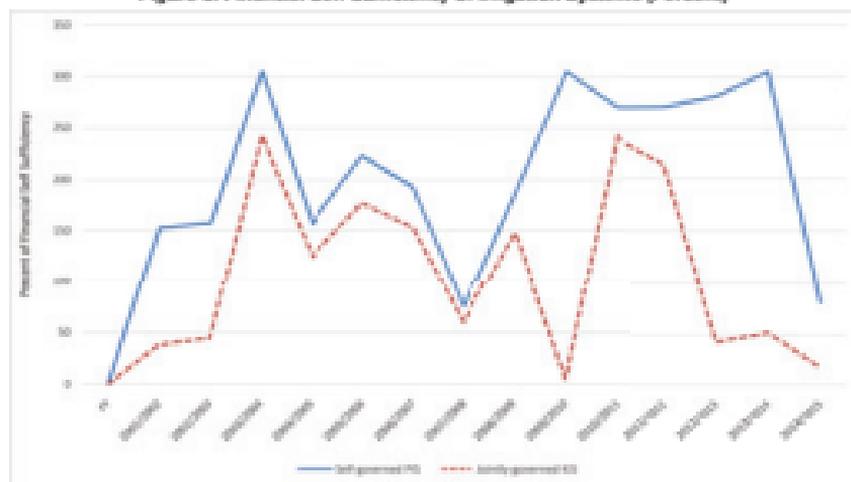


Field Study, 2016

The collection of ISF in the jointly-governed RIS 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. Trends in the financial self-sufficiency are given in Figure 6.

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



Field Study, 2016

The financial sustainability is to measure the sustainability of the irrigation institutions in terms of performance. 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. The financial sustainability consists of: 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 is greater than the total costs. In the case of irrigation systems, besides financial viability, other benefits as employment generation, nutritional standards and market activities associated with forward and backward linkages are common.

#### 4. Conclusion

The percent of financial self-sufficiency is higher in self-governed irrigation systems in comparison to jointly-governed irrigation systems. WUA was able to secure financial requirement to carry out all the operation in time using own resources in an economized way in self-governed irrigation systems,

but the collected fund was far below for operation in jointly-governed irrigation systems. Which confirmed that this can affect the sustainability of the systems in the long run and dependent over do. Lack of efficiency and effectiveness of the irrigation fee collection has been a key factor for low financial self-sufficiency in jointly-governed irrigation system.

'Bottom up' approach was adopted to foster the collective goals among the irrigators

in self-governed irrigation system, but 'top-down' approach in jointly-governed irrigation system, which was given little inspiration to farmers towards water delivery. The farmers felt a more sense of ownership over the system due to full-fledged authority in self-governed irrigation systems, whereas in jointly-governed irrigation system, Department of irrigation status quo was still prevailing which resulted increased inability of the farmers to benefit as much as they should.

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*(Narayan Prasad Bhatta, PhD is Short-term Pool of Consultants for Senior Policy Advisor Support Millennium Challenge Account Nepal).*