

IMPROVED FOOD SECURITY AND INCOME FOR SMALL FARMERS THROUGH POND IRRIGATION-NEPAL

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ABSTRACT

Pond irrigation systems: are non-conventional irrigation systems practicing in Nepal comparatively higher and colder areas (~ 1600 msl in average), highly potential for fresh vegetable farming. Fresh vegetables are cash crops that can increase income of farmers by far more than that of cereal crops in a given area of land compared to cereal crops like wheat, maize, millet or paddy, provided market linkages are established. In this type of system water is collected in pond which is lined and sealed with sheet membranes. The sheets are water proof, resilient to harsh weather conditions; less affected by earth-movements, affordable for small farmers and can be easily repaired in case of small tears and replaced in case of damage. The water is conveyed to pond from springs or streams by means of pipes through gravity flow. Once the water is brought to farmers' land from distant water sources, the farmers are usually smart to utilize water efficiently. Since this type of system is often built in water deficit areas, farmers need to distribute water on equal basis, provide labour force equally for construction and contribute to operation and maintenance fund equally.

The pond irrigation system is implemented in selected food deficit areas in Nepal's rural central-eastern and mid- & far-western regions in seven districts as mentioned above through HELVETAS Swiss Intercooperation Nepal with financial support of Swiss Development Cooperation. They are hill areas, altitude ranging from 500 m to 2000 m above sea level. The size of pond practiced are 15, 30, 45 and 60 cubic meters which depends upon available water and proposed command area.

The potentiality of replication is proven as the pond irrigation technology is recognized by government bodies and "one village one pond" programme announced. The technology is also adapted by Community Irrigation Project (CIP) which is funded by ADB and is active in 12 other districts of Nepal.

Since the technology is simple, affordable and can bring significant difference in the livelihood of small farmers, local government bodies have shown interest to adapt pond technology. Some farmers have been practicing the technology for 5 years and have become one of the major sources of income.

The main factors of success are:

- The technology is simple to understand and implement by local technicians and farmers.
- It is a low-cost technology having a high probability of economic benefits.
- The technology is suitable for hill areas which account for more than 50% of the land area in Nepal.
- The technology is appropriate for small farmers striving for additional income from their small land.
- The technology is environment friendly.

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1. INTRODUCTION

In Nepal, of the total geographical area of 14,718,100 ha, the land suitable for arable agriculture is only 2,641,000 ha or about 18 %. Out of this, the potential irrigable area under surface and groundwater sources is only 1,766,000 ha owing to the rugged topography and difficult land terrain. On the other hand the population of the country is growing at the rate of 2,5 % per annum. Agriculture sector contributes 38 % of the total GDP employing about 80 % of the active population. However, agriculture production largely depends on monsoon rains. Of the total cultivable land only about two third is irrigable and only about less than half of this land has year round irrigation facility.

The Nepalese economy is dominated by agriculture as the main source of food, income, and employment for the majority in the country. To increase agricultural production, the Nepalese Government has prioritized irrigation, the development of non-conventional irrigation systems, the use of fertilizers and insecticides, the introduction of new seeds of better adapted and high-yield varieties, and the provision of credit. Besides of this, a considerable gap exists in the provision of irrigation facilities in the hill areas, where only about 27% of irrigable land is irrigated. In rural areas, the prevailing socio-economic exclusion and inappropriate land use combined with discriminatory land tenant systems have a negative impact on the livelihood conditions of marginalized and small farmers². In order to address the increased pressure on rural livelihoods and some of the issues raised above, LILI³ (Local Infrastructure for Livelihood Improvement Project) was conceived in 2004 by HELVETAS Swiss Intercooperation Nepal with the objective to improve food security and income by providing better access to water for irrigation to poor farmers with predominantly marginal landholding in selected food deficit areas of Nepal.

2. POND IRRIGATION SYSTEM

Pond irrigation systems are non-conventional type of Irrigation system practiced in water scarce area of mid hills focusing high value crops e.g. seasonal/off-seasonal vegetables. The system comprises intake at the water sources (mostly perennial spring source), pipe lines and pipes from intake site to near the pond sites, flow regulating chambers to distribute the water proportionately to different ponds, ponds 2-5 in number as per the need, water distribution post as outlets for irrigation.

² Small Farmer: Farmer having land less than 0.5 ha

³ LILI: Local Infrastructure for Livelihood Improvement Project, Project funded by Swiss Development Cooperation (SCD Nepal)

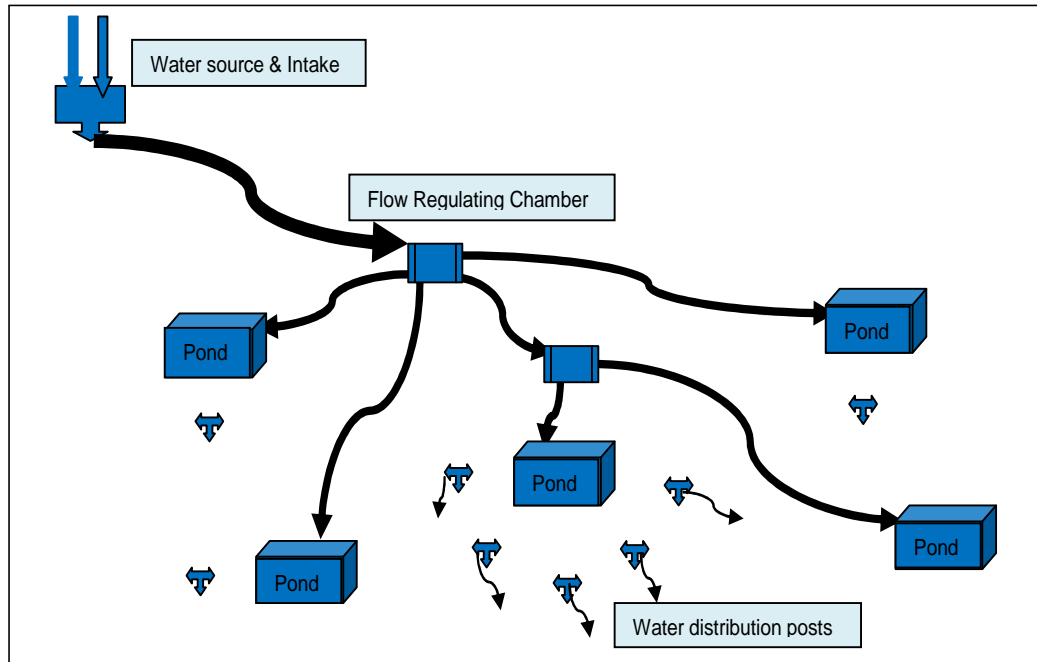


Figure1. A typical layout of Pond Irrigation System

In pond irrigation system water is collected in ponds excavated at the field and lined with water-resistant membrane (200 GSM⁴ SILPAULIN sheet membranes). The water is conveyed to pond from spring or stream as gravity flow by means of HDE pipes. Once the water is brought to farmers' land from distant water sources, the farmers can utilize it as per their agricultural plan and water sharing policies. The pond irrigation systems can be easily constructed at the regular but small water sources exist above the farm land. The size of pond practiced are 15, 30, 45 and 60 cubic meters which depends upon available water and proposed command area.



Figure 2: Excavated Pond with Silpaulin Lined



Figure 3: Pond with Soil Cement Jut bag lining

The excavated pond is lined with 200 GSM Silpaulin sheet. The Silpaulin sheet is water proof, resilient to harsh weather conditions, less affected by earth-movements, affordable for small farmers, easy to repair in case of small tears and replaceable in

⁴ GSM: Gram per square meter (represent the thickness of Silpaulin sheet)

case of damage. Life of the Silpaulin membrane sheet is generally claimed to be at least 10 years with the exposed of sun. Although, certain cautions are needed to care from damage of Silpaulin sheet caused by hitting the solid objects to the empty pond and firing. However, the punctured silpaulin membranes can also be repaired by sticking pieces of similar sheets with adhesives supplied, Soil Cement Jute bag⁵ lining over Silpaulin sheet is more safe and favoured by farmer.

3. FOOD SECURITY AND INCOME

Nepal being predominantly agricultural country with subsistence types of agriculture, above 65% of the farmers adopt traditional agricultural pattern with traditional water management practices and the irrigation systems are managed by the farmers with little or no assistance from the government agencies. However, these FMIS are in need of frequent maintenance and are often not reliable. Meantime Nepal has huge discrepancy in land occupation by the peasant farmers. More lands are occupied by less people, i.e. about 5% farmers owing 37% of total agricultural land against 47% of the farmers owning just 15 % of land (<http://www.ngofederation.org/index>), similarly, the major water sources are well captured and utilized by the rich farmers. Thus land and water availability is highly skewed fostering inequality among the Nepalese Society. The poor and small land holding farmers are often suffering from social and cultural conflicts on water right issues. There are various efforts made from public and other development agencies to increase the irrigation water availability with harmonized social harmony in a participatory way. The Pond Irrigation system is focusing to small farmers residing hilly areas in scattered way. The system is highly potential for fresh vegetable farming, seasonal and off-seasonal. Fresh vegetables are cash crops that can increase income of farmers by far more that of cereal crops in a given area of land compared to cereal crops like wheat, maize, millet or paddy, provided market linkages are established

The study report of LILI HELVETAS Swiss Intercooperation Nepal revealed that the Pond Irrigation Systems are more favourable in comparison to conventional type Canal Irrigation system for small farmers in terms of increase in cropping intensity, farm income and beneficiaries coverage. This paper highlights the success of small land holding farmers in managing scarce water sources through pond irrigation system and increase their food security and income.

This study is the analysis of 308 small irrigation schemes completed in different region of Nepal with the support of LILI HELVETAS Swiss Intercooperation Nepal within the period of three years (2009 to 2012). Total out 308 small irrigation schemes 112 schemes are Canal Irrigation system and remaining 196 schemes are Pond Irrigation system. The study showed that the coverage of DAGs⁶ as beneficiaries in pond irrigation system is more than in Canal Irrigation System. In Pond Irrigation System about 58% beneficiaries are belongs to DAG but in Canal Irrigation system only 47% beneficiaries are DAG. Likewise the beneficiaries having less land are more in Pond Irrigation System than in Canal Irrigation System. The average size of land per households in Pond Irrigation system are about 2.2 *Ropani*⁷ but in the case of Canal Irrigation System the average size of land is about 4.12 *Ropani*.

⁵ Soil Cement Jute bag: Jute bags filled with mixture of soil cement in about 1:12 ratio to protect Silpulin

⁶ DAG: Disadvantaged Group

⁷ *Ropani*: Area of land \cong 506 Square meter

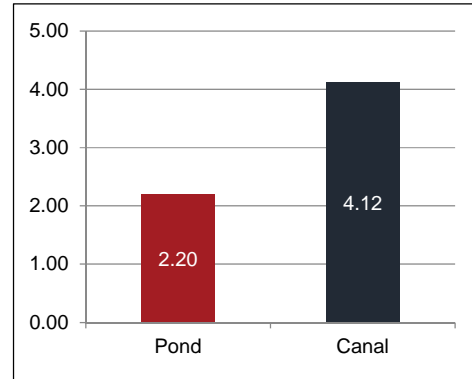
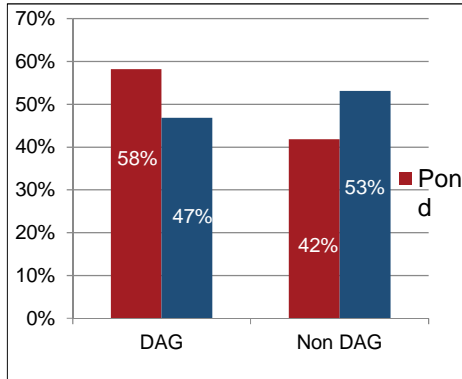


Figure 5: Land Holding Per HHs (*Ropani*) Figure 6: Beneficiaries Coverage per scheme (HHs)

The study also revealed that the increase of cropping intensity in comparison with the base line survey (without irrigation facility) is almost same about 40 % in Pond and Canal Irrigation system. In spite of almost same increase of cropping intensity the farm income in the case of Pond Irrigation system is much higher than in Canal Irrigation system. The regular irrigation water availability at bari land nearby resident supported to adopt new cash crops mainly off season vegetables to increase their income per *Ropani* land by NRS 630/- in average than in Canal Irrigation system.

Year	Types of schemes	Cropping intensity		Net Income (Rs/ Rop.)
		Baseline survey	Outcome Monitoring survey	
2011/12	Pond	162%	216%	4320
	Canal	150%	195%	3867
2010/11	Pond	187%	227 %	2'191
	Canal	150%	200%	1,779
2009/10	Pond	218%	250 %	3,047
	Canal	196%	222 %	2,018

Table 1: Cropping Intensity and Net Income from per *Ropani* of Land

CONCLUSION AND RECOMMENDATION

The Pond Irrigation system may be the best option in hill areas because the flow of water from source to pond is gravity-flow and is conveyed by means of pipe. The climate in these areas of Nepal is suitable for both season and off-season vegetable farming. The farmers of these areas work extremely hard to earn their living and also opt for seasonal migration to India for earning. With the available small land, usually less than half a hectare, the technology would be a boon for making a better living for small farmers, provided agricultural services are imparted for initiating optimal cropping pattern and higher yields. Market linkages are crucial for ultimately improving livelihoods.

Pond Irrigation system serves the most vulnerable groups of the society mainly, women, Dalit and Janjati community who otherwise have no other livelihood options than the agriculture in their settlement. To upscale this solution, the technology should be incorporated in governments' plan and policy. Trainings related to technology should be provided to authorities of government bodies at local and national level but also disseminated with farmers, other governmental and non-governmental organizations and donor agencies world-wide. A harmonized planning process and implementation modality should be agreed among major stakeholders to ensure that supports are received by the needy ones.

REFERENCES

LILI, Survey Cost Estimate and Design Report of Small Irrigation Schemes, LILI, Project Document, LILI, Annual Report, LILI Outcome Monitoring Report