WORKING PAPER 114

Multiple Use Schemes: Benefit to Smallholders

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International Water Management Institute

FUTURE HARVEST
IWMI is a Future Harvest Center supported by the CGIAR

Working Paper 114

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IWMI receives its principal funding from 58 governments, private foundations, and international and regional organizations known as the Consultative Group on International Agricultural Research (CGIAR). Support is also given by the Governments of Ghana, Pakistan, South Africa, Sri Lanka and Thailand.

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Pant, D.; Gautam, K. R.; Shakya, S. D.; Adhikari, D.L. 2006. *Multiple use schemes: Benefit to smallholders*. Colombo, Sri Lanka: International Water Management Institute. 48 p. (working Paper 114).

The authors wish to thank Douglas J. Merry of IWMI for his inputs in the preparation of this paper. They would also like to thank the staffs of International Development Enterprises/Nepal and Winrock International/Nepal for their support during the field study.

/drinking water / households / domestic water / cropping systems / water use / gender / women / cereals / vegetables / Nepal/

ISBN 92-9090-643-X

ISBN 978-92-9090-643-9

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Acronyms and Abbreviations

ADB/N	Agricultural Development Bank/Nepal
AEC	Agriculture Enterprise Centre (AEC)
APP	Agriculture Perspective Plan
ASC	Agriculture Service Center
CBO	Community-Based Organization
CBS/NPC	Central Bureau of Statistics/National Planning Commission
CEPREAD	Center for Economic Policy, Research, Extension and Development
DADO	District Agriculture Development Office
DLSO	District Livestock Services Office
HH	Household/s
IDE	International Development Enterprises
LSC	Livestock Service Center
MUS	Multiple Use System
SAPPROS	Support Activities for Poor Producers of Nepal
SIMI	Smallholder Irrigation Market Initiative
USAID	United State Agency for International Development
VDCs	Village Development Committees

Executive Summary

In Nepal, many small irrigation and water supply schemes have been built on users' initiatives. These small schemes are easily accessible to the poor and marginal households (HH). The Smallholder Irrigation Market Initiative (SIMI) project has developed nine multiple use water schemes (MUS) with new constructions and modifications to supply water for both household use and irrigation. A few of these schemes are new; in others existing drinking water schemes have been modified to include irrigation. This study was conducted to document the potential effects of these multiple use schemes, in order to determine the prospects and constraints for their expansion in the hills of Nepal. Household surveys and focus group discussions were carried out to generate the information on MUS.

The SIMI project has introduced various forms of intervention strategies to use the existing infrastructures for both irrigation and drinking water. Farmers are using either drip and sprinkler technology or irrigating directly through polythene pipes and buckets. The system development cost per scheme varied due to the cost of materials; however, a household could recover its investment cost in one year through the sale of vegetables, the main crop grown in MUS plots after the intervention. However, the benefits are not the same across the schemes and among the households because of differential market access. Women's access to income has increased as they are involved in vegetable farming and also selling the produce, but they do not have control over the income. Nevertheless, the majority of the users have benefited through increments in income and in home consumption of vegetables.

Water use patterns in households have changed after the introduction of MUS, and women's drudgery has reduced substantially due to less time required in fetching water. The extra time saved is used in weaving at home, in farming, and for rest and regular household activities. The availability of drinking water near the household has contributed to increased water use in the household. In most of the schemes the water users' groups have collected Rs10 (about US$0.15) from every household per month for maintenance of the system. However, the organization is very informal and lacks clear institutional processes. Gender balance is lacking due to minimal representation of women in decision making. In some groups, the maintenance fund has been transformed into a saving and credit fund, enabling farmers to have easy access to credit.

INTRODUCTION

Nepal's recently promulgated National Water Resources Strategy (2002) states that though Nepal is primarily an agrarian country with abundant water resources, only two-thirds of its total irrigable area has some form of irrigation and more than one-third of the total population still lacks access to safe water. In the hills of Nepal, a rural population of 8.5 million depends on agriculture and only 167,000 hectares out of the 369,000-hectare irrigable area are irrigated. The risk of poverty is more pronounced among farm HH without access to irrigation (table 1).

Table 1. Poverty and access to irrigation.

	NLSS-1	NLSS-2
Incidence of poverty among HH (%)	37.14	28.67
Incidence of poverty among farmers without irrigation (%)	38.76	36.98

Note: NLSS= Nepal Living Standards Survey.
Source: CBS/NPC, Nepal Living Standards Survey 1995/96, 2003/04.

Because of this, planners have concentrated on smaller irrigation schemes as evidenced in the 20-year Agriculture Perspective Plan (APP), National Water Resources Strategy and Tenth National Five-Year Plan (2002-2007), all of which aim at extending irrigation to 10,000 hectares of land through nonconventional irrigation[1] to tap water from numerous rivulets and springs. They provide promising opportunities for the development of smaller irrigation and water supply schemes. Many such schemes were built under users' initiatives and the users are benefiting from them for multiple purposes.

Multiple use schemes (MUS) are nonconventional schemes that provide water for both domestic use and irrigation. The water for MUS is mostly from the spring source and collected through gravity flow in a cement mortar jar which is known as a *Thai Jar.* It has a capacity of 3,000 liters for drinking water and is constructed over the ground. The water from the jar is distributed to the households through tap stands covering 4-5 households. After the Thai Jar is filled, the overflow from it is collected in an underground tank with a capacity of 10,000-15,000 liters through a pipe connection inside the Thai Jar. This is a ferro-cum-soil cement tank. The water is distributed to the farmers' fields for irrigation through offtakes (see annex 1 for a picture of MUS).

Building on this trend, the International Development Enterprises (IDE) and Winrock International with support from USAID and in partnership with the Centre for Economic Policy, Research, Extension and Development (CEPREAD), Support Activities for Poor Producers of Nepal (SAPROS, Nepal) and Agriculture Enterprise Centre (AEC), have promoted multiple use systems through their implementation in the mid-hills of Nepal under the SIMI project. These projects have developed nine multiple use water supply schemes. The present study was carried out to assess the effect of MUS implemented in three districts,[2] Syangja, Palpa and Surkhet, under the SIMI project.

[1] Irrigation technologies, such as drip and sprinkler irrigation, treadle pumps and rainwater harvesting come under nonconventional irrigation.

[2] A district is a politico-administrative unit. There are 75 districts in Nepal.

Study Goal and Objectives

The overall goal of this study was to document potential effects of multiple use schemes to determine prospects and constraints for their expansion in the hills of Nepal. The objective of this study was to look into the various aspects of introduction and use of MUS and their effect on the household and the community. The study tried to answer following questions:

1. Can such MUS yield similar benefits across the wide range of socioeconomic and agro-climatic conditions in the hills of Nepal?
2. What are the key physical, social, economic, organizational and policy attributes that significantly influence the outcomes from the MUS schemes?
3. What are the constraining and facilitating factors for the expansion of these MUS schemes?

Methodology

Altogether nine schemes, three in each of the districts, were studied by administering a set of questionnaires. These schemes were in operation at least for two seasons,. The questionnaires were pretested in one of the MUS in Syangja; these households were not included in the final study sample. Thirty percent of the total MUS households in each of the MUS schemes were randomly selected from the MUS completed households list at the site for interview. Altogether 69 households, 29 from Syangja, 24 from Palpa and 16 from Surkhet (table 2) were included in the sample and the interview was carried out with the household head or the person who was managing the household in the absence of the household head. See also annex 2 for details on the database of MUS. Other project-related information was collected from the key informants in the study areas. Focus group discussions were used to collect primary information for gender aspects of the study.

Table 2. Distribution of sample households studied in each of the schemes and their accessibility.

Sample district and sites	Total HH	Total sample	Accessibility from the roadhead	Accessibility to road/market center	Nature of market for fresh vegetables
I Syangja					
Kumalgaun	51	15	5 minutes' walk from the Siddharth highway to the Syangja district HQ from Pokhara	45 minutes' walk from the HQ of Syangja district	Supplier-dominated
Senapuk	23	8	30 minutes' walk from the roadhead	30 minutes' walk to the roadhead (Bhakunde) and 20 minutes' bus ride to the market	Supplier-dominated
Pelakot	21	6	One hour of walk from the roadhead at the Galyang, Siddharth highway	45 minutes' walk to the Galyang market	Supplier-dominated
Grand total	95	29			

Table 2—Continued

Sample district and sites	Total HH	Total sample	Accessibility from the roadhead	Accessibility to road/market center	Nature of market for fresh vegetables
II Palpa					
Chiskhola	14	4	One hour of walk from Arebhanjyang on the Siddhartha highway and 10 minutes' walk from the roadhead	10 minutes' walk to the village market (Tahun and Deurali)	Buyer-dominated
Dibindanda	37	11	50 minutes' walk form the the roadhead	50 minutes' walk to the market	Buyer-dominated
Bhalebans	30	9	One hour of walk from the Ramdi Bridge on the Siddhartha highway	45 minutes' walk from the village to the collection center in Ramdi Bridge	Buyer-dominated
Total	81	24			
III Surkhet					
Piple	14	4	One-and-a-half hours' walk from the roadhead	One-and-a-half hours' walk to the market	Buyer-dominated
Nayagaun	10	3	Three hours' walk from the roadhead	Three hours' walk to the market	Buyer-dominated
Kareni	29	9	Three hours' walk from the roadhead	Three hours' walk to the market	Buyer-dominated
Total	53	16			
Grand total	229	69			

Source: Field survey 2005.

Limitations of the Study

Since this was an exploratory study with limited resources, the sample was small and no statistical tests of significance would be meaningful. Further, due to the unavailability of benchmark data, assessment of the scheme was based on the information obtained from respondents for situations before and after the interventions.

Sampled districts are in the mid-hills of Nepal. They are located in the Western Development Region and Mid-Western Development Region. The study districts are given in map 1.

SOCIOECONOMIC CHARACTERISTICS OF THE HOUSEHOLDS

Family Size, Age, Education and Migration

The average family size of the sampled households is around 7.6 persons (table 3). This is higher than the national average of 5.4 (2001 Population Census). This shows that the labor availability for agricultural activities in the studied area is not a problem. Of the total sample population the composition of male-female ratio is about 0.89:1. The dominance of female members shows the important role they could play in MUS activities that the project should pay attention to. In Surkhet, 25 percent of households are reported to have migrated during the last 5 years.

Map 1. Map of Nepal with studied districts.

Note: The areas with grids denote the studied districts.
Source: Central Bureau of Statistics/National Planning Commission HMG Nepal.

Table 3. Social characteristics of respondents.

Sampled districts	Characteristics											
	Sex		Average	No. of HH head respondents	Average family size	In-migration	Period year	Education (classes) in percentage				
	M	F						Nil n=24	1-4 n=18	5-7 n=14	8-10 n=10	College n=3
Syangja	20	9	44	13 (45)	6.9	0	0	28	25	17	20	10
Palpa	8	16	39	10 (45)	7.6	0	0	63	12	17	8	0
Surkhet	14	2	30	11 (69)	8.1	4 (25)	5	6	50	31	13	0

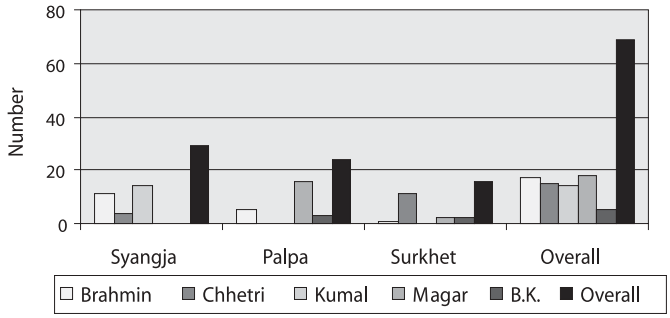
Note: Figures in parentheses are percentages.
Source: Field survey 2005.

The table shows that the number of respondents other than the household heads was also significant indicating greater responsibility carried out by other members of the households. The survey result shows that about one-third (31%) of the respondents are illiterate, and very few (18%) have completed education up to middle school.

Ethnicity, Occupation and Social Inclusiveness

Due to the inclusive nature of the MUS they cover households from all the social strata in the sites[3] (figure 1). The Kumal and Magar belong to the Vaisya caste group and the BK to the Occupational caste group. However, the dominance of higher-caste groups in some localities is observed due to the clustered settlement in the villages. The participation of occupational caste groups is low indicating their lower accessibility to the ownership of land. The majority (51%) of the respondents are engaged in some other activities besides agriculture whereas almost half (49%) of them are exclusively engaged in farming, indicating the importance of farm income to their households (annex 3).

Figure 1. Distribution of ethnicity.



Landholding and Land Tenure

The average farm size per household is about 0.386 hectare. Out of this, nearly 65 percent is unirrigated land known as *bari*. The dominance of unirrigated land exemplifies the importance of micro irrigation (table 4).

[3] There are four major caste groups in Nepal: Brahmin, Chhetri, Vaisya and Occupational.

Table 4. Distribution of landholdings and land tenure (area in ha).

Characteristics	Landholding size in sampled districts			Average landholding size
	Syangja	Palpa	Surkhet	
Khet-lowland	0.225	0.08	0.36	0.21
Own	0.19	0.07	0.36	0.19
Rented in	0.03	0.01	0.0	0.01
Rented out	0.01	0.0	0.0	0.003
Bari-upland	0.14	0.27	0.49	0.27
Own	0.15	0.27	0.0	0.27
Rented in	0.001	0.002	0.0	0.02
Rented out	-	-	-	-
Pakho-marginal land	0.11	0.06	0.17	0.18
Own	0.11	0.0	0.0	0.11
Rented in	0.0	0.0	0.0	0.0
Rented out	0.0	0.0	0.0	0.0

Source: Field survey 2005.

Livestock Holdings

The households have a sufficient number of livestock. But the average number of livestock (cattle) per household is reported to have declined by 5.88 percent (table 5) after the MUS while the numbers of buffaloes, pigs and poultry have risen marginally.

Table 5. Distribution of livestock by households.

Sampled districts	Livestock holdings																	
	Cattle			Buffaloes			Goats			Pigs			Poultry			Others (Duck)		
	Before	After	Change(%)	Before	After	Change(%)	Before	After	Change(%)	Before	After	Change(%)	Before	After	Change(%)	Before	After	Change(%)
Syangja	0.9	0.9	0.0	2	2.1	10.0	2.1	1.9	-20.0	0.2	0.3	10.0	2.7	2.3	-40.0	0.3	0.1	-20.0
Palpa	1.2	1.3	10.0	2.3	2.3	0.0	2.9	3.1	20.0	1	1.1	10.0	6.8	6.4	-40.0	0	0	0.0
Surkhet	4.1	3.6	-50.0	0.9	1.2	30.0	4.1	3.4	-70.0	0	0.1	10.0	6.9	9.6	270.0	0	0	0.0
Overall	6.2	5.8	-40.0	5.2	5.6	40.0	9.1	8.4	-70.0	1.2	1.5	30.0	16.4	18.3	190.0	0.3	0.1	-20.0

Source: Field survey 2005.

MULTIPLE USE SCHEMES (MUS)

Intervention Strategy

The interventions by the project in different locations have followed basically four strategies, as presented below.

1. Intervention with completely new irrigation and drinking water schemes based on the need of the users in these locations (Kumalgaon in Syangja).

2. Intervention through construction of irrigation scheme and use of existing drinking water schemes that were constructed before MUS (Sorek and Pelakot in Syangja; Chhiskhola in Palpa and Kareni in Surkhet).

3. Intervention with only one scheme (underground tank) that is being used for both irrigation and drinking water (Dibindada in Palpa and Piple, Surkhet).

4. Intervention with separate Thai Jar with a capacity of 1,500 liters (Jarbuta, Nayagaon in Surkhet) for each household which is used for both irrigation and drinking water.

Therefore, the project activities in different locations are varied. However, the rehabilitation of the existing drinking water schemes has both helped in maximizing the use of existing facilities and reduced costs to the project and users. Further, this has helped provide services to a larger number of farmers. The use of only one scheme both for irrigation and drinking purpose shows the lack of uniformity in design criteria of the project as well as lack of sensitivity towards improving the hygiene of the users—one of the primary objectives of the project. This is because there are chances of contamination of the underground tank as opposed to the Thai Jar.

Cost of MUS

The MUS system's costs are for the improvement/construction of intake, Thai Jar, irrigation water collection tank, improvement of the distribution system, installation of micro irrigation offtake and the construction of drinking water tap stands (table 6)**.** The costs to the farmers are cash investment in purchasing the drip kits and labor contribution in the collection and transportation of local construction materials such as sand and stones, trench digging and pipe laying. The cost of materials, which have to be purchased from outside, is provided by the project. This can be considered as a matching fund from the project.

Table 6. Distribution of costs (in $[4]) and sources of payment (in %).

Indicators		Sampled districts			Overall
		Syanja	Palpa	Surkhet	
The system cost		22.0	18.9	13.7	18.2
Cash investment		18.0	0	13.8	10.6/15.9
Average cost per household		15.5	40.5	40.8	32.3
Users' response		n=29	n=24	n=16	n=69
Source of payment	Self	58.6	58.3	56.2	57.7
	Loan	41.4	41.7	43.8	42.3

Source: Field survey 2005. $1.00=72.0 Nepalese rupees.

In an average sampled household, investment for system development (table 6) varied from $15.46 in Syangja to $40.8 in Surkhet due to the construction of individual jars for each of the households in one of the schemes. The farmers contributed $13.9 in Surkhet and $18 in Syangja to purchase drip kits. The period of life of the system is estimated to be about 20 years and therefore

[4] In this paper, $ means US$.

per year cost investment for the scheme is about $2.21 only while taking into account the investment in Syangja. In the same way, household investment for the system is $4.41 while taking into account the 5-year life span of the drip kit. It could be said that they can recover the cost in one year. This is in reference to the income of the household in Syangja which is $78 (please refer to the household income from MUS given on p. 24). Discussion with the different stakeholders and farmers indicated that they did not receive any subsidy from anywhere for the purchase of drip kits. But according to the project officials, one of the systems in Surkhet, which had a single jar for each of the households, mobilized grants from government agencies.

Participation in MUS

Sources of information and farmers' understanding

The sampled farmers received information on technology/the project in the following ways:

- In Syangja it was through the SIMI project staff's field visit program to the villages where they organized group meetings to inform the villagers about the project and MUS activities and communication from farmers in other villages.
- In Palpa it was the NGO/CBO/line agency from where they received the information.
- In Surkhet, the SIMI project staff themselves approached the farmers.

The role played by different agencies including Village Development Committees (VDCs) was important in providing information and creating awareness, besides farmers' commitment to make cash investments. The general perception is that subsidy to purchase or free distribution of drip kits to the farmers plays a major role in the introduction of the technology but that was not important in this case.

With respect to the farmers' understanding of MUS in the study sites:

- The majority of the farmers understood it as irrigation schemes combined with drinking water—Syangja and Surkhet.
- The users understood it as drinking water schemes combined with irrigation—Palpa.

The differences in farmers' understanding could be attributed to their priorities and existence of either a drinking or irrigation scheme and also the way the message was communicated to them. These analyses clearly indicate that a clear message about MUS is still lacking. In all the schemes, however, farmers indicated drinking water as their first priority. However, allocation for irrigation is gaining importance due to income from the vegetable sales. Therefore, farmers have enforced a time allocation (2-3 hours daily) for drinking water to save water for irrigation during lean seasons.

Table 7. Distribution (in %) of respondents understanding of MUS.

Understanding about MUS	Sampled districts		
	Syanja n=29	Palpa n=24	Surkhet n=16
Drinking + Irrigation	44.8	54.1	43.7
Irrigation + Drinking	55.2	55.9	46.3

Source: Field survey 2005.

The majority of farmers (50.75%) expect an increment in home consumption of vegetables as well as their market sale. Findings indicate that 31.34 percent of the respondents expected increased home consumption of vegetables after MUS. The majority of the participants did not foresee income generation as the primary objective of having MUS at the beginning of the project as their expectation was for drinking water. This shows that the MUS scheme has been able to meet its objective with respect to the users' expectation from it.

Users' participation in the MUS project cycle

The categorization of their participation level was determined through the users' criteria for various levels of participation (table 8, p.10). In this respect, the following indicators can be observed:

- Very active participation indicates users approaching the concerned agencies, their necessary contribution and participation in the discussions and decision making.
- Active participation indicates their involvement in the discussion and decision making occasionally and contributions made for the implementation.
- Inactive participation indicates involvement upon request from those who were actively involved.

The analysis of the responses indicates that the majority of the respondents participated very actively and actively during the project cycle and very few respondents were inactive. However, the women users were not actively involved in the decision-making process as they were reported to have participated in work planned by others and giving suggestions on needs and problems. All the MUS groups had males in the leadership positions except at Chhiskhola 6, Palpa, because of the absence of young male members who were away for service outside the village. The nonactive male participants indicated that their negative response was due to their past experience with other projects where they made contributions. This negative response from the households was due to the absence of male members who had gone outside the village for work. In most of the schemes, a group of people took the leadership role and were instrumental in liaising with the concerned agency and users. They negotiated modalities with the project officials and mobilized the necessary labor and assigned tasks in consultation with other users.

In terms of gender aspect, the males participated in planning and decision making while women, by and large, were involved in implementation. The division of labor among males and females showed that mostly males participated in breaking stones and constructing walls while females were involved in carrying the sand and stones. There were very few cases of disputes during or after project implementation. The process for selection and implementation of MUS is presented in the flow chart given in annex 4. In the context of organizational aspect of MUS, in all district sites users' committees were formed. These committees had formed various subcommittees for site selection, measurement of the availability of water resources and selection of the pipe route, the sites for construction of tap stands and the location of irrigation tanks. The project field staff followed the participatory approaches through consultation with different stakeholders and line agencies.

Users' evaluation of MUS with different indicators

The response of the majority of the farmers was that they had benefited from the MUS with respect to the increase in household income (67.86%), water saving (76.3%) and time saving in water collection (70.1%). The saved time was used for vegetable production (54 %); 44.5 percent reported other income-generating activities, such as weaving at home, taking place during the saved time (table 9).

Table 8. Distribution (in %) of respondents' participation in different stages of MUS development.

Activities	Participation	Sample district							
		Syanja		Palpa		Surkhet		Overall	
		Female	Male	Female	Male	Female	Male	Female	Male
During need identification, selection and design	Very active	11.1	55.0	6.3	50.0	0.0	42.9	5.8	49.3
	Active	66.7	45.0	62.5	50.0	100.0	57.1	76.4	50.7
	Inactive	22.2	0.0	31.3	0.0	0.0	0.0	17.8	0.0
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
During construction	Very active	11.1	55.0	6.3	50.0	50.0	50.0	22.5	51.7
	Active	77.8	45.0	62.5	50.0	50.0	50.0	63.4	48.3
	Inactive	11.1	0.0	31.3	0.0	0.0	0.0	14.1	0.0
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
During commissioning	Very active	11.1	55.0	6.3	50.0	0.0	42.9	5.8	49.3
	Active	77.8	45.0	62.5	50.0	100.0	57.1	80.1	50.7
	Inactive	11.1	0.0	31.3	0.0	0.0	0.0	14.1	0.0
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
During evaluation	Very active	11.1	55.0	6.3	50.0	0.0	50.0	5.8	51.7
	Active	77.8	45.0	62.5	50.0	100.0	50.0	80.1	48.3
	Inactive	11.1	0.0	31.3	0.0	0.0	0.0	14.1	0.0
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
System management	Very active	11.1	55.0	6.3	50.0	0.0	42.9	5.8	49.3
	Active	77.8	45.0	62.5	50.0	100.0	57.1	80.1	50.7
	Inactive	11.1	0.0	31.3	0.0	0.0	0.0	14.1	0.0
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Field survey 2005.

Table 9. Distribution (in %) of users' responses on MUS benefits.

Indicators	Sampled districts		
	Syanja n=2	Palpa n=24	Surkhet n=16
More land irrigated with less water	86.2	37.5	100.0
Increased income	62.0	41.6	100.0
Water saved	100.0	33.3	87.5
Time saved in water collection	100.0	41.6	68.7
Saved water used in cash crop production	62.0	37.5	62.5
Saved time used for other income-generating activities	37.9	33.3	62.5
Less weeds	62.0	37.5	50.0
Labor saved	62.0	12.5	81.3
Irrigation labor saved	62.0	33.3	81.3
Increase in employment	100.0	37.5	87.5
Loose and soft soil	62.0	41.6	87.5
Improved household hygiene	100.0	41.6	81.3

Note: For MUS benefits described by users see also annex 5
Source: Field survey 2005.

MUS and Drinking Water

Sources, access and quality of MUS water

One important component of MUS is the supply of drinking water to the households. Water sources used by sample households before the MUS were old systems (52.33 %), springs (39.2 %), the river (19.8 %) and irrigation channel (25 %). Regarding the quality of MUS-supplied water, the response of the majority (93.36 %) was that it was clean and the response of the remaining 9.7 percent was that the supplied water was of medium quality (table 10). This shows that the project has maintained a high level of technical standard in the design of the schemes and has paid adequate attention to prevent water contamination where a separate drinking water scheme is in operation. This is not the case where underground tanks are used both for irrigation and drinking water. The users also deserve credit for their effort in maintaining the water quality through regular maintenance.

Table 10. Distribution (in %) of users' responses on source and quality of MUS-supplied water.

Indicators		Sampled districts			Overall
		Syanja n=2	Palpa n=24	Surkhet n=16	
Source of water before MUS	Spring	3.4	37.5	37.5	39.2
	River		33.3	6.3	13.2
	Irrigation channel			25.0	8.3
	Old system	96.6	29.2	31.2	58.0
Quality of MUS supplied water	Clean	93.1	100.0	87.5	93.36
	Medium	6.9	0	12.5	6.4
	Dirty	0	0	0	0

Source: Field survey 2005.

Household use and time saving

A water use activity inside or outside the household is affected by the distance of the availability of water to the household. Only 13.6 percent of the sampled households were washing clothes within the household before the project, and after the project this proportion reached 82.67 percent (table 11) besides the use of water within the household for other activities (dish washing, bathing of adults and children, and vegetable cleaning)). Therefore, water use activities within the household have increased after MUS intervention.

Time-saving (table 12) is an important contribution of the availability of drinking water under MUS. Users' responses indicate that, on average, time saved is about 22 minutes for a round-trip fetching of water by households. If a household makes three trips in a day, the saving is more than one hour and it is estimated that, for a year, it is nearly 50.19 working days (a working day of 8 hours). If its weighted cost is estimated at $0.13 per day then it is around $46 per year per household.

Women in the communities were positive about MUS because they considerably reduced the time needed for fetching water thereby reducing their drudgery, as water fetching is primarily the women's responsibility. The respondents provided multiple answers to the use of time saved. The response to how the time saved was used shows that most of the respondents are using it for farming. During the field visit, it was observed that the users from older (more than 2 years) schemes were

Table 11. Distribution (in %) of users' responses on household use of water.

Activities	Location of activities	Sampled districts						Overall	
		Syanja n=29		Palpa n=24		Surkhet n=16			
		Before	After	Before	After	Before	After	Before	After
Washing clothes	Within the house	10.3	89.7	16.7	83.3	12.5	75.0	13.16	82.6
	Outside the house	89.7	10.3	83.3	16.7	87.5	25.0	86.86	17.4
Dish washing	Within the house	55.2	89.7	66.7	100.0	50.0	68.8	57.3	86.17
	Outside the house	44.8	10.3	33.3	0	50.0	31.2	42.7	13.8
Bathing: adults and children	Within the house	24.1 17.2	86.2 86.2	16.7 25.0	91.7 24	0 31.3	50.0 68.8	13.6 24.5	75.97 35.8
	Outside the house	75.9 82.8	13.8 13.8	83.3 75.0	8.3 0	100.0 68.7	50.0 31.2	86.4 75.5	24.03 15
Vegetable cleaning	Within the house	86.2	93.1	100.0	100.0	50.0	75.0	78.73	89.36
	Outside the house	13.8	6.9	0	0	50.0	25.0	21.27	10.6

Source: Field survey 2005.

Table 12. Distribution of users' responses on time saving.

Indicators		Sampled districts			Overall
		Syanja	Palpa	Surkhet	
Round-trip time to collect water (in minutes)	Before MUS	27	31	27	28.3
	After MUS	3	5	11	6.3
Per day time saved (in minutes)	After MUS	72	78	48	66
Use of time saved	Response	n=29	n=24	n=16	n=69
Extra time due to MUS (in %)	Yes	93.1	91.6	87.5	92.8
	No	6.9	8.4	12.5	9.2
If yes, how do you use the time (in %)	Weaving at home	0	0	6.2	2.06
	More time in farming	65.6	54.2	81.3	67.03
	More time for rest	41.4	33.3	31.3	35.3
	Regular household (HH) activities	34.5	75	31.3	46.9

Source: Field survey 2005.

found to be busier in farming as they had derived the benefit from intensive farming compared to the new (1-year) schemes. Also, it is interesting to note that the households were using the time for leisure also indicating the decline in the drudgery compared to the time before MUS.

Drinking water and health aspects

The availability of drinking water near the household has contributed to increased water consumption for household use and better hygiene of the household members (table 13). In the households, the major factor was that from where to bring water depends firstly on the quality of water followed

Table 13. Distribution (in %) of users' responses to waterborne diseases.

Indicators		Sampled districts			Overall
		Syanja n=29	Palpa n=24	Surkhet n=16	
Status of waterborne disease	More	3.4	16.7	37.5	19.2
	Less	96.6	83.3	62.5	80.8
Knowledge about water as source of waterborne disease	Yes	96.5	45.8	75.0	72.4
	No	3.5	54.2	25.0	27.6
Source of information		School, radio, health post	Hospital, radio, health post	School, radio, health post	

Source: Field survey 2005.

by quantity of water and distance to sources (table 14). The majority (72.4%) of MUS users were aware that water was a major source of waterborne diseases and reported (80.8%) that waterborne diseases had decreased after MUS. They have gained this knowledge from various sources like the hospital, the radio, the health post and the school. However, 19.2 percent of households have reported that waterborne diseases had increased due to wastewater-logging close to the households where the numbers of mosquitoes had increased. Users also reported that consumption of fresh vegetables had improved the health of the family members. In one community of Syangja, drinking water supplied for a school may have had a positive effect on children's health.

Table 14. Users' ranking on factors determining the water need.

Factors	Sampled districts			Overall
	Syanja	Palpa	Surkhet	
Distance to source	3	3	3	3
Quantity of water	2	2	2	2
Quality of water	1	1	1	1

Source: Field survey 2005.

One important change due to MUS was the construction of latrines by almost all the households in the Syangja district. However, in the Palpa district the users did not seem to be much concerned about it. When asked for reasons for not having latrines, one elderly women said that latrines bring flies. This suggests that hygiene and sanitation should be an integral part of the project intervention which is lacking at present.

Daily per household water consumption for different water uses and sources

Even though the major source of water is the MUS tap, still households are using the traditional sources like the river and springs (table 15). The table reveals that tap water is mostly used for cooking, drinking, utensil washing, bathing, house cleaning and livestock. This indicates the importance of the tap water where the quality of the water has to be ensured. A large quantity of water is used for livestock indicating its importance in the household economy. Still households are using water from the river and springs for washing clothes during the lean season when there is restricted water supply from the tap-stand. The reason for this is the timing and quantity of the

water availability. In almost all the schemes, users reported that tap water was supplied in the morning for 2 to 3 hours. This is the time when they have to be busy doing the household chores. Therefore, they cannot wash their clothes. Besides, during the lean season the drinking water is supplied for even a shorter time in order to balance the supply to irrigation. Therefore, the tasks requiring more water are carried out in the nearby streams.

When asked who performed most of the household activities, the groups reported that women carried out 75 percent of them and the males carried out the rest. When asked "what changes have been made in gender role so far after the intervention of MUS?" the female respondents reported that men have started cooperating with women to perform household chores, particularly in fetching water and managing livestock due to the closeness of the tap. Previously, women had to fetch water even for use by men.

Table 15. Distribution of users' responses on daily per household water consumption for different uses and source (in liters).

Activity	Source	Sampled districts			Overall
		Syanja	Palpa	Surkhet	
Cooking	Tap	48	21	38	35.7
	River	4	0	0	1.3
	Well	1	0	0	0.3
Utensil washing	Tap	41	25	33	33
	River	2	0	0	0.7
	Well	0	0	2	0.7
Cleaning house	Tap	222	20	11	84.3
	River	1	0	0	0.3
	Well	0	0	6	2
Drinking	Tap	150	19	36	68.3
	River	1	0	0	0.33
	Well	0	0	0	0.00
Livestock	Tap	385	71	134	196.67
	River	2	0	0	0.67

Source: Field survey 2005.

Changes brought about by MUS on water use activities

The changes brought about by MUS were evaluated from the water availability point of view (table 16). The major objective of MUS was to make water available for different purposes. In this regard, 85.2 percent of the sampled households have responded that water availability for kitchen use has increased whereas 14.7 percent reported there was no difference before and after the project. Availability of water for bathing (90.1%), washing (89.3 %) and for other activities has also increased. However, respondents have reported that water availability has decreased during the lean season when there is scarcity. The majority (91 %) of the users reported an increase in the availability of water for livestock. Therefore, it can be concluded that the availability of water has increased for most of the activities and that enough water is not available for household activities during the lean season (March to May).

Table 16. Distribution (in %) of users' responses on the changes brought about by MUS on water use for different activities.

Purpose of availability of water	Difference	Sampled districts			Overall n=69
		Syanja n=29	Palpa n=24	Surkhet n=16	
For kitchen use	No difference	17.2	20.8	6.3	14.7
	Increased	82.8	79.2	93.7	85.2
	Decreased	0		0	0
For bathing	No difference	17.2	12.5	0	9.9
	Increased	82.8	87.5	100.0	90.1
	Decreased	0	0	0	0
For washing	No difference	13.8	16.7	0	10.7
	Increased	86.2	83.3	100.0	89.83
	Decreased	0	0	0	0
For animals	No difference	10.3	16.7	0	9
	Increased	89.7	83.3	100.0	91
	Decreased	0	0	0	0
For other purposes	No difference	24.1	12.5	18.8	18.46
	Increased	75.9	87.5	0	54.46
	Decreased	0	0	71.2	23.73

Source: Field survey 2005.

Training and follow-up support

The analysis of skill development and follow-up evaluation indicate that skill-development training in MUS was provided only by SIMI through their staff. The trained persons were from the local community and the training period was from 2 hours to 7 days depending on the issues and curricula. The resource persons were from SIMI. Users reported that they received training on pipe fitting and maintenance, safeguarding of water tank and clean water, off-season vegetable production, nursery preparation, plastic house construction and income generation. The farmers' responses to the effectiveness of the training were affirmative. The majority of the farmers reported that they would not have been able to adopt the technology without training. In most of the schemes, the households have collected $0.14 per month from every household for maintenance of the system. However, in some of the groups, this is collected not only for a maintenance fund but for transforming it into a savings and credit scheme. This was important for the group sustainability.

AREA, CROPS AND CROPPING PATTERN

MUS Technology and Irrigation

Types of technology and area under MUS

Land under MUS is mostly rain-fed upland where maize or finger millet was cultivated before intervention. The area covered by MUS for each of the households is only 0.0125 hectare. A small area of *khet* (irrigated land) was also used under MUS in the Surkhet district. The area depended upon the type of irrigation technology used by the households (table 17). The total area irrigated under MUS is 0.67 hectare.

Table 17. Distribution of land (in ha) under MUS including type of technology used.

District	Type of MUS and area coverage					
	Drip	Sprinkler	Both	Pipe	Surface irrigation	Total
Syanja	0.16	0.01	0.01	0.04	-	0.22
Palpa	0.24	-	-	-	-	0.24
Surkhet	0.18	0.01	0.01	-	0.01	0.21
Overall	0.58	0.02	0.02	0.04	0.01	0.67

Source: Field survey 2005.

In sampled households the majority (60 %) are using drip/sprinkler, as it is one of the conditions of the project intervention. The use of drip irrigation is promoted to enable farmers to use low-cost technology for increased benefit from the available scarce water. A few households were irrigating directly through polythene pipes and buckets. Those who were not using drip or sprinkler reported their inability to purchase it for $39 or that the area under irrigation was too small. For a single season, the total cropping intensity of a MUS plot is a minimum of 200 percent compared to other plots where it is less then 100 percent depending on the monsoon. Thus, the total area served by MUS in a year is nearly 2.025 hectares.

Water availability in the source decreases during the winter and spring and, therefore, the farmers can plant in a limited area only. The problem seems to be more acute in the Palpa district than in the other two districts indicated by the decreasing land area under cultivation in winter and spring compared to that in summer (table 18). Those who have expanded the area for vegetable cultivation find it impossible to irrigate only through drip technology and are therefore irrigating through pipes too. A significant percentage (26.1%) of households is practicing it.

Table 18. Distribution of cultivated area (in ha) under MUS, by season.

Approximate area under irrigation	Sampled districts		
	Summer	Winter	Spring
Syanja	0.2	0.14	0.14
Palpa	0.18	0.01	0.01
Surkhet	0.04	0.02	0.18

Source: Field survey 2005.

Expansion of irrigation area and constraining factors

Some of the households (41%) are interested in expanding the area for vegetable cultivation (table 19) but water availability is the constraining factor as the collection tanks are designed to serve only the designated area.

Besides, drip technology has a capacity to serve only a fixed area. However, a few of the households have slightly expanded the area when their neighbors were not using the water. Expansion of area by those who are not interested may be due to the unavailability of land in the MUS plot, the market problem for their product or the lack of family labor. The previous analysis has indicated that mostly women were involved in farming.

Table 19. Distribution of users (%) interested in expanding the area.

Response to extend the area	Yes	No
Syanja N=29	0.45	0.55
Palpa N = 24	0.29	71
Surkhet N=16	0.5	0.5
Overall	0.41	0.59

Source: Field survey 2005.

Production, Consumption and Change Pattern in the MUS Plot

Cereals

The major crops grown in the plot before MUS were maize, millet, wheat and paddy.

Millet and maize were totally replaced by vegetables after MUS. The farmers from Surkhet who are engaged in vegetable seed production are deriving maximum benefit from it; therefore, they have replaced cereal farming with vegetable farming. Almost all produced cereals were consumed in the households (table 20).

Table 20. Production, consumption and sales (kg) trend of, and income ($) from, cereals from the MUS plot per HH.

Crop	Sampled districts						Overall	
	Syangja		Palpa		Surkhet			
Cereals	Before	After	Before	After	Before	After	Before	After
Maize - Production	23.9	13.0	26.8	5.8	153.8	6.3	68.17	8.37
- Consumption	16.9	12.6	25.5	5.8	153.8	6.3	65.4	8.2
- Sale	0	0	0	0	0	0	0	0
- Total income	0	0	0	0	0	0	0	0
Wheat - Production	2.2	0	6.8	3.6	185.4	10.9	64.8	4.8
- Consumption	2.2	0	6.8	3.6	185.4	0.6	64.8	1.4
- Sale	0	0	0.	0	0	4.4	0	1.47
- Total income	0	0	0	0	0	1.21	0	0.40
Paddy - Production	9.6	6.4	0	0	204.6	128	71.4	44.8
- Consumption	9.6	6.4	0.0	0	188	111.4	65.86	39.27
- Sale	0	0	0	0	16.6	16.6	5.5	5.5
- Total income	0	0	0	0	3.47	3.47	1.16	1.16
Millet – Production	19.7	0	2.1	0	0	0	7.2	0
- Consumption	19.7	0	2.1	0	0	0	7.2	0
- Sale	0	0	0	0	0	0	0	0
- Total income	0	0	0	0	0	0	0	0
Grand total	0	0	0	0	3.47	4.69	1.16	1.56

Source: Field survey 2005.

Vegetables

Vegetables were the main crops in the MUS plot after the intervention. Tomato, cucumber, cabbage and cauliflower are the newly introduced crops in the MUS plot. More than 90 percent of vegetables produced is sold and the remaining 10 percent is used as home consumption (table 21). The table also shows that households are earning income from the sale of vegetables. The farmers from Syangja

Table 21. Production, consumption and sales (in kg) trend of, and income ($) from, vegetables from the MUS plot per HH.

Crop	Sampled districts						Overall	
	Syangja		Palpa		Surkhet			
Vegetables	Before	After	Before	After	Before	After	Before	After
Tomato - Production	2.1	90.1	0	13.2	0	114.1	0.7	72.5
- Consumption	0.2	5.4	0	7.1	0	7.8	0.06	6.6
- Sale	1.9	84.7	0	6.1	0	106.3	0.6	65.7
- Income	0.33	13.65	0	1.14	0	12.96	0.11	9.3
Cabbage - Production	0	8.6	0	5.8	0	68.6	0	27.7
- Consumption	0	2.8	0	1.1	0	2.4	0	2.1
- Sale	0	5.8	0	4.8	0	66.1	0	19.4
- Income	0	0.71	0	1.21	0	8.37	0	26.9
Cauliflower - Production	0	25.5	0	15.2	0	145.3	0	62
- Consumption	0	5.5	0	5.8	0	5.6	0	5.6
- Sale	0	13.4	0	9.5	0	117.2	0	46.7
- Income	0	2.39	0	1.76	0	22.78	0	8.97
Cucumber - Production	0	32.9	0	0	0	34.4	0	22.4
- Consumption	0	7.8	0	0	0	5	0	4.3
- Sale	0	20.1	0	0	0	29.4	0	16.5
- Income	0	5.34	0	0	0	8.16	0	4.5
Brinjal - Production	0	0	0	4	0	17.5	0	7.17
- Consumption	0	0	0	2.4	0	5.3	0	2.57
- Sale	0	0	0	1.6	0	12.2	0	4.6
- Income	0	0	0	0.32	0	2.40	0	0.90
Bittergourd - Production	1.7	4.9	0	3.8	0	40.6	0.56	16.4
- Consumption	1.7	1.4	0	1.5	0	3.1	0.56	2.0
- Sale	0	3.5	0	1.9	0	37.5	0	14.3
- Income	0	1.77	0	0.64	0	10.24	0	4.22
Bodi - Production	1.7	0	0	5.6	0	25	0.56	10.2
- Consumption	0.3	0	0	2.9	0	1.9	0.1	1.6
- Sale	1.4	0	0	2.7	0	23.1	0.46	8.6
- Income	0.48	0	0	0.65	0	4.02	0.16	1.56
Chili - Production	0	1.7	0	2.5	2.5	15.6	0.83	6.6
- Consumption	0	0.6	0	1.0	2.5	1.9	0.83	1.17
- Sale	0	1.1	0	1.6	0	13.3	0	5.33
- Income	0	0.81	0	0.55	0	7.30	0	2.89
Total income in $	0.81	24.69	0	9.11	0	77.06	0.27	36.95

Source: Field survey 2005.

have been able to earn 30 times more cash income after MUS intervention. The farmers from Surkhet have been able to earn the highest income after MUS intervention. This was largely due to their involvement in vegetable seed production for the last 3-4 years for which they received support from one of the NGOs. This also indicates that, given the availability of water and proper extension services, the farmers can derive maximum benefit from MUS. Thus vegetables became a major source of cash income for the MUS households. The farmers from Surkhet are earning more in a year followed by farmers of Syangja compared to farmers from Palpa. The differences could be attributed to the year of scheme operation, market access and demand for the vegetables. The market in Syangja is supplier-dominated (table 2) whereas the market in Palpa is buyer-dominated indicating no bargaining power for the seller resulting in less value for their products. For example, farmers in the Chhiskhola of Palpa have to depend on the middlemen or the buyer at the local market because the market is at a distance from their fields. The access of women to marketing is slowly increasing than in the past because of their increased involvement in agricultural activities. Since the data presented are on a district basis, the low earning in one of the schemes has affected the district average.

Each household now consumes varieties of fresh vegetable, which were not available before the MUS intervention. Vegetables produced in MUS have promoted rural-urban linkages and villagers are exposed to the goods available in the urban area affecting their consumption pattern.

Crops and cropping pattern in the MUS Plot

Farmers have changed their cropping pattern within the command area of MUS after intervention, and crops grown in the MUS plot are tomato, cauliflower, cabbage and cucumber (table 22). In some plots, paddy, wheat and mustard seed are also grown in the MUS plot but in small patches. Cauliflower is found to be intercropped with maize in Pelakot of Syangja. Therefore, the cropping intensity of MUS plots is more then 300 percent.

Table 22. Cropping pattern of the MUS plot.

Crop	Status	Month											
		Apr.	Mar.	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Maize	Before												
Millet	Before												
Tomato	After												
	After												
Cauliflower	After												
	After												
	After												
Cabbage	After												
	After												
Cucumber	After												
	After												
	After												

Source: Field survey 2005.

The crop seeds used by farmers have changed from a local to an improved variety and they are using multiple seeds. The project has created awareness and its effect is observed in the adoption of the seed varieties. Farmers are inclined towards group approaches rather than planning the crop

individually (table 23). Likewise, farmers have started to use different approaches in crop planning like contracting out the expected product, observation of market trends and use of market information from the radio. There has been increased consultation between men and women in carrying out farm activities in recent years as compared to past years.

Table 23. Distribution (in %) of users' rsponses on crop planning.

Approaches	Sampled districts						Overall	
	Syanja n=29		Palpa		Surkhet			
	Before	After	Before	After	Before	After	Before	After
In groups	13.8	86.2	0	18	1	12	4.9	38.73
Individually	25	14	17	6	15	6	19	8.67
Vegetable sales	n=29		n=24		n=16		n=69	
On contract	0	3	0	1	2	4	0.66	2.67
On their own	0	26	0	23	14	12	4.67	20.33

Source: Field survey 2005.

Crop budgets

Net return for cereals seems negative due to the low yield rate and traditional farming in Surkhet (table 24). As shown in tables 25 and 26 vegetable seeds and vegetables are providing higher family incomes in the sample sites. The farmers from Surkhet opined that after the availability of water from the MUS intervention they have been able to expand the area for vegetable seed production. Therefore, their income from vegetable seeds is higher than that from the other two sites (figure 2). In the case of vegetables, a negative net return is found in Kumal Gaun of Syangja where not even a single crop is properly harvested, the crop being damaged by the heavy hailstones in March 2005; in Palpa too, the produce of a year is not harvested and therefore the calculation is only for one crop (table 26). For the farmers of Kumal Gaun in Syangja vegetable farming is risky because that area is prone to hailstones.

Figure 2. Gross income from MUS in one season.

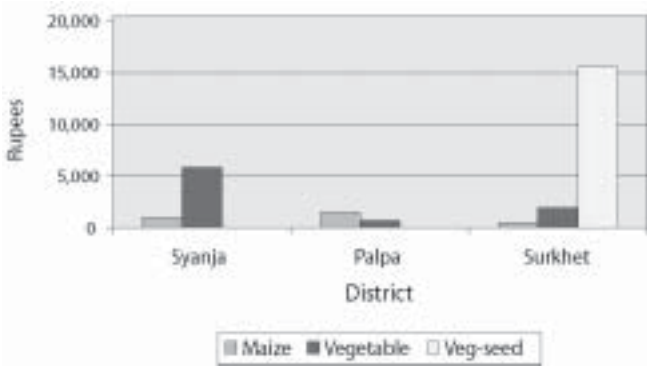


Table 24. Cost and benefit estimation by districts for cereal crops.

Serial		Cereal crops			
no.	Items	Syangja	Palpa	Surkhet	Overall
1	Labor (total) values ($)	9.67	8.36	6.67	8.23
	Male (days)	3.24	3.02	4.64	3.63
	Female (days)	2.59	4.15	3.90	3.55
	Total (days)	5.83	7.17	8.54	7.18
2	Material cost (total)	4.18	11.99	2.65	6.27
	Cash investment				
	Farmyard manure				
	Other investments				
3	Total investment (1+2)	13.85	20.35	9.31	14.50
4	Products (productivity)-yield per 0.05 ha (kg)	77.60	115.91	58.47	83.99
5	Value of product ($)	14.31	20.93	7.54	14.26
6	Net return=value of the product-total investment	0.46	0.58	-1.77	-0.24
7	Net return=value of the product-cash investment	10.13	8.94	1.22	7.98
8	Net return ($)				
	Per unit of land	0.46	0.58	-0.11	0.31
	Per unit of labor	-0.27	-0.07	-0.01	-0.03
	Per unit of produce	-0.01	0.01	0.00	0.00
	Per unit of cash investment	0.01	0.01	-0.02	0.00

Source: Field survey 2005.

Table 25. Cost and benefit estimation by districts for vegetable seeds.

Serial		Vegetable seeds			
no.	Items	Syangja	Palpa	Surkhet	Overall
1	Labor (total) values ($)			4.89	4.89
	Male (days)			3.74	3.74
	Female (days)			2.56	2.56
	Total (days)			6.30	6.30
2	Material cost (total)			11.02	11.02
	Cash investment				
	Farmyard manure				
	Other investments				
3	Total investment (1+2)			15.92	15.92
4	Seed productivity-yield per 0.05 ha (kg)			48.16	48.16
5	Value of product ($)			215.86	218.86
6	Net return=value of the product-total investment			99.97	99.97
7	Net return=value of the product-cash investment			49.65	79.65
8	Net return ($)				
	Per unit of land			49.98	49.98
	Per unit of labor			7.94	7.94
	Per unit of products			1.04	1.04
	Per unit of cash investment			0.06	0.06

Source: Field survey 2005.

Table 26. Cost and benefit estimation by districts for vegetables.

Serial no.	Items	Vegetables			Overall
		Syangja	Palpa	Surkhet	
1	Labor (total) ($)	60.42	6.37	10.61	25.80
	Male (days)	21.76	1.97	5.80	9.84
	Female (days)	9.86	4.91	8.31	7.70
	Total (days)	31.62	6.88	14.11	17.54
2	Material cost (total)	35.54	4.65	14.34	18.17
	Cash investment				
	Farmyard manure				
	Other investments				
3	Total investment (1+2)	95.96	11.02	24.95	43.97
4	Products (productivity)-yield per 0.05 ha (kg)	163.7	50.1	461.1	207.2
5	Value of product ($)	81.10	9.73	27.43	39.42
6	Net return=value of the product-total investment	-14.85	-1.29	2.48	-4.55
7	Net return=value of the product-cash investment	45.57	5.08	13.09	21.25
8	Net return ($)				
	Per unit of land	-14.85	-1.29	2.48	-4.55
	Per unit of labor	-0.47	-0.19	0.18	-0.16
	Per unit of products	-0.05	-0.03	0.02	-0.02
	Per unit of cash investment	-0.01	0.00	0.00	0.00

Source: Field survey 2005.

Agricultural services and technologies

Farmers' rating indicates that nongovernment agencies, which also include the SIMI project, are better service providers than government agencies (table 27). Therefore, the services of these agencies need to be strengthened in order to provide better services to the farmers.

Table 27. Distribution (in %) of farmers' responses on sources of agricultural services.

Sources	Sampled districts			Overall
	Syanja	Palpa	Surkhet	
District Agriculture Development Office (DADO)	18.0	12.0	0	10.0
District Livestock Services Office (DLSO)	6.0	9.0	0	5.0
Agriculture Service Center (ASC)/Livestock Service Center (LSC)	33.0	12.0	0	15.0
Others-SIMI, Agrovet, Community-Based Organization (CBO)	43.0	67.0	100.0	70.0
Total	100	100	100	100

Source: Field survey 2005.

Credit

The respondents are obtaining credit from multiple sources (table 28). Of course, the sources of credit before and after the project are the same like the Agricultural Development Bank/Nepal (ADB/N), Commercial Bank, group-saving scheme, local money lenders and others like local cooperatives

known as *Dhukuti*.[5] But after the project, there has been a substantial increase (55.55%) in the number of farmers obtaining credit from the group-saving scheme in Syangja and Surkhet. This has been made possible after the farmers had deposited money in the group-saving scheme with the income from the sale of vegetables. This has enabled other farmers to obtain loans from the group, which is considered to be cheap and easily accessible.

Since the respondents provided multiple answers, the total is more than the surveyed number of households given in table 28.

Table 28. Distribution (in %) of responses on sources of credit/loan.

Sources	Sampled districts						Overall	
	Syanja		Palpa		Surkhet			
	Before n=19	After n=17	Before n=11	After n=9	Before n=22	After n=23	Before n=52	After n=49
ADB/N	32.0	17.7	0	0	13.6	13.0	15.2	10.23
Cooperative	0	0	0	0	0	0	0	0
Commercial Bank	5.0	11.8	0	0	0	0	1.7	3.93
Group saving	11.0	23.5	0	0	31.8	43.5	14.3	22.33
Money lender	26.0	23.5	18.0	22.2	54.612	39.2	32.9	28.4
Other - Dhukiti/SIMI group fund	26.0	23.5	82.0	77.8	0	4.3	36.0	35.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Field survey 2005.

Production and marketing constraints

Regarding production issues, Syangja and Palpa have reported hailstones as a problem whereas in Surkhet the problem of disease and insects is reported (table 29) besides the problem of distance in marketing from Sorek and Pelakot in Syangja, and Chhiskhola in Palpa and from Surkhet. Besides, the dependence on the local markets has not enabled farmers to fetch good prices for their produce. In the existing MUS programs, it takes a minimum of one hour to walk the distance to the market facility, like the collection center near the highway except for the Chhiskhola in the Palpa district. The habit of group marketing is lacking at present. However, the group marketing approach is promoted and dissemination of this could help overcome the labor problem.

Table 29. Distribution (in %) of responses on production and marketing issues.

Issues	Sampled districts			Overall n=33
	Syanja n=16	Palpa n=1	Surkhet n=16	
Marketing issue				
a- No market for surplus	18.75	0	0	6.25
b- Market far away	31.25	100.0	93.75	75
c- Labor problem for transportation	18.75	0	0	6.25
d - Other	31.25	0	6.25	12.5
Production issue	Hailstone	Hailstone(1)	Disease, insects	

Source. Field survey 2005.

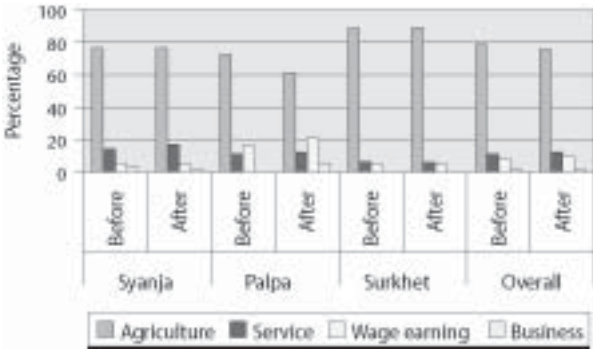
[5] *Dhukuti* is a common fund established through regular savings from its members and loaned out to members only when necessary.

Occupation, Household Income and Expenditure

Occupation

There has been a slight change in the household occupation before and after the project, although agriculture remains the main occupation. The majority of the respondents' occupation of economically active population was agriculture (79%) before the project whereas after the project it is 76 percent, followed by services which have increased by 1 percent after the project (figure 3). This slight change could be due to the migration of male members for services outside the village. There has been a slight increase in wage earning labor and the number of those involved in trade after the project. This could be the effect of the project but it is hard to establish.

Figure 3. Ocupational status of sampled site.



Household income from MUS

The distribution of income increment varies across the MUS schemes and among the households due to the effect of the project completion period, availability of agricultural services and access to the market. Thus, here the effect of MUS, especially in income, is analyzed in each of the schemes.

Syangja: There has been an increase in farmers' income after the MUS intervention. The older the scheme and nearer to the market, the higher the benefit due to better prices for the produce. The MUS intervention has mainly helped in vegetable farming like tomato, cucumber, cauliflower, cabbage and others (table 30). The MUS has encouraged self-employment (box 1) and has increased women's access to cash (box 2).

Table 30. Average income (in $) from the MUS plot in one season per HH, Syangja.

Vegetables	Sampled site					
	Pelakot		Sworek		Kumal Gaun	
	Before	After	Before	After	Before	After
Tomato	0.1	34.5		118.1		0.8
Cabbage		0.7		2.0		
Cauliflower		29.7		6.0		
Cucumber		20.2		3.2		8.4
Bittergourd			0.1	6.0		0.5
Chili		2.4		1.8		0.8
Bodi				118.1		
Total	0.1	87.5	0.1	136.9		9.6

Source: Field survey 2005.

In one season, farmers are earning $87.47 in Pelakot, $136.9 in Sworek and $9.64 in Kumal Gaun. In Kumal Gaun the scheme was completed only in March 2005.

Box 1. Bhoj Bahadur Kumal Gaun/Syangja

I am 23 years old. I have one wife and one son. I own 0.0201 ha khet, i.e., irrigated lowland and nearly 0.402 ha hal bari, i.e., unirrigated upland. Annually I harvest from this land 1,047 kg of maize, 109 kg of finger millet, and nearly 200 kg of potato and vegetable for home consumption. I also have a chicken shop for cash income. I always had cash shortages and so I decided to join the Indian army and, later on, decided to join the Nepalese police force where I served for 24 months. When I came on leave, I saw people cultivating vegetables and earning cash. Then I decided to cultivate vegetables and did not return to duty. Initially, I planted cucumber by irrigating through bucket. I came to know about drip irrigation from a neighbor and purchased one with a capacity to irrigate 80 plants and participated actively in MUS development. With 80 plants I sold 195 kg of cucumber at $0.21-0.28/kg and earned $48.61, and from the other 400 vegetable plants $76.39 thus earning a total of $125 within 3 months (January-March 2) and my initial investment was $20.8 only. In service, I have to work under the supervision of others. I'm the owner of my farm and I can earn more if I can work. Drip has changed my idea of going to Arabia for employment in the coming season. I will plant tomato and cauliflower and will earn more than in Arabia. Also, known as *Kukhure Kancha***,** the people in the community admire his progress**.**

Box 2. The Case of Chuya Aryal

Chuya Aryal lives in Senapuk Pelakot VDC 9, Syangja district. She is a mother of two daughters and two sons. She lives in an extended family with 12 members. Her husband has a small shop in the Galyang market. She had been educated only up to Grade V. She was happy to have drinking water and an irrigation facility supported by SIMI. Previously, she had to spend 2 to 3 hours just to fetch water in a day for household use and livestock. Now the saved time is utilized in the productive sector. As a member of the MUS group, she received four series of training on vegetable farming and started to grow them. Previously she used to buy vegetables for consumption, now she does not have to do so, as fresh vegetables are always available. She herself goes to the market to sell vegetables. She earned Rs5,000 by selling cucumber in one season and Rs8,000 in another season. The income helps purchase stationery and tiffin for her two daughters and sons. When asked who had access to the cash and who controlled the income, she says, "I have to give the cash earning from vegetables either to my husband or to my father-in-law. Sometimes, my family will consult me before spending the money but I have less control over income."

Palpa: The MUS intervention has mainly helped in vegetable farming like tomato, cauliflower, brinjal, cabbage, chili and others. In one season, MUS-plot farmers are earning $21.20, $4.70 and $48.40 in Chappani, Tahun and Bhalebas, respectively (table 31).

Table 31. Average income (in $) per HH in Palpa from a MUS plot in one season, Palpa.

Palpa	Chappani		Tahun		Bhalebas	
	Before	After	Before	After	Before	After
Brinjal		3.9				0.8
Chili		0.2		0.7		6.5
Potato						0.7
Tomato		8.0				15.4
Cauliflower		3.1		3.5		24.3
Cabbage						0.7
Bodi		5.9		0.5		
Total		21.2		4.7		48.4

Source: Field survey 2005.

Surkhet: The MUS intervention has mainly helped in vegetable farming like cucumber, tomato, cauliflower, brinjal, bodi, chili and others. In one season, farmers from a MUS plot are earning $21.8 in Dahachaur, $250 in Jarbuta and $18.8 in Kereni. Farmers from Jarbuta were able to earn a higher income due to better prices for their cucumber which had gone up to $0.56 per kilo and chili up to $0.62 per kilo (table 32). They could fetch better prices because they had market access to Surkhet, the district headquarters, in one hour (box 3). The other two sites (Dahachaur and Kareni) will have to depend on the local market. In Kareni, the major produce is seed from which farmers are earning a higher income per hectare. They were producing vegetable seeds before the MUS intervention.

Box 3. Case of Bam Bahadur Thapa, Surkhet, Jarbuta

This farmer had started cultivating vegetables, carrying water in a bucket for one hour's distance before MUS. Because of this carrying problem they stopped cultivating vegetables. After the MUS he has restarted vegetable farming and is happy with his income although it is less due to the 2-hour distance to the market.

Even though MUS is for vegetable farming it has helped in the dissemination of agricultural technology, and farmers are using new information to grow their traditional crops like paddy, maize and millet so that their annual income from agriculture has increased.

After MUS the share and the structure of gross annual cash income have changed due to the vegetables production. During the focus group discussion, the women reported that the income level had increased but they had less access to cash and had less control over their own earnings.

Table 32. Average income (in $) per HH in Surkhet from a MUS plot in one season, Surkhet.

Surkhet	Dahachaur		Jarbuta		Kereni	
	Before	After	Before	After	Before	After
Pumpkin				10.4		
Cucumber				101.8		
Chili				52.1		2.5
Onion						1.5
Radish seed					0.6	0.9
Tomato				13.9		11.5
Cauliflower		15.1		48.6		
Brinjal		6.7				2.5
Bodi				23.2		
Total		21.8		250.0	0.6	18.8

Source: Field survey 2005.

ANALYSIS AND FINDINGS

Numerous rivulets and springs in Nepal provide promising opportunities for the development of smaller irrigation and water supply schemes in the water-scarce rural areas. Many such schemes were built under users' initiatives and the users are benefiting from them for multiple purposes. Moreover, these smaller schemes are easily accessible to the poor and marginal households through indigenous and modern low-cost technology. Considering this fact the SIMI project has introduced the multiple use schemes (MUS) to provide the benefits in a short time and at affordable cost to the marginal farmers.

This study has tried to look into the various aspects of introduction and use of MUS and its effect on the household and the community to identify factors for up-scaling. Due to the unavailability of benchmark data, the assessment of the schemes is based on the information obtained from the respondents for the before and after situations.

An analysis of the nine schemes that supply water for household use and irrigation indicated that MUS covers households from all the social strata in the sites. Nevertheless, more of the upper-caste groups benefited due to ownership of land which is mostly concentrated among them. Also, upper-caste groups were found to be more literate than respondents from other caste groups indicating their level of awareness about the scheme.

The interventions by the project in different locations have followed basically four strategies. Existing or abandoned drinking water and irrigation schemes have been rehabilitated or combined with the MUS project activities. The project has maintained a high level of technical standard in the design of the schemes and has paid adequate attention to prevent water contamination where a separate drinking water scheme is in operation. One underground collection tank is used both for irrigation and drinking water. Out of nine schemes, two have one tank for both irrigation and drinking water. But other schemes have separate jars and tanks for drinking water and irrigation, respectively. This shows lack of uniformity in the design criteria of the project. Also this shows lack of sensitivity towards the improved hygiene of the users, which is one of the primary objectives of the project. The users also need to be commended for their effort in maintaining the water quality through regular maintenance. The farmers' direct cash investment in the drip kit purchase is in addition to their labor contribution for MUS installation. Discussions with the different stakeholders and farmers

indicate that they have not received any subsidy from anywhere thus invalidating the general perception that subsidy plays a major role in the introduction of the technology. But, according to the project officials, a few of the systems have mobilized grants from government agencies.

The processes followed in the implementation of the MUS activities usually started through information-sharing, awareness-creation and motivating the concerned stakeholders not only by the project staff but also by NGOs, CBOs and farmer groups. In all the schemes, a group of people took the leadership and negotiated modalities with the project officials. The project was successful in eliciting necessary participation from the users. The majority of the farmers participated very actively and actively during the project cycle. The participation of females however, revealed that they were not actively involved in decision-making processes and participated in work planned by others. Division of labor between males and females showed that mostly males participated in work requiring physical strength and skills while females were involved in carrying materials at the construction site. However, the project field staff paid attention to ensure women's participation in all project activities. Males occupied all the key positions in the users' committee except in one of the schemes, Palpa, because of the absence of young male members in the households. In some cases, women were not aware of their position in the users' committee. Very few respondents were inactive and that was due to their negative experience in similar types of projects in which they had made contributions.

There were differences in farmers' understanding of MUS that could be attributed to their priority, the existence of either a drinking or an irrigation scheme and also the way the message was communicated to them. But their priority was for drinking water and they had the expectation of increments in home consumption of vegetables. Users, however, had not expected income generation at the beginning of the project. This shows that the MUS scheme has been able to meet its objective with respect to the users' expectation from it. The fixed time allocation for drinking water during lean seasons to save water for irrigation reveals the importance of income from vegetable sales to the households.

There were very few cases of disputes during project implementation and afterwards. This was largely due to the personal ego of some of the users and bad relationships with the neighbors. The fewer disputes were due both to the working rules in practice although they were not in written form and to the homogeneity of the community and effective leadership by some of the group members including the women.

The collection tanks were designed to serve a fixed number of households and area. The area under cultivation in MUS varied according to the availability of water across the seasons. MUS was rated good and excellent by both men and women due to the availability of a clean and adequate water supply and the opportunity for productive use. Farmers opined that this scheme was easy to handle. Farmers' experience regarding the regularity of water supply for drinking water was good but the users' investment was very low.

Women carry out 75 percent of the household activities. Therefore, time-saving for women is one of the important contributions of the drinking water scheme under MUS. Users' responses indicate that, on average, time saved in a day is more than an hour. This has helped considerably in reducing the drudgery of women. They use the extra time in farming and weaving at home; they also take some time for resting and for regular household activities. In older schemes they are so busy in the farm activities, apart from household activities, that they have no free time as they had earlier. Users from older (more than 2-year) schemes were found to be busier in farming as they have derived the benefit from intensive farming compared to the new (1-year) schemes. Men have also started helping women in fetching water and managing livestock due to the closeness of the tap.

Water use activity within the household has increased after the MUS. Availability of the drinking water near the household has contributed to increased water consumption for household use thereby contributing to improved hygiene of the household members. The responses from the users indicated that increased water availability has contributed to a decrease in water-related and waterborne diseases. However, a few households have reported that waterborne diseases had increased due to wastewater-logging and that the number of mosquitoes has increased. One important change due to the MUS was the construction of latrines by almost all the households in the Syangja district. But this was not the case in other districts.

Skill development was emphasized by the project through training programs, and follow-up programs have strengthened farmers' capability. The training of the local farmers on operation and maintenance of the scheme was an important component of the project intervention. However, females were not trained for maintenance, creating problems when skilled men were absent. The systems are well-operated and maintained. The farmers responded to the effectiveness of the training positively.

In the households, the major factor from where to bring water depends firstly on the quality of water followed by the quantity and distance to sources. Tap water is mostly used for drinking, bathing and for livestock because of its quality. A large quantity of water is used for livestock indicating its importance in the household economy. However, washing clothes which requires more water and which is also carried out in the daytime is done at the river. This is because the MUS scheme water is available only in the morning and is enough only for household use. Besides, women enjoy socializing at the river with their friends after the household chores. During the lean season (March-May) drinking water is supplied for even a lesser time in order to balance the supply to irrigation. Therefore, the tasks requiring more water are carried out in the nearby river/streams. Water scarcity is observed for vegetable cultivation in winter and spring. Most of the households use either drip or sprinkler technology and others irrigate directly through polythene pipes and buckets.

The dominance of *bari* (unirrigated upland) land exemplifies the importance of micro irrigation as canal irrigation cannot be extended to these lands. However, MUS covers, in average, only 0.0125 ha per household. Millet and maize which were the major crops in the upland have been totally replaced by vegetables after the MUS. The cropping intensity of MUS plots is more than 300 percent and the farmers are using both local and improved seeds after MUS intervention. The adoption of seed varieties is the result of the awareness created by the project. Now farmers are inclined towards group approaches in planning the crop, rather than individual approaches, which was lacking earlier in the study sites.

Labor availability for agricultural activities in the studied area was not a problem due to the larger population in the economically active age group. The dominance of female members shows the important role they were playing in the MUS activities. But there could be underemployment for the available active labor force due to the small size of land resulting in less agricultural activities. Women were also involved in decisions relating to agricultural activities as revealed by increased consultation between men and women. This was due to the vegetable cultivation which is a new crop and is important for cash income to the households. Respondents reported that 90 percent of the vegetable produced is sold and the rest consumed in the households. Farmers have started contracting out the expected output in Syangja and Surkhet.

Farmers have started observing market trends for selling their produce and use this knowledge as well as market information from the radio. Therefore, vegetables have become a major source of cash income for the MUS households. There was variation in income earned among the households due to the differences in the year of scheme operation, market access and demand for the vegetables. Hailstone, disease and insects are the major problems faced by the farmers. Besides labor shortage

for transportation of produce, dependence on the local market resulting in lower prices for their product was reported by some of the household members. The habit of group marketing is lacking at present. Vegetables produced in MUS have promoted rural-urban/rural-rural interaction because of buying and selling transactions. The involvement of women in marketing is slowly increasing unlike in the past.

The analysis shows that vegetables and vegetable seeds are providing higher family incomes in the sample sites. However, profits vary across the sites due to market accessibility. It also indicates that vegetable seed production fetches more return than fresh vegetable production. However, there is variation due to various factors. The older the scheme and closer to the market the higher the benefits derived due to better prices for the products. But women reported that they had less access to cash and had less control over their own earnings.

Employment opportunities for farm households through vegetable farming have increased more than for cereal crops due to the intensity of the farming. The NGOs are providing efficient agricultural services compared to the government agencies.

Respondents are obtaining credit from multiple sources. After the project intervention, there has been a substantial increase in the numbers of farmers obtaining credit from group savings in Syangja and Surkhet. This implies that the formation of the saving and credit group encouraged by the project is instrumental in serving credit needs of the farmers.

There has been a slight change in the household occupation before and after the project, although agriculture remains the main occupation. There has been a slight increase in wage earning laborers and in those involved in trade after the project. This could be the effect of the project, as households are engaged in vegetable and vegetable seed sales. There has been an increase in the structure of gross annual cash income. This increase could be attributed to the increase in agricultural income from vegetable production as there has been an increase in households by 11 percent that is reported to have been earned from business (trade).

Finally, the outcomes of the MUS are influenced by various factors and some of the attributes and their indicators are presented in table 33.

Table 33. Attributes and indicators affecting outcome of MUS.

Attributes	Indicators
Physical	Water availability and access to it; distance to the market; availability of water for drinking and irrigation as per the design criteria; availability of agricultural services.
Socioeconomic	Ethnicity, family size, access to, and size of, holding; income from other sources; presence of male members in the household; willingness and ability of the household to pay for the water scheme.
Environmental	Distance to the water source; cleanliness of the water sources; users' willingness and capability to invest for the health and sanitation facilities.
Policy and organizational	Opportunities available for participation in the group and in decision making; possibility of decision making at group level; backstopping support from the implementing and other partner agencies.

Source: Field survey 2005.

CONCLUSIONS AND RECOMMENDATIONS

The introduction of MUS in the rural areas has been beneficial to the users, especially to smallholders. The expansion of this activity specifically targeting the occupational caste groups would help them uplift their economic conditions. For this, it is necessary to have a targeted campaign in the areas where they are concentrated. As farmers have been able to earn increased incomes from vegetable farming on small plots of land compared to growing cereal crops, their food security has improved. Therefore, this activity needs to be expanded to other areas where there is food deficit and access to markets exists. This would enable households to increase their incomes. The project needs to emphasize more on the vegetable seed production where there are market constraints for fresh vegetables. Encouraging farmers to group market could also help solve this problem.

The project is following various intervention strategies. The standardization of the MUS design of having two separate tanks for drinking water and irrigation would be highly beneficial. The constraining factors for the expansion of the irrigated area were found to be the availability of water, and MUS technology, which need to be addressed in future interventions. Up-scaling of the technology to expand the cultivated area would be more beneficial for the farmers. The users are benefiting from the increased availability of water, but they need to be provided with more knowledge on proper hygiene and sanitation in order to maximize health benefits to the household. Combining the supply of drinking water with latrine construction as part of the intervention strategy would be beneficial to the community. This is more necessary in the communities where there is less knowledge on the sanitation aspects.

Various saving and credit groups are becoming successful in expanding income-generating activities in other parts of the country. Thought needs to be given to encouraging MUS groups to expand their activities to provide agricultural services to the group members and developing into a viable saving and credit group through training on organizational systems like management and keeping accounts. This would enable these groups to become strong institutions at the local level. There needs to be gender balance particularly in decision-making positions; this needs to be emphasized for institutional strengthening. Micro-enterprise development training to both men and women in order to build entrepreneurship capacity would be beneficial to identify comparative advantages on vegetable production, overcoming marketing constraints, cost benefit analysis, etc. This is needed more by women as they are mostly involved in farming and marketing.

As MUS technology was introduced only 2 years ago, it is too early to make an impact evaluation at the household level. Therefore, there is a need to initiate ongoing monitoring of the newly introduced MUS besides doing an impact evaluation in 4 to 5 years of implementing MUS projects.

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ANNEX 1

Picture of MUS

Photo: Deepak Lochan Adhikary, IDE/Nepal

ANNEX 2

Detailed Database of MUS

Sample district and site	Scheme completion period	Total no. of HH	Type of scheme	Number of offtakes	Number of taps	Major SIMI program	Program in field	Accessibility from the top of the road	Accessibility to road/market center	Nature of market for fresh vegetables	Total sample
I Syangja											
Kumalgaun	15 Baisakh 2062	51	Drinking with irrigation	13	-	Off-season cucumber	Off-season cucumber	5 minutes from the Siddharth highway to Syangja district HQ	District HQ of Syangja district which is 45 minutes' walk.	Supplier-dominated	15
Pelakot	30 Chaitra 2060	23	Drinking with irrigation	-	6	Off-season vegetables	Off-season vegetables	30 minutes' walk from the roadhead	30 minutes'walk to the top of the road (Bhakunde) and 20 minutes' bus ride to Waling	Supplier-dominated	8
Swarek	20 Falgun 2060	21		6	7	Off-season vegetables	Off-season vegetable	One hour walk from the top of the road to Galyang	45 minutes' walk to the Galyang market	Supplier-dominated	6
Total		95		19	13						29
II Palpa											
Chiskhola	15 Magh 2060	14		4	-	Off-season vegetables	Off-season vegetable	One hour walk from Arebhanjyang in Siddhartha highway and 10 minutes' walk from the top of the road	10 minutes' walk to the village market (Tahun and Deurali)	Buyer-dominated	4
Dibindanda	13 Chaitr 2060	37		6	-	Off-season vegetables	Off-season vegetable	50 minutes' walk form the top of the road	50 minutes' walk to the market	Buyer-dominated	11
Bhalebans	20 Asar 2061	30		3	5	Off-season vegetables	Off-season vegetable	One hour walk from Ramdi bridge on the Siddhartha highway	45 minutes' walk from the village to the collection center in Ramdi bridge.	Buyer-dominated	9
Total		81		13	5						24

Continued

Detailed Database of MUS—*Continued*

Sample district and site	Scheme completion period	Total no. of HH	Type of scheme	Number of offtakes	Number of taps	Major SIMI program	Program in field	Accessibility from the top of the road	Accessibility to road/market center	Nature of market for fresh vegetables	Total sample
III Surkhet											
Piple (Dahachaur)	Bhadra 2061	14		6	-	Off-season vegetables	Off-season vegetable	One-and-half hours' walk from the top of the road	One-and-half hours walk to the market	Buyer-dominated	4
						Off-season vegetables	Off-season vegetable				
Nayagaun	5 Srawan 2061	10		5	-	Off-season vegetables	Off-season vegetable	Three hours' walk from the top of the road	Three hours' walk to the market	Buyer-dominated	3
Kareni	16 Chaitra 2061	29		6	-	Off-season vegetables	Vegetable seed dominated	Three hours' walk from the top of the road	Three hours' walk to the market	Buyer-dominated	9
Total		53		17	-						16
		229		*49*	*18*						*69*

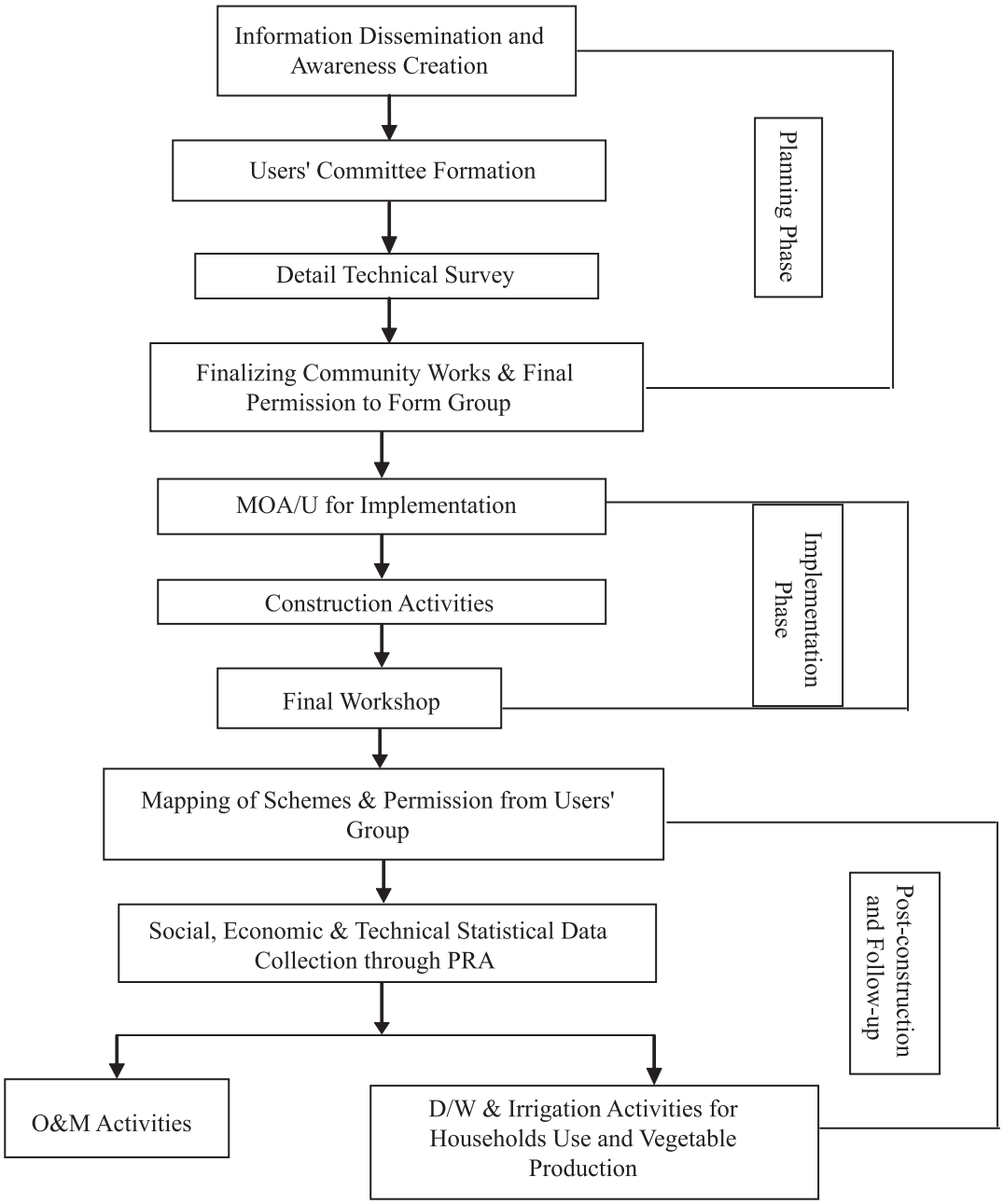
ANNEX 3

Social Status of Respondents of Sampled Households (No.)

Characteristics	Sampled districts			Overall
	Syanja	Palpa	Surkhet	
A 1 Social status				
Elected to VDC/DDC	0	0	0	0
Nominated to VDC/DDC	1	0	0	1
An active member of any political party (leadership position)	1	0	0	1
2 Profession of respondents				
Working for the government	5	0	5	10
Working for the private sector	3	0	2	5
Others	5	0	0	5
Farmer/local resident	23	7	9	39
Service holder	4	0	5	9
VDC elected representative	0	0	0	0
Nominated representative	0	0	0	0
A member in the users' group	6	0	10	16
Member of CBO, etc. (family member, yes	*11*	*1*	*15*	*27*
No	18	6	0	25
Membership				
Drinking water user group	9	0	8	17
Forest user group	4	0	2	6
Irrigation user group	5	1	4	10
Women's group	4	1	0	5
Agriculture group	3	0	9	12
Livestock group	3	0	0	3
Other (specify club)	3	0	2	5

ANNEX 4

Stages of MUS Implementation



ANNEX 5

Benefits of MUS Described by the Users

Indicators	Sworek		Senapuk		Bhalebas		Chhiskhola	
	Before	After	Before	After	Before	After	Before	After
Availability of drinking water	They had six taps, constructed on BS 2052, but the water supply was not regular.	Now they have eight taps; therefore safe and clean drinking water is available through the pipe system.	They had three taps, which were not enough for their village. Women were not allowed to touch the tap during their menstruation periods and had to go to the river for washing.	Now they have nine taps; therefore, safe and clean drinkingwater is available round the year. Women are allowed to use the tap during their menstruation periods.	Drinking water was not enough for 30 households.	Now they have six taps for drinking and five offtakes for irrigation. Due to the open channel the drinking water is not clean.	They had four taps, which were not enough for 14 families. The water supply was not regular in winter. Women had to fetch water far away from the household.	Now they have four taps for drinking and five offtakes for irrigation.
Saving of time	Women had to spend a lot of time to fetch water, like 20 to 30 minutes per *gagre* (jar of 20 liters). Earlier, they had to queue up to wash the clothes.	Time spent on fetching water was saved by 1 to 2 hours per day. Now they can wash as and when they need. 2 to 3 hours were saved in a week in washing the clothes.	Earlier, they had to wait in queue to fetch the water and wash the clothes.	Saved 1 to 2 hours per day. They can wash the clothes in their own houses as and when needed. Hence, improved hygiene.	Earlier, they had to queue up to fetch water and wash the clothes.	Saved about 2 hours per day.	Women had to spend a lot of time to fetch water.	Saved about 2 hours per day in fetching water.

Continued

Benefits of MUS Described by the Users—*Continued*

Indicators	Sworek		Senapuk		Bhalebas		Chhiskhola	
	Before	After	Before	After	Before	After	Before	After
Irrigation	There was no irrigation facility. They had to depend on rainfall for irrigation. Therefore, they used to grow vegetables, based on seasons. Fresh vegetables were not available for everyone to eat.	Women started to use their saved time on vegetable production. For irrigation they use drip/sprinkler, carrying in buckets direct from pipes. They started growing cauliflower, cabbage, ladies-finger, *Karela*, *Lauka*, radish, off- season onion and potato in addition to the traditional cucumber and leafy off-season vegetables. They started to inter-crop cauliflower and tomato in maize.						

Continued

Benefits of MUS Described by the Users—*Continued*

Indicators	Sworek		Senapuk		Bhalebas		Chhiskhola	
	Before	After	Before	After	Before	After	Before	After
Income Generation	They did not grow vegetables and there was no income from the sale of vegetables.	Men and women started to generate income from vegetable production.	They did not grow vegetables and there was no income from the sale of vegetables.	Men and women started to generate income by selling vegetables. Cash available to meet household expenses with the increase of income. Women's mobility has increased as they have to go to the market for selling their produce.	They did not grow vegetables and there was no income from the sale of vegetables.	Men and women started to generate income by selling vegetables. That helped increase income to some extent to meet household expenses.	They did not grow vegetables and there was no income from the sale of vegetables.	Men and women started to generate income from vegetable production.
Sanitation	Sanitation was poor due to unavailability of water. Places were dirty.	People started to use toilets. About 17 out of 20 households have toilets.						
Training opportunities	They have no training as such.	They have received a series of training on vegetable farming. Therefore, they have gained knowledge on the plantation of vegetables, nursery management, disease and application of pesticides.						

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FUTURE HARVEST
IWMI is a Future Harvest Center supported by the CGIAR

ISBN 92-9090-643-X
ISBN 978-92-9090-643-9