Irrigation Newsletter

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NEWS UPDATE

IDA Mission visit

An IDA team (the Mission) conducted a review of Component B – Irrigation Management Transfer (IMT) of the Irrigation and Water Resources Management Project (IWRMP) from September 18 to 24, 2009. The Mission comprised Mr. Shyam Ranjitkar (Task Team Leader), Mr. Joop Stoutjesdijk (Lead Irrigation Engineer), Dr. Prachanda Pradhan (Institution Development Specialist) and Mr. Achyut Man Singh (Irrigation Specialist, FAO).

The main activities of the Mission were:

- Reviewed the current level of Water Users Association (WUA) development and the actions undertaken so far by the Project Development Office (PDO) and Sub-project Management Unit (SMU) to develop further WUA capability,
- Met government staff involved with WUA development and Irrigation Management Transfer (IMT) activities and conducted detail discussions on various aspects, and
- Visited the Kankai Irrigation System, Narayani Zone Irrigation System (block no. 2 and 8), and the Sitagunj Secondary Canal in the Sunsari-Morang Irrigation Project and had a thorough discussion with the respective WUA members and office personnel regarding the IMT process, implementation status and its problems.

The Mission worked in close collaboration with the Project Director and his senior staff. It briefed the Secretary of the Ministry of Irrigation and the Director General of Department of Irrigation. There was broad agreement by the Secretary, the Director General, and the Project Director with the Mission's findings and recommendations to improve the performance of the Component B.

Nobel laureate in Economics inspired by the Farmers' Managed Irrigation Systems in Nepal

Elinor Ostrom, who has written books and articles about Nepal ranging from irrigation to forest management and Oliver Williamson won the 2009 Nobel Prize for Economics for work on community institutions' role in preventing conflict.

The theme of Ostrom's work is the governance of "common resource pools" - such as pastures, fisheries, irrigation systems or forests - to which more than one person has access. Unlike pure public goods such as the atmosphere, where one person's use does not reduce the amount available to others, people deplete these resources when they use them. Standard economic models predict that in the absence of clearly defined property rights, such common resources will be overexploited, with individuals acting without regard for the effects of their actions on the overall pool. Overfishing, overgrazing or over irrigation (the "tragedy of the commons") will result. Over time, stocks of the common resource will dwindle. But its not always the case; she mentioned, if we well manage a common resource pool it can be managed successfully by the people who use them, rather than by governments or private companies.

Ms. Ostrom work is based on the case studies from fisheries in Maine to irrigation systems in Nepal. Her study is concentrated on how common resources are actually managed by communities. She found that people often devise rather sophisticated systems of governance to ensure that these resources are not overused. These systems involve explicit rules about what people can use, what their responsibilities are, and how they will be punished if they break the rules. In particular, she found that self-governance often worked much better than an ill-informed government taking over and imposing sometimes clumsy, and often ineffective, rules. Her work centers on how communities manage their common lands and natural resources such as pastures, rivers, lakes, and forests. Though the approach in recent decades has been to regulate or limit the use of such resources or to privatize them, Ostrom's research finds that common properties often very well managed by the people who use it. For instance, citing the example of irrigation, a case from Nepal, she has stated the problem clearly that farmers share the use of a stream/river for irrigation. The farmer-managed irrigation systems are more effective in terms of getting water to the tail end, higher productivity, lower cost, than the fancy irrigation systems built with the help of Asian Development Bank, World Bank, USAID, etc. They face a collective problem of organizing to clear out the weeds and silt in the irrigation channels. Each farmer would like to have the others do it. There are incentives to free-ride on the "public spiritedness" of others – however, everyone may think this way and nothing will get done. On the basis of this hypothesis, she finds that factors such as face-to-face contact (likely when there are small numbers), the equality of each farmer's stake in the benefits of irrigation, and the ease of

Highlights of the Issue

Editorial

Climate Change and Food Security

Melting Himalayan glaciers and other climate change impacts pose a direct threat to the water and food security of more than 1.6 billion people in South Asia, according to preliminary findings of a study financed by ADB. Nepal, where nearly 80% of its 27 million people depend on farm income, does not have enough irrigation network and poor farmers rely on rainfall which has become irregular and unpredictable, (Oxfam report). More than 3.4 million people are estimated to require food assistance due to combination of natural disasters in Nepal. Changing weather conditions endangers Nepal's crops, already crossing food storages and pushing poor villagers to eat half stomach or fall into debts. With regards to Nepal's agricultural systems, the main threats posed by climate change relate mostly to changes in the temperatures and rainfall pattern. Given the lack of irrigative infrastructure and sustenance nature of small holder farming, Nepal's agricultural systems are highly dependent on suitable climatic conditions and thus vulnerable particularly to any change in climate. The Himalayas are experiencing a general warming trend. The mean maximum temperature of Nepal is reported to be increased by 0.06 centigrade per annum between 1977 and 2000, (IPCC 2007). Nepal's contribution of global greenhouse gas emissions is just 0.025 percent, among the lowest in the world. The possible impacts of climate change include predicted decreases in precipitation during the winter months which will reduce winter and spring crop production, increases in temperature which reduces in maize and wheat yields, insufficient water for irrigated agriculture, and so on. The preparation of NAPA (National Adaptation Program of Action) in Nepal is the first step towards developing long term plans for responding climate change. The process is intended to effectively communicate Least Developed Countries (LDC's) immediate climate change adoption needs and is to be undertaken in a short period of time and utilize existing information.

Although lot of potential adaptation options highlighted and identified by government of Nepal already in agriculture sector, one of the chief challenges in the coming decades will be to capture and store excess water during the periods of high water availability. Improved land management and storage systems together with efficient use of water would be other challenges.

Moreover, awareness creating about climate change and its likely impacts, prioritizing and institutionalizing actions at national level; and helping communities to play a greater role themselves to reduce their vulnerability are few more works to be done by various agencies in Nepal.

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monitoring the farmer's contribution in all type of activities make the likelihood of cooperation greater.

She has authored two books about Nepal titled "Improving Irrigation Governance and Management in Nepal" and "From Farmers' Fields to Data Fields and Back: A Synthesis of Participatory Information Systems for Irrigation and Other Resources". And her journal articles: "The Institutional Analysis and Development Framework: Application to Irrigation Policy in Nepal"; and "Design Principles and the Performance of Farmer-Managed Irrigation Systems in Nepal".

Best Employee of the Year

On the occasion Civil Service Day, 8 Sept. 2009, in a special function Hon'ble Minister of Irrigation Mr. Bal Krishna Khand felicitated Mr. Sushil Chandra Acharya with the Best Employee of the Year B.S. 2065/66 award.

Mr. Acharya graduated in B.E. Civil Engineering from Institute of Engineering, Pulchowk Campus in 1994 and joined the government service as an Engineer (Gazette III class) in the Department of Irrigation in July, 1996. He completed M.Sc. in Land and Water Development from UNESCO-IHE, Delft, The Netherlands in 2004. During his career in the government he has work in different offices within the Department of Irrigation and Department of Water Induced Disaster Prevention. On July 2009 he was promoted to the post of Senior Divisional Engineer and at present is the Chief of Division No. 5, Bhairhawa under Department of Water Induced Disaster Prevention.

DoI Administrative Update

Two Senior Divisional Engineers of civil irrigation group Mr. Sugumbar Yadav and Mr. Dev Narayan Mishra have been promoted to the post of Superintendent Engineer.

During July to November 2009 following officers has been appointed/ transferred to various posts within the Ministry of Irrigation. Executive Director in Groundwater Resources Development Board Mr. Jivan Lal Shrestha as been reassigned to the post of Deputy Director General, Ground Water Irrigation Division, Department of Irrigation and Mr. Pramod Raj Sharma has been appointed as an Executive Director. Regional Irrigation Director of Western Development Region Mr. Prakash Paudel has been transferred and been appointed as the Coordinator of Community Irrigation Project. Regional Irrigation Director of Mid-western Development Region Mr. Shiva Kumar Sharma has been transferred to Regional Irrigation Director of Central Development Region and Mr. Dilip Bahadur Karki has been appointed as the acting Regional Irrigation Director of Mid-westrn Devlopment Region. Likewise, Mr. Pradip Raj Pande and Mr. Dev Narayan Mishra has been appointed as the acting Regional Irrigation Director of Western Development Region and Far-Western Development Region respectively. Mr. Niranjan Dev Pandey, Mr. Ashok Singh and Mr. Ram Babu Regmee has been appointed as the Project Director of Irrigation Water Resources Management Project, Project Chief of Rani Jamara Kulariya Irrigation Project and Project Coordinator of Small and Medium Irrigation Project respectively.

DoI Achievement during the Fiscal Year 2065/66

Department of Irrigation (DoI) has made substantial achievement during the fiscal year 2065/66 B.S. Irrigation infrastructure was developed for an additional 25,549 ha area. The details of progress are as follows:

Babai Irrigation Project	800 ha
Non-conventional Irrigation Technology Project	550 ha
Medium Irrigation Project	5,384 ha
Groundwater Deep Tubewell	840 ha
Groundwater Shallow Tubewell	17,975 ha

Thus, 6,734 ha from surface source and 18,815 ha from groundwater source was achieved. In total by the end of the last fiscal year (B.S. 2065/66), 12,27,596 ha of land are under irrigation in Nepal.

Besides this DoI has also made improvement in the existing farmer managed irrigation systems and given continuity to the task of operation and maintenance for schemes under agency management. Thus, overall physical and financial progress for the last fiscal year was 81.97 % and 74.92 % respectively.

Central Coordination Committee meeting

The Central Coordination Committee meeting of Department of Irrigation, Department of Agriculture, Nepal Agriculture Research Council and Agriculture Development Bank was organized by Department of Agriculture on 25 Aug. 2009 at its office premises, Harihar Bhawan, Pulchowk. The meeting reviewed the actions taken by the committee on the decisions of the previous meetings and further discussed on various aspects of coordination between these organizations for effective and sustainable implementation of the irrigation and agriculture development programs. The meeting decided to request the World Bank Mission to include Nepal Agriculture Research Council in the various activities in the Bank funded Irrigation and Water Resources Management Project (IWRMP).

TRAININGS/WORKSHOPS/SEMINARS

On-the-job Training for Engineers

System Management and Training Program conducted a Professional Development On-the-job Training for the officers, promoted to the post of Engineer, of DoI from November 2nd to 13th 2009. The training program was conducted at Department of Irrigation, Jawalakhel and was participated by 43 engineers working in different irrigation directorates, divisions, sub-divisions and project offices under the DoI.

The objective of the program was to enhance the technical capability of the engineers and refresh them about the current activities of the department. Various subjects on technical know-how and design, working modality of the central level irrigation projects, administrative and financial management and as well as irrigation development vision and plans were covered. The participants expressed that the training program was very useful and match to their indeed requirement and related to their job. They highly appreciated the presentation of the

resource persons. The participants suggested such types of training programs should be orgainzed at the regional level with more emphasis on technical design aspects and at least twice a year.

WUA Training

During the month of October 2009, training program on Irrigation Service Fee Collection and Management was organized by System Management and Training Program to the beneficiary farmers of Kankai Irrigation System, Sitagunj Branch of Sunsari Morang Irrigation Project and different irrigation systems of Saptari district at their respective irrigation systems. The duration of the training program was of three days and the participants were WUA members and active farmers of the irrigation systems. The participants were impressed by the training and they had demanded similar type of trainings should be conducted at the grass root level and in their respective villages.

FEATURE ARTICLES

Potential and Optimum Availability of Groundwater Resources and its Balance in Terai

✍Sagar Kumar Rai

General

Nepal is a mountainous and a landlocked country. It is bordering with china in the North and India in the south, east and west. Nepal lies between latitude 26°22' N to 30° 27'N and longitude between 80° 4' E to 88° 12' E. The total area is 147181 Km². The average east to west length is about 885 km and north to south is about 193 km. The altitude varies from 64 m to 8848 m.

Water resources

Based on the available hydrological data, estimated annual runoff from the 6000 river systems of Nepal is 220 BCM, with average annual precipitation of 1530 mm. About 80 % of total rainfalls occur during the three months (Jul to Sep) and during these three months (rainy season) about 141 BCM (64 %) of all rainfall immediately drain as surface runoff. Of the remaining 36 %, some is retained in the form of snow and ice in the high Himalayas, some percolates through the ground as groundwater and some is lost due to the evaporation and transpiration. Snow, ice and groundwater acts as a natural reservoir, supplying the rivers throughout the dry season. Since there are only few lakes, natural surface storage doesn't play a major role in the hydrological cycle. There are main 4 major river systems or basins i.e. the Koshi, the Narayani, the Karnali and the Mahakali which comes into existence before Himalaya was rise on the present level. The total catchments area of these entire river systems are about 194471 Km^2, of which about 46673 Km^2 (24%) lays in India and china (Tibet).

Nepal is also endowed with extensive groundwater resources. Groundwater is found in most of the Terai and in some mid-hill valley like Kathmandu and Dang. In the Terai, present annual withdrawal of groundwater, for various purposes, is estimated at 1.04 BCM which is about 20% of the minimum possible annual recharge estimate of 5.80 BCM. Most of the groundwater is losses through evaporation, transpiration and base flow to Indo like as surface water. In the Kathamndu Valley, in contrast, the total annual abstraction is presently estimated at 23.4 MCM, which is much greater than the maximum recharge estimated of 14.6 MCM. The effect of groundwater mining and pollution in Kathmandy valley is alarming and need urgent attention.

The groundwater resources of Nepal is mainly occurred in Terai, Inner Terai , and in Kathmandu Valley .The 30 Km wide belt of plain area in the south running from east to west in Nepal constitute the grain basket of Nepal *Fig -2*. The area slopes south near the foothill and becomes flat near the Indo-Nepal boarder. It is the part of the Indo-Gangetic basin which has a depth of around 6000 m near the foothills. On the basis groundwater hydrology the Indo-Gangetic basin can be considered as one of the biggest groundwater basin in the world. The porous material is found to decrease with the increase of depths. On the basis of hydro-geological nature, the Terai is further divided in to three distinct zones i.e. Bhabar or recharge zone, Middle Terai and Southern Terai.

The Kathmandu valley is also a highly potential area for groundwater resources. It is an intermountain circular basin with an area of 500 Km^2. The Valley is filled with a thick succession of a late Pleistocene and Quaternary unconsolidated sediments of fluvio-lacustrine origin. The sediment thickness is about 550 to 600 m in the center part. On the basis of hydro geological nature, the Valley is divided in to three groundwater zones i.e. Northern Groundwater division or recharge area, Central division and Southern division.

Previous estimation of groundwater recharge of Terai

1. D. Duba (1982)

D. Duba considered recharge to the Bhabar zone and to the shallow aquifer of south of Bhabar zone. The total area of Bhabar zone is 4014 Km^2 and means annual recharge is 685 mm (33.5%) of annual rainfall. The direct average annual rainfall recharge to the shallow aquifer (south of Bhabar) is 429 mm.

2. Jerkins (1983)

On the basis of some C14 isotopes studies in the region between the Siwaliks, Butwal and the boarder, have suggested some boundary recharge from subsurface Siwalik sediments in to the Terai alluvium. BLGP- Siwaliks factor of recharge

3. Electrowat (1984)

Estimate of potential recharge to Bhabar zone, generally based only on rainfall recharge (ignoring the river bed infiltration and upward leakage) is about 465 mm

4. Kenting (1984)

Estimate of direct rainfall recharge to the shallow aquifers south of the Bhabar zone is 124 to 370 mm.

5. Groundwater Development Consultant (GDC), UK (1994)

Estimate of potential recharge is 450 mm after reducing safety factor and for conservative value for planning purpose.

6. Tahal (1992)

Tahalof Israel, modeling works (BLGWP/ Tahal 1992) present a groundwater balance for the Bhabar zone which allows that 42 % rainfall (1100 mm) reach the aquifer , this study also considered recharge inputs from stream which across the Bhabar Zone.

7. Groundwater Resources Development Board/UNDP (1992)

The Shallow Aquifer Investigation Program presents that the annual recharge of Terai is 5800 MCM.

Q.1. What is the situation of groundwater balance in Terai ?

Groundwater balance describes inflows and outflows in a natural groundwater system. The differences between the total inflows and outflows are equal to any change in groundwater storage. The following relationship can be set up for non equilibrium balance

$$I - O = S_{bal}$$

Where,

I – total rate of groundwater *inflow* MCM/Yr

O – Total rate of groundwater *outflow* MCM/Yr

S_{bal} – Volumetric rate of groundwater *stored or released* MCM/yr

In detail,

Groundwater inflow

- Precipitation (Q_{pre})
- Inflows from surface water (Q_{surf})
- Lateral subsurface inflow (Q_{lsi})
- Upward leakage (Q_{up})

Groundwater outflow

- Discharge at springs (Q_{Spring})
- Discharge to surface water ($Q_{surfout}$)
- Abstraction (Q_{well})
- Lateral subsurface outflow (Q_{lso})
- Downward leakage (Q_{dwn})
- Evapotranspiration (Q_{evapo})

Computation of inflow parameters

Groundwater inflow by D. Duba method

Ignoring river bed infiltration and upward leakage and consider here only main items i.e. Precipitation (Q_{pre}) for inflow

1. Bhabar Zone

Area of Bhabar Zone = 4014 Sqkm

Mean annual vertical infiltration = 0.685 mm (D. Duba 1982) 33.5 % of annual rainfall.

Potential annual recharge in Bhabar zone = 2762 MCM

2. South from Bhabar zone

Area of main Terai = 29838 Sqkm

Mean annual vertical infiltration = 0.294 mm (D. Duba 1982)

Potential annual recharge in main Terai zone (Shallow Aquifer) = 8837 MCM

Therefore, total annual groundwater recharge in all Terai of Nepal=11599 MCM

Groundwater inflow by fluctuation (piezometric head difference) methods:

$$S_{gws} = BS_y \text{ Äö/Ät}$$

Where,

S_{gwg} - volumetric rate of groundwater stored or released MCM

B - Surface area of the aquifer -33852 Km^2

Sy -Specific yield (dimension less) - 0.2

Äö -Discrete difference in hydraulic head for time t - 1.5 m (average)

Ät - Discrete length of time (year) - 1 year

$$S_{gws} = 10156 \text{ MCM/yr}$$

Groundwater inflow by Conservative (rainfall infiltration) methods

Surface area of the aquifer = 33852 Km^2
Average annual rainfall in Terai = 1500 m
Average annual rainfall infiltration = 300 (20%)
Annual groundwater recharge **=** 10156 MCM/yr

Computation of outflow parameters
I. lateral subsurface outflows through Indo-Nepal boarder (Q_{lso})
Q_{lso} = -KHWs (Äö/Äs) or Q_{lso} = TWs (Äö/Äs) or Qlso = TWs x Gradient
Where,
Ql_{so} = Flow rate through the stream tube (m3/day)
T = Transmissivity (m2/day) -1500 m2/day
Ws = width of the stream tube (m) - 885 km
Äö = discrete difference in hydraulic head (m)- 1
Äs = discrete difference between contour line m-1250
or Äö/ Äs = (hydraulic gradient) = 0.0008 (1/1250 m)
Therefore,

$$Ql_{so} = 388 \text{ MCM/year}$$

II. Abstraction of groundwater (Qwell)
A. From Shallow Tubewell (STWs)
- Existing STWs by 2006 (DOI +ADBN) = 65112
- Private STWs = 20% of DOI and ADBN STWs = 13022
- Total STWs = 78134

Present average annual pumping hours of per STW = 400 hrs
Average annual discharge = 0.0144 MCM (10 l/sec)
Therefore, annual groundwater abstraction from all STWs = 1125 MCM
B. From Deep Tubewell (DTWs)
- Average existing DTWs by 2006 (DOI) = 605
- Average DTWS of DWSC and DWSD = 200
- Average DTWs of private industries and hospitals = 400
- Total numbers of DTWs = 1205

Present average annual pumping hours of per DTW = 400 hrs
Average annual discharge = 0.0432 MCM (30 l/sec)
Therefore, annual groundwater abstraction from all DTWs = 52 MCM

C. From dug wells and hand pumps for domestic purpose
- Total population of Terai by 2001 = 11205288
- Annual population growth rates = 2.25 %
- Number of year = 5

$$P_n = P_o (1+r)^n$$

Where,
P_n = Population in n^{th} year
P_o = Present population
R = Population growth rate
n = number of years
Then,
Total population by 2006 (P_n) = 12523897
If, only 80% population of Terai used dug well and hand tube wells=10019117
Say 1 million populations
If daily use of groundwater = 80 lt /day
Annual used of groundwater from dug wells and hand tube wells = 292 MCM

Say,
Amount of groundwater used by cattle is 20 % of above estimated amount = 58 MCM

Total annual groundwater consumption = 1915 MCM

$$S_{bal} = (10156 – 1915) \text{ MCM}$$

Therefore, in 2006 S_{bal} = 8251 MCM (81%)

Q. 2. What will be the groundwater balance by 2015 (2071/72) or up to the end of Agricultural Perspective Plan (APP)…?

A. From shallow Tube well (STWs)
- Proposed STWs by 2015 (DOI +ADBN) = 176000 (8800/year)
- Private STWs = 20% of DOI and ADBN STWs = 35200
- Total STWs = 211200

Proposed average annual pumping hours of per STW = 600 hrs
Average annual discharge = 0.0216 MCM (10 l/sec)
Therefore, annual groundwater abstraction from all STWs = 4562 MCM
B. From Deep Tube well (DTWs)
- Proposed average DTWs by 2015 (DOI) = 1000 (50/year)
- Average DTWS of DWSC and DWSD = 400
- Average DTWs of private industries and hospitals = 600
- Total numbers of DTWs = 2000

Proposed average annual pumping hours of per DTW = 600 hrs
Average annual discharge = 0.0432 MCM (30 l/sec)
Therefore annual groundwater abstraction from all DTWs = 193 MCM
C. From dug wells and hand pumps for domestic purpose
- Total population of Terai by 2001 = 11205288
- Annual population growth rates = 2.25 %
- Number of year = 14

$$P_n = P_o (1+r)^n$$

Then,
Total population by 2015 (P_n) = 14964000
If only 75% population of Terai used dug well and hand tube wells = 11223000
If daily use of groundwater = 100 lt /day
Annual use of groundwater from dug wells and hand tube wells = 410 MCM
Say, amount of groundwater use by cattle is 25 % of above estimated amount = 103 MCM
Total annual groundwater abstraction by the end of APP (2015) = 5268MCM (52 %)
Therefore, S_{bal} (2015) = 4888 MCM (48%)

Q.3. On the basis of the availability of groundwater resources, how many DTWs and STWs can be installed for irrigation?

As per the GDC report,
- Potential are for DTWs = 6147 Km^2 (614700 ha)
- Potential area for STWs = 9246 Km^2 (924600 ha)

Total potential area from groundwater irrigation is 15413 (1541300 ha), which is about 45 % of the total land of Terai

A. Requirement of DTWs
- If suitable command area per DTW = 40 ha
- Then, number of DTW = 15368
- If the abstraction of groundwater by these DTW in the rate of 30 l/sec and operation hours 600 hrs / per year per DTW,

Then, abstraction of groundwater = 664 MCM

B. Requirement of STWs
- If appropriate command area per STW = 2.5 ha
- Then, number of STWs = 370000
- If the abstraction of groundwater by these STW in the rate of 10 l/sec and operation hours 600 hrs per year per STW,

Then, abstraction of groundwater = 7992 or 8000 MCM
Therefore, the total annual groundwater consumption = 8664 MCM
If we add the groundwater consumption by domestic purpose (513 MCM/year) and lateral subsurface outflow (388 MCM/year)

Therefore, the total annual consumption of groundwater will be 8901 MCM, which is about 88% of total recharge through the precipitation.

Conclusion

On the basis of infiltration rate and the difference of piezometric head, the annual groundwater recharge of Terai is estimated about 10156 MCM and the discharge in 2006 was estimated about 1915 MCM which was about 19 % only of total recharge. In the same way, by the end of Agriculture Perspective Plan (2015), the groundwater consumption will be about 5268 MCM, which will be about 52 % of total recharge. On the basis of availability of groundwater resources and projected abstraction rate, the optimize number of DTWs up to be about 15368 and the number of STWs up to be about 370000 in the Terai. After the installation of mentioned numbers of tube wells, the annual consumption of groundwater will be 8901 MCM, which is about 88% of total recharge. It means, about 1255 MCM (12 % of recharge) groundwater is still be safely left in the natural reservoir of Terai. For the estimation of groundwater consumption, the operation hours has assumed as 600 hrs per year per tube well at the rate of 30 l/sec for DTW and 10 l/sec for STW. The amount of groundwater, which utilize for domestic consumption and flows through lateral outflow, have already been included in mentioned amount. Moreover, the population growth, and possible water consumption by human beings and cattle have also been projected for finding the appropriate result.

*** Mr. Rai is Senior Divisional Hydrogeologist in DoI*

Scope of Social Science Application in Irrigation Developmenet

✍ Gauri Lal Upadhyay

Background

Irrigation is a most important sector to be developed for better farm production. Various initiatives have been taken throughout the country for its development in the past. Lot of resources also has invested so far. But actual out put has remained below expected level. One of the reasons associated with the prevailing situation of low return is defect in approach adopted in the past. Planners and executors have taken irrigation development is purely a technical affair and it is a sole duty of irrigation technicians. In the past we never consider People; one of the most important components of Irrigation development as emphatically as required. Previously, irrigation development activity in Nepal has done in isolation for long period. We never tried to answer one of the most potential questions i.e. irrigation development for whom? Not only that prevailing Socio-cultural and belief system; crucial human factors in the successful implementation of irrigation project also consider lightly during project development process.

Irrigation Sector: Where we are ?

Nepal is underdeveloped country and it is used to say that more than eighty percent of the total population is basically depends on agriculture for their subsistence. The present trend of agricultural production is not enough to meet internal requirements of people and the country. The gross domestic agricultural production need to be increased to feed ever-growing population of Nepal. The population growth rate of Nepal is comparatively higher than rest of the countries. This is 2.1 percent according to the latest census. Food security will be a major issue in the future which needs to be addressed. There are only two possible alternatives to raise agricultural production: either extension of arable land or intensification in agriculture. There is no possibility of extension of arable area that could meet our requirements for long. So, intensification of agriculture is one appropriate solution to the national challenge of food crisis. Intensification demands availability/application of inputs and massive adoption of agricultural extension technology.

Thus irrigation as a major input seems a vital component of agricultural development. The practice of irrigation is not a recent development and actually started since the beginning (probably with the beginning of agricultural practices). Farmers themselves have constructed various small and medium irrigation systems with the help of local technology and resources. These all now are called Farmer managed Irrigation Systems (FMIS) and it is said that they have served more than 70% of the total irrigated area of Nepal. These systems number more than 17000 under surface irrigation and over 22000 Farmer-owned Shallow Tube-wells through out the country. Some of the FMIS Surface Irrigation Systems are at least a century old.

It is said that allocation of Government fund in the irrigation system in Nepal started in 17th and 18th century with the construction of Raj Kulos (State canal) in Kathmandu valley. Apart from this, Chandra Canal is one of the oldest Agency managed Irrigation System (AMIS) which was built in 1923. With the introduction of first Five year Plan (1956) planned development of irrigation systems initiated in Nepal and various small, medium and large scale Irrigation Systems were built in last five decades which provide irrigation service in around 30 % if total Irrigated land area.

Previously all efforts of development were guided and directed by the top-down or trickle-down approach. The decade of Eighties is a major turning point in the development history of Nepal when various community development programs like IRDPs were formulated and implemented. These efforts designed on the basis of Bottom-Up development approach and participatory style of intervention.

In the past we have mistaken the idea of irrigation development and assumed it as a sole duty of professional engineers. No doubt, their contribution has immense value in the specific aspect of the entire process of irrigation development. But the social dimension of irrigation development was not considered properly. It is also equally essential to consider, analyze and study the people and the social fabric very intensively before and during implementation of any irrigation development program/projects.

Realization: How it all started ?

It was realized that one should have better understanding of socio-cultural milieu of targeted people or community for proper implementation of irrigation projects during 1980s when bottom-up development approach gradually has been replacing the trickle-down approach. Bottom-up approach strongly recommends beneficiary participation in all sorts of planning and implementation processes. Consequently, government started to seek people's involvement in project initiations.

Participation itself is not a new and strange concept for us. As we discussed about farmer managed irrigation systems which were basically constructed through indigenous technological know how and local efforts on self-help basis. Huge structures were built throughout the country during that period. But when government started intervention without any concern of local people they become more and more dependent. Gradually they started to think that "government authority is a provider and local people are the silent receiver whatever they provide". In other words all development programs including irrigation programs are being imposed from the top for a long. We never felt the need of local consultations in this regards. After a long practice of prescriptive style of intervention past efforts of irrigation development were reviewed and participatory development approach was prescribed as better solution to overcome with such historical drawbacks. It widened the role and function of all stakeholders in the process of irrigation project development. Consequently, concern authority has realized the need of multidisciplinary inputs to address widening functions for sustainable development of an irrigation projects.

Introduction of People Centered Approach in Irrigation Development:

The concept of people-centered development occupies a center place at present. It is also well accepted that development is obviously a multi dimensional efforts. In recent decade, it has been well recognized that the problem of development is basically social, cultural and human in nature and not merely technological or economic. Merits of technological change is one aspect but the more crucial aspect is how people perceive it and how close it is to their needs, problem and priorities (Devkota, P. L., 2000).

The concept of participation is bloomed during 1970s and 1980s throughout the world. Now the word Participation has become an umbrella term in the process of development intervention. A comprehensive definition of participation propounded by UN will be relevant to quote here for whom "participation is the process by which efforts of the people themselves are united with those of governmental authorities to improve the economic, social and cultural conditions of communities into the life of nation and enable them to contribute fully to the national process" (United Nations, 1963).

The performance of most of the AMIS developed in the past has remained ineffective. Contemporary studies reveal that one of the vital causes of weak performance is not to involving concerned stakeholders in the Irrigation development and management process. So the government has reviewed its past development practices and open new horizon of participatory era of Irrigation development.

After 1980s Government has incorporated participatory approach as a way of irrigation development in basic need program for the first time. Subsequently, reflection of participatory concept could be found in every policy documents, legal documents, periodic plans, programs etc. Participatory approach gradually becomes a main theme of development philosophy in all development sectors including irrigation.

Irrigation policy, 2060 is a major guideline of the government that makes various provisions related with involvement of farmers in irrigation development. It has obviously mentioned about the need of participation through an organized group of local users, Like as Tenth periodic plan (2002-2007) fixed its priorities as rehabilitation of farmers irrigation system, gradually transfer small & medium scale AMIS and increase farmer participation in the identification, construction, repair and maintenance of irrigation projects. Similarly National Water Plan also provided top priority to the user participation and need of strengthening WUAs.

No doubt, the motive of an irrigation development program is to uplift the existing socio-economic status of concerned beneficiaries. Local beneficiaries as a major stakeholder should have an opportunity to participate in the total process of irrigation development. New irrigation policy is one step forward in this direction. Now it is right time to materialize aspiration of existing policies and design irrigation development program/projects accordingly. Institutional development in the local level is a prerequisite for sustainable irrigation development in this regard.

Future Destination: Need of Change

At least, beneficiary groups have to involve in the decisions making process from the very inception regarding irrigation development. People's participation, therefore, is must during conceptualization and identification of the problems (in research), decision making (in planning), resource mobilization and implementation (in action), benefit sharing (in results) and overall evaluation (in control). People are the primary users of irrigation and the remarkable repositories of knowledge and belief about irrigation and crop farming technology. If people are ignored during project processes, we can not expect sustainability of an irrigation project.

Appropriate knowledge and expertise need to be applied in specific type of activities. Thus past narrow approach which claims irrigation development is a sole duty of only engineers/technicians what *Messerchmidt* has appropriately said "disciplinary tribalism" should be uprooted. It is not only in irrigation development activities, disciplinary tribalism is prevalent in other sectors too. Better consequences could be drawn if the working strategy is more integrative and interdisciplinary. Prevalent environment is so complex that the role of any discipline could not be underestimated. They could facilitate the process either one or another way to draw an expected outputs.

So, it is high time to discard the conventional view of disciplinary tribalism in development sector including irrigation. It is an established fact that an application of interdisciplinary skills in project development and management is one of the prerequisites for its sustainability.

Scope of Social Sciences application in Irrigation Development Process

Moreover, Social scientists (Sociologists, Anthropologists, Economist, etc.) could play a vital role in such people oriented development initiatives. They can contribute their ability from the very beginning that is identification of problem level to evaluation or general assessment level of an irrigation project. Saying more specifically, followings are the major roles to play by professional Social Scientists in irrigation development activities

- Social scientists, especially Sociologists and Anthropologists, no doubt, are able to study and analyze indigenous knowledge and belief system by which they can answer how local people perceive irrigation development initiatives? What is their perception about local problems? What is the indigenous innovative process? And so on. It may be easier and more adaptive to launch irrigation development programs after study of overall socio-economic realities. If indigenous knowledge and technical knowledge go side by side the project could be more sustainable and operative.
- Sociologists and Anthropologists look any issue or problem with anthropocentric approach or they are basically concentrated in human affairs. They might provide an appropriate package of solution regarding community betterment. So, their involvement could be beneficial to the local people for whom the program is designed.
- Planning is one of the crucial stages of development. No expected output could be drawn without proper planning. Planners should incorporated local conditions, contexts, concerns as well as social, cultural and human variables in designing projects and carrying out subsequent executing activities at the village level. Involvement of Social Scientists as a member of planning team may provide better inputs for good and complete plan.

- Success of any program depends on techniques of implementation. Prevalent socio-cultural values could play a vital role in program implementation process. Attitude, views, knowledge, belief and perception of target people (major stakeholder of the program) might be identify, sorted and analyzed better by the social scientists rather than persons having another background.
- Huge depositories of theoretical approaches, doctrines, principles and assumptions with Social Sciences could provide a unique angle of vision for analyzing people-resource interrelationships.
- Generally, twofold benefit resulted from the implementation of irrigation development program namely economic and social. Here Sociologists and Economists could be an appropriate medium to measure socio-economic benefits and overall impact of that particular program more concretely.
- Social Science and its sub disciplines are the subjects with ample methodological stocks. It can provide a suitable method in action, motivation, and training as well as in research.
- They can prepare a basis for plan, prediction, action, management and evaluation of the particular irrigation development programs by studying human relationships such as land tenure, division of labor, kinship, social hierarchy, cultural taboo, etc. That is the prerequisites for successful implementation and sustainability of irrigation development programs.
- Successfully implementation of Irrigation Projects needs serious attention in every step of project cycle. There is a need of developing partnership in irrigation development with the spirit of mutual control, mutual learning, joint action, negotiation, accommodation and consensus building. It is a continuous process and the social scientists could be appropriate resource persons to deal with these processes.
- Issues like inclusion, social mapping, gender participation, governance, etc are common to every project and must be addressed properly. Social scientists could be an appropriate medium to plan and execute those aspects.
- In the case of large irrigation projects where local people are compelled to displace due to the project activities, government must have resettlement plan for those who are displaced. Appropriate resettlement plan requires in-depth investigation of socio-cultural fabric of concerned communities which may be better accomplished by the social scientists.

Conclusions:

It is concluded that along with the role of technical manpower Social Scientists also have an immense role to play to draw an expected output from irrigation development program. Thus possibility of success of any irrigation development program will be lower when the role of Social scientists in the process of irrigation development is minimized. Definitely, an interdisciplinary action team could provide better approach of development and prescribe appropriate remedies to the problems.

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