Management of Turned-over Systems in Bhairahawa Lumbini Groundwater Project: Role of Farmers and Agency in System Management

- Mahendra B. Gurung1

INTRODUCTION

The Bhairahawa Lumbini Groundwater Project (BLGWP), Stage I, was initiated in 1977 after His Majesty's Government signed a loan agreement with IDA (World Bank) in November 1976. The objective of the project was to provide year round irrigation facility in 7,600 ha of cultivated land using groundwater by developing deep tube wells (DTWs) through electrically operated pumps and motors. The Project area, a terai Gangetic plain of Rupandehi District, some 300 Km west of Kathmandu, has been investigated to contain groundwater reserve that could supply up to 180 million cubic meters of water per annum.

Contrary to then popular approach of agency's intervention in selecting irrigation projects, the project was launched based on 'supply driven' approach. Design of the Project was carried out on the basis of technical feasibility and its implementation followed the parameters determined by the design and was solely carried out by the Project. Consequently, the role of farmers was almost nil or limited only to those areas where some farmers took initiatives on their own.

The Project was later expanded to more areas of the district through Stage II and the ongoing Stage III. In course of time, the basic approach of undertaking the Project has changed giving more emphasis on the role of beneficiary farmers. On these backgrounds, this paper focuses on the activities of Stage I tube well systems, which are already in operation and have passed through the stage of turnover.

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1 Mr. Gurung is a senior divisional engineer in Department of Irrigation, now assigned as Chief of Engineering Division of Bhairahawa Lumbini Groundwater Project, Siddharthnagar. The author would like to express his sincere gratitude to the Project Manager Mr. P. S. Tater for his guidance and high appreciation to the Local Consultant Mr. P.N. Tiwari who helped him in many ways in preparing this paper.

STAGE I DEVELOPMENT

The project under Stage I has developed 64 deep tube well units, electrically operated, for some 6,500 beneficiary families. It has built 254 Km of open channel irrigation canals and 32 km of new or rehabilitated existing drainage. Each tube well unit draws water of about 450 m^3/hour and covers a command area of around 120 ha. The project has built a network of 94 Km of village gravel roads and has erected 96 km of 11 kv power transmission lines. In addition, the Project has built 33 agriculture-related buildings such as agriculture sub centers, store houses, and JT/JTA quarters. Out of total 64 system units, 37 lie in Manpakadi area, west of Tinau river, monitored by Manpakadi Agriculture sub center and 27 in Bhalwari area, east of the river, monitored by Bhalwari Agriculture sub center. Other infrastructures are distributed accordingly.

All the infrastructures targeted for stage I, however, could not be completed within its scheduled period up to 1982/83, partly due to delay in procurement of electro-mechanical equipment and partly because the Project's electrical network could not be connected to the national power grid within the period. Consequently, all the Stage I tube wells were commissioned only in 1985/86, under Stage II, and came into operation. Beneficiary farmers or water users in Stage I Project were identified and grouped (WUG)1 on adhoc basis. They were treated as helpful more for transmitting agriculture extension activity programs, another aspect of the Project, rather than for their participation in planning, design and implementation.

STAGE II AND STAGE III INTERVENTION

Since the year the Stage I tube wells came into operation, the Project paid for the electricity bills, pump operation, and the general maintenance costs. In return, the beneficiary farmers paid an irrigation fee at the flat rate of Rs 200 per hectare to the Project. This continued to the end of the Stage II, i.e., 1989/90.

Intervention of Stage II in 1983/84 brought a conceptual change in technical aspect. In that, the open channel irrigation system working under gravity for Stage I was changed to buried UPVC (Unplasticised Polyvinyl Chloride) pipe system that works under pressure head. But there was practically no change or improvement in the concept of implementation although a provision for emphasizing the role of water users was made in the Staff Appraisal Report (SAR).

Started in 1990/91, Stage III of the Project continues to follow the technical aspect adopted under Stage II but has brought a radical change in the implementation concept

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1 The term WUG stands for Water Users Group formed of the beneficiary farmers to interact with Agency, i.e., the Project.

through what is known as participatory approach. To state briefly, the year 1990/91 proved to be a threshold year, in addition to itself being a starting year for Stage III, bringing a turning point and making a break through for management transfer of the Stage I tube wells. Similarly, 1994/95 became yet another year to reckon with in the sense that the program strategy for system turnover as well as real farmers' participation received a boost in this year. In other words, the role of farmers in organized and active manners has been distinguished, defined, and emphasized under this Stage which have made management transfer of Stage I tube well systems units possible.

TURNOVER OF STAGE I TUBE WELL SYSTEM

It has been stated above that after commissioning of the Stage I tube wells in 1985/86, the water users were asked to pay irrigation fee at a flat rate of Rs 200 per hectare and in return, all other expenditures were borne by the Project. The Project record showed that each tube well was running at an average of 1,000 hrs per year that gave the Project a feeling that farmers were making a very good use of tube well waters. (Please see table-1)

In 1990/91, the water charge rate was raised to Rs 400/ha per year as a step toward reaching up to Rs 1000/ha in order to meet the O&M costs and recover the capital cost, if possible. This step was, however, met with strong resistance from the farmers, which went up to refusal of taking any water from the tube wells. The result was the sharp drop in water charge collection.

The Project carried out an in-house study to find the actual trend of pumping hours, areas being irrigated, water charge to be and being collected, and the electricity bills the Project was paying. It was found that up to 1989/90, the water charge collection was in the range of Rs 600,000, around 60 percent of total receivable, whereas the electricity bills payable to Nepal Electricity Authority (NEA) amounted in the range of Rs 3 million, about 5 times the water charge collected. In other words, water charge collection was only at the range of 20 percent of electricity bills. In 1990/91, when the water charge rate was doubled, the collectible amount increased but the actual collection declined considerably to only 3 percent. (Please see table 2)

In fact, the Project and the World Bank were aware of the imbalance between the total revenue collection and electricity bills and were applying 'wait and see' principle, expecting an improvement. The study made both the parties alert and serious to think over the sustainability of the systems built. This became very important because whatever trend was allowed to set up for Stage I would be carried over to the Stage II and Stage III tube wells as well.

Thus, on the background of system sustainability, there were only two alternatives left:

1. Raise the water charge collection at least to cover the O&M costs and stick to it no matter what resistance from the farmers comes; or

2. Turnover the system management to the organized water users called WUGs or WUAs and let them exercise the whole responsibility gradually.

The first option did not prove appropriate as the water users1 had already opposed the rise in water charge rate and also due to the fact that it would allow the systems to rest on the Government responsibility forever. The second option to turnover the system to the concerned WUGs was therefore determined feasible because the WUGs under this option will have full responsibility as well as the rights to make the best use of the tube well waters. Also, this process will be consistent with the turnover policy for Stage II and Stage III tube well systems.

This option has been included in the preparation of Stage III Project appraisal, which has stated -

> *"Several modifications of Stage I DTWs are necessary for farmers to take over DTW management and pay full O&M costs, which are key objectives of the Project. Unlike later stages, the 64 DTWs in Stage I have open channel distribution systems and only about 35 percent of the total channel length of each DTW is lined. .... To enable farmers to take over direct responsibility for DTW operation and pay the full costs of O&M, the Project would include provision for selective lining of an additional watercourse length totaling about 140 Km. NEA has agreed to base the fixed portion of the power charge on measured peak power use under the reduced water delivery, rather than on the transformer rating, thus reducing power costs. Participation would be based on farmers demand, the formation for a registered WUA by the DTW farmers groups and commitment by the WUA to provide an agreed cash and/or labor contribution to channel lining construction and takeover responsibility to pay full O&M costs."*
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> - (SAR, May 7,1990 paragraph 3.6 for Stage - III)2

Thus in Stage III, the causes of problem faced in Stage I tube wells were identified and recorded and a process of turnover was developed and applied. The process incorporated

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1 The terms, 'beneficiary farmers', 'farmers' or 'water users' used in this paper have identical meaning referring to the farmers who receive water from the Project tube wells for irrigation purpose.

2 The term SAR stands for Staff Appraisal Report prepared by IDA/World Bank before reaching an agreement with HMG/N.

the principles of sector approach tested for Irrigation Line of Credit Pilot Project which was gaining maturity since Mahakali II Project implementation, leading to formulation of Irrigation Policy 1992.

Turnover Process

The turnover process for Stage I of the Project consisted of following steps:

1. The WUGs of DTW unit serious for the turnover program must have clear account with NEA, specifically for paying all arrears of electricity bills. This record would be checked and verified by Farmers Organization Division (FOD) of the Project.

2. An agreement is signed between the Project and WUG which would express written commitment from both the parties on compliance of Irrigation Policy in terms of farmers' participation, canal lining, and formal turnover.

3. The Project would carry out canal lining (system rehabilitation) of the unit. This work would be completed by Maintenance Division or Engineering Division of the Project in consultation and close coordination with FOD. The Division would establish its own procedure to carryout canal lining works.

3.1 A joint walk- through is made by Project staff and members of WUG to identify and make inventory of the problem spots and necessary canal lining on fields. This will result into design, estimate and provisions of resource mobilization.

3.2 WUGs will mobilize farmers for participation either through cash and/or voluntary labor contribution as determined in the (around 5% of) estimate whereas the Project will arrange for contractor to carry out the DOI's part of works. In this whole process, WUG will also fulfill its supervisory role as well as a role of a motivator to see that farmers' obligations are also duly fulfilled on time, to ensure that the inventory lists are not overlooked and to negotiate with the Project for any additional genuine demand from the farmers, if any.

4. Until the canal lining works are completed, the Project would continue to provide subsidy in the demand charge of electricity cost to the WUG for the unit in proportionate of earthen channel over the total channel length.

5. From the beginning of the first Nepalese fiscal year and after completion of the canal lining, the subsidy is stopped and pump operator from the office is replaced by the one appointed by WUG itself.

6. The Project continues to provide maintenance cost for a period of twelve consecutive months after the completion of canal lining. This is the period of training the operator and WUG for water management, record keeping and the general know-how about electro-mechanical parts of the pumping equipment installed in the pump houses. After this period, i.e. as of the first month after the 12-month period and onwards, the WUG becomes fully responsible for the system's operation and maintenance. In other word, the process of turnover becomes complete (Please see flow diagram).

THE PROJECT ACCOMPLISHMENTS

The Project accomplishments for and after turnover of the systems' management for Stage I may be regarded as remarkable. This became possible due to various farmers' friendly strategies and due to special emphasis the Project put forward in the fiscal year 1994/95. The systems were provided with limited rehabilitation on sporadic demand basis before the turnover program was conceptualized. The Program approach was initiated in 1992/93 for the first 5 tube wells units followed by 9 tube well units in 1993/94 and took a giant leap in 1994/95 by considering for 17 tube well units in an increasing order in later years. By the end of 1996/97, total of 60 tube wells were brought under turnover program completing the canal lining works for 138 km. The remaining 4 tube wells had technical problems and were of least interest for farmers to participate resulting into removal of pumping equipment (Please see table 3). The Project accomplishments may be described as follows:

Farmer Mobilization

As described elsewhere, the system construction was carried out in supply driven approach, which generated indifferent behaviors among the beneficiary farmers and was reflected in their dependency syndrome. Different meetings, dialogues and clear explanations made it possible to make the farmers familiar with the irrigation system and irrigation policy and to make them aware of their responsibility.

Farmers have carried out earth excavation, back filling and grass turfing in the newly lined area and have contributed about 5 percent of the total capital cost as required by the Irrigation Policy 1992. In fact, the increasing preparedness of farmers to excavate even new channels for lining reflected their intrinsic sense of participation to meet the need of irrigation facility for agricultural production. Giving due regards to their genuine demand, as it is a "demand driven approach", and incorporating them in the system implementation has earned two basic achievements: i. They have a realization that they must contribute their share in the process and ii. They, increasingly, do have a feeling that the irrigation system built belongs to them, i.e., an "ownership feeling".

Institutional Development and Farmer - Agency Relationship

Farmers, during the conceptualization of the Stage I Project, were grouped on adhoc basis and the groups were premature to take any institutional form that could institutionally cooperate with the Project. This could, perhaps, be attributed to existing tradition and environment of any irrigation project concept. Therefore, even after the completion of the systems, the farmers had a general expression that the systems were built by the Project and will continue to be the responsibility of the Project. This implied a weak binary relationship, which eventually grew up as the root cause of all the resistance against turnover steps taken by the Project.

It was in Stage III that the project, backed up by Irrigation Policy and its committed staff, made a sincere effort to break through this backlog. Uniformity in information dissemination, sincere implementation with quality assurance, adherence to the Agreement and constant monitoring enhanced the confidence of beneficiary farmers over the project to a great deal and helped in making a break through. Canal lining was made flexible to cover additional rehabilitation of the system such as pump houses, outlets and other structures requiring repair and maintenance. All these steps contributed to improve the system performance, a key aspect of sustainability.

In addition, working with a team spirit together with the farmers helped to establish a relationship which turned out to be stronger, more active and more effective than before. The special team work in 1994/95 to mobilize farmers' participation for Stage III tube wells construction in eastern sector of the Project area had a direct or indirect impact to make the farmers of Stage I area more responsive toward participatory approach.

The Water User Groups have been registered, phase wise, in the District Water Resource Committee receiving legal status of association called Water Users Association (WUA) and are empowered with necessary rights and responsibilities.

Accomplishment Data

Table - 3 shows the accomplishments of the Project as of 1996/97 regarding number of tube well systems lined and turned over to the respective WUAs including the status of their registration in the District Water Resources Committee, Rupandehi.

At present, if the Project was paying for the whole O&M cost, the pumping hours would remain the same as before, i.e. 980 hrs average per annum. The demand charge, energy cost and operator costs alone would have reached to Rs 8,684,200 without adding for minor repairs. After take over by WUGs, the pumping hours have come down to 330 hours on average per annum and the salaries for their operator are less resulting into the O&M cost of Rs 3,639,200. This shows not only the shift of burden from HMG/N but

also shows reduction in cost by around 58 percent. In addition, this has also saved about 1,652, 000 KW-hrs of energy which, in other words, is an input to national power-grid to reduce stress on load shedding.

System Performance

Before the turnover process, the pumping hours per annum of the tube wells were quite high and the effect was reflected satisfactorily in agricultural activities such as cropping intensity, cropping patterns and yields. After the turnover, which required paying all electricity bills by WUGs directly to the NEA at the first place, the pumping hours dropped remarkably by more than 65 percent. It was feared that this drop in pumping hours would adversely affect the existing agricultural performance. The records, however, completely negated the projection and showed steady at first and rise in the performance in later years.

Records from Agriculture Division up to 1995/96 show that the cropping intensity has reached to a level of 209.3 percent, remarkably more than SAR target of 186 percent. The productivity of high yielding variety of paddy has been recorded 4.5 mt/ha, more than SAR target of 3.50 mt/ha. These notable features are observed in hot season crops which were not projected in SAR target but have been introduced in more than 17 percent of the Stage I area, increasingly adopted even after turnover. Kidney beans (Rajma) as a new crop for vegetable and sunflower as a new crop for oilseeds are of particular significance, which are increasingly accepted by the farmers as cash crops. (Please see tables 4.1, 4.2 and 4.3)

The system performance reflected through agricultural activities itself speaks of its status. This has been possible due to the fact that the Agency, playing its role actively and effectively, has regarded the beneficiaries not only as water users but also as leader farmers who can turn tube well waters into income generators through farming.

System Management

Before turnover, when everything regarding operation and maintenance was borne by the Project, the WUGs enjoyed a luxurious life staying aloof from any system management aspect. The turnover process, however, taught them about the features and functions of the system, enriched them with the scope of their rights and responsibilities and, as a result, they understood the very significance of their roles. Consequently, although there was a transitory resistance at early stage, they gradually sided towards taking over the tube well systems.

At present, the WUGs of turned over tube wells are regularly paying electricity bills to NEA. They have hired their own pump operators upon being trained by the Project. They

have started to pay for minor spare parts that may be required for repair of pumping equipment. They keep their annual income - expenditure record that is audited annually by the Project.

On the other hand, they collect from the beneficiaries, a fixed charge, as a security, at the rate of around Rs 200 per ha per year. They also collect energy charge for the pump being run per hour with some additional levies to cover other expenses. They sell water to the adjoining non-member farmers at higher rate than to the members. They have levied a penalty of about 25 percent extra charge for those who do not pay the charges due on time. Also, in some areas, they sell the fodder grown at canal sides within the command area, on contract, to raise funds in the WUG account. The records show that the WUGs' savings in the bank accounts as of 1996/97 have the funds from as low as Rs 7,000.00 to as high as Rs 117,700.00 which obviously reflect the status of activeness and effectiveness of the respective WUGs. Overall, the income-expenditure record shows a comfortable balance (Please see table 5).

Thus the farmers, in an organized manner, have realized their roles for the system management and have started to take lead over the Project's. On July 10 and 11, 1996 (26&27 Ashar, 2053), Bhalwari and Manpakadi Agriculture sub-centers, other related physical infrastructures (buildings, etc.) and the administration have been handed over to the District Agriculture Office, Rupandehi which then onward will provide necessary assistance to the farmers within the Project's command area. In order to enable the WUGs to stand on their own, recently on 29 and 30, Bhadra 2054 (14&15 Sept. 1997), the Project organized separate meetings for WUGs of 26 DTWs in Bhalwari area and of 34 DTWs in Manpakadi area with local private (workshop) companies named Shrestha Engineering, Binay Trading, Lumbini Electrical and Sampada, all located at Siddharthnagar to familiarize themselves. Now onwards, it is expected that should any repair works for electro-mechanical parts be required, the concerned WUGs would contact directly to any of these companies in the same way as they did to NEA for electricity bills.

ISSUES

There are issues ranging from planning, design and implementation to the management of the tube wells. Issues encountered by the Project may be grouped as follows:

Planning and Design

Hydro-geologists, engineers and association organizers must show their full professionalism, which must be reflected in planning, design and implementation. In Stage I of BLGWP there are many cases where it is felt that they should have given more effort on this regard. At least four tube wells under the project have been abandoned

primarily because the tube wells are located in low lying areas, since the distribution system follows gravity flow principle, most of the planned areas do not receive water. This has caused poor interest from the farmers and the abandonment as limited beneficiaries cannot afford the O&M costs. Tube well locations in at least two tube wells and their command area layouts have been found such that the command has a proximity to one tubule but has been included in for the other, the farther one. The canal alignments and positioning of outlets have also come under comments. Land acquisition problems caused delayed implementation. The planners and implementers must choose one of the two alternatives: either consult the beneficiaries or show the sincere professionalism.

Lining of Canals

As described by the SAR mentioned above, majority of channel distribution system developed in Stage I of the Project had earthen channels mostly constructed on raised earthen embankments. This obviously gave rise to high leakage, vulnerability of the system any time, anywhere and consequently led to a high loss of water in the conveyance system. The tail end farmers were, therefore, deprived of irrigation facility, which was reflected in low water charge collection and created resistance during initial discussions. The Proposed or imposed increase in water charge rates victimized both the water recipients and those deprived of. This situation made farmers to react. This issue, strongly raised by the farmers, was resolved by lining the earthen channels and rehabilitating the breached and broken parts with their involvement.

Affected by the traditional supply driven approach of the Project, the WUG members would not believe that their concern would be incorporated and, so, there was a weak participation during inventory preparation. However, when the implementation started and the Project Staff gave their voice due regards depending on genuineness, they started to cooperate opening the real path toward turnover. There were social conflicts, political rivalry and mismanagement from existing WUGs which were all reflected in rotation irrigation and were solved amicably. In fact, this issue helped the Project in a way that, had there been no requirement of canal rehabilitation, the project probably could not have gained a chance to mobilize farmers' participation and the turnover program would have faced even more difficulties or even failed.

Inter Disciplinary Coordination

Point fixing for the tube well location which is done jointly by hydro-geologists, engineers, association organizer and the consultant has been found shifted in many cases by a driller when he goes for drilling. This has raised many problems regarding fixing of pump house boundary especially in Stage III areas where certain farmers offer land free of cost for pump house. This was not an issue for Stage I as the lands of pump houses were also acquired. But this act seems to have led the tube wells to cover comparatively

smaller areas in the fields than planned on paper. The point of issue is that once the tube well location is significantly shifted from originally fixed point, the whole layout has a chance of being affected, leading to possible mismanagement of the whole system unit.

Investment Cost

The Project tube wells are deep tube wells and the unit cost is about Rs 60,000-65,000/ha at present value. If the cost for transmission lines (1 Km) and for roads (1 Km) is added, the unit cost will rise to Rs 80,000/ha. Whether this cost is high or less and whether this type of system should be continued or not is purely a matter of debate. However, with integrated approach, the Project has provided multifaceted facilities in addition to irrigation and agricultural extension in order to raise the living standard of its beneficiaries, an objective of poverty alleviation campaign, thus covering a broad spectrum of development.

Resource Generation and O&M

WUGs have started to generate resources essential to meet O&M costs, which are around Rs 1000/ha per year. However, the resource generated does not seem to leave any substantial savings in the WUG account which is also essential to meet the requirement should there be any major break down either in the system or in the equipment. This is important for WUGs, as they are to depend on their own incomes in the years to come. This issue calls for brainstorming from all especially from those who have earned specific knowledge, skill and experience in privatization.

Electricity Cost

The water users have to pay two types of electricity charges to NEA. The first is termed fixed Demand Charge. This is levied on the basis of motor rating and has to be paid per month immaterial of whether the pump is run or not. It used to be Rs 20/KW, now has been increased to Rs 25/KW since June 1996.

The other part is energy charge that is levied per unit of the meter on the basis of pump operation. It used to be Rs 0.80 per unit up to 1992. Then, when turnover process was started, it was increased to Rs 0.95, then to Rs 2.20 in 1994 and then to Rs 3.05 per unit since June 1996 to date. The latest increase was by about 39 percent. This has become a major issue among the beneficiary farmers and, if not given a serious thought, it may question the very sustainability of these and similar schemes.

In India, the electricity charge to the farmers for irrigation purpose has been heavily subsidized. In addition, the irrigation purpose has been given special preference for electricity supply. This may sound inconsistent for Nepal where open market economy

has been widely advocated. However, a reduced charge on the irrigation water would encourage the farmers by many folds to adopt extensive cropping pattern and intensive farming.

Cases of Theft

Cases of theft are increasingly coming up as a new issue and concern for the Project as well as for the WUGs. So far, 12 of transformers (11/0.4 kv) costing around Rs 60,000 per unit and 3 km of Rabbit conductor wires (11 kv) costing around Rs 33,000 per Km have been stolen at different Stages of the Project. The Project or the WUG does not have any authority to punish the offenders even if they are caught red hands. Administration some times show their activities but soon slow down possibly because of protection of the suspects by political parties. As a result, there seems no cease in the trend, which is rocking the institutional stand.

Internal Command and External Demand

The Stage I of the project was as a kind of imposition on the beneficiary farmers. It cared neither for the internal command nor for external demand of the beneficiaries. The demand driven principle under the sector approach introduced during system rehabilitation in particular under Stage III had a chance of instigating external demands. They would demand for lining of more and more channels. However, in course of time, as the turnover program was implemented without allowing the demands to inflate unnecessarily, the internal command of the beneficiaries has been promoted. The phase out process of turnover had, in essence, this objective. It will be reflected more distinctly as the WUG management over the systems gains maturity in due course.

CONCLUSIONS AND RECOMMENDATIONS

BLGWP Stage I project has given many lessons not only in management transfer but also in the concept of system planning, implementation and management. This has opened up the pros and cons of supply driven approach and sector approach. Also, the very feature of integrated system of the project has been found to be very close to an ideal model that may be prescribed for replication where overall and speedy development is the prime objective.

1. Planners, Implementers and particularly managers should show their in-depth sincerity towards the ethics of profession, be it in the system design, implementation, procurement, or in interdisciplinary coordination. Time, cost and process must all be bound and guided by the highest degree of sincerity.

2. A deep or shallow sized tube well irrigation systems preferably of ILC type with similar approach of BLGWP Stage I may be a better option considering that the smaller size will lead to better manageability, less cost and possible homogeneity of beneficiary farmers, which are the basic factors of a sustainable and effective irrigation system.

3. In order to generate more resource from the tube well water, probably, the best way may be for the WUA to enforce a regulation that no land under the command is allowed to leave fallow. In other words, the farmers must adopt intensive farming. This, if possible, may generate almost permanent employment for some people of the area. The tube wells' use will be maximized. And, when there is a booming crop production, the farmers may appear in better living standard and at the same time, WUA will enrich its account ensuring sustenance of the system.

4. Something must be carefully thought and done in the energy charge aspect in order to encourage the farmers to make the best use of tube wells, which can deliver water just at a button-push anytime, any season. Cheaper irrigation can be a motivation on itself for greater production.

5. Encouragement to the beneficiary farmers, especially to their role, should also be given through guaranteeing the reliable inputs such as improved seeds, fertilizers and insecticides in addition to irrigation and better market facilities. The long-term effect of a successful system management or system performance will be resembled by emergence of new agriculture based industries and vice versa.

Bhairahawa Lumbini Groundwater Project

Stage - I

Accomplishment Table

S. No.	Description of Items	Unit	Target	Achievement	Remarks
1	Tubewells drilled	No.	64	64	
2	Tubewells system units	No.	64	64	
3	Distribution Channels.	Km	254		
	3.1 Earthen			9	
	3.2 Brick lined			245	
4	Village Gravel Roads.	Km	70	94	
5	Pumping Equipment	No.	64	63	1
6	Power Transmission lines	Km	75	96	
7	Power Substation	No.	1	1	
8	Drainage Construction	Km	32	32	
9	Buildings.				
	9.1 Agri. Subcentre	No.	2	2	
	9.2 Store House	No.	8	8	
	9.3 JT/ JTA Quarter	No.	23	23	
10	System Turnover	No.	64		
	10.1 Complete Turnover			58	
	10.2 Partial Turnover			2	
	10.3 pumping Equipment Removed			4	2
11	Irrigation Area	Ha.	7680	7200	
12	Beneficiary family	No.		6580	
13	Project Cost.	(Rs '000)	171,000	171638	

Notes:

1. Well no. W/41, Bhagalpur has a full-blown artesian flow of around 450 m3/hr and does not require pumping equipment.
2. Well no. W/34 W. Amuwa, W/52 W. Semari, W/60 Bhagusari, all 3 under Manpakadi subcentre and W/69 Pathardanda under Bhalwari subcentre have technical problems and the pumping equipment has been removed from them.

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Stage I

Overall Average Pumping Hours

Table – 1

S. N.	Year	Tubewells under Manpakadi Subcentre 934 no. operating)	Tubewells under Bhalwari Subcentre (24 no. operating)	Overall Average (Hrs.)
1	1989/90	970	727	
2	1990/91	1215	820	
3	1991/92	1152	1011	
	3 Years average	1113	853	983
4	1992/93	320	234	
5	1993/94	500	189	
6	1994/95	252	478	
7	1995/96	232	133	
	4 years average	401	258	330
	Overall drop in pumping hrs. after turnover %			66 %

Table - 2

Water Charge vs. Power Cost

S. No.	Fiscal Year	Water Charge Rs/Ha	Assessed Irrigation Area Ha.	Receivable Water Charge Rs.	Total Collected Rs.	% Collected	Electricity Bill paid by Project Rs.	Bills, Times of Receivable W. Charge	Bills, Times of Collected W. Charge
1	1987/88 (2044/45)	200	3,800	760,000	548,460	72	3,669,947	4.8	6.7
2	1988/89	200	4,843	968,600	543,518	56	3,966,788	4.1	7.3
3	1989/90	200	4,843	968,600	615,696	64	2,610,781	2.7	4.2
4	1990/91	400	4,843	1,937,200	51,252	3	3,075,729	1.6	60
5	1991/92	400	4,843	1,937,200	1,717,787	89	4,398,745	2.3	2.6
6	Avg. of last two years.			1,937,200	884,520	46	3,737,242	1.9	4.2
7	1992/93	Systems of Water Charge collection stopped; Turnover Programme started.							

Source: Experience with Implementation of Farmer's participation concept, Tahal consulting Engineers

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Stage I

List of Turned-over Tubewells

Table – 3

2054/6/6 (Sept. 22, 1997)

S. N.	Tube Well No. And Name		V. D. C.	Ward No.	Number of Beneficiaries	Command Area Ha.	Canal lined Year	Hand-over Date	Remarks
1	W/11	Karahiya	Karahiya	7 Kha	128	96	2049/50	2052 Srawan	
2	W/13	W. Pahuni	Anandaban	9 Ga	145	113	2049/50	,, ,,	
3	W/63	Jamuhani	Gangoliya	5 Ka	181	130	2049/50	,, ,,	
4	W/66	Thatharihawa	Gangoliya	9 Ka	100	110	2049/50	,, ,,	Regd.
5	W/48	Ramgunj	Dayanagar	5 Nga	200	129	2049/50	,, ,,	Regd.
6	W/9	Muriyari	Gangoliya	1 Ka	110	100	2050/51	,, ,,	
7	W/12	Semara	Karahiya	5	140	144	2050/51	,, ,,	
8	W/4	E. Sakhuwani	Madhwaliya	1 Ka	120	106	2050/51	,, ,,	
9	W/17	Khairiya	Tikuligadh	1 Ka	114	120	2050/51	,, ,,	
10	W/20	Tikuligadh	Tikuligadh	7 Kha	123	135	2050/51	,, ,,	
11	W/24	S. Pharsatikar	S. Pharasatikar	1 Ka	160	140	2050/51	,, ,,	Regd.
12	W/31	Puraini	Manpakadi	7 Ka	113	128	2050/51	,, ,,	Regd.
13	W/51	Dayanagar	Dayanagar	5 Nga	159	104	2050/51	,, ,,	
14	W/55	Chapiya	Dayanagar	1 Nga	137	126	2050/51	,, ,,	
15	W/1	Pharsatikar	S. Pharsatikar	1 Ka	164	108	2051/52	2053 Srawan	Regd.
16	W/14	Bankati	Tikuligadh	2 Kha	140	120	2051/52	,, ,,	
17	W/15	E. Pahuni	Anandban	8 Kha	150	113	2051/52	,, ,,	
18	W/19	E. Semari	Tikuligadh	7 Kha	125	120	2051/52	,, ,,	
19	W/21	Dubauliya	Motipur	8 Ka	98	98	2051/52	,, ,,	Regd.
20	W/22	Betahi	S. Pharsatikar	3 Kha	90	98	2051/52	,, ,,	Regd.
21	W/23	Dogna	S. Pharsatikar	2 Ka	100	102	2051/52	,, ,,	Regd.
22	W/40	Belahiya	Manpakadi	3 Ka	108	100	2051/52	,, ,,	Regd.
23	W/26	W. Kewalpur	S. Pharsatikar	5 Ka	108	120	2051/52	,, ,,	Regd.
24	W/30	N. Gurauliya	Manpakadi	1 Ka	95	92	2051/52	,, ,,	Regd.
25	W/39	Sisawa	Manpakadi	4 Gha	145	153	2051/52	,, ,,	Regd.
26	W/44	W. Sakhuwani	S. Pharsatikar	3 Gha	215	110	2051/52	,, ,,	Regd.
27	W/47	Rehara	Amuwa	2 Kha	119	124	2051/52	,, ,,	Regd.
28	W/49	W. Khungaon	Dayanagar	7 Gha	89	118	2051/52	,, ,,	Regd.
29	W/50	E. Khungaon	Manpakadi	2 Kha	118	110	2051/52	,, ,,	Regd.
30	W/56	Madangunj	Amuwa	1 Ka	152	120	2051/52	,, ,,	
31	W/61	Baidauli	Amuwa	2 Ga	160	100	2051/52	,, ,,	
32	W/07	Karaujiya	Tikuligadh	5 Ka	150	133	2052/53	Srawan 2054	Regd.

S. N.	Tube Well No. And Name		V. D. C.	Ward No.	Number of Beneficiaries	Command Area Ha.	Canal lined Year	Hand-over Date	Remarks
33	W/18	S. Supauli	Tikuligadh	8 Ka	114	120	2052/53	,, ,,	Regd.
34	W/25	Mohangunj	S. Pharsatikar	2 Ka	171	114	2052/53	,, ,,	Regd.
35	W/33	Manpakadi	Manpakadi	2 Ka	109	132	2052/53	,, ,,	Regd.
36	W/35	W. Sitalpat	Manpakadi	5 Ka	129	120	2052/53	,, ,,	Regd.
37	W/27	E. Kewalpur	S. Pharsatikar	1 Ka	117	108	2052/53	,, ,,	Regd.
38	W/32	Rajhar	Manpakadi	1 Ka	132	114	2052/53	,, ,,	
39	W/34	S.Gurauliya	Manpakadi	5 Ka	92	84	2052/53	,, ,,	
40	W/36	E. Sitalpat	S. Pharsatikar	4 Ka	102	124	2052/53	,, ,,	
41	W/37	Kuwari	Manpakadi	1 Ka	122	136	2052/53	,, ,,	
42	W/53	Bahata	Manpakadi	5 Ka	124	128	2052/53	,, ,,	Regd.
43	W/38	Madhubani	Manpakadi	9 Ka	96	118	2052/53	,, ,,	Regd.
44	W/41	Bhaglapur	Manpakadi	8 Ka	70	132	2052/53	,, ,,	Regd.
45	W/45	Kanari	Amuwa	6 Ka	157	132	2052/53	,, ,,	
46	W/46	Sarjugunj	Amuwa	2 Ka	134	110	2052/53	,, ,,	
47	W/59	S. Madangunj	Manpakadi	9 Ka	72	126	2052/53	,, ,,	Regd.
48	W/62	Bardahawa	Amuwa	9 Ka	255	170	2052/53	,, ,,	Regd.
49	W/16	N. Supauli	Tikuligadh	8 Ka	155	120	2052/53	,, ,,	Regd.
50	W/28	Bihuli	Madhauliya	8 Ka	155	120	2052/53	,, ,,	
51	W/42	Kotihawa	Tikuligadh	9 Ka	140	126	2052/53	,, ,,	
52	W/57	Jura	Madhauliya	7 K	150	118	2052/53	,, ,,	
53	W/67	Barauliya	Gangoliya	3 Kh	114	128	2052/53	,, ,,	Regd.
54	W/3	Bhalwari	Karahiya	3 Kh	110	116	2052/53	,, ,,	Regd.
55	W/29	Pakadihawa	Gangoliya	3 Kh	108	116	2052/53	,, ,,	Regd.
56	W/64	Byoratola	Makrahar	3 Kh	75	131	2052/53	,, ,,	
57	W/65	Chamkipur (R)	Madhauliya	8 Ka	155	144	2052/53	,, ,,	Regd.
58	W/68	Gangoliya	Gangoliya	4 Ka	90	80	2052/53	,, ,,	
Partially Handedover									
59	W/5	Parsawal					2053/54	To be fully handed over by Srawan 2055	Regd.
60	W/58	Bharauliya					2053/54		

Bhairahawa Lumbini Groundwater Project

Stage I

Year-wise Cropping Intensity

Table 4.1

CCA: 7200 ha. = 100% (60 DTWs)

Crops	Pre-Project	SAR Target	Actual achievements: % of CCA " With the Project"								
			87 - 88	88 - 89	89 - 90	90 - 91	91 - 92	92 - 93	93 – 94	94 - 95	95 - 96
KHARIF (Monsoon)											
Paddy (Local)	91.00	6.67	2.50	2.00	2.60	3.20	2.50	3.50	1.60	0.50	0.8
Paddy (HYV)	3.00	89.00	95.20	95.40	94.50	93.20	94.80	92.30	95.90	95.60	94.3
Sugarcane (Perennial)	2.00	1.33									
Pulses	2.00		0.70	1.00	0.30	1.20	0.90	1.30	0.70	1.40	1.8
Maize			0.10	0.10		0.10					0.1
Vegetables					1.30	0.50	0.20	0.70	0.60	0.70	0.4
Groundnut						0.10				0.30	0.4
Other Seasonal Crops											0.2
Sub total	**98.00**	**97.00**	**98.50**	**98.50**	**98.70**	**98.30**	**98.40**	**97.80**	**98.80**	**98.50**	**98.0**
RABI (Winter)											
Wheat	15.00	73.00	29.90	46.80	42.10	37.50	37.70	36.80	48.00	43.20	44.4
Maize		3.00	0.60	2.80	1.80	1.90	0.20	0.10	0.20	2.30	0.2
Oilseeds	2.00	4.00	17.20	11.00	19.70	19.60	19.10	21.80	17.00	17.00	17.1
Pulses	3.00	6.00	10.50	11.90	14.30	15.60	14.80	17.80	16.30	17.50	17.3
Potatoes		3.00	2.80	3.00	3.40	4.50	5.10	4.00	4.60	6.10	6.1
Vegetables			5.50	6.00	5.80	5.10	5.10	3.10	4.90	6.50	6.8
Sugarcane (Perennial)			0.90	0.40	0.20	0.20	0.50	0.60		1.10	1.3
Other Seasonal crops			1.00	9.20	5.60	2.80	1.40	0.10	0.70	0.50	0.9
Sub total	**20.00**	**89.00**	**68.40**	**91.10**	**92.90**	**87.20**	**83.90**	**84.30**	**91.70**	**94.20**	**94.1**
HOT SEASON											
Paddy			0.60	0.80	0.30	0.10	0.10	0.10	0.10	0.20	
Maize			1.80	2.80	4.60	2.50	1.50	2.60	3.30	5.60	6.4
Pulses (Kidney beans)			0.30	0.10	0.40	0.10	0.50	0.40	1.00	2.50	2.8
Vegetables			1.40	1.10	3.00	1.70	2.00	2.00	2.80	2.80	4.60
Sunflower										0.70	1.40
Others			0.10	0.20	0.10	0.50	0.40	0.10	1.30	1.30	2.00
Sub total	**0**	**0**	**4.20**	**5.00**	**8.40**	**4.90**	**4.50**	**5.20**	**8.50**	**13.10**	**17.2**
Grand total	**118.00**	**186.00**	**171.10**	**194.60**	**200.00**	**190.40**	**186.80**	**187.30**	**199.00**	**205.80**	**209.3**

Note: Out of 64 DTW systems built (7,680 ha.), 4 DTWs have been abandoned due to technical reasons causing reduction in command area by 480 ha.

Bhairahawa Lumbini Groundwater Project

Stage I

Year-wise Yields of Major Crops

Table 4.2

CCA: 7200 ha. = 100% (60 DTWs) September 1997

Crops	Pre-Project	SAR Target	Actual achievement: Yield MT/Ha.								
			87 - 88	88 - 89	89 - 90	90 - 91	91 - 92	92 - 93	93 – 94	94 - 95	95 - 96
KHARIF											
Paddy (local)	1.10	2.70	3.00	2.60	2.70	2.60	2.60	2.10	2.40	2.00	2.80
Paddy (HYV)	1.80	3.50	4.60	4.40	4.50	3.50	4.50	4.20	4.50	4.30	4.50
Sugarcane	25.00	50.00									
Pulses	0.50		1.30	1.20	1.20	0.70	1.30	1.30	1.20	1.20	1.60
Maize			3.70	3.00		3.20				3.30	3.70
Vegetables					22.20	17.60	15.00	13.70	24.00	21.40	22.90
Groundnut						1.60		2.40	1.90	2.00	1.90
RABI											
Wheat	0.80	3.00	2.90	2.60	2.70	2.80	3.00	3.10	3.20	3.30	3.03
Maize		2.00	3.70	3.80	4.00	3.20	4.40	4.00	3.70	3.50	2.89
Oilseeds	0.40	0.70	0.70	0.70	0.80	0.70	0.70	0.40	0.70	0.80	0.67
Pulses	0.50	0.80	1.10	1.20	1.10	1.30	1.50	0.90	1.40	1.70	0.83
Potatoes		10.00	18.00	27.00	25.00	19.70	25.10	22.10	24.10	24.20	22.00
Vegetables				21.00	20.00	22.10	17.90	23.40	23.30	24.50	19.76
HOT SEASON											
Paddy			4.00	2.90	2.80	3.20	3.50	2.40	2.80	3.00	
Maize			3.50	3.80	3.20	2.90	4.40	3.00	3.30	3.00	2.89
Pulses			1.00	1.30	1.10	1.00	0.90	1.30	0.80	1.10	1.33
Vegetables			20.50	27.00	18.90	18.20	31.30	24.80	20.80	21.00	20.73
Sunflower										1.50	1.43

Bhairahawa Lumbini Groundwater Project

Stage I

Cropping Intensity, Yield and Production

Table 4.3

Command Area: 7,200 Ha. F. Y. 1995/96 (2052/53)

Crops	Cropped Area (%)			Yield (MT/Ha.)			Production (MT)		
	Before Project	Appraisal Target	With Project	Before Project	Appraisal Target	With Project	Before Project	Appraisal Target	With Project
Monsoon Crops									
Local Paddy	91	6.67	0.80	1.10	2.70	2.80	7688	1383	161
HYV Paddy	3	89.00	94.30	1.80	3.50	4.50	415	23923	30553
Sugarcane (Perennial)	2	1.33	1.30	25.00	50.00	73.00	3840	5107	6833
(Maize)		-	0.10		-	3.70		-	27
Pulses	2	-	1.80	0.50	-	1.60	77	-	207
Vegetables	-	-	0.40	-	-	22.90	-	-	660
Groundnuts	-	-	0.40	-	-	1.90	-	-	55
Others	-	-	0.20	-	-	-	-	-	-
Sub total	**98**	**97**	**99.3**	**28.4**	**56.2**	**110.4**	**12020**	**30413**	**38496**
Winter Crops									
Wheat	15	73.00	44.40	0.80	3.00	3.03	922	16819	9686
Maize	-	3.00	0.20	-	2.00	2.89	-	461	42
Oil seeds	2	4.00	17.10	0.40	0.70	0.67	61	215	825
Pulses	3	6.00	17.30	0.50	0.80	0.83	115	369	1034
Potato	-	3.00	6.10	-	10.00	22.00	-	2304	9662
Vegetables	-	-	6.80	-	-	19.76	-	-	9675
Others	-	-	0.90	-	-	-	-	-	-
Sub total	**20**	**89**	**92.80**				**1098**	**20168**	**30924**
Hot Season Crops									
Paddy	-	-	-	-	-	-	-	-	-
Maize	-	-	6.40	-	-	2.89	-	-	1332
Pulses	-	-	2.80	-	-	1.33	-	-	268
Vegetables	-	-	4.60	-	-	20.73	-	-	6866
Sunflower (Oilseeds)	-	-	1.40	-	-	1.43	-	-	144
Others	-	-	2.00	-	-	-	-	-	
Sub total	**0**	**0**	**17.2**				**0**	**0**	**8610**
Grand total	**118**	**186**	**209.3**				**13118**	**50581**	**78030**

The 'Before Project' & 'Appraisal' target have been taken from Staff Appraisal Report for Stage 1 of BLGWP and the 'With Project' figures are from Agriculture Division of the Project.

Bhairahawa Lumbini Groundwater Project

Stage I

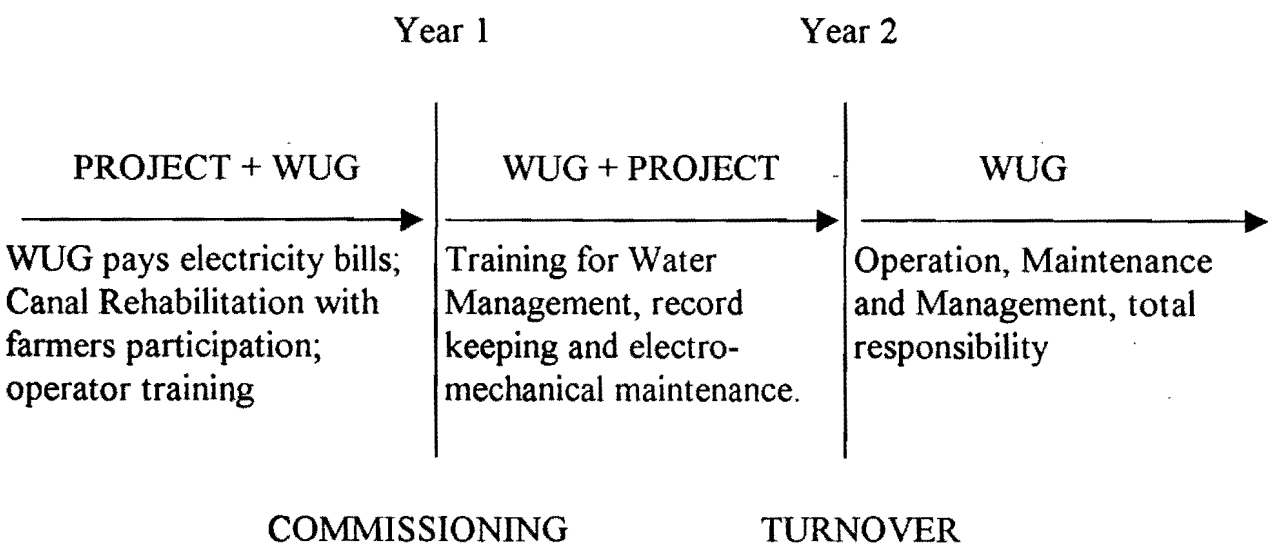
WUG's Income Expenditure and Balance

Table – 5

S. N.	Fiscal Year	Income Rs.	Expenditure Rs.	Balance Rs.	Balance, % of Income
1	1992/93				
	(2049/50)	1,772,000	1,377,000	395,000	22
2	1993/94	1,867,000	1,376,000	514,000	28
3	1994/95	2,483,000	1,736,000	723,000	29
4	1995/96	2,421,000	1,218,000	1,203,000	50
5	1996/97	3,154,800	1,811,300	1,343,500	43

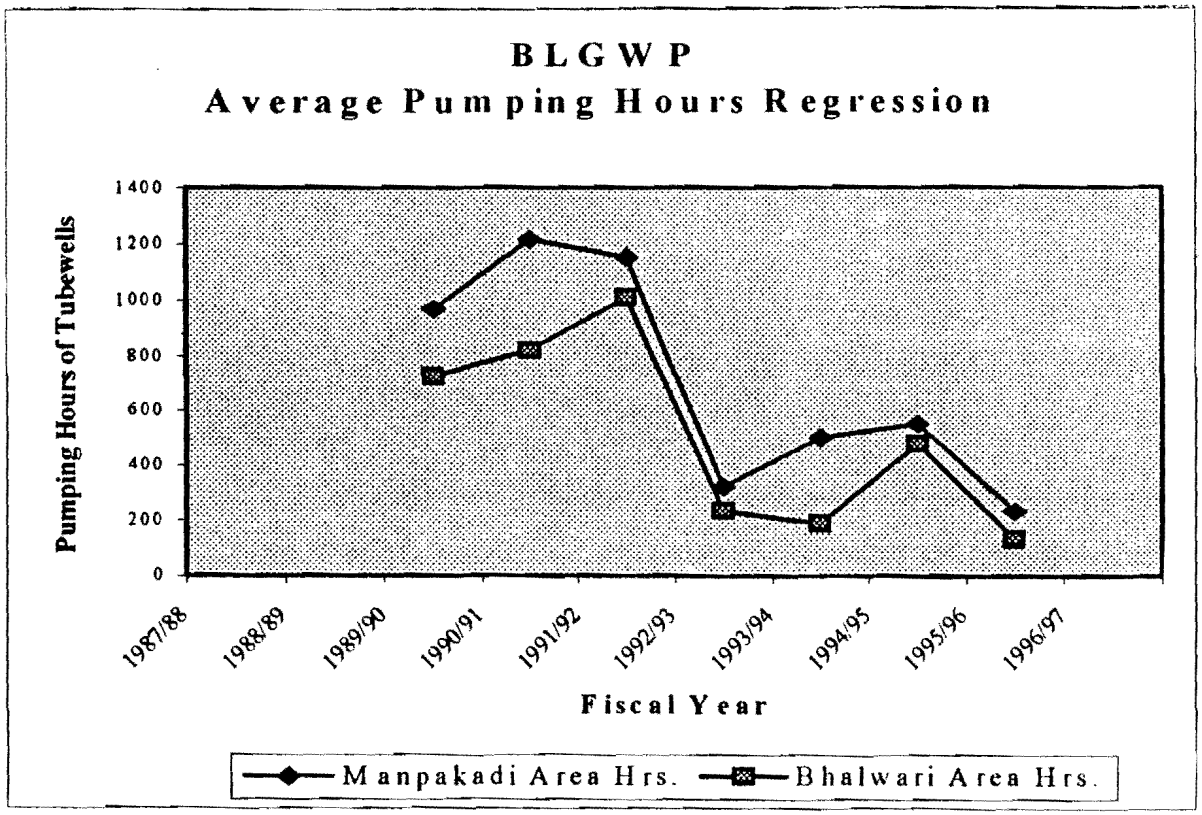
Source: Experience with Implementation of Farmer's participation concept, Tahal Consulting Engineers Ltd, BLGWP, April 1994.

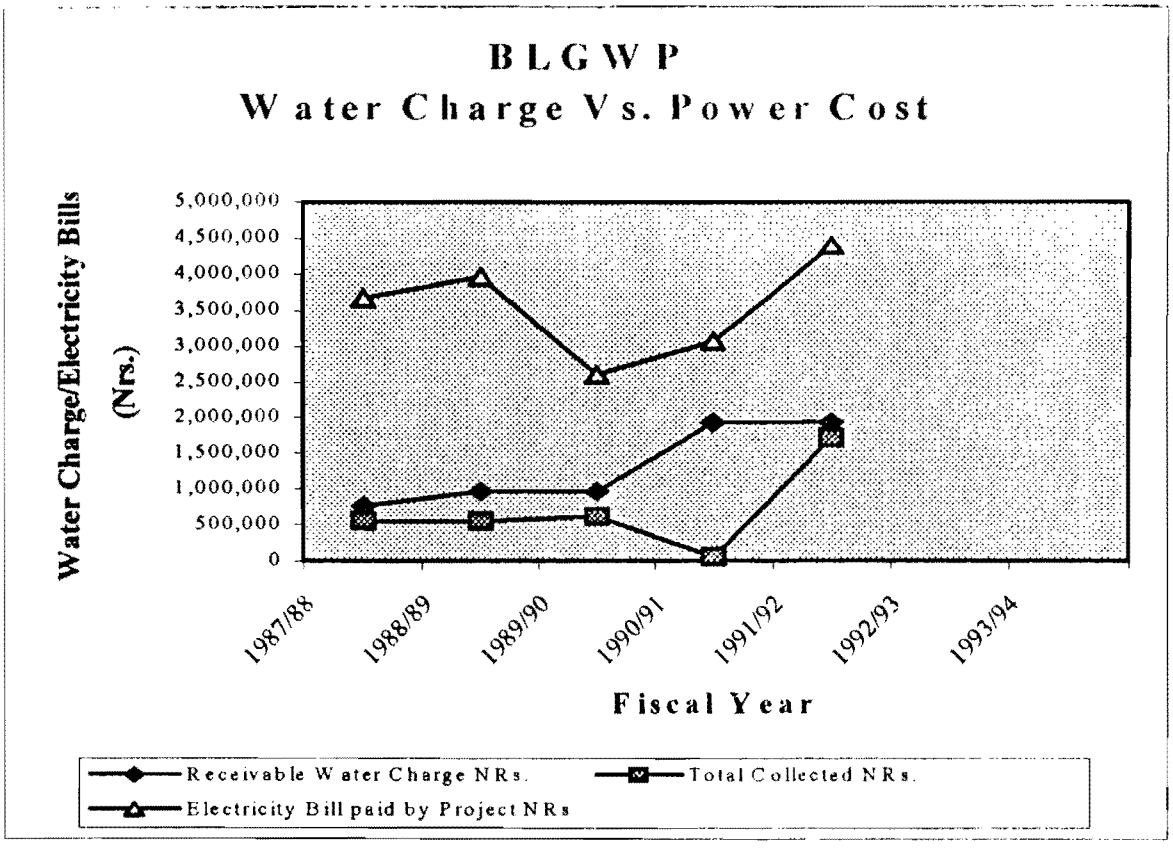
Flow Diagram of Turnover Process for Operating Stage – I Tubewells

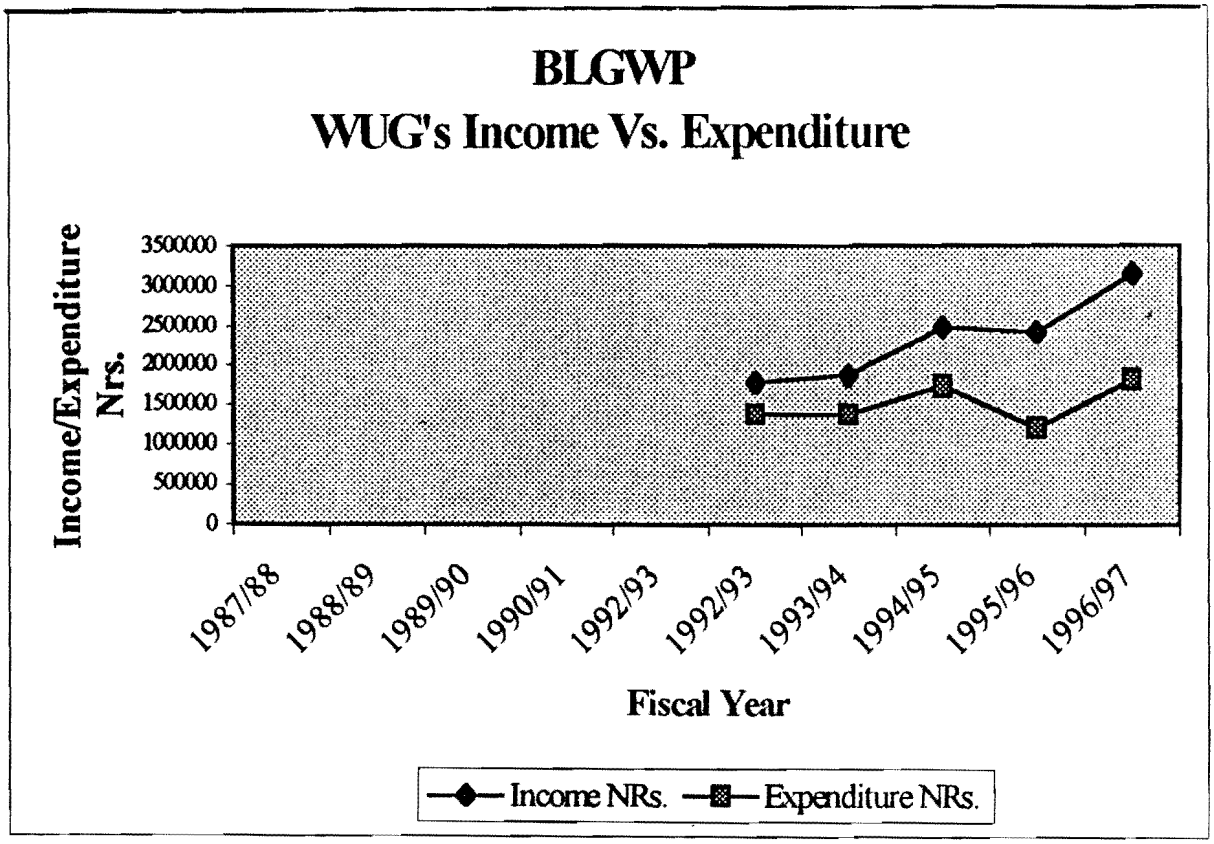


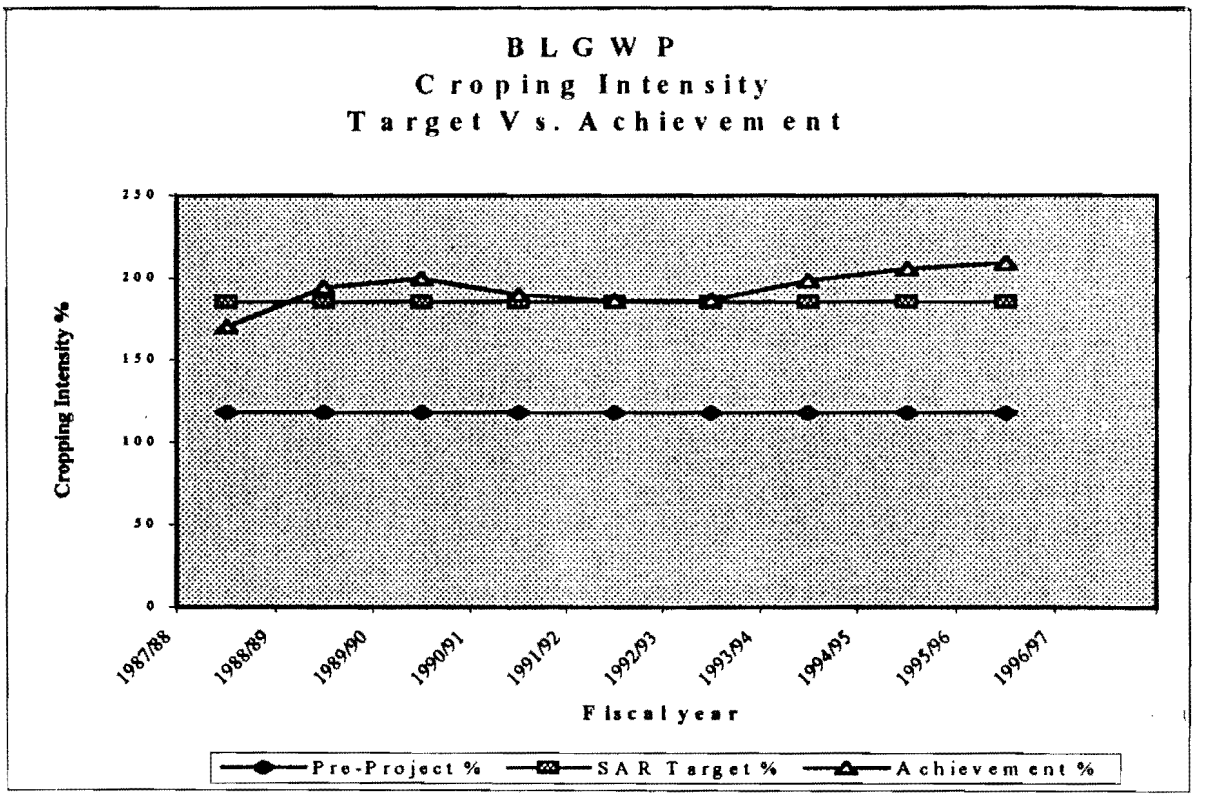
Year 1. a. Subsidy on Demand Charge is discontinued.
b. Project's Operator is pulled out.

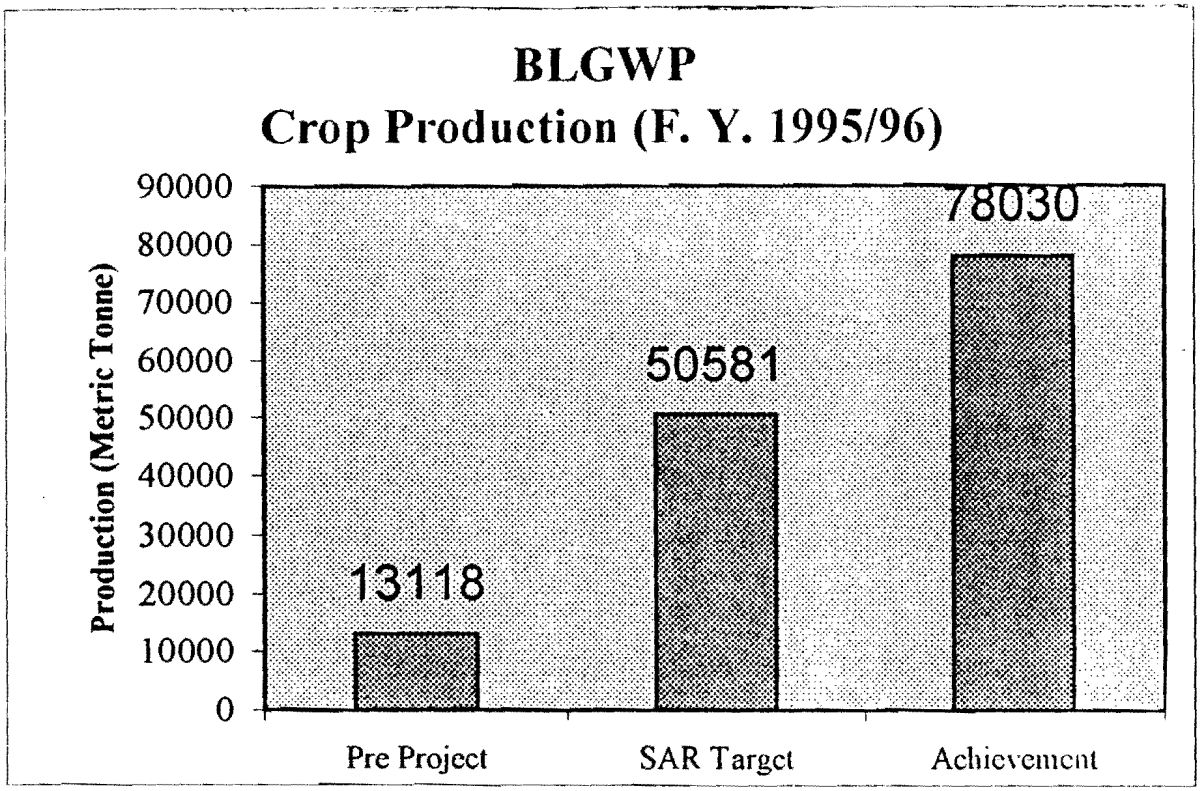
Year 2. a. Project stops paying for maintenance cost.


BLGWP
Average Pumping Hours Regression
Pumping Hours of Tubewells
1400
1200
1000
800
600
400
200
0
1987/88
1988/89
1989/90
1990/91
1991/92
1992/93
1993/94
1994/95
1995/96
1996/97
Fiscal Year
Manpakadi Area Hrs.
Bhalwari Area Hrs.


BLGWP
Water Charge Vs. Power Cost
Water Charge/Electricity Bills (Nrs.)
5,000,000
4,500,000
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
1987/88
1988/89
1989/90
1990/91
1991/92
1992/93
1993/94
Fiscal Year
Receivable Water Charge NRs.
Total Collected NRs.
Electricity Bill paid by Project NRs


BLGWP
WUG's Income Vs. Expenditure
Income/Expenditure Nrs.
3500000
3000000
2500000
2000000
1500000
1000000
500000
0
1987/88
1988/89
1989/90
1990/91
1992/93
1992/93
1993/94
1994/95
1995/96
1996/97
Fiscal Year
Income NRs.
Expenditure NRs.


B L G W P
C r o p i n g I n t e n s i t y
T a r g e t V s . A c h i e v e m e n t
Cropping Intensity %
250
200
150
100
50
0
1987/88
1988/89
1989/90
1990/91
1991/92
1992/93
1993/94
1994/95
1995/96
1996/97
Fiscal year
Pre-Project %
SAR Target %
Achievement %


BLGWP
Crop Production (F. Y. 1995/96)
Production (Metric Tonne)
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
13118
50581
78030
Pre Project
SAR Target
Achievement

M&E Systems for Evaluating Management Transfer1

EVALUATING PROCESS AND PERFORMANCE

Management transfer has been widely accepted as a means of improving irrigated agricultural performance in Nepal. The Department of Irrigation through various programs and projects is fully engaged in carrying out this policy of management transfer. It is expected that the end results will be increased agricultural productivity and a decrease in government expenditures on operation and maintenance.

At this point in time, much time and effort are needed to complete management transfer. Yet there is sufficient experience to date, which can be reviewed. Two basic questions arise:

1. Is management transfer the right thing to do?
2. Are we doing management transfer right?

The first question relates to the policy of management transfer. Is the policy of transferring management really leading to desired benefits? If the expected and desired impacts are realized, then no changes in policy directions are required.

The second question relates to the process of management transfer. In Nepal, the management transfer process is young, and several approaches exist. Which of these leads to successful management transfer? Relating the various processes to impacts should help us to better understand which process leads to success.

How are the answers to these questions obtained? Present data collection and monitoring activities do exist. Within the HMG/N there are several monitoring systems. The question posed here is:

Do existing M&E systems provide information to answer the above questions?

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1 This paper is based on a research study conducted earlier by Mr. I. Neupane, IIMI Consultant, Nepal

MONITORING AND EVALUATION

When making an intervention such as management in irrigation, a change of events is visualized. A greatly simplified example follows: Resources are provided for rehabilitation and modernization. Simultaneously, water users are organized and trained to manage irrigation. Local and responsive local management combined with appropriate infrastructure is to result in better water delivery to farmers. Improved water delivery induces more investment in other agricultural inputs leading to increased crop production, or increased value of production from higher value crops. This in turn leads to increased financial benefits to farmers. Farmers invest in local management to maintain the irrigation system in order to maintain increased returns. From a farmer point of view, more income is realized. From a national perspective, Nepal receives better returns to its land and water resources, and scarce resources can be diverted from operation and maintenance to other sectors.

The inputs into the process are financial resources, the rehabilitated canals, the new areas open to irrigation, the training to water users. The outcomes and impacts are increase management capacity, better water delivery, better maintenance, non-deterioration of infrastructure, increased productivity and value of production, and a decrease in government expenditures on irrigation management.

All of these inputs, outcomes, and impacts could potentially be monitored. If results in the chain are not happening as foreseen, adjustments could be made. At this stage in management transfer, we are experimenting. We hypothesize that a certain combination of inputs, training, developing a certain type of WUA, turning over after rehabilitation, and other interventions will lead to the impacts desired. Until we complete the research, and relate these processes to impact, the research is not complete, and recommendations to repeat at other systems cannot be made on firm ground. Thus, the importance of M&E is combined with other studies during implementation.

M&E systems could be present at several levels. In an irrigation system, details of implementation could be monitored and evaluated. At district, regional, and central levels, key information could be gathered and evaluated, with less detail but of more irrigation systems at each higher level. At the central government level, such as the planning commission, certain key implementation variables could be monitored to allow for better decisions. A pyramid of information can be envisaged, with more details kept at the field level, and less detailed information, but information from more systems, kept at higher levels.

RESENT M&E SYSTEMS

What kinds of M&E systems exist in Nepal that are relevant for evaluating process and erformance of management transfer? A joint IIMI/RTDB study was carried out in larch and April of 1997 and results are summarized in the table below.

Key Information Monitored by Different Agencies/Projects

Indicators	NPC	MOA	DOI			ADB/N[1]	BLGWP	MLIP	SISP[2]
			M&E	MIS	IMTP				
1. Climate and River Discharge							✓	✓	
2. O&M Budget Monitoring	✓		✓				✓	✓	
3. Developed Irrigation Area	✓	✓	✓	*	✓	✓	✓	✓	
4. Canal Discharge Monitoring			*		✓		✓	✓	
5. Institutional Information									
- WUA's status			✓		✓		✓	✓	
- WUA's membership					✓		✓	✓	
- Water cess collection			✓		✓		✓	✓	
6. Agriculture Performance									
- Cropped area & intensity			*		✓		✓	✓	
- Crop yields			*		✓		✓	✓	
- Crop returns (income)			*		✓		✓	✓	

Regularly Monitored information.

Occasionally monitored but often not available.

ADB/N information all limited to no. of systems (tube wells + surface irrigation) developed each year by district. They also include partial information on irrigated area.

SISP virtually has no performance monitoring system at the center. Possibly there might be some information at the district and regional offices.

e MIS Unit of DOI was designed and set up to work fully for maintaining all the formation required for the management, including regular monitoring of system rformance. Unfortunately, its activities are limited just in keeping fragmentary records irrigation projects, hence, not serving the purpose of performance monitoring.

Since last year, IMTP has started monitoring of irrigation projects. The monitoring system uses limited crucial indicators covering mainly the operational and performance parts. The summary table indicates that the data collected and used by IMTP for monitoring are quite adequate and reliable. But there is still need to keep on refining the data collection, handling and management methods for the M&E system to become sustainable and efficient.

What about quality of data? Considering the spectrum of monitoring information from monetary inputs to impacts, it is generally easier to measure inputs. It is easier to track investments in irrigation development, than net benefits to farmers. In general, the quality of information follows the same trend with better quality data on irrigation investments, and decreasing quality of information on production related data.

Where is the best information? The best information is kept at the project level. Particular projects with active donor involvement keep more complete records and have better quality data. Bhairahawa Lumbini Groundwater Project, Sunsari Morang, and Marchwar Lift have a wealth of information. Even at Kankai, which is entirely DOI funded, data is available, although not as complete or as well organized as in the donor supported projects. At higher levels, within SMB or MISU, both quality and quantity of information are insufficient, and campaigns to collect information are sporadic.

Where are the strengths? The strength to build on is the fact that there is much data being collected. These are available at project sites, and through many specialized commissioned studies. Much data exists. There is also a desire to get this information at various levels, and recognition of weaknesses by DOI officials.

Where are the gaps? At least three main gaps can be identified. The first is the lack of data related to outputs. The second is a poor information flow from field to higher levels, making comparative analysis for policy decisions difficult. The third is a total lack of information on how the water resource is used due to unavailability of information on water discharge.

Output Data. Let us focus here on productivity, area served, cropping intensity and overall production. At the Project level, time series data can readily be obtained in a few cases. While the M&E section of SMB has made occasional efforts, several gaps exist both in time series and from several irrigation systems. For the National Planning Commission, area brought under irrigation is a key focus. But, the actual area irrigated season by season, or production does not form a main part of its monitoring system. Given this status, it is difficult to answer the first question mentioned in the beginning.

Information Flow. For MISU and the SMB's M&E section to receive information, they have to actively pursue for the information, rather than to rely on a regular flow of

information from the field. This makes it extremely difficult to maintain a time series of information. Evidently there is no great motivation for sending the data, nor can serious actions be taken if the data is not provided.

Water Flow Information. Where water is plentiful, information on water flows may not be critical. But, especially for the dry season, water is in short supply to meet demands. Without water discharge information, effectiveness of water distribution of water cannot be established, a water balance cannot be generated to know how water resources are being used, and finally, productivity of water cannot be determined.

Can existing M&E Systems be used to evaluate process and impact? The answer at present is clearly no. Adequate information provided by M&E systems is not readily available. Certainly, M&E systems could be upgraded to help provide the answers.

How to Proceed

To strengthen present M&E systems, some recommendations can be made:

A demand for output and impact information needs to come from key decision-makers. When there is little demand for this type of information, there is little motivation to maintain a system to keep it. Presently, key decision makers focus on provision of inputs and expenditures of budget. More focus is required on the returns from those inputs.

Encourage information flows from field level to central level, and feedback from central level to fields. Collection and reporting of information, as well as development and dissemination of reports from the center can become part of the regular program of the concerned units to ensure that it gets done.

Assist local management organizations to develop their own M&E systems. In transferred systems, capacity for M&E through record keeping should be built up. As part of transfer programs, users' associations should be required to track key variables through their record keeping and submit reports. This will build their capacity to monitor performance of their system, and will become a part of DOI's monitoring efforts.

Streamline reporting requirements. The art of M&E lies in identifying the minimum required information. The usual practice is to ask for too much information, creating an unnecessary burden on all involved. The approach suggested here is to start with very little information, then add more information when it becomes evident that they are required. For outputs, it is recommended that MISU and SMB's M&E focus on O&M budget expenditures by government and farmers, area irrigated, yields of major crops, and inflow into the irrigated area.

Supplement Monitoring Information with Special Research Studies. To answer the second question posed in this paper, it will be necessary to develop special studies to determine the links between process and impacts. Monitoring information should provide clues, then research hypotheses be developed and tested to find answers.