The Turnover of Public Tubewells in Uttar Pradesh
A Case Study of a Successful Cooperative Society

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INTRODUCTION

UTTAR PRADESH (UP) is the largest state (province) of India in terms of population and ultimate irrigation potential and fourth largest in terms of geographical area. Its population of 139 million represent 16.5 percent of the country's population and its 25.6 million ha of ultimate irrigation potential constitute 22.6 percent of the country's ultimate irrigation potential. The the state with 294,411 square kilometers [km^2] is 9 percent of the country's geographical area. In the state 75 percent of [main] workers are engaged in agriculture and the per capital availability of land is 0.23 ha. The average size of the operational holdings in the state comes to 0.93 ha compared to the national average of 1.68 ha (GOUP, 1991a). The net irrigated area in the state is 10.5 million ha, of which 34 percent is irrigated by surface sources, and 66 percent through ground water resources (GOUP, 1992). Of the groundwater irrigated area, 54 percent is irrigated by private tubewells, 7 percent by government-owned state tubewells and 4 percent by wells (GOUP, 1991 b). Presently there are 28,626 state tubewells in U.P., each having a command area of about 100 ha. However the average irrigated area per tubewell is quite low, being 15 ha for kharif (monsoon crop) and 32 ha for rabi (winter crop).

Government Policy

In February 1992, the Government of U.P. after due consideration decided to start a pilot project under which initially 100 state tubewells of the Irrigation Department (ID) were to be handed over to the command farmers after they had constituted a Nalkoop Panchayat Samiti (Tubewell Cooperative Society) for operation and maintenance on lease for five years. The conditions laid down by the state government for the turnover of the tubewells are as follows:

i. The water distribution system of the tubewell is fully constructed.
ii. The discharge of the tubewell is not less than 25,000 gallons per hour.
iii. The tubewell operator will be appointed and paid by the society and he will be accountable to the society for his work. In case the operator appointed by the ID is already working in the tubewell turned over to the society, his continuance in that job will be at the discretion of the society.
iv. The society will bear the cost of electrical charges at the rate applicable to private farmers and the balance due to the electricity board will be borne by the ID as a subsidy to the society.
v. The government will pay to the society at the rate of [$]76 per tubewell in the beginning as its contribution so that the society may not face any difficulty in carrying out minor repairs.
vi The turnover scheme will be executed by the ID but the early proceedings of the lawful constitution of the society and other lawful responsibilities will be borne by the officers of the cooperative department at the district and block levels[2].
vii. The society will pay to the ID a lease rent of [$]1.5 per year during the lease period. The turnover of tubewells in U. P. started from Kharif, 1992 and till May 1994, 45 state tubewells had been turned over to the farmers.

MAMPUR TUBEWELL COOPERATIVE SOCIETY (MTCS)

The paper describes the establishment and the working of MTCS. In particular the paper examines the changes associated with irrigation management transfer (IMT) such as water use efficiency, cropping intensity and productivity, cost of water to the beneficiaries, control of the water to users in IMT and the gains or losses to the government.

The Mampur Tubewell

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[2] The block is the unit of development administration below the district and presently on an average consists of about 125 villages and 155,000 population.

The 33 kg tubewell in Sultanpur district is located in Mampur Village, which is about 28 km from Sultanpur towards Jaunpur. It was constructed in 1974-75 as a state tubewell and during 1889 when the Lambhua cluster was being formed under the Indo Dutch Tubewell Project (IDTP) this tubewell was also included in the cluster and it was decided that this tubewell will be treated as a "dedicated tubewell". This meant that the tubewell would be provided with a power supply on a dedicated feeder line and minor repairs would be made in the existing system of the tubewell.
According to the official records the tubewell has the following features :

i. The gross command area (GCA) is 96 ha and the cultural command area (CCA) is 84 ha.
ii. The pump installed is with 20 horse power.
iii. The discharge of the tubewell is 41,000 gallons per hour.
iv. The number of farmers in the command is 150. Of these 108 have less than 0.5 ha of land, 35 have 0.5-1 ha of land and only 7 farmers have above 1 ha of land. This means that there is a preponderance of marginal and near landless farmers in the command.

The Politics of Turnover and Confrontation

The main reason behind the turnover of the tubewell to MTCS was the farmers' extreme dissatisfaction with the arbitrary ways the tubewell operator distributed water and levied water charges. The socio-economist with the Monitoring and Appraisal Cell (MAC) of the IDTWP played the role of a catalyst by accident. The crucial assurance and the encouragement for the formation of MTCS came from the Executive Engineer (EE) at Sultanpur. He told the farmers that if they could muster the support of more than 50 percent of the tubewell command farmers he would help them in the takeover of the tubewell. However, the most important factor was the interest and the stakes of pro take over village leaders, particularly that of Tewari's (present secretary of the society). Tewari's younger brother was a strong contender for the post of the tubewell operator in 1989 but Singh ultimately got selected for the post. According to Singh, Tewari could never forgive him for this and, therefore, did not leave any stone unturned in letting the tubewell turned over to a society whose backbone was Tewari.

Until the turnover of the Mampur tubewell, relations between the coordinator farmer participation unit (FPU) and the EE were satisfactory. However a big confrontation between the two started soon after the turnover of the Mampur tubewell and this has created lots of problems for other tubewells in the district. This has been discussed at length in a report by the author (Pant, 1993.).

The Socioeconomic Bases of Power

The bases of power in India in general and rural India in particular consist of religious groupings, social rankings, numerical strength and economic means. Social rankings are largely determined by the caste compositions. The essence of caste is the arrangement of hereditary groups in a hierarchy[3]. The popular impression of the hierarchy is a clear-cut one, derived from the idea of Varna, with Brahmins (priests) at the top and Harijans (scheduled castes) at the bottom. But as a matter of fact only the two opposite ends of hierarchy are relatively fixed, in between and specially in the middle regions, there is considerable room for debate regarding mutual position (Srinivas, 1969). Numerical strength has acquired a very important role after independence in 1947 and more particularly with the advent of the democratic process. Economic strength in the rural setting is largely determined by the land one owns. Since MTCS consists of those who have land in the command of the tubewell, it would be most appropriate to make an examination of these individuals in terms of their socioeconomic status which has been attempted in Table 1.

The Table shows that mostly the command farmers consist of Hindus and there are only 2 percent Muslims. Among the Hindus, both in terms of numerical strength and share of land in the tubewell command, Thakurs occupy the top position. In terms of per capita land and social ranking they occupy the second position after the Brahmins. This gives Thakurs a position of prominence in the tubewell command and in the village. Scheduled castes although coming second in terms of numerical strength have very little land in the tubewell command or outside. Socially also they rank lowest. The only advantage the scheduled castes seem to have is their numerical strength in the tubewell command. Brahmins come in the third place in terms of numerical strength but they own over one fourth of the land in the tubewell command and have the largest per capita land. Their economic pre-eminence is reinforced by the fact that they occupy the top position in the social hierarchy.

[3] According to Srinivas the features of the caste prevailing through the past centuries may be described under nine heads: hierachy; endogamy and hypergamy; occupational association; restriction on food, drink and smoking ; distinction in custom, dress and speech; pollution, rital and other privileges and disabilities; caste organization and caste mobility.

It would be interesting to see the relevance of the socioeconomic status in obtaining power in the management of the tubewell. Hence in Table 2 the socioeconomic affiliations of members and office holders of the tubewell society have been presented. An important point which clearly emerges from the Table is that the two most powerful posts of the president and the secretary are held by Brahmins. Of the three less important posts, two (vice president and treasurer) are held by the Thakurs and the remaining one that of the auditor is held by a backward. In fact Brahmins do not possess many of the characteristics which go with power. Except in respect of per capita land and social status, their rank is lower in other respects, such as numerical strength, land owned in the tubewell command, shares held in the society and representation in the board of directors. Therefore, it goes to the credit of Brahmins that they occupy the two top posts in the tubewell cooperative society. [The main reason is that they, nay the secretary has carried all caste categories with him.] The situation is the opposite in the case of Thakurs who have equal,if not more prerequisites of power and influence but are not united. Therefore divisions among Thakurs and] the acceptability of Brahmins, particularly of the president and the secretary by other caste members is the most decisive factor in obtaining the two most important posts in the society. The other point which is very important from the point of view of equity is that the scheduled castes who have very low positions socially and economically and who generally get neglected by the influential groups in resource allocation get a fair amount of representation in the board of directors and thereby in the overall management of the tubewell. This is very important from the point of view of disadvantaged groups and gives credit to the tubewell cooperative society.

WORKING OF MTCS

The working of the tubewell society is examined in two parts. Part one examines the working of MTCS in terms of its legitimacy and institution building. This includes observance of rules and regulations and maintenance and distribution of water. Part two examines the impact of IMT in terms of various gains or losses emanating as a consequence of transfer of the tubewell from the government agency to a farmers cooperative society.

Fulfillment of Legal Requirements

As regard the question of fulfillment of legal requirements, it is found that the society has observed most such requirements. Its general body and the board of directors/management committee have been meeting regularly as required by the bylaws. The general body consists of 150 farmers having land in the tubewell command, although voting rights have been conferred to only 58 share-holding farmers. During 1992-93 the general body met thrice with an average attendance of 41. During 1993-94 also, the general body met thrice with an average attendance of 55. As per the bylaws the general body must meet at least twice in a year, one after each of the two cropping seasons - kharif and rabi. In the case of management committee/board of directors, although bylaws do not specify any number, it is envisaged that it should meet as often as required. In 1992-93, there were 4 meetings with an average attendance of 10 members out of the total 15. In 1993-94, there were 13 meetings with an average attendance of 8.

One relevant question concerning the working of the tubewell is the mode and extent of control of the user farmers over the tubewell. Here this control can be exercised in the general body which, if farmers want can be called at any time. However, as pointed out earlier, while there are 150 user farmers, the voting rights are vested with only 58 shareholders. Yet it may go to the credit of the MTCS that all its decisions todate (May 1994) have been taken on the basis of consensus among the user farmers and the general body meetings which are attended by non member water users in large numbers. In none of the meetings held so far has a division of vote been required.

As regards the question of the limited number of membership (58 out of 150), the secretary clarifies, that it is so on account of confusion concerning the membership fee. The management committee felt that the membership fee amounted to [$]1.7 and that is what it demanded. But during a recent training on book keeping, the secretary came to know that the amount required was only 30 cents. He mentions that since most of the farmers are very poor with tiny pieces of land, they could not afford to pay [$]1.7 but since the actual membership fee is only 30 cents most of the farmers would now come forward for membership.

Water Distribution

There are certain factors which affect the water distribution in this tubewell. Two positive factors are that the tubewell has a very good discharge of water (41,000 gallons per hour) and the power supply is available 18 hours per day compared to about 8-10 hours per day in the region. A negative factor in case of the tubewell is that the water distribution system of the tubewell is partially modernized. One half of the command of the tubewell (Loop 'A') is served by open channels which were constructed some twenty years earlier. The other half (Loop 'B') is served by an

underground PVC pipe system which is grossly inadequate. This means that although a good amount of water is available, it cannot be utilized fully in an economic way. As a result, a good number of fields which come under the command of the tubewell are not served by it and many of them buy water from the private diesel-based pumpsets.

Considering the fact that two different kinds of distribution systems exist, the tubewell society has devised two different methods of water distribution in the two loops. In loop 'B,' which has an underground PVC pipe line, days have been fixed for opening of the outlets and the distribution of water within each outlet is supervised by an outlet president. In respect of loop 'A', where open brick channels exist, the irrigation starts from the field which is closest to an open channel and goes on from one end to another, field to field.

All those who have land in the command are eligible to receive water from the tubewell irrespective of the fact whether they are members of the society or not. In case there is no demand for water from the command farmers, water can be given to the fields which are outside the command. The water is provided to them on the same terms and conditions that apply to command farmers. During rabi 1993-94,four farmers'fields outside the command were provided with water.

Operation and Maintenance

The routine operation of the tubewell is done by the secretary as there is no other operator for the tubewell. As regards the upkeep of the distribution system, it has bee decided that each beneficiary will clean and maintain the field channel irrigating his field. In addition, in the case of loop 'B', the outlet presidents are also responsible for the safety and upkeep of outlets and other water distribution micro structures. As regards the safety of the tubewell, apart from individual farmers, it is the secretary who shoulders the main responsibility of the security of the tubewell. He has a distinct advantage over others in this respect as he can keep a watch over the pump because it can be viewed very clearly from his house.

The repairs whether minor or major are the responsibility of the tubewell society. In case of minor repairs the MTCS itself can get these done. In case of major repairs the MTCS can get it done by the ID but the MTCS will be required to pay the repairs charges to the ID immediately after the repairs. To facilitate minor repairs in the initial stage, the MTCS was given a nucleus fund of [$] 76 on November 14, 1992.

During November 1993 when the rabi water requirement was at its peak, the tubewell started malfunctioning and it required immediate repairs. The secretary went to the EE, Sultanpur, who told the secretary that the ID did not have the material but he helped the secretary to obtain the material from the company which supplies to the government at the most reasonable rates. The repair work was done immediately costing [$]]107 and, as a result, the rabi crop was not affected at all.

Performance Result

In this part, the changes associated with IMT of the tubewell such as water and electricity use efficiency, cost of water to beneficiaries, financial viability, crop productivity, cropping intensity, gender impacts, etc., are covered. In Table 3 some of the indicators of comparison between pre and post IMT have been mentioned and it would be appropriate to examine these in some detail. The Mampur tubewell was taken under the IDTP in 1989 and started irrigation from rabi 1990-91 after the renovation. During both the cropping seasons, the net irrigated area increased after the turnover of the tubewell except during kharif 1992-93. This is understandable because during karif the MTCS ran the tubewell only for 11 days during September 20-30 after the takeover on 19 September. Similarly, the gross irrigated area or watering area also shows an increase after the takeover. The same is the case of average watering, which after IMT veers around 3 waterings per crop, while before IMT it was around 2 waterings. However when the running hours of the tubewell are examined the average time per ha watering has gone down after the IMT. This means that the crops get more water but less electricity after the IMT as the running hours of the tubewell have gone down. This clearly means that after the takeover the water and electricity use efficiencies of the tubewell have increased considerably.

In terms of water charges collection, the data show mixed results. In the case of kharif the average collection from water charges before IMT was [$] 229 which is higher than the collection after IMT even if the figure for 1992-93 is disregarded. In the case of rabi, the average collection before IMT was [$]382,while after IMT it is [$]433. However, the average per year revenue earnings from the tubewell are higher after IMT compared to before IMT and come to [$]611 before and [$] 620 after. It should be noted, that while calculating the figures after IMT, the kharif 1991-92 figures have been disregarded as these relate to a short period of eleven days.

The crucial test is the cost of irrigation water to farmers before and after the IMT. In this respect the performance of MTCS is impressive. In terms of per watering charges as well as overall irrigation charges the MTCS has done very well. The average water charges per ha per watering during kharif before IMT came to [$]2.7, while after IMT they came down to [$]1.2. Similarly for rabi the charges before IMT came to [$]3.7 while after IMT they scale down to [$]

2.6. In case of water charges per net irrigated ha, the price a farmer was paying before IMT during kharif was [$]6.2 and after IMT [$]3.2. Similarly, the water charges per net ha during rabi before IMT were [$]9.2 while the same after IMT were [$] 7.3. All this clearly shows that the farmer has to pay less after IMT, while the quantum of water for the crop received by him is more.

The preceding examination clearly demonstrates that there is a definite improvement in irrigation management after IMT. The important question is how this improvement has affected the cropping pattern and the crop productivity. Table 4, therefore, has been prepared with this view in mind. A glance at the Table clearly shows that the cropping intensity has increased from 143 percent before IMT to 162 percent in the post IMT period. The Table also shows that the crops like wheat which require a timely and adequate supply of water occupy a higher proportion of cropped land now in comparison to the pre IMT period. This is a clear indication that with better water management there is a crop diversification from traditional to modern cropping patterns. Although the data regarding productivity are not available for all the crops, the available data for wheat, baddy and sugarcane show that the productivity of these crops has increased by about 10 percent which again gives credit to good management of tubewell by the MTCS.

Financial Viability

Another issue which is of vital importance in respect of IMT is the question of gains and losses to the government and the financial viability of the local management in terms of its long-term sustainability. To examine the first part of the question, it would be most appropriate to calculate the average expenditure and income in respect of Mampur (33) tubewell before and after the IMT. The same has been attempted in Table 5. The Table shows that the tubewell was incurring an annual loss of [$] 876.08 before IMT, while it does not incur any loss per se to the government after the IMT. The government gives subsidy in power tariff at the rate of 75 percent to the MTCS as it does to all individual farmers. Even if whatever expenditure ID incurs on this count is regarded as its loss, the total loss to the ID comes down to [$]656.40 which is [$] 219.68 less than the pre IMT annual losses which the tubewell was incurring.

The other aspect of the financial viability and which relates to the sustainability of a local management institution is also very important. [In Table 6] the income and the expenditure of MTCC till kharif 1993 has been recorded. Unfortunately the data are not available till March 1994 (rabi), when the society's performance is still better. Despite this lacuna the following statement shows that the MTCS is in a healthy financial state.

Income and Expenditure of MTCS (20 Sept. 1992 to 20 Sept. 1993) (in US $).

Income		Expenditure	
- Share Capital @ $ 0.6 per person for 57 members and $ 1.5 for one member	36.06	Electricity charges	186.36
- Membership fee @ 15 Cents per person	8.79	- Tubewell and fish pond repairs	133.33
- Nucleus fund given by ID	75.76	- Lease rent payment to ID	3 03
- Collection from Irrigation Charges 414.82		- Stationery etc.	16.59
		- Deposits in the bank	177.87
		- Cash in hand	18.25
Total	535.43	-	535.43

During this period the tubewell ran for a total of 2,764 hours of which 1,420 hours were during two kharif seasons and 1232 during the 1992-93 rabi season. This gives it a total income of [$] 604 [$] 215 for kharif and [$] 389 for rabi. The rate for kharif is 15 cents per hour while for rabi it is 30 cents per hour. At the end of kharif (September 1993), the water charges collection was 69 percent of the due which is a very good collection. Even without the last rabi collection the MTCS was having a balance of [$] 196. Given the fact that the tubewell ran for 1,515 hours during rabi 1993-94, an additional amount of [$]460 will be added to its income which speaks volumes about the financial viability of the tubewell. In fact, in December 1993 the state government carried out a detailed evaluation of the 31 tubewells which had been handed over to the farmers. In this evaluation, the MTCS got the top position in terms of all indicators used in the evaluation (GOUP, 1993). Our examination presentation thus far also shows the MTCS in a positive light in terms of indicators discussed earlier. There are two other aspects which need to be touched upon to have a more decisive judgement regarding the performance of MTCS.

Access by Poor to Water

The command of Mampur tubewell consists of 72 percent farmers below marginal (upto 0.5 ha) and 95 percent of all are marginal farmers. Neither the author nor the evaluator of the U.P. Government report referred in earlier found any complaint from any of the water users. Rather, all farmers were found to be highly satisfied. The contrast was more illuminating in comparison to the pre-IMT stage when the government-appointed operator ran the tubewell in a callous and arbitrary way and all sections of the farmers were critical of his ways.

In the tubewell command, among those whose fields are most difficult to irrigate, the scheduled castes are most prominent. They constitute 22 percent of command farmers. An overwhelming majority of scheduled castes huddle together with very tiny land pieces averaging at 0.15 ha. Yet none of them made any complaint against the new management of the tubewell. On the contrary, they were highly satisfied with the MTCS management. During June 1994, the MTCS plans to extend underground pipes and outlets to their fields at an estimated cost of [$] 90.

Gender Impact

The impact of IMT is most conspicuously visible in case of scheduled caste woman. An important feature of the scheduled caste households is that in majority of cases the menfolk work in far off industrial and metropotitian cities from where they come only during important festivals. The wives who remain in the village do the cultivation. In the pre IMT stage, most of them were not getting water from the tubewell, hence they were growing rain fed crops. However after the IMT they have started getting some water and have started growing a wheat crop in their tiny pieces of land. In fact the president of one of the outlet committees is Naiki, a scheduled caste women of about 36 years of age. She is also a member of the land management committee. Although as per the rules, a woman is generally coopted in the committee, the same is not true in the case of Naiki. She was elected in an open meeting of *gaon sabha* (village assembly) for that post. Naiki owns about 0.25 ha of land and supervises water distribution to 25 farmers who have land in the outlet whose president she is. Even the highest caste Brahmins approach the lowest caste Naiki when they need water.

CONDITIONS OF SUCCESS

An important element of IMT is what contributes to its success. This is important from the point of view of long-term sustainability, replicability and extension of the model in other areas and places. Keeping this ground reality in mind, an attempt has been made in the following section of the paper to identify and explain factors which contribute to the success of the MTCS.

The Quality of Local Leadership

The local leadership of the MTCS tries to take all sections of water users, representing basically different caste affiliations with them. The secretary is a cool and persuasive person who rises above caste and factional affiliations in matters of management of the tubewell society. As a result, there is not even a murmur of protest against IMT of the tubewell and the way it is managed. It goes to the leadership qualities of the secretary that he has kept a large section of the hostile Thakur castes within bounds. Despite the rivalry the Thakurs have with Brahmins, there is no obvious confrontatation between them in matters of tubewell management. Similarly, almost the whole scheduled caste population is satisfied with the working of the tubewell. Thus, taking various factional and caste groupings with him has been a hallmark of the quality of the management leaders, particularly of the secretary. According to the EE the deep attachment and affinity of the secretary with the tubewell on account of close physical proximity of the main tubewell structure and ownership of large land holdings in the tubewell by his family members have greatly contrbuted to the success of the MTCS.

Adequate and Predictable Water Supply

The two positive factors in the case of the Mampur tubewell are its good discharge and a longer duration of availability of electricity. With the use of HYV seeds and chemical fertilizers, the adequate and timely supply of water is very important for the growth of the plants. In the case of the Mampur tubewell both these conditions are met.

Greater Interaction with Support Agency Staff

A high degree of interaction and more frequent coutacts between the officers of MAC and FPU and the farmers is another factor responsible for the success of MTCS. MAC and FPU officers have been holding several meetings with the farmers, both with respect to their present strategy and future plan. It has been found that the initial encouragement and guidence from senior officers and the close involvement of the field staff to educate, aid and advise the farmers is a sine qua non if such water cooperatives are to succeed (Pant, 1986).

Rewards on Success

The successful working of the MTCS has been duly recognised by the Dutch collaborators and the society has been rewarded with funds for installation of 10 Mark II hand pumps for drinking purpose. This gives encouragement to the society to do their work well. Some incentives must be built in the programme to induce the farmers to take over the functions of IMT in a responsible manner.

Acquisition of Legitimacy

Finally, it is in the acquisition of the legitimacy of its authority not only in the eyes of user farmers and other farmers of neighbouring villages but also in the eyes of the officials of the government and donor agencies, etc., that the success of the MTCS lies. However, this position acquired by MTCS has not come overnight but is the result of a continuous process of stabilisation and institutionalisation of MTCS. The initial success in the management of irrigation functions of operation and maintenance, distribution of water and resolution of conflicts gave a boost to the society in broadening its functions and taking up other allied activities.

Conclusion

Presently, there are 2,8626 state-owned tubewells in U.P. and the average irrigation from these tubewells is much below their capacity. The average irrigation by a state tubewell is 15 ha (against the envisaged 35 ha) during kharif and 32 ha (against the envisaged 57 ha). Even a tubewell like the 33 kg which has a very good discharge rate, with near ideal electric supply and which most recently renovated was incurring an annual loss of [$] 876.08 to the state exchequer. Compared to it in the case of the rest of the state tubewell would be worse. For calculation's sake if this loss is taken as an average loss, the annual loss to the state exchequer on account 2,8626 tubewells is to the extent of [$] 25 million. Given the facts that the state government has come out with a positive policy statement in respect of IMT, has long ago passed an order in favour of IMT of state tubewells, and, has formulated model bylaws for the tubewell cooperatives, it makes lots of sense to pursue IMT with full vigour in the state. The attainment of the goal of IMT is a formidable task and the problems are more accentuated on account of near absense of successful local rural cooperatives in U.P. However IMT is essential if the state is to be saved from near bankruptcy.

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Figure 1. 33 KG, Mampur District, Sultanpur.

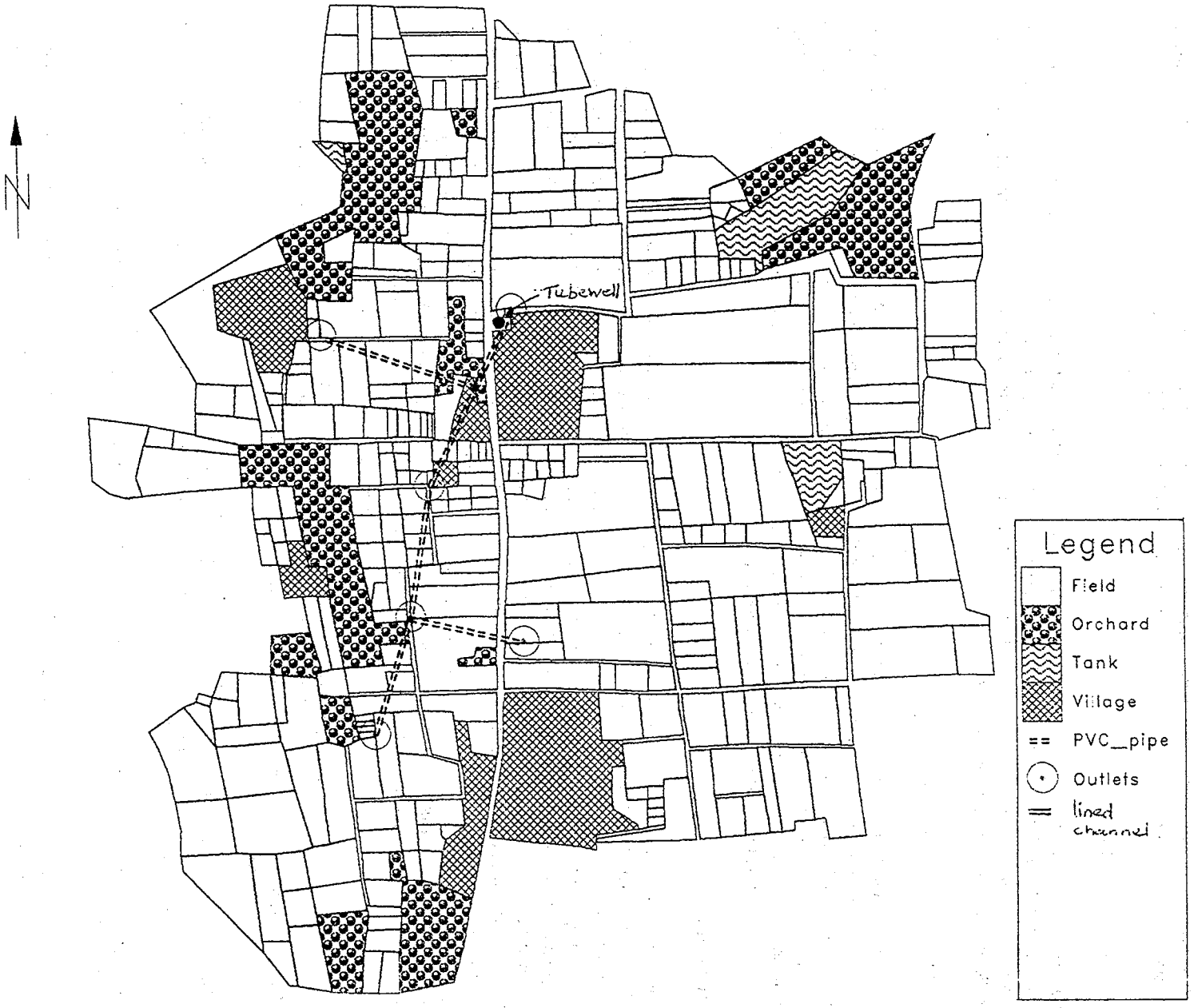

Table 1. Socioeconomic background of the tubewell command farmers (land in ha).

Caste	No. of Farmers	Land in TW	Per capital and in TW	Total land owned	Per capital total land owned
Thakur (H)	62	37.1	0.60	75.1	1.21
(Rajput)	(41.3)	(51.5)		(53.5)	
Scheduled (L)	33	5.0	0.15	6.3	0.19
Caste	(22.0)	(6.8)		(4.5)	
Brahmin (H)	26	18.6	0.72	40.6	1.56
	(17.3)	(25.8)		(28.9)	
Ahir/Yadav (B)	16	4.8	0.30	6.5	0.41
	(10.7)	(6.7)		(4.6)	
Other (B)	10	4.4	0.44	7.3	0.73
Backward	(6.7)	(6.1)		(5.2)	
Muslim	3	2.2	0.73	4.6	1.53
	(2.0)	(3.1)		(3.3)	
Total	100.0	100.0		100.0	
N	150	72.1	0.48	140.4	.94

TW = Tubewell, figures in parenthesis indicate percentage.

Table 2. Caste affiliation of different power groups in MTCS (land in ha).

Caste	Land owners in TW Command %	Land owned in TW Command %	Shareholders %	Board of Directors Memebers %	Management Committee command of %	Non-Member owner in the TW %
Thakur (H)	41.3	51.5	29.3	53.3	40.0	48.8
Rajput						
Scheduled (L)	22.0	6.8	10.3	13.3	--	27.2
Caste						
Brahmin (H)	17.3	25.8	24.1	13.3	40.0	13.1
Ahir/Yadav (B)	10.7	6.7	27.7	6.7	--	2.2
Other (B)	6.7	6.1	6.9	6.7	20.0	6.5
Backward						
Muslim	2.0	3.1	1.7	6.7	--	2.2
Total	100.0	100.0	100.0	100.0	100.0	100.0
N	150	72.1	58	15	5	92

H = High caste, B = Backward caste, L = Low caste.

Note : The data used in the two tables have been provided by the MTCS secretary. The land in the command (72 ha) is less than the one given in the official records (84 ha). According to the secretary, official records also include orchard and waste lands in the CCA, hence it gets inflated.

Table 3. Performance of the tubewell before and after IMT (area in ha and currency in US $)

Items	Before IMT			After IMT	
	1990-91	1991-92	1992-93	1992-93	1993-94
A Net irrigated area					
Kharif	--	31	43	14	54
Rabi	32	51	--	56	63
B Gross irrigated area (watering area)					
Kharif	--	72	99	14	162
Rabi	63	144	--	159	176
C Average No. of waterings					
Kharif	--	2.3	2.3	1.0	3.0
Rabi	2.0	2.8	--	2.8	2.8
D Running hours					
Kharif	--	1315	1691	188	1232
Rabi	656	2040	--	1344	1515
E Average time per net ha irrigated					
Kharif	--	42.4	39.3	13.4	22.8
Rabi	20.5	40.1	--	24.0	24.0
F Average time per watering					
Kharif	--	18.3	17.0	13.4	7.6
Rabi	10.4	14.2	--	8.5	8.6
Water charges ($)					
Kharif	--	210	248	28	187
Rabi	182	581	--	407	459
Average water charges per watering					
Kharif ($)	--	2.9	2.5	2.0	1.2
Rabi	2.9	2.8	--	2.6	2.6
Average water charges per net irrigated ha ($)					
Kharif	--	6.8	5.9	2.0	3.4
Rabi	5.7	11.4	--	7.3	7.4

Rupee conversion rate: Rs. 33 = $1

Source: Government of U.P. except net irrigated area during rabi 1992-93, 1993-94 and Kharif 1993-94. These data were calculated ny the author himself in consultation with the secretary, MTCs.

Tabel 4. Cropping Pattern and Productivity before and after IMT

Crop season / Crops	Before IMT Percent area	Productivity (Qtl/ha)	After IMT Percent area	Productivity (Qtl/ha)
KHARIF				
Paddy	24.0	35.0	37.4	38.0
Millets	16.0	NA	13.1	NA
Pigeonpea	11.0	NA	8.3	NA
Sugarcane	5.0	195.0	8.2	200.0
Other crops	2.0	NA	0.2	NA
Fallow	42.0	--	32.8	--
Total	100.0	--	100.0	--
N =	84 ha		84 ha	
RABI				
Wheat	50.0	21.0	54.9	
Pigeonpea	15.0	NA	10.3	
Other pulses	10.0	NA	19.8	
Sugarcane	2.0	195.0	4.0	
Other crops	8.0	NA	6.1	
Fallow	15.0	--	4.9	
Total	100.0	--	100.0	
N =	84	--	84	

Source : MAC for post IMT data and author's discussions with representative farmers for pre IMT data.

Table 5. Expenditure and income of the 33 Kg. (Mampur) Tubewell before and after IMT.

1. BEFORE IMT

I Expenditure Items	No. of tubewells under the staff	Average annual expenditure in 33 kg. (in $)
A Annual repairs provision	NA	212.12
B Staff salary		
- Operator (remuneration + incentives)	1	242.42
- Mechanic	20	30.30
- Junior Engineer (JE)	25	45.45
- Mate of the JE	25	30.30
- Assistant Engineer (AE)	100	18.18
- Peon of the AE	100	7.57
- Surveyer	25	9.09
- Executive Engineer (EE)	400	7.57
- Six Assistants of EE	400	11.36
C Payment to the electricity board @ $ 3.6 per horse power per month for the 20 horse power pump.		872.47
Total		1487.08
II Income Items		
- Average annual income from water charges		611.00
Total losses to the government		865.47

2. AFTER IMT

I Expenditure	
- Payment to the electricity board @ $ 3.6 per horse power per month for the 20 horse power pump.	872.72
II Income Items	
- Receipt from MTCS in lieu of electricity charges @ $ 0.9 per horse power per month	218.18
- Annual lease rent from MTCS	1.50
Total income	219.68

Note: The state government gives 75% subsidy in electricity to the MTCS at the rate applicable to individual farmers.