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Attitudes of the Irrigation Bureaucracy in India to Scientific Water Management Tasks in Irrigated Agriculture: A Case Study from Gujarat State, India

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Introduction

Poor performance of the major irrigation projects in India judged in terms of the gross area irrigated each year as against the visualised gross irrigable area, of the yields per hectare for each of the major crops, and of the current cropping patterns as against the proposed cropping patterns has been mainly traced to woefully inadequate discharge of water management functions, given the physical infrastructure[1]. The latter includes the dam, reservoir, net-work of canals and branches and distributaries up to the government outlet, and the distribution system below the government outlet consisting of field channels and field drains serving each individual farmer's field. The management functions relate to non-physical inputs including the management of the system such as rotation of canals and distributaries depending on the irrigation needs of the farmers, delivery of water at the farm level in accordance with crop-water requirements and at appropriate intervals, and settlement of disputes among the farmers.

The water management functions today are exclusively exercised by one of the two wings of irrigation bureaucracy, namely, the operation and maintenance (O and M) wing, the other wing being construction and design (C and D). The personnel of the O and M wing tend to feel that they are concerned only with the operation of the distribution system to regulate supplies at the government outlet and that they are not responsible for its distribution and use at the farm level. The agricultural staff, on the other hand, feel that their roles are only limited to their respective functions such as the construction of the on-farm development (OFD) works like field channels and field drains to supply water and to remote excess water, extension or input-supplies and not to cover water delivery to the farmers' fields. Thus, the delivery of water at the farm level, the timeliness, reliability and adequacy of which are so critical both to utilisation of irrigation supplies and to crop growth, has been found to be no-man's land[2].

The excessive pre-occupation with physical infrastructure and no concern for non-physical aspects are the outcome of certain attitudes of the irrigation personnel which is the subject matter of study in this paper. The empirical content of this paper is drawn from two irrigation projects in the State of Gujarat, in India, with which the second author is closely associated. The paper is divided into three sections. The first section provides a general background relating to the major irrigation projects in India and the personnel operating them in terms of their responsibilities and functions. The

second section presents the findings of the survey of attitudes of the personnel whereas the final section lists out certain policy conclusions flowing out of the study.

1. The Background

Major irrigation projects in India are those designed to irrigate a net area of 10,000 hectares and more. Their objectives are to provide a protective cover for the crops during the *monsoon* and to provide year-round irrigation supplies for facilitating multiple cropping as well raising high yielding varieties of crops which are generally water and labour intensive.

The operations and maintenance of major irrigation projects are the direct responsibility of the State. The O and M wing of the Irrigation Department is entrusted with this responsibility. This wing is headed by the Chief Engineer who sits at the State Secretariat to assist the Permanent Secretary of Irrigation in monitoring the operations of the irrigation projects and in general policy matters. The field officers who exercise the supervisory and administrative functions at the project level consist of Superintending Engineers, Executive Engineers and Deputy Engineers. Their subordinate personnel include sectional officers, Karkoons and Chowkidars. The organization chart is shown in Figure 1.

The farmers, who are the clientele of the Irrigation Department are brought in the picture through the Canal Advisory Committee comprising their representatives elected to the State Legislative Assembly, and leading irrigators of the area. The Committee advises the local Superintending Engineer, and the Executive Engineer and the Deputy Engineer of the project by going through the complaints of the farmers received in writing or represented through their oral communication with them and by visiting the project area along with the engineers and examining the deficiencies complained against. Though the irrigation department is not likely to reject the committees's recommendations, the effective role of the committee is limited as much depends on the members of the committee and its chairman.

Functions and responsibilities of the field officers and subordinate personnel as presented in Table 1 stem forth more from authority than from any serious concern with efficient use of scarce supplies of water. The recognition of the client's interest which is reflected by his anxiety to have water supplies under conditions of certainty, adequacy and reliability, and the identification of bureaucracy's interest with that of irrigators are also absent.

Since there is no agricultural hand attached to the O and M, there is no opportunity for any input in the preparation of irrigation schedules either at the farm level or at any other higher operational level in regard to crop-water requirements and other agronomical considerations. The only communication which the departmental personnel have with irrigators seems to be relating to receipt of applications for irrigation supplies to their fields and finding out unauthorised irrigation and punishing those who commit irregularities[3].

In order to meet these particular deficiencies as well as to bring about better coordination among the personnel especially those belonging to the irrigation department and

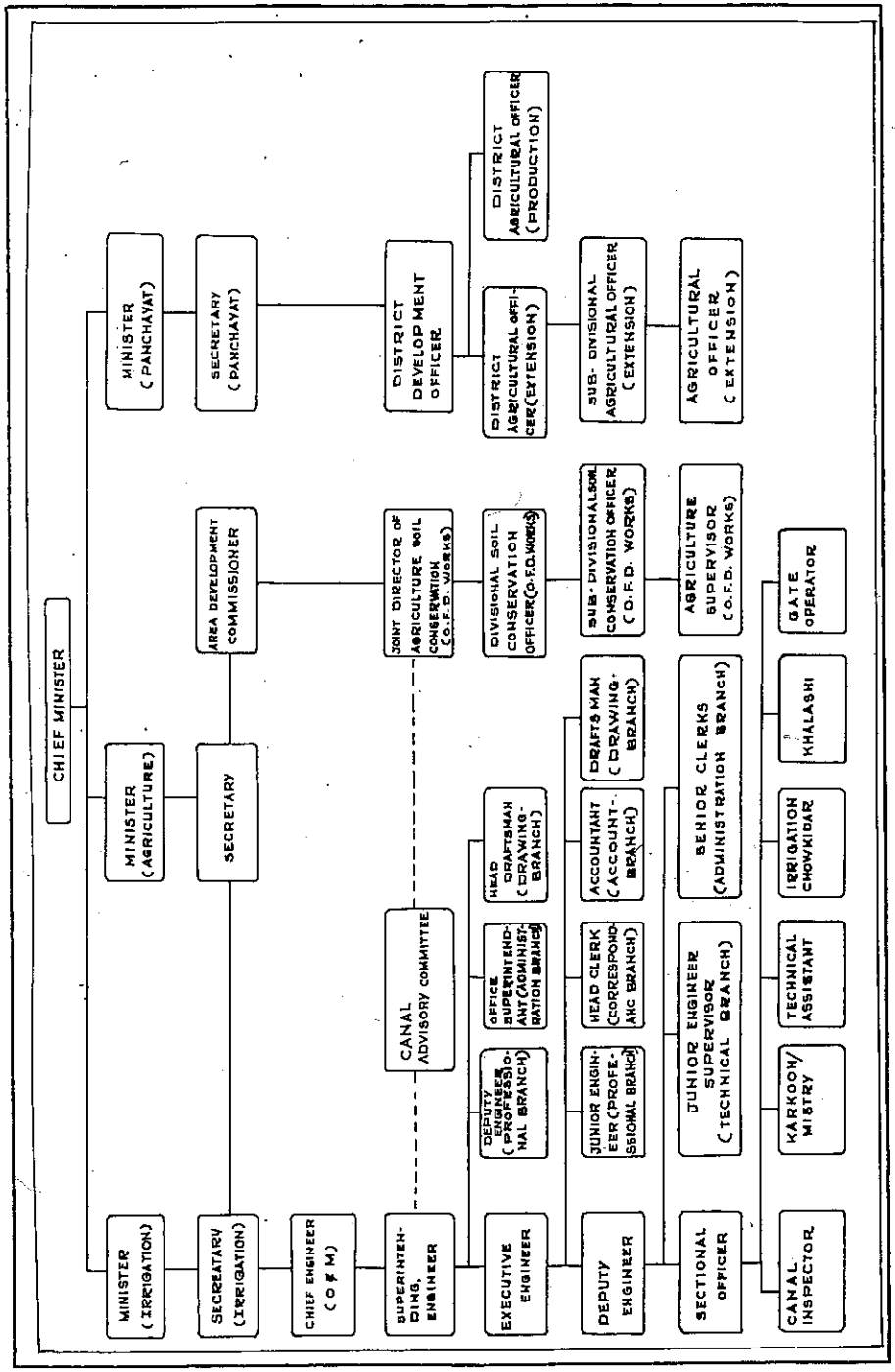

Figure 1: Organisation Chart of Irrigation Administration in Gujarat State, India

Table 1: Functions and Responsibilities of Irrigation Officers and Subordinates

Officer/Subordinates	Functions and Responsibilities
Superintending Engineer	a) distribution of budget, finalisation and sanction of tenders b) inspection of all works and offices c) supervision of distribution of water
Executive Engineer	a) supervision of works b) payment of bills to contractors c) maintenance of accounts of works, stocks and stores, and submission of accounts to audit office d) supervision and maintenance of irrigation management e) keeping the canal, branches and distributories in running condition f) distribution of water g) inspection of sub-divisions h) hearing and attending to complaints of irrigators and solving the problems of irrigation
Deputy Engineer	a) supervision of works under his charge and to see that all work is to be done according to specification b) to prepare bills of work done and to submit to the Executive Engineer for payment c) surveying and preparing of plans and estimates of projects in his charge d) to maintain accounts of works, stock and stores and its proper utilisation and checking the custody of materials at stores and site of works e) maintenance and management of irrigation of canals for smooth flow of water f) proper distribution of water in fields, collection of water applications, their scrutiny and sanction g) deduct unauthorised irrigators and to conduct *panchnama* h) to prepare demand statement maintaining water accounts i) keeping the register of irrigation records
Sectional Officer	a) management and supervision of works under his charge and repairs and improvements of canals, canal gates and structures in proper condition in his charge b) proper distribution of water according to the programme fixed c) to obtain water application form from Canal Inspector and to forward it to Deputy Engineer for sanction d) preparation of bills for water, maintaining registers of water, watch the unauthorised watering and preparation of *panchnama* e) supervision and guidance to staff working under him f) controlling the labour working under him and solve the problems of irrigators g) proper maintenance of accounts of stock and stores
Canal Inspector	a) to inspect canals and keep them in good condition b) to assist the Sectional Officer in his work
Mistry/Karkoon	a) maintenance of muster roll of labourers, and supervision b) maintenance of canals c) distribution and collection of water application forms d) to take measurements of area irrigated e) to watch unauthorised irrigation water f) to help the Sectional Officer in preparing demand statements
Irrigation Chowkidar	a) to watch proper distribution of water during day and night
Khalashi Gate Operator	a) attending camps and survey works b) to maintain and operate the canal gates

the agriculture department, the concept of Command Area Development (CAD) in irrigation projects has gained enormous popularity and acceptance by various State Governments[4]. Accordingly, each project or set of projects has a CAD Commissioner who coordinates the functions of irrigation, agriculture and cooperation departments. Each State has its own version of a CAD organisation with varying degrees of control and authority over the constituent departments. In Gujarat, the CAD Commissioner has under him only the soil conservation wing of agriculture for OFD works, but he has no direct control over the irrigation department or the agricultural extension wing of agriculture department. Therefore, most of his time is spent on coordination among various departments. In those states, where the CAD concept has been accepted and implemented now for some time, it has been increasingly recognised that a loose and ineffective coordination is no substitute for a unidirectional and single line of command-oriented organisation for irrigation administration. The current pattern of division of responsibilities between the departments and absence of organisational control by the CAD Commissioner over each department functioning in the command areas has been a major hurdle in forcing a unified approach for better water management. One of the solutions that appears to be is to evolve a single cadre of water management personnel having multi-disciplinary skills in irrigation engineering, agronomy, land development and extension[5].

For effective utilisation of the irrigation supplies, five management tasks have been identified by *Bromely, Taylor* and *Parker*[6]. They are:

a) keeping the distribution net-work in good condition,
b) intensive operation and maintenance of infrastructure,
c) careful planning of cropping patterns and schedules of irrigation,
d) care in the allocation and scheduling of water both among and within systems, and
e) equitable distribution of available water to all sections of irrigation community.

a) The first task is essentially engineering in content. For keeping the distribution system in good condition, which means the maintenance of designed discharge at all times, the main system should be kept in order[7]. This comprises main and lateral canals which are to be kept clear of weeds and silt.

b) Intensive operation and maintenance of the infrastructure refers to effective use of the irrigation facilities right from the head works down to the farmers' fields. Intensive operation would mean a very careful rotation of distributaries so that water is used when actually required with a view to avoid any wastage. Maintenance of the infrastructure above the government outlet normally does not pose a problem since funds are provided in the budget, but what is critical is the maintenance of the infrastructure below the outlet, which is the collective responsibility of the irrigators. Experience has shown that they maintain their field channels and other community-held items only under conditions of certainty, adequacy and reliability of irrigation supplies[8].

c and d) The next two items in the series of management tasks are a logical sequence to the above. Planning of cropping patterns under the constraints of limited water availability and working out the water requirements of crops and the intervals at which water has to be released at the outlets and in turn, rotation of minors and subminors in which these outlets are situated, require skills in agronomy and soil science[9]. Added to these, carefully worked out schedules of irrigations at appropriate intervals for each land holding (known as rotational water supply) are to be placed before the beneficiaries whose participation by way of acceptance and abiding by schedules is fundamental to any programme of rotational water districution at the farm level[10].

e) Finally, ensuring the access of all sections of the irrigating community below the government outlet to water is a vital task before the managers. In the present institutional framework of family farms and unequal land distribution in the third world countries and when land reforms are being implemented unfortunately at a slow pace, access of the rural poor to essential inputs, such as water and credit is one of the critically significant ways of accelerating rural development[11]. Equity in the distribution of water supplies, regardless of the irrigator's locational situation, tail-end or head-reach, of economic position, big landlord or small farmer, or of the caste, either high or low, is one of the key tasks before the management in water distribution below the government outlet.

The abvove discussion points out to the supreme need of assuring supplies of water to all farmers under conditions of certainty, adequacy and reliability keeping in view the soil-crop-water relationship on the one hand, and securing the irrigators' acceptance and cooperation in regard to maintenance of strict scheduling of water supplies on the other hand. The management tasks, therefore, become essentially multi-disciplinary in nature drawing from the disciplines of civil and agricultural engineering, agronomy and soil sciences, extension and rural sociology and communication. The project management can no longer look at these tasks in isolation and assign them to persons of different disciplines as being done today. Instead, the irrigation officials have to become parts of an integrated whole and perform the tasks as allotted to a single new discipline, namely, water management cadre.

In the event of a formation of a new cadre, the personnel of the present O and M wing of the irrigation bureaucracy will have to be absorbed in such a cadre with appropriate in-service training. However, the attitudes of the personnel towards water management tasks have to be assessed and taken into consideration before the cadre is assembled. Carving out an exclusive cadre with specialised skills of inter-disciplinary nature from the currently existing departments of compartmentalised functions itself would give rise to complicated problems of civil service such as seniority and pay fixation, and equality of promotional opportunities. Added to these, if we have the personnel of conflicting and discouraging attitudes, the problems of integration further get compounded.

The next section analyses the attitudes of the O and M personnel of the irrigation department and present the survey results.

2. Results of the Survey of Attitudes

Traditionally, operation and maintenance tasks of irrigation projects in India have been looked down as activities which do not require specialised skills of sophisticated nature usually demanded in the more prestigious sphere of construction and design. The result has been that the O and M personnel tend to take the positions reluctantly and look forward to moving out to the C and D wing when opportunities arise. Secondly, it happens that sometimes persons get posted in the O and M due to some

punitive reasons such as abuse of authority or proved incompetence or corruption in the construction and design wing. Because of this, there is some disdain attached to the O and M and it is not unusual meeting some engineers alleging that they have been punished by the Minister on political grounds.

Apart from the above psychological reasons, there are some professional reasons as well such as those relating to job satisfaction, and availability of variety of experiences and promotional opportunities. The O and M personnel tend to feel that the other side of the hedge is greener and hence they become unwilling birds of passage.

Further, the new and emerging components of public relations with irrigators and inter-departmental liaison involved in irrigation management seem to frighten them. They fear that in operation and maintenance it is not always possible to keep the farmers pleased by allowing them to take the irrigation supplies as and when the latter wanted, since they work under constraints of scarcity and, therefore, the disgruntled politicians may like to have them replaced by more pliable persons by transferring them out to far distant places having much less living and working comforts[1 2].

The engineers are also known to prefer independence of action which, they feel, is much more in construction and design. In the latter, they are relatively more insulated from the public and the necessity of inter-departmental liaison work with other departments is also much less.

Thus, at least the following eight *statements* reflecting the generalised attitudes of the O and M personnel to water management emerge to be tested in an empirical analysis.

1. Construction and design given greater job satisfaction than water management.
2. Construction and design is for „hard" applied science people, whereas water management is for „soft" applied science people.
3. Construction and design offers a high degree of independence of action, since it does not require liaison with other departments.
4. Water management needs multi-disciplinary skills, and learning these new skills is difficult.
5. Water management is a monotonous acitivity, whereas construction and design offers a greater variety of experiences.
6. Construction and design offers greater promotional opportunities.
7. Construction and design does not require those difficult public relations with irrigators which are generally required in water management.
8. There is a constant fear in water management that the dissatisfied local politicians may successfully attempt to have the personnel transferred out to distant places.

The empirical ground was provided by two completed irrigation projects which are the responsibility of the second author. The bigger of the two is Mahi-Kadana Irrigation Project covering 224,000 hectares as culturable command area with 231 engineers, and the other project is Panam Irrigation Project covering 40,000 hectares as culturable command area with 125 engineers. A non-disguised and structured questionaire was prepared and given to all the 356 engineers functioning in supervisory and administrative capacities known as gazetted engineers in these two projects. The above listed eight statements were graded on a five point *Likert* scale ranging from „strongly agree" to „strongly disagree" and were included in the questionaire. Weights of 5, 4, 3, 2 and 1 were given to „strongly agree", „agree", „do not know", „disagree" and „strongly disagree" respectively to all statements.

Furhter, they were also asked to give their background in terms of schooling, whether in rural or urban areas, in terms of agricultural bias, whether he or his parents had any agricultural land and in terms of level of education, whether a graduate engineer or a diploma holder (Table 2). The objective behind collecting the data was to test whether the differences in the socio-economic background of the respondents had any significant on their attitudes.

Table 2: Socio-Economic Background of the Engineers

Total Number of Engineers	Social Background		Agricultural Bias		Education	
	Rural	Urban	Having Agricultural Land	Having no Land	Diploma in Engineering	College Degree in Engineering
289	99	190	118	171	53	236

289 engineers out of 356 engineers returned the questionaire complete in all respects, the response being 81 percent of the total. Responses for each attitude statement recorded on the Likert scale along with their weighted mean are presented in Table 3. The following null hypotheses were formulated and „t" values were calculated for testing their significance.

i) Amount of job satisfaction is the same whether in water management or construction and design.
ii) "Hard" science and "soft" science people are indifferent to construction and design, and water management.
iii) The degree of independence of action is the same in construction and design, and water management.
iv) It is not difficult to learn the multi-disciplinary skills needed in water management.
v) Water management, and construction and design offer the same variety of experiences.
vi) Promotional opportunities are identical in water management and construction and design.
vii) Construction and design, and water management require the same amount of public relations.
viii) There is no fear of transfer in water management from the dissatisfied politicians.

As regards job satisfaction, the null hypothesis stands rejected and the attitude that construction and design gives greater job satisfaction than operation and maintenance is established. Further, the attitude that construction is for „hard" science people and operation and water management is for "soft" science people is also upheld. The attitude that construction gives freedom of action is also found statistically significant. In regard to the statement that water management involves multi-disciplinary skills and learning them is difficult, the statistical analysis shows that the null hypothesis that it is not difficult to learn the multi-disciplinary skills cannot be rejected.

Table 3: Attitudes of the Irrigation Engineers (N = 289)

Sr. No.	Statements	Strongly Agree	Agree	Do not know	Dis-agree	Strongly Disagree	Weighted Mean	t Statistic
1.	Construction and design gives greater job satisfaction than water management.	73	164	15	31	6	3.92	16.50*
2.	Construction and design is for "hard" applied science people, whereas water management is for "soft" applied science people.	43	130	29	68	19	3.38	5.52*
3.	Construction and design offers a high degree of independence of action and it does not require liaison with other departments.	38	167	14	55	15	3.55	8.49*
4.	Water management needs multidisciplinary skills and learning these new skills is difficult.	13	123	55	81	17	3.12	1.91
5.	Water management is a monotonous activity, whereas construction and design offers a greater variety of experiences.	80	169	10	27	3	4.02	19.71*
6.	Construction and design offers greater promotional opportunities.	28	105	38	93	25	3.06	0.88
7.	Construction and design does not require those difficult public relations with irrigators which are generally required in water management.	39	179	13	53	5	3.67	11.62*
8.	There is a constant fear in water management that the dissatisfied local politicians may successfully attempt to have the personnel transferred out to a distant place.	63	119	71	31	5	3.71	12.24*

* Significant at One Percent Level by two -- Tailed Test

With reference to the statement that water management is a monotonous activity and that construction and design offers a greater variety of experiences, the null hypothesis gets rejected and the attitude towards water management as monotonous activity is found confirmed. However, the statistical exercise shows that the null hypothesis that there is no difference between water management and construction in regard to promotional opportunities cannot be rejected.

As regards the statement that construction does not require the same amount of public relations as required in water management, an overwhelming percentage of engineers supported the view, and thus, the preference for construction and design is statistically found significant. The last statement about the fear of transfer in water management due to dissatisfied politicians also emerges statistically significant.

Thus, out of eight statements only two are found to be statistically not significant. All the other six are statistically significant attitudes towards water management functions.

To determine whether differences in the socio-economic background of the engineers have had any impact on their attitudes, Chi-square tests of significance were conducted. While doing so, the responses under "strongly agree" and "agree" were combined into one category of "agree". Those under "strongly disagree" and "disagree" were combined together into another category of "disagree" while those who did not express any opinion were ignored. Table 4 represents the results of the tests which reveal that none of the six significantly determined attitudes is influenced by the differences in the socio-economic background of the engineers. The possible explanation for this uniform result is that the engineering profession in India, especially, in the State Governments is a highly status-conscious occupation and the backgrounds either urban or rural, degree or diploma holders do not matter. It appears that the members of the irrigation bureaucracy display a high degree of espirit-de-corps in their general attitude towards water management.

Table 4: Impact of Differences in Socio-Economic Background of Attitudes of Engineers: Chi-Square Test of Significance

Differences in Background			Statements Reflecting Attitudes					
			1	2	3	5	7	8
Urban/Rural			0.2475	0.0794	0.2393	2.6838	1.0601	0.0848
Having Land	Having No Land		0.4832	0.3402	0.5568	1.6319	0.5701	0.4647
Diploma Holder	Degree Holder		0.6379	0.3415	0.9275	1.7536	5.9548	0.4792

3. Policy Conclusions

The current inadequacy in the discharge of water management functions of a multi-disciplinary nature has been due to the excessive pre-occupation of the irrigation bureaucracy with the physical infrastructure rather than the non-physical management inputs. Further, compartmentalised functioning of various departments in the command areas of irrigation projects has also been held responsible for the present unsatisfactory state of affairs. Since a single cadre of water management will have to be largely composed of the existing personnel of the operation and maintenance wing of the irrigation bureaucracy trained in agronomy, extension and rural sociology, a critical analysis and an understanding of the attitudes would be useful before going in for such a separate cadre.

A sample study of 289 engineers from two major irrigation projects of the State of Gujarat showed that construction and design wing of the irrigation department was preferred to water management for various reasons.

The policy implications are obvious. The State Governments in Gujarat and elsewhere in India should take steps to raise the status of the personnel involved in operation and maintenance through appropriate methods of recognition of special skills needed in water management. One way is to set up an exclusive water management training centre in each State with programmes for different levels of officers such as workshops for senior level and in-service courses for middle level so that a sense of commitment and self-esteem are instilled and fostered. Encouragingly, the engineers did not feel that learning the new skills was difficult. Further, they did not also find that the promotional opportunities in water management were lacking.

Once the fostering of special skills takes place in the training institution exclusively set up in each State, problems encountered earlier in operation and maintenance, such as water-logging and salinity conditions which were often considered outside the purview of the O and M would present themselves in a new light and they would pose sufficient challenges for the water managers. Further, farmers' involvement, emergence of new cropping patterns and their water requirements and other such variety of problems become worthy of probe and specialisation. Recognition of the skills, presence of numerous problems of the kind referred to and continuous search for solutions bring forth challenges which would give job satisfaction to the personnel involved in the irrigation projects.

The alleged fears of lack of independence of action and of adverse political interference arise more from the current disorganised or almost indisciplined ways of irrigation supplies to farmers. In fact, the richer and the more powerful farmers, either due to their big sized land holdings or due to their socially superior caste positions tend usurp supplies with the result that the weaker sections of the irrigation community are literally left high and dry.

Introduction of certain occasional discipline is always likely to evoke violent reaction from the vested interests which function through the local politicians. The only appropriate way is to bring about a more systematic overhauling of the irrigation management through the strict introduction and enforcement of rotational water supply to all the farmers below the outlet in accordance with crop-water requirements

and soil-characteristics at appropriate intervals. This needs a more organised approach at all levels, the main system, branches and outlet.

Further, the participation of the farmers through the threetier system of outlet committee at each outlet, distributary committee at the distributary and an apex body at the project level would also be another step towards self-regulation. Only through these means can the perverse role of the vested interests and the manipulation by the disgruntled politicians be drastically reduced or ultimately eliminated.

Summary

This paper is a study of engineers from two irrigation projects in the State of Gujarat with regard to their attitudes to water management tasks. The sample study shows that construction and design wing of irrigation department was preferred to water management for various reasons. However, encouragingly the engineers did not feel that learning the new skills for water management especially with regard to soil sciences and agronomy as well as working together with farmers, was difficult. Therefore, it is necessary to set up water management training programmes for different levels of irrigation personnel. Such training programmes would prepare the way for evolving a cadre of water management over time and for achieving a high degree of professionalisation in water management.

Zusammenfassung

Dieser Beitrag behandelt eine Studie über die Einstellung der Ingenieure in zwei Bewässerungsprojekten im indischen Staat Gujarat zu Aufgaben des Wasser-Managements. Die Stichproben-Untersuchung zeigt, daß der Konstruktions- und Planungsteil der Bewässerungsabteilung gegenüber dem Wasser-Management aus verschiedenen Gründen bevorzugt wurde. Die Ingenieure haben jedoch keine Schwierigkeiten empfunden, neue Fertigkeiten in der Wasserbewirtschaftung, besonders auch im Hinblick auf Boden- und Pflanzenbaukunde sowie auf die Zusammenarbeit mit den Bauern, zu erlernen. Deshalb ist es notwendig, Ausbildungsprogramme in Wasserwirtschaft für verschiedene Ebenen des Bewässerungspersonals einzurichten. Solche Programme würden den Weg bereiten, mit der Zeit Kader für das Wasser-Management heranzubilden und damit einen hohen Grad an Professionalisierung bei ihnen zu erzielen.

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