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A case for professionalization of water management in irrigation projects in India

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SUMMARY

The heavy investment in irrigation in India has not brought the expected benefits and this article argues first that a major difficulty arises from the way irrigated water is administered. The distribution of water is controlled by irrigation engineers who lack the knowledge and information to manage water in a way that maximizes agricultural production and achieves the confidence of farmers. The staffing structure and related professional values discourage the development of a new more appropriate specialism. The article goes on to argue that a new organization of work and associated staffing structure is needed which will encourage a new professional specialization bringing together staff and expertise currently dispersed in separate specialisms in engineering, agronomy and other aspects of agriculture.

Substantial investments have been made to increase the irrigation potential of the country as part of planned development during the last thirty years since Independence (Government of India, 1977, Part V, pp. 41–45). During the Sixth Five Year Plan the irrigable area is expected to increase from the current 53 million hectares to an anticipated 70 million hectares by 1983. However, it has been shown that utilization of the irrigation potential created thus far has been dismally low (Murthy, 1976). Such underutilization has primarily been attributed to lag in the construction of infrastructure at the farm level such as field channels from the government outlet to individual farmers' fields for supplying water and field drains to remove excess water from the fields, and land levelling and land shaping so that water reaches in an even manner to all parts of the field. This particular lag was sought to be corrected by setting up Command Area Development Authorities in the mid-seventies which were to take up, among other things, on-farm development works below the government outlets (Jayaraman, 1979).

We have by now six years of experience in command area development. In those projects where on-farm development works have either been completed or nearly completed, the results assessed in terms of gross area irrigated, productivity per hectare or desired changes in cropping patterns have still been found to be far below expectations (Singh, 1979). Reasons are obvious. It is not

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the infrastructure alone either above or below the government outlet which determines the performance of an irrigation system as was thought earlier; the management of the system also significantly affects the efficiency of the project.

The objective of this paper is to examine the present state of the art in irrigation management in India and to explore the ways in which management can become professionalized. The paper is organized into three sections. The first section deals with the essentials of efficient water management; the second section examines how to achieve professionalization in water management, the final section brings out certain policy implications.

ESSENTIALS OF WATER MANAGEMENT

An irrigation system is ready for operation once the physical construction is over. The latter refers to facilities relating to main canals and drains (primary), distribution system and lateral drainage (secondary) and field channels to supply water to fields, and field drains to remove excess water (tertiary).

Water management, as it stands today, consists of rotating the main and lateral canals with a view to ensuring the designed discharge (say one cubic foot of water per second) at gated outlets serving a command area not exceeding forty hectares. The farmers in the service area of the outlet fend for themselves since it is considered that irrigation administration has nothing to do directly with the farmers and is not involved with questions about the distribution of water, crop requirements, equity or social considerations. At the most it is assumed that the agricultural department, through either its extension wing or its agronomy section has to look after the utilization of water matching available water to suitable crops and soils,

Agricultural personnel are involved in the command area and entrusted with preparation of agricultural production plans and their implementation, either through their on-farm development work or through their association with the Panchayati Raj institutions or as agents of the Director of Agriculture (and independent of Panchayati Raj), and all are prone to deny a responsibility for the distribution of water from the outlet to each farmers' fields. Thus, water management at the farm level today is a no-man's land belonging neither to the irrigation nor to the agriculture departments (Singh, 1979).

The resultant picture has been well described and documented. The unequal distribution of irrigation benefits and the near anarchy prevalent in almost all the systems of the country are well known (Hart, 1978). The farmers at the upper reaches of the canals and the outlets, economically and socially powerful farmers and those who have political connections usurp water supplies to the neglect of tail-enders and weaker sections. Further, the irrigation indiscipline leads to everyone scrambling for water all the time so that no farmer gets the required amounts of water at any time. Irrigation regardless of the crop–water–soil relationship results either in over-irrigation or under-irrigation and this is bad for land and crops. Indeed over-irrigation is the more harmful since both land and crops are likely to be damaged.

Introducing rotational water supply at the farm level is seen as the solution. This involves preparing a roster of irrigation at the outlet for each farmer fixing

day and time and appropriate intervals as advised by agronomists (Jayaraman, 1980a). Such corrective action has been introduced in all projects recently financed by the World Bank. In these projects, rotational water supply has been included as a special requirement as part of the strategy to ensure equity in distribution of irrigation benefits to all farmers irrespective of their physical location and economic or social position in the village. The physical investments required for introducing rotational water supply include measuring devices at each outlet and at each minor or sub-minor head to ensure the designed discharge; initial lining of the field channels from the outlet up to optimum distances, and upgrading and rehabilitation of the distribution system, and these developments are so expensive that no State Government can afford them without specific financial assistance.

However, efforts to introduce rotational water supply have brought home two important lessons for irrigation engineers:

(1) Working out rotational water supply schedules needs additional knowledge beyond irrigation engineering especially knowledge regarding agronomy, soil–crop–water relationships and rural sociology.
(2) Rotational water supply at the farm level means that the discharge at the government outlet must be as designed; this requires that lateral levels and the main system have to be managed more efficiently.

Whereas the second lesson refers to the need for upgrading the engineering skills of the personnel, the first stresses the acquisition of entirely new knowledge. With these, the irrigation administration immediately becomes multi-disciplinary in character both in concept and practice and goes beyond the bare essentials of opening and closing gates and what is known as operation and maintenance regardless of what is happening at the farm level.

Experimental rotational water supply schemes have yielded very encouraging results. Farmers accept and welcome greater system management despite the obvious restriction on their previously enjoyed anarchical freedom to procure water. Their trust in irrigation personnel is established and confidence in supplies is secured. Thus the credibility of the system makes them feel that the management will do everything to supply water within their areas of jurisdiction (Jayaraman, 1981). In turn, irrigation personnel are gratified to see that additional management has yielded favourable results. This mutual confidence paves the way for an atmosphere favourable to new institutions encouraging, for example, farmers organizations to regulate supplies below the outlet themselves, solve disputes among irrigators and to maintain field channels and drains, (Jayaraman, 1980b).

Similarly, certainty, reliability and adequacy in irrigation are needed to achieve the cropping pattern visualized in the project appraisal report. Generally, the experience has been that farmers in the command areas have been exposed to the risks arising out of uncertainty and inadequacy in irrigation with the result that not only the visualized cropping patterns have not materialized but also the much expected multiple cropping has not taken place (Jayaraman, 1980c). In the absence of certainty, adequacy and reliability in irrigation, extension alone will not bring about the projected cropping pattern.

Other benefits that would emerge out of controlled application of water at the farm level would include protection of soil from being subject to over-irrigation and consequent damage due to salinity.

In this situation management tasks become twofold:

(a) At the field level, to measure and control the flows of water into and along the main and lateral canals such that flow is reasonably equal throughout the system.
(b) At the planning level, to determine priorities in providing water and having done so to prepare irrigation schedules (Lazaro and Wickham, 1977, p. 124).

Once the tasks are clear, it is easier to examine whether the adoption of business management techniques could be extended to water management. In several respects irrigation is not like private business; the profit motive is not the inspiring factor; hiring and firing of personnel is faster in the private sector than in the public sector; and the private sector has full control over even the last rung of employees, but in the public irrigation system farmers are independent and autonomous.

Despite these differences, Lazaro and Wickham (1977, p. 124) advocate the acceptance and adoption in a modified form of four basic functions of business management in the sphere of irrigation management. These are planning, organizing, leading and controlling. Successful performance of these management functions calls for a carefully prepared manpower development scheme and for encouraging a new professionalism among staff.

HOW TO PROFESSIONALIZE WATER MANAGEMENT

The term administration often refers to a regulatory system of work in Government. Circumspection and carefulness are always attached to Governmental work as the legal rights and duties of the citizen are involved, and the executive authority has to be exercised with great caution bearing in mind the constitutional position. It is no surprise to note that irrigation administration as a term refers to functions, responsibilities and powers of the officials and subordinates in the irrigation projects vis-à-vis the irrigators. These functions, responsibilities and powers are regulated by, and derived from, the legal statutes and rules framed under them. For example, in the State of Gujarat, the functions, responsibilities and powers of irrigation personnel are derived from the Bombay Irrigation Act (1879) and the Gujarat Canal Rules (1962). Table 1 lists the functions of supervisory and administrative staff.

Figure 1 presents the organization chart of a typical project where 'operation and maintenance' is headed by the Superintending Engineer with his supporting staff, along with divisional heads (executive engineers) and sub-divisional heads (deputy engineers) with their supporting staff.

The stated responsibilities of staff relate to the preparation prior to the beginning of the season of an irrigation programme for the distribution of

Table 1. Functions and responsibilities of irrigation officers and subordinates

Officer/subordinates	Functions and responsibilities
Superintending Engineer	(a) as the head of the department and the controlling officer, in charge of distribution of budget, sanctions and tenders, (b) inspection of all works and offices, (c) supervision of distribution of water.
Executive Engineer (in charge of about 120,000 acres and heading a division with 3 or 4 sub-divisions)	(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 (in charge of about 40,000 acres and heading a sub-division with 4 sections)	(a) supervision of works under his charge and seeing that all work is done according to specification, (b) preparation of bills of work done and their submission to Division office for payment, (c) surveying and preparing of plans and estimates of projects in his charge, (d) maintaining the account of works, stock and store and its proper utilization and checking the proper 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) deducting unauthorized irrigators and conducting *panchnama*, (h) preparation of demand statement maintaining water accounts, (i) keeping the register of irrigation records.
Sectional Officer (heading a section)	(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) obtaining water application form from Canal Inspector and forwarding it to Deputy Engineer for sanction, (d) preparation of bills for water, maintaining registers of water, watching the unauthorized watering and preparation of *panchnama*, (e) giving supervision and guidance to staff working under him, (f) controlling the labour working under him and solving the problems of irrigators, (g) proper maintenance of accounts of stock and stores.
Canal Inspector	(a) inspection of canals and keeping them in good condition, (b) assisting the Sectional Officer in his works.
Mistry/Karkoon	(a) maintenance of the muster roll of labourers, and their supervision, (b) maintenance of canals,

Table 1. (*Continued*)

Officer/subordinates	Functions and responsibilities
	(c) distribution and collection of water application forms, (d) taking measurements of area irrigated, (e) watching unauthorized irrigation water, (f) helping the Sectional Officer in preparing demand statements.
Irrigation Chowkidar	(a) watching proper distribution of water during day and night.
Khalashi	(a) attending camps and survey works.
Gate Operator	(a) maintaining and operating the canal gates.

water,[1] solving irrigators' problems and complaints, preventing the wastage of water and the like; the agricultural component pertaining to the crop–soil–water relationship is totally absent. The responsibilities do not reflect a concern with the efficient use of scarce supplies of water, nor do they recognize the client's (the farmer's) anxiety to have water supplies under conditions of certainty, adequacy and reliability.

Reflecting this existing conception of responsibilities the staffing pattern is strictly confined to those with engineering and related technical skills, and from section to secretariat there is no agricultural hand attached to any engineering or technical officer. Thus, there is no opportunity for any input into the preparation of irrigation schedules reflecting crop–water requirements and other agronomical considerations. Further, the only communication which the departmental personnel have with irrigators seems to relate to receiving applications for irrigation supplies to their fields, finding out unauthorized irrigation and punishing those who commit irregularities. The apparent problem-solving and dispute-resolving functions are more backed by legal powers than by any sympathetic concern for farmers' interests.

What is lacking is a serious professionalist approach to water management with a concern for the clients' interest as well as a commitment to the discharge of specialized functions.[2] Water management tasks as outlined in the previous section are a subject worthy of professionalization. However, personnel engaged in the part of irrigation management known today as 'operation and maintenance' treat this as a temporary phase in their career in irrigation and they look forward to the day when they can move to the more prosperous and prestigious wing, namely 'construction and design'. With irrigation engineers spending their time either in 'construction and design' or 'operation and maintenance', those who are drafted into 'operation and maintenance' tend to take up their jobs reluctantly and feel that they are being neglected or punished by superiors.

[1]The procedure for obtaining applications requesting irrigation supplies by each farmer prior to each season in a year is unique to Gujarat and Maharashtra States in India. This is under the Bombay Irrigation Act of 1879. The Irrigation Department Officers scrutinize these requests with reference to any past irrigation dues and grant the request. Only thereafter can farmers take the irrigation supplies.

[2]The conception of professionalism used in this article is that developed by Schein (1972) and Wilensky (1969).

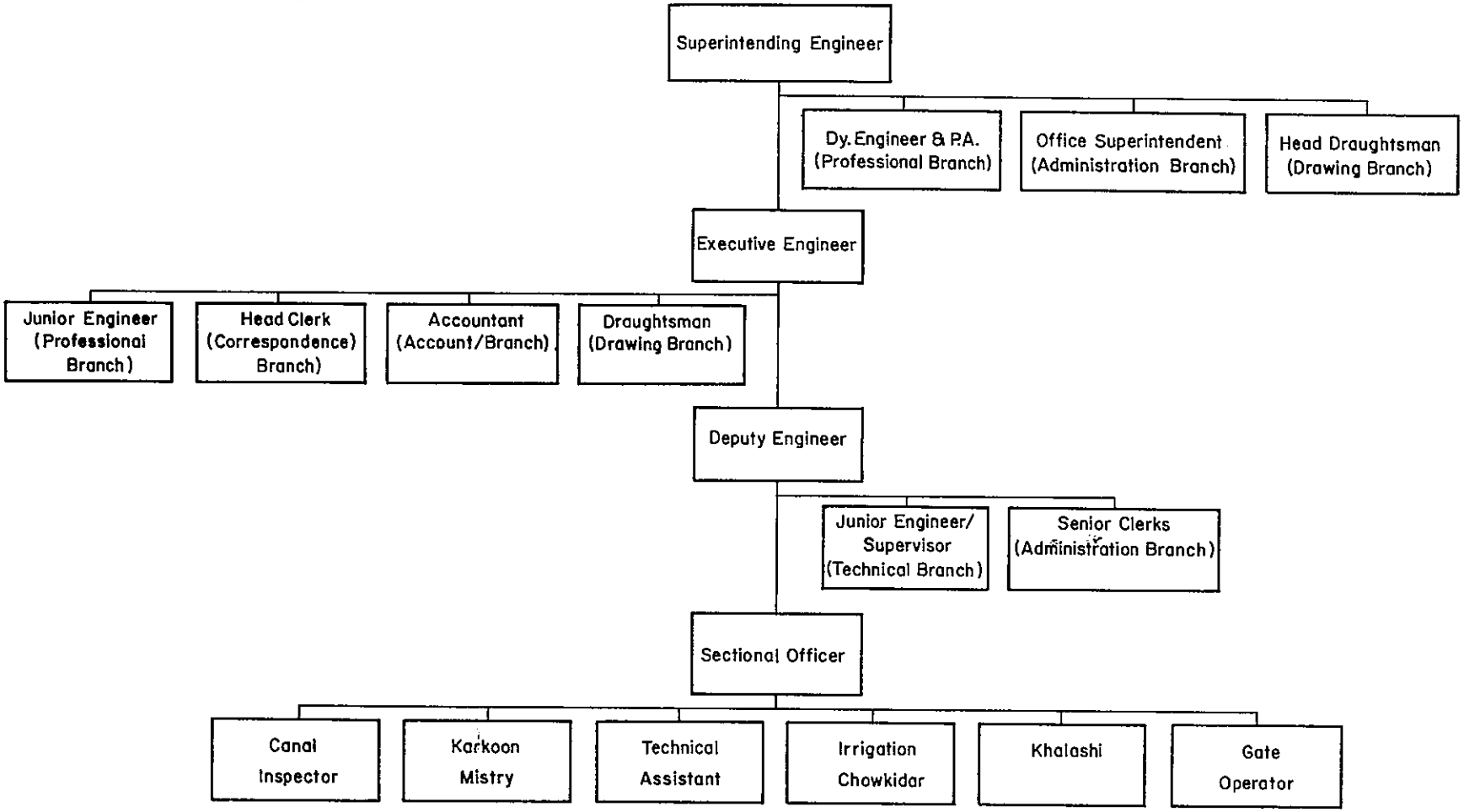

Figure 1. Organization chart of irrigation administration in a typical irrigation project

In an attitude survey conducted in an irrigation project in Gujarat State the following emerged to be the chief reasons for engineers preferring construction and design to tasks of water management (Jayaraman and Jayaraman, 1981).

(a) Construction offers greater promotional opportunities than water management.
(b) Construction presents greater job satisfaction than water management.
(c) Water management needs a lot more difficult public relations with irrigators.
(d) Construction offers a higher degree of independence of action unlike water management since the latter requires liaison with other departments.
(e) Construction is for 'hard' applied science people whereas water management is for 'soft' science people.
(f) Water management needs additional skills such as agronomy which are difficult to learn.
(g) There is a constant fear in water management that there are larger chances of making local politicians unhappy and such dissatisfied local politicians may have the personnel transferred to a distant place.
(h) Water management is a monotonous activity whereas construction offers a greater variety of experiences.

Looking to the built-in prejudices against water management in the irrigation department, the first steps toward professionalization are to encourage an atmosphere of self-esteem in the eyes of the personnel concerned and to create an appropriate institutional and staffing structure. This might best be achieved by strengthening promotional opportunities by creating a separate department and water management cadre. At present a single department with a disproportionately large number of posts of chief engineer in the construction and design wing has tilted the promotional opportunities in favour of the latter and against 'operation and maintenance'. One obvious solution is setting up an independent Command Area Development Department in the Secretariat of the State Government which could ultimately be headed by the top man in the proposed water management cadre, as it is in the Public Works Department which is headed by an Engineer functioning as permanent Secretary to Government. All the existing irrigation projects could be brought under the Department and each project or set of projects covering an area of 300,000 hectares could be assigned to officers of the rank of Chief Engineer designated as Project Managers. The term Engineer might not be retained as it connotes a narrow range of specialization.

With such a structure each Project Manager could be assisted by a Deputy Manager of the rank of Superintending Engineer and assistant managers and sub-managers. The aim would be to strengthen each sub-division and division and the higher supervisory levels of management with appropriate agriculture and agronomy expertise. For example, each sub-division would have an irrigation agronomist and an extension officer of identical rank to assist the sub-manager in drawing up irrigation schedules and communicating them to the farmers with the objective of seeking their comments and securing their final acceptance for formulation of rotational water supply schedules at and above the farm level.

Similarly each division would be supported by an agronomist and an extension

specialist of higher rank to assist the division head in supervisory functions of water management. In a similar manner all the way up the hierarchy appropriate agricultural and irrigated-agronomy skill-components will be supplied to meet the deficiencies observed at these levels.

The water management cadre would thus be composed of both irrigation engineers and agricultural personnel. In the short run, the 'operation and maintenance' personnel and agronomists and extension officials working at various levels in the command area of the project might have to form part of the same cadre of water management. This would mean an extremely difficult process of integrating personnel with varying educational backgrounds and experience and belonging to different services in the State whose common denominator is that all of them at a given point in time are found working in the command area of an irrigation project. It is fully recognized that to do this would involve surmounting problems relating to salary scales, seniority, and placement in the cadre and other matters.

Apart from the need for resolving the usual civil service integration conflicts, what would be most vital in the short run would be filling up the gaps in the knowledge of engineers and agricultural personnel belonging to both supervisory and administrative staff and sub-ordinate personnel. This would involve a special training programme and may require the establishment of training centres and new degree programmes in the universities.

With a different administrative structure, its own cadre and the provision of appropriate training, a profession could be built up. Specialized knowledge will be imparted to those who have to perform certain unique tasks; and there will be a career structure providing promotional opportunities. In this way, those in the cadre should feel that they are autonomous, that they have self-respect and that they know what is best for their client.

CONCLUSIONS

Various evaluation studies by independent researchers and international financing agencies have shown that there has been a lack of professionalism in irrigation administration and that there are insufficiently trained and experienced personnel for planning the distribution of water resources. Such a state of affairs has affected the success of many irrigation projects since the performance of an irrigation project depends vitally on delivering water to the farmers' lands in an adequate, timely and reliable manner.

Absence of professionalism has been attributed by the irrigation personnel to various reasons such as lack of promotional opportunities and of job satisfaction compared to those in construction and design.

For water management to become a specialization with its own professional cadre certain steps are necessary.

(1) The two wings in Indian State Irrigation Departments (construction and design of irrigation projects, and operation and maintenance) should be separated with distinct departments at the State secretariat. The Department of Irrigation would handle construction and design and the Command Area Development Department would look after operation and maintenance of

irrigation projects. Both the departments could be under a single minister in the State for better co-ordination.

(2) The Command Area Development Department would be manned by water management cadre personnel. The Department would ultimately be headed by a member of the cadre and thus the cadre personnel would be provided with a career structure and promotion opportunities.

(3) The cadre of water management would in the short-run be composed of *all* personnel who are working in irrigation projects whether engineers or agricultural personnel. The idea would be to have a multidisciplinary team knowing all about irrigation management, irrigated agriculture and land development. The initial problems of integration of such diverse personnel into a single cadre have to be faced and sorted out.

(4) Training programmes are required.

(5) A sufficient number of top posts of the current rank of chief engineers and superintending engineers would be created to supervise the management operations.

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