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# IRRIGATORS' ORGANISATIONS FOR BETTER WATER MANAGEMENT: A CASE STUDY OF ATTITUDES OF IRRIGATORS FROM GUJARAT STATE, INDIA

T. K. JAYARAMAN

*Mahi-Kadana Irrigation Project, Ahmedabad-380009, Gujarat, India*

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*SUMMARY*

*This paper examines the attitudes of irrigators in an irrigation project in India to their active involvement in the management of the project. The study reveals that the irrigators are only prepared to form an informal association at the outlet level, with minimum functions. These functions include the maintenance of the physical infrastructure below the outlet, solving disputes among farmers and the regulation of water distribution schedules, provided that the conditions of availability of water supplies and the presence of a receptive irrigation staff are fulfilled.*

## INTRODUCTION

The participatory rôle of irrigators in irrigation projects has been attracting attention in the developing countries. This is because of an increasing concern about mobilising the local resources so that at least some part of the investment made in the capital intensive infrastructure and some part of the annual operational costs of the facilities can be recovered. There is also anxiety about tapping the hitherto neglected resources of the farmers such as their knowledge of the local environment and their skills in the management of water at the local level.[1]

However, it has been observed that the prerequisite to any mobilisation of local resources in irrigation projects through the participatory process is the demonstration of reasonably adequate, predictable and controllable water supplies. However, the forms of participation—ranging from voluntary to government-induced organisation—are likely to vary from project to project in a given region and from region to region. The purpose of this paper is to examine the types of organisations of beneficiaries which may fit in with differing circumstances, as well as their functions and responsibilities, and to undertake an assessment of the



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irrigators' attitudes towards their involvement in irrigation management. The empirical background is provided by an irrigation project with which the author is associated. The paper is divided into three sections. The first section discusses the general principles and forms and functions of organisation, whilst the second discusses the results of a survey of irrigators' attitudes. The last section presents a list of conclusions with policy implications.

## IRRIGATORS' ORGANISATIONS

In a surface irrigation project where the technicalities of the project determine the location of the dam, the construction of the reservoir and the distribution system network, the irrigators' participatory rôle would essentially be one of helping the project management in running the system. Depending upon the capacity and willingness of the farmers to accept responsibility, the degree of participation would vary. For example, at one end of the spectrum, irrigators in Taiwan display a high degree of sophisticated self-governance by sharing with the Government half the cost of the construction of projects in addition to bearing the total responsibility for the operation and management of irrigation and drainage channels. The latter also includes full control over the management staff such as hiring and firing.[2] At the other end, there are farmers in irrigation projects in India looking to the Government to maintain the field channels and field drains below the outlet level which were constructed by the Government's agencies on their behalf.

The Taiwan situation has been explained as one of evolutionary management techniques developed over time with particular reference to historical forces such as the period of Japanese rule (1895–1945). During this period, Taiwan was developed as a major rice exporter and, at that time, the presence of an authoritarian government, using its force to put its strong commitment to agricultural development into action over fifty years, in conjunction with a well trained technical management and educated and disciplined farmers, contributed to the emergence of an active rôle for the farmers.

### *Necessary and sufficient conditions*

In irrigation projects in India and elsewhere, the absence of farmer participation has been attributed to a lack of favourable economic, social, administrative and institutional factors.[3] It is intriguing to note, however, that even in certain areas of India where the local self-government institutions have come to stay and where the co-operative ventures are thriving, farmers' associations at outlet levels have not yet materialised. For example, in the State of Gujarat, which is known for its long history in credit societies and milk processing and cotton ginning co-operatives, irrigators in the surface irrigation projects have not felt the urge to come together to assume the collective responsibility of maintaining community-oriented items

below the outlet. As is the case with the rest of the country, the irrigation department is responsible for maintaining the physical infrastructure only up to the outlet and the maintenance of field channels and drains below the outlet is considered to be the farmers' responsibility.[4] The resultant situation is chaotic as the on-farm irrigation inefficiencies arising from poor maintenance tend to wipe out all the apparent gains from the main system improvements.

Two empirical studies conducted in the district of Kheda, one of the most progressive districts of the State, revealed that the delivery of appropriate and reliable amounts of water to the outlets and from the outlets to the farmers' fields was the main prerequisite for community level action. It was seen that the farmers got together to attend to the collective maintenance of field channels and structures commonly held below each outlet only when the rotational water supply (RWS) was strictly enforced as part of a World Bank aided scheme. They did not, however, wish to undertake any other responsibility.[5]

Further, there is also a need for a receptive staff, both in the irrigation and the agriculture departments, working in unison to further the objectives of irrigated agriculture. Thus, both the conditions have to be simultaneously fulfilled before anticipating any voluntary involvement of the farmers in irrigation management. It is, therefore, obvious that there is no point in merely stressing the institutional factors alone as being responsible for the lack of irrigator participation, in the absence of efficient management of the system to instil confidence in farmers with regard to the predictability, adequacy and controllability of water supplies.[6]

*Consideration of certain aspects*

Before involving the irrigators in management, an examination of certain aspects of management and organisation is necessary. These aspects concern (a) the type of organisation, (b) the size of the organisation, (c) the functions and powers of organisation, (d) its leadership, (e) its administrative status, (f) the motivation of farmers who refuse to join the organisation and (g) special consideration with regard to weaker sections of the society such as scheduled castes and scheduled tribes, and marginal and small farmers.

*Type of organisation*

Setting up an organisation of farmers in an irrigation project which has had no previous experience requires careful consideration. The temptation to have the organisation legally registered under a statute so as to confer on it formal status should be resisted. This is because the relationships between the farmers and the sharing of the responsibilities at the beginning are best regulated by understanding and sympathy rather than by legal sanctions and restrictions. To start with, it is better to have an informal organisation governed more by consensus among the members than the the formal procedure of voting.

*Size of organisation*

The size of the organisation is influenced by various considerations. An area covered by a government outlet (not exceeding 40 ha) comprising all the irrigators in its command would be operationally ideal. If the area has been under rotational water supply (RWS), sub-groups would have been formed for each day of the week. If each sub-group has a leader, there would be a certain number of sub-group leaders in each outlet. These sub-group leaders would elect the outlet group leader. Thus, each outlet group would have a leader and sub-group leaders not exceeding seven in number with a hundred per cent membership of the farmers. This group can convert itself into an irrigators' association for the outlet.

*Village organisations*

As the rural society often happens to be a village-based society, it is better to have a village association of irrigators formed by the irrigators of all outlets falling within the village boundaries.[7] For example, if there are eight outlets whose command area falls within the boundaries of a village, all the irrigators will form the village associations. The executive committee of such an association will comprise all the group leaders of the outlets, who will then elect a president. But, if the project area is well connected by roads, and if there are communication facilities such as bus transport, it would be far easier to have an association of outlets on a canal basis cutting through village barriers. However, one should be aware of inter-village rivalries and, if such rivalries are present, it is preferable to be cautious and to set up associations along the village lines.

Irrigation systems on a distributary basis—say, a sub-minor or a minor—are hardly co-terminous with the village boundaries. A sub-minor may cover three or four villages and a minor seven or eight villages. Therefore, a critical level of federation of the outlets would be one that is canal based, either a minor or a series of sub-minors. At the canal level, there can be a federation of village associations. At the apex level, these various canal federations would form a federal body of the command area irrigators.

*Functions*

Since we visualise, at the initial stages, informal associations at three levels, their functions can only remain simple. The outlet level association would maintain the on-farm infrastructural facilities at the outlet level such as field channels, field drains and control structures initially installed by government and paid for by the beneficiaries and they would also help the authorities in the equitable distribution of water by facilitating a strict observance of the RWS schedules and promoting liaison with water users and the bureaucracy. If the experience proves favourable over time, the outlet associations can grow into a water co-operative with jurisdiction over a minor or sub-minor comprised of several outlet associations. The organisation's functions could become more complicated and involve, for example, buying water

at discounted rates from the Government in advance for each season and retailing it among its members.[8] The co-operative could also undertake several promotional activities such as extension advice, sale of fertilisers and pesticides, the custom hiring of vehicles and implements and even the marketing of produce.

*Leadership*

The leadership at the outlet level, the village level or canal level and at the apex level has to reflect an equitable representation. At the outlet level, the outlet association leadership may be rotating each year but, at the more complex levels, the president has to be elected following the democratic norms of periodical elections. Once a leader is selected or an executive committee is formed, he or it has to represent the interests of all the farmers, large or small.

*Weaker sections and farmers' organisations*

It may happen that the small and marginal farmers—as well as the weaker sections—may hesitate to join the association under the impression that their interests would be best served by remaining outside the association and their interests would be better protected by the government bureaucracy rather than by the leaders of the association. Such a situation can be corrected by the presence of an enlightened leadership which can successfully persuade them. Alternatively, a more equitable graduated voting scale to reflect the interests of both groups of users in the organisation could be introduced.

*Support rôle of local bodies*

In certain States in India, it is likely that local bodies have already come into being and are actively discharging the statutory functions under law. Perhaps, under the government directives, these local bodies may show interest in forming irrigators' associations. For example, the village *panchayats* may take the initiative and take up the minimal functions of the maintenance of field channels and drains and of the observance of rotational water supply schedules. If the *panchayats* are faction-ridden or dominated by certain castes, the irrigators' associations may reflect the same conflicts. It is also possible that the village *panchayats* may contain non-farming interests such as local *banias* (tradesmen) or professional politicians who may not have any genuine interest in irrigation. These elements would like to increase the sphere of their influence and look upon the opportunity with ulterior motives, leading to adverse results. Fearing the intrusion of these non-irrigators, the irrigators may prefer an association of their own and be averse to those who have no interests in irrigation *per se*.

The foregoing discussion leads us to conclude that (a) only in those project areas where the necessary and sufficient conditions of availability of reliable water supply and of receptive management staff are satisfied, can we think in terms of irrigators' participation, and that (b) there are going to be divergent views on the subjects of the

size, status, functions and powers of the associations. Therefore, it will be useful to be aware of the irrigators' attitudes to the structure of the association, the different gradations of their participatory functions and their preparedness to assume responsibility before any 'top-down' efforts of the Government, through its executive orders, are undertaken.

The next section reports the results of a survey of attitudes of farmers in an irrigation project in Gujarat State.

## ATTITUDES TO IRRIGATORS' ORGANISATION

*Background of the project*

The project chosen for the study of attitudes is the Mahi-Kadana Irrigation Project with a dam across the river Mahi at the village of Kadana in the Panchmahals District of the State of Gujarat. The Mahi river rises in the Vindhya Hills in the State of Madhya Pradesh in central India and flows through the State of Rajasthan and then traverses the middle of Gujarat from the north-east to the south-west before discharging into the Gulf of Cambay, 580 km away from its source.

The project consisted of two phases. The first phase related to the construction of a diversion weir across the river at Wanakbori in the District of Kheda whilst the second phase referred to the construction of the dam at Kadana village in the District of Panchmahals, 140 km upstream of the river. The first phase of the project was completed in 1960 and the second phase in 1978. The cultivable command area of the project is estimated to be 0·212 million hectares of Kheda District on the right bank of the river and 0·011 million hectares in Panchmahals District on the left bank.

The distribution system has only very recently reached the completion stage on the left bank but a large part of the area on the right bank has been receiving irrigation supplies for the last two decades due to the completion of the first phase of the project. The diversion weir has enabled fairly substantial irrigation in the monsoon season from July to October and limited irrigation in the winter season from October to March, and in hot weather from March to June, depending upon the river flow. After completion of the dam in 1978, year-round irrigation has become a reality with greater areas under irrigation both in the winter and in the hot weather seasons.

*Area under study*

Figure 1 is a sketch map of the command area (221·36 ha) under the Rawalapura sub-minor (9·82 cusecs) on the right bank of the river and presents details of the irrigation system together with the network of watercourses and farmland under the command of each outlet (one cusec). The choice of the area for the attitude survey

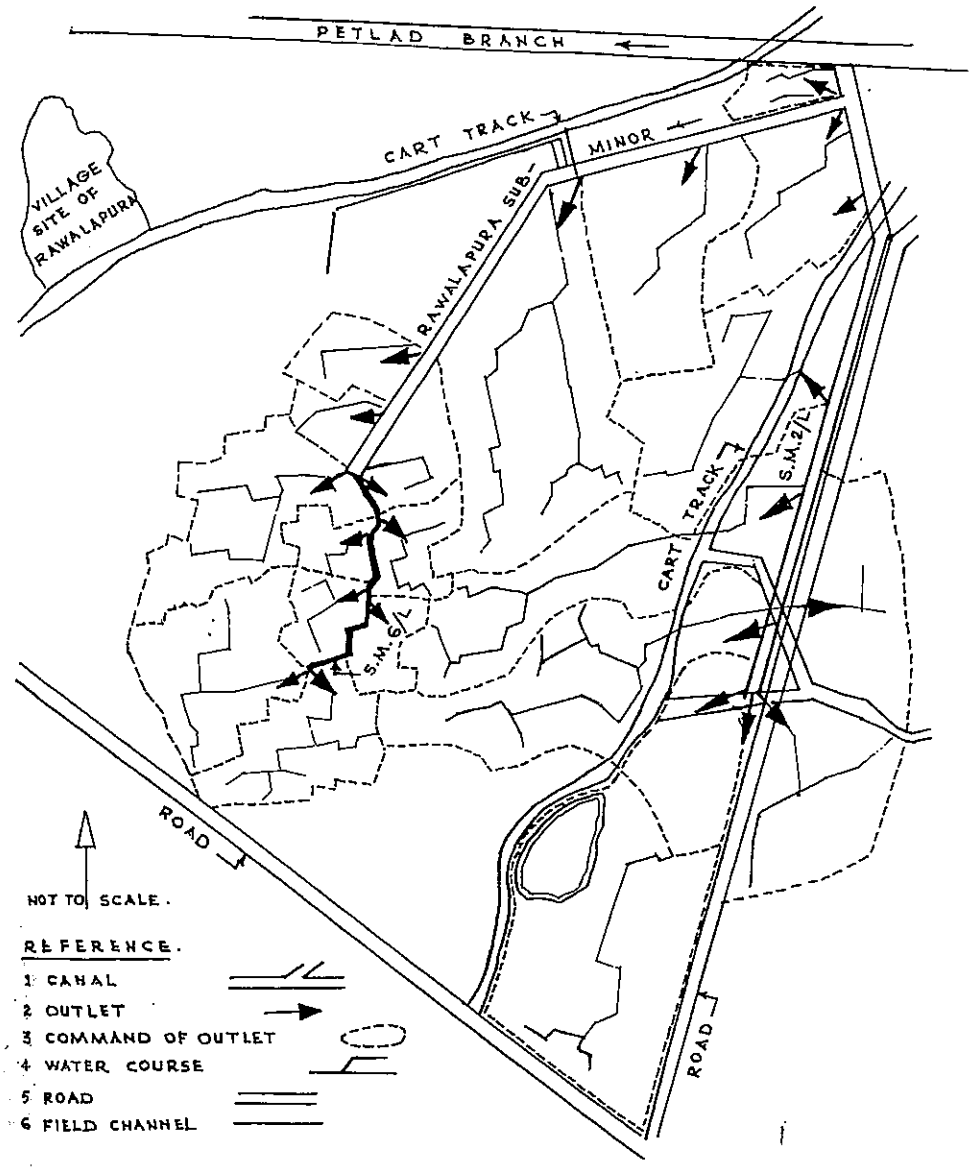


Fig. 1. Command area under Rawalapura sub-minor, Mahi–Kadana Irrigation Project, Gujarat State, India.

was influenced by two considerations. First, it has been receiving irrigation supplies since the early 1960s during the monsoon season and, for the last three years, with the completion of the dam, in the winter and the hot season as well. Secondly, the area forms part of the World Bank aided scheme of RWS which began as an experimental measure in the winter of 1978–79. Before the introduction of RWS, the irrigation department, operating as part of the command area development authority (CADA), restored the system to good condition by incurring substantial expenditure on physical infrastructures such as the installation of measuring devices at the minor head and at each outlet, and flow regulators in the minor and on clearing the field channels of weed and silt. Further, an intensive application of technical and managerial resources was resorted to for preparing the RWS schedules for water distribution and for implementing them through extension among the irrigators.[9]

At each outlet, sub-groups were formed for each day of irrigation, assigned as per the RWS schedule, and each sub-group had a leader. These sub-group leaders, not exceeding seven in number, signifying the days of the week, formed the outlet committee, with its own leader. The outlet committee and sub-groups assumed the rôle of self-regulation of the RWS schedules.

Thus, the lands in the Rawalapura sub-minor were assured of water at appropriately predetermined intervals and in fixed quantities, depending upon the soil–crop characteristics. The socio-economic impact of the experiment, discussed elsewhere, has been favourable.[10] Since both the necessary and sufficient conditions of assured water supply and a receptive staff have been fulfilled, it was felt that the area is suitable for further experimentation with regard to the formation of an irrigators' organisation. The CADA has also been toying with the idea of setting up a water co-operative for the first time in the command area. The idea received a boost when it came to be known that the irrigators had joined together in an informal way to maintain field channels and structures. Before each season started, the farmers made a contribution of five rupees per head to employ labour in order to bring the field channels into good condition. Encouraged by the voluntary efforts towards community action, the CADA undertook a survey of irrigators' attitudes towards their active involvement.

*Methodology*

The attitudes towards irrigators' organisations can be broadly categorised as follows:

(a) Necessary and sufficient conditions.
(b) Types of organisation.
(c) Election procedure.
(d) Functions of organisations.
(e) Resources of organisations.
(f) Involvement of non-irrigators.

(g) A water co-operative.

In all, 18 statements were prepared for the above categories and were included in a non-disguised and structured questionnaire. The questionnaire was given to all the 305 irrigators in the command area of the Rawalapura sub-minor and thus an effort was made to elicit their replies on a hundred per cent basis. The statements were graded on a simple three-point Likert scale ranging from 'agree' to 'disagree', instead of a conventional five-point scale, since most of the irrigators were found to be unable to distinguish between the two views 'strongly disagree' and 'disagree' or 'strongly agree' and 'agree' in a pilot test of the questionnaire.

*Different categories of irrigators*

Two-hundred-and-ninety-seven of the 305 irrigators responded to the questionnaire as the remaining eight were away from the villages at the time of the interview visits by the investigators. Thus, there was a 97% response. The irrigators were classified into three categories with reference to (a) size of the farms and (b) location of the farm in the command area of each outlet, and into four categories with reference to (c) educational background. With regard to the major division of size of farms, the official definitions of marginal (landholding size not exceeding 1 ha), small (landholding size above 1 ha and not exceeding 2 ha) and large farmers (landholding size of 2 ha and above) were followed. The locational position of irrigators was defined as follows. The length of the field channel from the outlet to the farthest of the plots in the command area of a given outlet was divided into three equal parts. The farms falling within the first part were designated head reaches, those falling within the central part, middle, and those falling under the last part, tail enders.

With regard to educational background, irrigators without education were classified as those with no schooling, those who had studied up to the seventh standard were classified as those with a primary school background, those who had studied up to the eleventh standard as those with a secondary school background and those who had studied above the eleventh standard as those with a higher educational background.

The distribution of the 297 farmers into different categories under the three major divisions as described above is shown in Table 1. The irrigators were mostly marginal and small farmers (77%), whereas the large farmers were in the minority (23%). In terms of educational background, 15% of farmers had no schooling of any kind whereas a major part of them (57%) had only primary education; farmers with secondary education comprised 23%. Farmers with higher education formed a negligible proportion (4%).

*Analysis of attitude responses*

Table 2 presents the responses of all farmers for each attitude statement recorded on the Likert scale along with their weighted mean and $t$ statistic.

TABLE 1
DISTRIBUTION OF IRRIGATORS INTO DIVISIONS AND CATEGORIES

| | *Size* | | | *Location* | | | *Educational background* | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Marginal farmers* | *Small farmers* | *Large farmers* | *Head reaches* | *Middle* | *Tail end* | *No education* | *Primary education* | *Secondary education* | *College* |
| Number of irrigators ($N = 297$) | 114 (38) | 114 (38) | 69 (24) | 84 (28) | 116 (39) | 97 (33) | 45 (15) | 170 (57) | 70 (24) | 12 (4) |
| Area in (ha) (Total: 195·36) | 47·30 (24) | 67·88 (35) | 80·18 (41) | 72·26 (37) | 80·81 (41) | 42·29 (22) | 25·69 (13) | 102·88 (53) | 49·43 (25) | 17·36 (9) |

(Figures in parentheses denote percentages.)

To reflect the necessary and sufficient conditions, the irrigators were asked about their perception of the working of the RWS and their ability to self-regulate the schedules and the need for an organisation. Ninety-six per cent of the farmers expressed satisfaction with the RWS, 79 % felt confident about the ability to self-regulate and 71 % agreed that there was a need for an organisation. The weighted mean was higher than the simple arithmetic mean and was found to be statistically significant by the two-tailed *t* test, the level of significance chosen being 5 %. Thus, the null hypotheses that the irrigators are indifferent to RWS, to their ability to self-regulate and to the need for an organisation are rejected. It can thus be safely concluded that the area is ready for organisational efforts to involve the farmers in irrigation management.

With regard to the type of organisation (Table 3), of the 211 farmers who desired an organisation for irrigation (71 % of the 297 farmers) two-thirds rejected a formally structured organisation, their rejection being statistically significant. Ninety-two per cent of 211 irrigators (194)—or 65 % of all the irrigators in the area—preferred the outlet level organisation which is the present practice in the Rawalapura sub-minor. Since two-thirds of the respondents preferred the current arrangements of outlet level committees, all the 297 farmers were asked a specific question about them. Their satisfaction with regard to the present system emerged as statistically significant. However, with regard to the current procedure for selecting the chairman of the committees on a consensus basis, the farmers were overwhelmingly in favour of election, as borne out by the statistical significance attached to their reaction.

With regard to the functions of the organisation, six attitude statements were presented to the farmers. These were related to solving disputes, liaison with the irrigation department, observance of RWS schedules, maintenance of field channels, collection of irrigation charges and processing of applications and extension work. All six attitudes were found to be statistically significant. However, certain functions, such as the maintenance of field channels, conflict resolution and liaison with the irrigation department had greater support among the respondents than other functions. The ranks assigned to these functions are discussed separately.

Whilst the irrigators positively responded to the raising of resources for the organisations, as reflected in the statistical significance attached to their statements, there was some disagreement about the manner of mobilising resources. Forty per cent of the irrigators disagreed with the suggestion to increase the irrigation rates and earmarking the incremental proceeds for the committees whereas 70 % of the farmers reacted favourably to the procedure of collecting fees from the members. Thus, it is obvious farmers prefer their own mode of raising resources to the governmental efforts of increasing the irrigation rates.

On the subject of involvement of outsiders in the irrigators' organisation, the irrigators were more or less equally divided. The null hypothesis that they were indifferent to this specific idea cannot be rejected since the *t* statistic was found to be

TABLE 2
ATTITUDES OF IRRIGATORS IN RAWALAPURA SUB-MINOR ($N = 297$)

| *Agree* / *Statement* *1* | *Agree* *2* | *Do not know* *3* | *Disagree* *4* | *Weighted mean* *5* | t *statistic* *6* |
|---|---|---|---|---|---|
| Necessary and sufficient conditions: | | | | | |
| 1. RWS is working satisfactorily | 284 (95) | 5 (2) | 8 (3) | 2·929 | 46·23* |
| 2. Irrigators are able to self regulate the observations of RSW schedule | 235 (79) | 3 (1) | 59 (20) | 2·592 | 12·748* |
| 3. It is desirable to have an irrigators' organisation | 211 (71) | 14 (5) | 72 (24) | 2·468 | 9·399* |
| Type of organisation | | | | | |
| 1. The organisation should be formal | 66 (31) | 4 (2) | 141 (67 | 1·168 | −16·33* |
| 2. The present system of outlet committees and sub-groups is satisfactory | 161 (54) | 34 (12) | 102 (34) | 2·198 | 3·704* |
| Election of Chairman | | | | | |
| 1. It is desirable to have the chairman of the committee elected | 176 (59) | 23 (8) | 98 (33) | 2·262 | 4·878* |
| *Functions:* | | | | | |
| 1. Solving disputes among irrigators | 235 (79) | 20 (7) | 42 (14) | 2·649 | 15·632* |
| 2. Liaison with irrigation department on behalf of irrigators | 222 (75) | 22 (7) | 53 (18) | 2·569 | 12·613* |

| | | | | | |
|---|---|---|---|---|---|
| 3. Observance of RWS schedules | 186 (63) | 18 (6) | 93 (31) | 2·313 | 5·871* |
| 4. Maintenance of field channels and structures | 225 (76) | 11 (4) | 61 (20) | 2·552 | 11·704* |
| 5. Collection of irrigation charges and processing of applications on behalf of the irrigation department | 171 (58) | 18 (6) | 108 (36) | 2·212 | 3·856* |
| 6. Extension in water management | 192 (65) | 13 (4) | 92 (31) | 2·337 | 6·317* |
| Resources for organisation: | | | | | |
| 1. Existing irrigation rates can be raised by a certain percentage and the incremental proceeds may be handed to each outlet committee for maintenance purposes | 164 (55) | 14 (5) | 119 (40) | 2·152 | 2·712* |
| 2. The outlet can collect fees from members for maintenance and repair purposes | 210 (71) | 15 (4) | 72 (25) | 2·465 | 9·343* |
| Involvement of non-irrigators: | | | | | |
| 1. It is desirable to associate village leaders although they may not be irrigators | 144 (49) | 24 (8) | 129 (43) | 2·051 | 0·916 |
| 2. It is desirable to associate village *panchayat* with irrigators' organisation | 65 (22) | 37 (12) | 195 (66) | 1·562 | −9·114* |
| Water co-operative: | | | | | |
| 1. It is desirable to have an irrigators' co-operative society | 117 (39) | 33 (11) | 147 (50) | 1·899 | −1·857 |
| 2. It is feared that corruption and malpractices prevalent in other co-operatives may spread to the water co-operative | 138 (46) | 55 (19) | 104 (35) | 2·114 | 2·190* |

* Significant at the 0·05 level by two-tailed test.
Figures in parentheses denote percentages of total.

TABLE 3
IRRIGATORS' ATTITUDES TO TYPES OF ORGANISATION BY DIFFERENT CATEGORIES

| | | *Size* | | | *Location* | | | *Education* | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Marginal* | *Small* | *Large* | *Head reaches* | *Middle* | *Tail end* | *No education* | *Primary education* | *Secondary education* | *Higher* |
| Total number of irrigators | 297 | 114 | 114 | 69 | 84 | 116 | 97 | 45 | 170 | 70 | 18 |
| | | (38) | (38) | (24) | (28) | (39) | (33) | (15) | (57) | (24) | (4) |
| Number of irrigators | 211 | 82 | 83 | 46 | 69 | 77 | 65 | 30 | 122 | 48 | 11 |
| preferring organisation | (71) | (72) | (73) | (67) | (82) | (66) | (67) | (67) | (72) | (69) | (92) |
| Form of organisation | | | | | | | | | | | |
| (a) Formal | 66 | 22 | 27 | 17 | 16 | 31 | 19 | 10 | 39 | 14 | 3 |
| | (31) | (27) | (33) | (37) | (23) | (40) | (29) | (33) | (32) | (29) | (27) |
| (b) Informal | 141 | 58 | 55 | 28 | 53 | 44 | 44 | 20 | 81 | 32 | 8 |
| | (67) | (71) | (66) | (61) | (77) | (57) | (68) | (67) | (66) | (67) | (73) |
| (c) Do not know. | 4 | 2 | 1 | 1 | 0 | 2 | 2 | 0 | 2 | 2 | 0 |
| | (6) | (2) | (1) | (2) | 0 | (3) | (3) | 0 | (2) | (4) | 0 |
| Level of organisation | | | | | | | | | | | |
| (a) Outlet | 194 | 76 | 74 | 44 | 62 | 73 | 59 | 29 | 111 | 43 | 11 |
| | (92) | (93) | (89) | (96) | (81) | (95) | (91) | (97) | (91) | (90) | (100) |
| (b) Minor | 9 | 1 | 7 | 1 | 3 | 3 | 3 | 0 | 7 | 2 | 0 |
| | (4) | (1) | (8) | (2) | (4) | (4) | (5) | 0 | (6) | (4) | 0 |
| (c) Village | 8 | 5 | 2 | 1 | 4 | 1 | 3 | 1 | 4 | 3 | 0 |
| | (4) | (6) | (2) | (2) | (6) | (1) | (5) | (3) | (3) | (6) | 0 |

(Figures in parentheses denote percentages to total.)

insignificant at the 5% level. However, they definitely disagreed with the idea of associating *panchayat* bodies with irrigators' organisations, as evidenced by the *t* test of significance.

With regard to the statement on the subject of a water co-operative, the respondents were found to be indifferent, since the *t* test was found to be of no significance. However, on the statement relating to the fear of malpractices prevalent in other co-operatives spreading to the water co-operative, the irrigators' agreement was found to be statistically significant.

Whilst the above discussion relates to all farmers in the Rawalapura sub-minor under study, it is necessary to conduct specific statistical tests to find out whether the differences in major divisions such as size, physical location and educational background have had any influence on their attitudes. Before doing so, it will be useful to refer to Table 3 and examine the preference patterns among each category of farmers in three major divisions.

*Preference patterns*

Of 297 irrigators, 211 (71%) preferred to form an organisation. Analysed from the point of view of size of farms, 72% of marginal farmers, 73% of small farmers and 67% of large farmers opted for organisation. In the case of physical location, 82% of farmers in the head reaches, 66% of farmers in the middle part and 67% of tail enders were keen to form an organisation. From the point of view of educational background, the largest percentage of farmers with higher education (92%) preferred organisation whereas the lowest percentage (67%) came from those who did not have any education.

With regard to the type of organisation, 67% of the total 211 farmers opted for an informal association and this percentage is reflected in almost every category in the three major divisions. In the case of size of farms, 70% of marginal farmers, 66% of small farmers and 61% of large farmers were in favour of an informal type of organisation. Similarly, with regard to location, 77% of irrigators in head reaches, 57% of the 'middle' irrigators and 68% of the tail end irrigators preferred the informal type of organisation. With regard to farmers divided into various levels of educational background, the percentage of farmers with no education, of farmers with primary education and of farmers with secondary education favouring an informal type of organisation was the same (67%). However, the corresponding percentage in the case of those with higher education was much greater (72%).

Of the total number of 211 irrigators, 194 (92%) preferred the organisation at the outlet level. The same proportion is almost reflected among the categories of irrigators in each major group. In the case of size of farmers, the highest percentage came from the large farmer category (96%), in the case of location, it was from the middle farmers (95%) and in the case of educational background, the highest percentage was among the farmers with higher education (100%).

Since the CADA was keen to know the reaction of the irrigators with regard to

setting up a water co-operative in the area, all the irrigators were specifically asked their opinion on the subject (Table 4). Fifty per cent were opposed to the idea and this particular response was reflected among the farmers in the three categories of marginal, small and large farmers. With regard to physical location, a high percentage (64 %) of the tail enders were opposed to water co-operatives. However, with regard to educational background, only a third of the farmers with higher education disapproved of the formation of water co-operatives. However, the farmers in the other three categories were more or less equally divided.

*Chi-square tests of significance*

Thus, the differences in size of the farms, physical location and educational background have seemingly some impact on the irrigators' attitudes. In order to determine the statistical significance of any empirical relationship between these differences and attitudes, chi-square tests were conducted with the level of significance at 5 %. The results are presented in Table 5.

Except for a statement relating to water co-operatives, none of the attitudes is dependent upon the differences in farmers' land holding sizes. The statement relating to water co-operatives, whose computed chi-square is significant at the 5 % level, is with regard to the fear of corruption in other co-operatives spreading to water co-operatives. More than half the number of marginal farmers and more than 50 % of the large farmers agreed with the statement but only 40 % of the small farmers shared this belief. Because of this divergence, the attitude emerged as being significantly dependent upon the differences in the size of the farmers' holdings.

However, five statements—one relating to necessary and sufficient conditions, three relating to functions, one relating to resources for organisations and one relating to water co-operatives—were found to be significantly dependent upon differences in physical location. Whilst 82 % of irrigators in the head reaches agreed to have an organisation, only 67 % and 66 %, respectively of the middle and tail end irrigators felt it desirable to have the organisation. For this reason, the statement turned out to be significantly dependent on differences in physical location. Similarly, with regard to the statement on solving disputes as a function, 78 % and 70 % of the middle and tail-end irrigators expressed agreement but a much larger percentage (90 %) of head reach farmers agreed with the statement. These differences explain the statistical significance of the attitude. With reference to the irrigators' attitude towards the liaison function with the irrigation department, a high percentage (86 %) of farmers in the head reaches supported the view. But, as only smaller percentages of farmers in the middle part (77 %) and in the tail-end (62 %) shared the view, the divergences in agreement rendered the attitude critically dependent on these differences.

The statement on the subject of the collection of irrigation charges and the processing of application forms on behalf of the irrigation department received a low (34 %) agreement from tail-enders but 69 % of head reach and 68 % of middle

TABLE 4

IRRIGATORS' ATTITUDES TOWARDS WATER CO-OPERATIVES BY DIFFERENT CATEGORIES

| | | *Size* | | | *Location* | | | *Education* | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Marginal* | *Small* | *Large* | *Head reaches* | *Middle* | *Tail end* | *No education* | *Primary education* | *Secondary education* | *Higher* |
| Total number of irrigators | 297 | 114 | 114 | 69 | 84 | 116 | 97 | 45 | 170 | 70 | 12 |
| Irrigators preferring water co-operative | | | | | | | | | | | |
| For | 117 | 44 | 45 | 28 | 44 | 51 | 22 | 20 | 59 | 30 | 8 |
| | (39) | (39) | (40) | (40) | (52) | (44) | (23) | (44) | (35) | (43) | (67) |
| Against | 147 | 58 | 54 | 35 | 30 | 55 | 62 | 21 | 86 | 36 | 4 |
| | (50) | (51) | (47) | (51) | (36) | (47) | (64) | (47) | (50) | (51) | (33) |
| Do not know | 33 | 12 | 15 | 6 | 10 | 10 | 13 | 4 | 5 | 4 | 0 |
| | (11) | (10) | (13) | (9) | (12) | (9) | (13) | (9) | (15) | (6) | 0 |

(Figures in parentheses denote percentages.)

TABLE 5

IMPACT OF DIFFERENCES AMONG IRRIGATORS ON ATTITUDES TOWARDS ORGANISATIONS (CHI-SQUARE TESTS OF SIGNIFICANCE)

| *Differences in* | *Statements* | | | | | |
|---|---|---|---|---|---|---|
| | *Necessary and sufficient conditions* | | | *Type of organisation* | | *Election of chairman* |
| | *1* | *2* | *3* | *1* | *2* | *1* |
| Size: | | | | | | |
| Marginal/small/large (Degrees of freedom: 4) | 1·809 | 1·511 | 3·295 | 1·827 | 7·981 | 2·112 |
| Location: | | | | | | |
| Head reaches/middle/tail end (Degree of freedom: 4) | 3·953 | 3·412 | 10·626* | 7·621 | 3·730 | 6·811 |
| Educational Background: | | | | | | |
| No education/primary education/secondary education/college (Degrees of freedom: 6) | 2·894 | 11·770 | 10·134 | 2·375 | 8·135 | 1·482 |

| *Difference in* | *Statements* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | *Functions* | | | | | | *Resources of organisation* | |
| | *1* | *2* | *3* | *4* | *5* | *6* | *1* | *2* |
| Size: | | | | | | | | |
| Marginal/small/large (Degrees of freedom: 2) | 1·613 | 1·156 | 2·004 | 3·598 | 1·406 | 3·112 | 5·430 | 2·037 |
| Location: | | | | | | | | |
| Head reach/middle/tail end (Degrees of freedom: 4) | 12·575* | 14·365* | 9·382 | 2·796 | 33·610* | 8·720 | 16·629* | 4·631 |
| Education Background: | | | | | | | | |
| No education/primary education/secondary education/college/ (Degree of freedom: 6) | 10·008 | 3·548 | 11·570 | 4·330 | 7·959 | 15·708* | 2·146 | 4·256 |

| *Difference in* | *Statements* | | | |
|---|---|---|---|---|
| | *Involvement of non-irrigators* | | *Water co-operatives* | |
| | *1* | *2* | *1* | *2* |
| Size: | | | | |
| Marginal/small/large (Degrees of freedom: 4) | 2·571 | 7·335 | 1·042 | 10·266* |
| Location: | | | | |
| Head reach/middle/tail end (Degrees of freedom: 4) | 7·324 | 1·636 | 19·985* | 8·605 |
| Educational Background: | | | | |
| No education/primary education/secondary education/ college (Degrees of freedom: 6) | 12·650* | 2·757 | 9·984 | 3·714 |

(* Significant at the 0·05 level.)

part farmers support it. Because of these differences, the statement emerged as being significantly dependent on locational differences.

Finally, with regard to a water co-operative society, agreement ranged from 22 % in the case of the tail-end irrigators to 45 % of the middle part and 52 % of the upper part of the command area. Because of these variations, the attitude of farmers towards water co-operatives was found to be critically dependent on locational differences.

Two statements were found to be empirically dependent on differences in educational background. One pertains to extension in water management as a function of the irrigators' organisation and the other relates to the involvement of non-irrigators in the organisation. With regard to the first, 78 % of farmers with no education desired extension in water management as a function of the organisation, whilst only 68 % of the farmers with primary and secondary education supported the view. In the case of those with higher education, the percentage of agreement was much less (33 %). Because of these wide variations, the statement emerged as being significantly dependent. With regard to the second statement, there were divergent degrees of agreement on the subject of involving non-irrigator leaders of the village in the irrigators' organisation. The percentages of agreed farmers from the categories of farmers with no education, with primary education, with secondary education and with higher education were 42 %, 53 %, 40 % and 50 %, respectively. Consequently, the chi-square statistic turned out to be significant at the 0·05 level.

*Ranking of functions*

Each irrigator was also asked to assign a rank to the following suggested six functions of the organisation as he perceived them to be important.

(a) Solving disputes among the irrigators.
(b) Liaison with the irrigation department on behalf of irrigators.
(c) Observance of the RWS schedules.
(d) Maintenance of the field channels and structures.
(e) Collection of irrigation charges and processing of the applications of irrigators on behalf of the irrigation department.
(f) Extension in water management.

These ranks were analysed by major division. For example, the ranks assigned by small farmers, marginal farmers and large farmers and their frequencies are presented in Tables 6 to 8. For each function, aggregate scores are computed by summing the total marks arrived at for each rank by multiplying the frequencies of farmers occurring in that rank with the score of that rank on the basis of the first rank being equal to 6 marks, the second rank to 5 marks, the third rank to 4 marks, the fourth rank to 3 marks, the third to 2 marks, the second to 2 marks and the sixth to 1 mark. The final rank is given to each function by ranking the aggregate scores. Thus, marginal farmers gave the final rank of one to observance of RWS schedules,

TABLE 6
RANKS ASSIGNED TO FUNCTIONS OF IRRIGATORS' ORGANISATIONS: MARGINAL FARMERS

| *Functions of irrigators' organisations* | *Frequencies of irrigators in the rank assigned* | | | | | | | *Final rank* |
|---|---|---|---|---|---|---|---|---|
| | *1* | *2* | *3* | *4* | *5* | *6* | *Aggregate scores* | |
| 1. Solving disputes among irrigators | 10 | 12 | 24 | 37 | 16 | 15 | 374 | 4 |
| 2. Liaison with irrigation department on behalf of farmers | 11 | 15 | 36 | 18 | 23 | 11 | 376 | 3 |
| 3. Observance of RWS schedules | 31 | 53 | 13 | 11 | 6 | 0 | 554 | 1 |
| 4. Maintenance of field channels and structures | 48 | 22 | 14 | 15 | 12 | 3 | 526 | 2 |
| 5. Collection of irrigation charges and processing of applications of irrigators on behalf of the irrigation department | 0 | 3 | 9 | 14 | 39 | 49 | 220 | 6 |
| 6. Extension in water management | 14 | 9 | 18 | 19 | 18 | 36 | 330 | 5 |

TABLE 7
RANKS ASSIGNED TO FUNCTIONS OF IRRIGATORS' ORGANISATIONS: LARGE FARMERS

| *Functions of irrigators' organisations* | *Frequencies of irrigators in the ranks assigned* | | | | | | | *Final rank* |
|---|---|---|---|---|---|---|---|---|
| | *1* | *2* | *3* | *4* | *5* | *6* | *Aggregate scores* | |
| 1. Solving disputes among irrigators | 6 | 8 | 12 | 19 | 10 | 14 | 215 | 4 |
| 2. Liaison with the irrigation department on behalf of farmers | 11 | 9 | 26 | 12 | 9 | 2 | 271 | 3 |
| 3. Observance of RWS schedules | 12 | 32 | 12 | 8 | 4 | 1 | 313 | 2 |
| 4. Maintenance of field channels and structures | 27 | 12 | 14 | 9 | 5 | 2 | 317 | 1 |
| 5. Collection of irrigation charges and processing of applications of irrigators on behalf of the irrigation department | 6 | 4 | 3 | 4 | 32 | 20 | 164 | 6 |
| 6. Extension in water management | 7 | 4 | 2 | 17 | 9 | 30 | 169 | 5 |

TABLE 8
RANKS ASSIGNED TO FUNCTIONS OF IRRIGATORS' ORGANISATIONS: SMALL FARMERS

| *Functions of irrigators' organisations* | *Frequencies of irrigators in the ranks assigned* | | | | | | | *Final rank* |
|---|---|---|---|---|---|---|---|---|
| | *1* | *2* | *3* | *4* | *5* | *6* | *Aggregate scores* | |
| 1. Solving disputes among irrigators | 6 | 7 | 19 | 43 | 18 | 21 | 333 | 4 |
| 2. Liaison with the irrigation department on behalf of farmers | 10 | 16 | 36 | 23 | 20 | 9 | 402 | 3 |
| 3. Observance of RWS schedules | 29 | 56 | 20 | 8 | 1 | 0 | 560 | 1 |
| 4. Maintenance of field channels and structures | 54 | 17 | 19 | 15 | 7 | 2 | 546 | 2 |
| 5. Collection of irrigation charges and processing of applications of irrigators on behalf of the irrigation department | 11 | 6 | 7 | 8 | 43 | 39 | 273 | 5 |
| 6. Extension in water management | 4 | 12 | 13 | 17 | 25 | 43 | 280 | 6 |

the second rank to the maintenance of field channels, the third rank to liaison work, the fourth rank to the solution of disputes, the fifth rank to extension and the last rank to the collection of irrigation charges on behalf of the Government. The large farmers also followed the same pattern but the small farmers had a very slight variation in ranking with respect to the collection of water charges and extension in water management.

Similar exercises were undertaken for the three categories of irrigators by physical location and the four categories by educational background. For want of space, the Tables are not reproduced here but a summary of their rankings is given in Table 9.

To determine whether the ranks assigned by the three categories of irrigators with regard to size and location, and by the four categories of irrigators with regard to educational background, differ considerably among themselves, Kendall's coefficients of concordance were also calculated. The values of the coefficients were fairly high for all the three major divisions. The maximum value was unity recorded for the second major division—i.e. physical location—as there was virtually no difference between the three categories in their ranking of functions. It is obvious that farmers assigned a high priority to maintenance of field channels, regulation of RWS schedules and solving of disputes and a low priority to the collection of irrigation charges and extension in water management.

## POLICY CONCLUSIONS

A survey of attitudes of irrigators conducted in the Mahi-Kadana Project in Gujarat State, India, towards their involvement in irrigation projects leads us to conclude that:

(a) Although favourable conditions for farmers' involvement prevail, thanks to the assured supply of water and the presence of a receptive irrigation and agricultural staff, an informal organisation at the outlet level on the current lines of outlet committees was overwhelmingly preferred.

(b) There was a general agreement on the nature of the functions of the outlet level organisations but the emphasis was more on simple and uncomplicated functions such as (i) collective maintenance of field channels and structures (ii) observance of RWS schedules (iii) liaison with the irrigation department and (iv) solving disputes among farmers. Functions like collection of irrigation charges from the farmers and extension in water management received a low priority and it appears they may be best left to the departmental personnel.

(c) The irrigators were clearly against involving *panchayati* (local self-government) institutions such as village *panchayat*.

(d) There was no clear preference for water co-operatives.

(e) The irrigators were against government earmarking of funds for organi-

TABLE 9

SUMMARY OF RANKS ASSIGNED TO FUNCTIONS OF IRRIGATORS' ORGANISATIONS BY CATEGORIES

| | *Ranking of functions of irrigators' organisation* | | | | | | *Kendall's coefficient of concordance* |
|---|---|---|---|---|---|---|---|
| | *Solving disputes among farmers* | *Liaison with the irrigation department* | *Observance of RWS schemes* | *Maintenance of field channels and structures* | *Collection of irrigation charges and processing of applications* | *Extension in water management* | |
| Category of Irrigators: | | | | | | | |
| I Size: | | | | | | | |
| (a) Marginal | 4 | 3 | 1 | 2 | 6 | 5 | 0·949 |
| (b) Small | 4 | 3 | 1 | 2 | 5 | 6 | |
| (c) Large | 4 | 3 | 2 | 1 | 6 | 5 | |
| II Location: | | | | | | | |
| (a) Head reaches | 4 | 3 | 1 | 2 | 6 | 5 | 1·000 |
| (b) Middle | 4 | 3 | 1 | 2 | 6 | 5 | |
| (c) Tail end | 4 | 3 | 1 | 2 | 6 | 5 | |
| III Education: | | | | | | | |
| (a) With no educational background | 3 | 4 | 1 | 2 | 6 | 5 | 0·696 |
| (b) With primary school background | 4 | 3 | 1 | 2 | 6 | 5 | |
| (c) With secondary school background | 4 | 3 | 2 | 1 | 6 | 5 | |
| (d) With college background | 3·5 | 3·5 | 1·5 | 5 | 6 | 1·5 | |

sations from the proceeds of irrigation charges. The irrigators preferred to raise their own resources for discharging their limited functions.

The above conclusions should point out to the CADA the need for consolidating the favourable atmosphere created by the introduction of RWS and by the intense involvement of the irrigation and agricultural personnel rather than preoccupying itself with efforts to set up sophisticated institutional arrangements such as water co-operative.

The latter require a long period of experience in the discharge of decentralised functions such as observance of RWS schedules and shared responsibilities among the farmers and collective action involving minimum financial outlay. In the faction-ridden village societies, complicated functions with financial responsibilities create acute problems of accountability and financial propriety. Irrigators with good intentions tend to look upon these institutions with suspicion as breeding grounds for dishonest practices.

In these circumstances, informal arrangements at a decentralised level, such as outlet committees with minimum functions such as observance of RWS schedules, maintenance of field channels through their own resources, liaison with the irrigation department and solving of disputes, should continue to be encouraged. The CADA personnel can easily do this through open dialogues with irrigators in many forums, such as village meetings before each season starts, divisional water advisory committee meetings held by the executive engineers with leading irrigators as members and Area Development Authority meetings which are held every quarter.

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