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Livelihood Concerns in Water Resources Management Regimes in Scarce Conditions

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I

INTRODUCTION

Irrigation provides a source of livelihood to millions of people both in developed and developing countries. In parts of South Asia, where there has been a massive thrust on rural development, extensive networks co-exist with the greatest concentration of rural poverty in the world. Production and livelihoods are linked with poverty alleviation. However, generation of employment and income and support of livelihoods is a high priority than production (Chambers, 1988). Generally, the poor stand to gain from better management of irrigation schemes through generation of employment and income, security against impoverishment and enhancement in their quality of life. In dry regions, irrigation projects need special attention towards its efficient management through people's participation that may bring the desirable result to meet the ultimate objectives of the schemes.

Rajasthan is an extremely water scarce region. Only one per cent of the country's water is available for 5 per cent of the population living in 10 per cent of the total geographical area. The rainfall is generally low and uncertain. A major part of the state is arid and semi-arid. Irrigation on a large scale is absolutely necessary for achieving an economically viable level of agricultural production. Irrigation works are not only a source of water for its crops but also are the only source of water for meeting drinking water requirements for millions of human and livestock population. The agriculture sector is the major consumer of water where as high as 90 per cent of the total availability is used for irrigation purpose. The domestic demand is fulfilled by about 9 per cent of the total supply while only one per cent is allocated for other uses.

The economy of Rajasthan is mainly dependent on the agriculture sector, which supports about 70 per cent of the population and contributes 40 per cent to gross domestic product. Presently, irrigated agriculture accounts for one-third of agricultural production and irrigation is increasingly becoming one of the critical factors for increased production. The productivity of irrigated land is low as compared to its potential. The major factors responsible for low agricultural productivity and food insecurity are insufficient and insecure water availability and lack of efficient irrigation management. Besides other factors that have caused food insecurity are small size of landholdings and lack of off-farm employment.

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The data used in the present study was collected for the major study "Minor Irrigation Programme Rajasthan, Phase II". The author is grateful to W.Stenzel for providing the facilities for accomplishing this study.

The challenge of coping with the scarcity of water resources can be met only by refocusing on the existing irrigation projects for efficient use of water. Rehabilitation of irrigation schemes may help in providing substantial benefits to the farming community at low investment. The programme will help to contribute in income and employment generation that further help in reduction in poverty in the rural areas. However, the structure of many of the irrigation schemes has deteriorated due to lack of maintenance, and many of the schemes have not been designed and constructed according to criteria for ensuring efficient water utilisation (GITEC, 2000). Lack of institutional co-ordination has resulted in an inefficient operation of the schemes. Consequently, productivity of irrigated agriculture is much below its potential. In this backdrop, the present study has attempted to analyse the various issues relating to livelihoods across the irrigation schemes and different categories of households.

II

SELECTION OF IRRIGATION SCHEMES AND APPROACH

In the present study four minor irrigation schemes were selected of which three were old schemes that were constructed before independence and one was new proposed scheme.¹ All the selected schemes were of minor size (see Table 1).

TABLE 1. SELECTION OF MINOR IRRIGATION SCHEMES IN RAJASTHAN

| Sr. No. | District | Tehsil | Schemes | Types of schemes | Total number of canal water users | Sampled canal water users | Proportion (per cent) of sample households |
|---------|-------------|-------------|---------|------------------|-----------------------------------|---------------------------|--|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| 1. | Chittorgarh | Bari Sadari | Parsoli | Old | 426 | 60 | 14 |
| 2. | Kota | Ladpura | Ranpur | Old | 281 | 44 | 16 |
| 3. | Tonk | Deoli | Panwar | Old | 502 | 55 | 11 |
| 4. | Kota | Singod | Awan | New | 207 | 40 | 19 |

The issues were addressed through primary level household survey, participatory methods and secondary data from village revenue records. Structured schedule was used to collect the data. From each selected irrigation schemes three villages and/or farms located on the head, middle and tail reaches of the main canal were selected randomly with a view to give a proportionate representation to all water users having varying access to irrigation water. In the present study, canal water users were selected for in-depth verification with a view that they get the direct benefits from the schemes. A sample of 199 households was drawn from all selected schemes. The household data were collected on recall method for the year 1998-99.² Information was collected on the following aspects; demographic, land holdings, source wise household income, employment pattern, agriculture and livestock husbandry and water resource management at farm and off-farm level. The information both qualitative and quantitative relating to gender and sale of assets was collected through participatory method and group discussion with old and knowledgeable individuals.

III

SOCIO-DEMOGRAPHIC CHARACTERISTICS

The demographic features of the command area of selected irrigation projects are reported in the present section. The average family size among the sample households varied between 5 to 8 persons per household across the schemes (see Table 2). It was almost comparable with the 1991 census figures (not reported in Table) with the exception of Ranpur project where it has gone up from 6 persons per family during 1991 (Government of Rajasthan, 1991) to 8 persons during reference period.

TABLE 2. DEMOGRAPHIC AND SOCIAL ASPECTS OF SAMPLE HOUSEHOLDS

| Particulars (1) | Parsoli (2) | Ranpur (3) | Panwar (4) | Awam (5) |
|---------------------------------|----------------|---------------|---------------|-------------|
| Average family size | | | | |
| Male | 3.12 | 4.50 | 3.02 | 3.73 |
| Female | 2.60 | 3.66 | 3.20 | 3.10 |
| Total | 5.72 | 8.16 | 6.22 | 6.83 |
| Sex ratio | 833 | 813 | 1059 | 831 |
| Average age at marriage (Years) | | | | |
| Male | 18.00 | 19.00 | 17.00 | 20.00 |
| Female | 15.00 | 15.00 | 14.00 | 16.00 |
| Difference | 3.00 | 4.00 | 3.00 | 4.00 |
| Literacy rates (per cent) | | | | |
| Male | 83.55 | 68.04 | 81.20 | 71.53 |
| Female | 34.07 | 40.87 | 32.00 | 23.30 |
| Total | 56.79 | 56.43 | 55.33 | 50.21 |
| Workforce | | | | |
| Male | 61.50 | 60.61 | 68.38 | 60.40 |
| Female | 60.90 | 63.98 | 59.72 | 58.06 |
| Total | 61.22 | 62.12 | 63.93 | 59.34 |
| Work participation | | | | |
| Farm sector | | | | |
| Male | 49.57 | 40.00 | 36.56 | 46.67 |
| Female | 75.79 | 43.69 | 62.79 | 62.50 |
| Total | 61.43 | 41.70 | 49.16 | 53.70 |
| Non-farm sector | | | | |
| Male | 50.43 | 60.00 | 63.44 | 53.33 |
| Female | 24.21 | 56.31 | 37.21 | 37.50 |
| Total | 38.57 | 58.30 | 50.84 | 46.30 |

Source: Field survey.

The age at marriage is one of the important factors of social development, which is responsible for population growth. This growth not only influences the living conditions of the households but also affect the per capita gains from the available irrigation facilities in the short run while decreasing per capita size of land in the long run. Across the schemes, the average age at marriage among both males and females varied from 17 to 20 years among males and 14 to 16 years in case of females. The age at marriage was lower in the Panwar irrigation project area as compared to that of the other areas. But, the average age at marriage was still lower as compared to state level estimates, i.e., 22.4 and 17.2 years for males and females respectively (NFHS-I, 1992-93). The lower average age at marriage may be

attributed to the conservative attitude of the society towards social traditions as well as lack of education.

Education: The literacy rate is one of the major factors that is considered to be an important one in the process of modernisation. In the present context, it varies between 50 to 57 per cent across different schemes (see Table 2). Except Awan scheme, the present literacy rate among the sample households across the schemes was comparable with the state level, NSSO estimates, i.e., 55 per cent during 1991.³ Among males the present literacy rate was considerably higher than the rate of 72 per cent during 1991 and lower in case of female literacy at 37 per cent except in Ranpur project area.

Work Force and Work Participation: The availability of work force and its deployment determines the level of production, consumption, investment and saving pattern of the households. In the development process of the agriculture sector, the availability of labour force becomes crucial for the households. The proportionate availability of labour force varies between about 59 to 64 per cent across the selected irrigation schemes. In Ranpur project area, females have the leading position in the availability of labour force as compared to other schemes. In Panwar area, they were lagging behind in proportionate terms from their male counterparts with larger proportion whereas there was slight difference in Awan and Parsoli project areas. The analysis shows that the households living in the command area are endowed with earning hands than consumptives.

The deployment of available labour force is bifurcated into farm and non-farm sectors. There exists a large variation in the deployment of available labour force between these two sectors across the irrigation schemes. In Parsoli project area, the farm sector was a major absorptive of available labour force whereas in Ranpur project area, this sector provided employment to only 42 per cent of the total labour force engaged in this sector. The rate of female participation in the farm sector was substantially higher as compared to males across all the schemes. In Ranpur and Panwar project areas, more than half of the total labour force was engaged in non-farm sector. In case of Ranpur, it is because of the fact that there are substantial opportunities for non-farm employment due its location near Kota City. In case of Panwar, large labour force is deployed in various activities related to irrigation project at Bisalpur in Tonk district.

Gender Relations across the Irrigation Schemes

Generally, irrigation planning is gender blind and does not consider the differential needs of men and women that do not bring the desirable results. Now, it is becoming increasingly evident that sustainable development can be meaningful only if it takes both men and women into its fold (Rathore *et al.*, 2000). In many development projects, extension agencies address only men since they are not sensitised to comprehend the role of women in the development process. This resulted in a weak link between women's participation and development of natural resources for the enhancement of productivity in the agricultural sector (Shah, 2000). They work harder and for longer hours, without any significant positive change in

their status. In the present section, an attempt has been made to examine the status of women in the irrigation project areas.

The status of women can be measured in many ways. Presently, the focus was on sex ratio, work participation, literacy rate and their involvement in handling household economy. The analysis shows that the sex ratio was favourable to males with the exception of Panwar scheme where it was favourable to females (see Table 2). In all three other schemes the sex ratio was considerably lower than that of state level estimates, i.e., 910 per thousand during 1991. Women play an active role in agriculture production as compared to male counterparts. Their contribution in non-farm sector was also considerable in certain cases as that depends upon the availability of such opportunities. Experience shows that irrigation has remarkable gender implications. No doubt, after irrigation the workload of females has been increased but has made their life more comfortable than earlier in respect of the accessibility to resources and standard of living (Singh, 2003). The benefits from the development projects in rural areas can be accelerated through the participation of women by forming their groups, imparting training and involving them in designing implementation of policy for future management of resources.

The female-headed households have increased almost everywhere as a result of demographic and socio-economic changes. Conventional wisdom holds that they are poorer, more vulnerable and more prone to transmit disadvantage to the next generation than households headed by men. The experiences from several regions show that there are no grounds for arguing that female-headed households have greater incidence of poverty than male-headed households (Grinspun, 2001). In the present context, an attempt has been made to study the role of women in performing their social responsibilities as a head of the household and to understand the reasons of such dimension.

The analysis shows that in Ranpur and Awan project areas more than one-fourth, i.e., about 27 and 26 per cent of the total households respectively were headed by females, whereas their proportion were nearly 23 per cent in Parsoli and 16 per cent in Panwar areas (see Table 3). There were three main reasons for heading the households by females as widowhood, whose husbands are working outside the villages and the irresponsible attitude of males towards domestic affairs. With the exception of Awan irrigation scheme (new one), the females performed the responsibilities towards their families in a larger extent where their male counterparts behaved in an irresponsible manner.⁴ It is due to the fact of deteriorating social values in the society. The proportion of such women headed households was about three-fourth in Parsoli area followed by nearly two-third in Ranpur and half in Panwar project area. In Awan project area, the proportion of such households was limited, i.e., only about 5 per cent. It is due to the fact of strong social set-up in the village. It is noticed across the different categories of households that the irresponsible attitude of males was prevalent among the poor households (marginal and small). It may be inferred that women belonging to this category have to face the social tension within and outside the households. Women were also heading the households in the absence of male partners when they left the village for the sake of livelihoods. In other project areas, their proportion was very low as compared to

Awan project area where the main occupation of some households are livestock rearing and men, generally, migrate with their animals. Under such circumstances, women have to perform the responsibilities as head of the households. There is no systematic pattern across the size of households and the proportion of female-headed households. Widowhood was the third reason that compels the females for heading their households. The proportion of such households was limited except in Panwar project area where it was nearly 18 per cent of the total women headed households (see Table 3).

TABLE 3. STATUS OF WOMEN HEADED HOUSEHOLDS ACROSS THE MODEL SCHEMES

| Scheme | Size of farms | Total number of households | Proportion of women headed households | Reasons for heading the households (per cent) | | |
|---------|---------------|----------------------------|---------------------------------------|---|-----------------------------------|---------------------------------|
| | | | | Widowhood | Males working outside the village | Irresponsible attitude of Males |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Parsoli | Marginal | 307 | 29.32 | 2.22 | 20.00 | 77.78 |
| | Small | 237 | 25.74 | 1.64 | 18.03 | 80.33 |
| | Medium | 182 | 7.69 | 14.28 | 42.86 | 42.86 |
| | Large | 2 | 0 | 0 | 0 | 0 |
| | Overall | 728 | 22.66 | 3.03 | 21.21 | 75.76 |
| Ranpur | Marginal | 140 | 30.00 | 7.14 | 33.33 | 59.53 |
| | Small | 108 | 36.11 | 5.13 | 17.95 | 76.92 |
| | Medium | 61 | 6.56 | 0 | 100.00 | 0 |
| | Large | 1 | 0 | 0 | 0 | 0 |
| | Overall | 310 | 27.41 | 5.88 | 29.41 | 64.71 |
| Panwar | Marginal | 495 | 31.31 | 16.36 | 18.18 | 65.45 |
| | Small | 170 | 39.41 | 14.93 | 32.84 | 52.23 |
| | Medium | 137 | 6.56 | 33.33 | 66.67 | 0 |
| | Large | 18 | 0 | 0 | 0 | 0 |
| | Overall | 820 | 16.46 | 17.78 | 29.63 | 52.59 |
| Awan | Marginal | 97 | 20.62 | 15.00 | 70.00 | 15.00 |
| | Small | 73 | 31.51 | 8.70 | 86.96 | 4.34 |
| | Medium | 60 | 28.33 | 0 | 100.00 | 0 |
| | Large | 0 | 0 | 0 | 0 | 0 |
| | Overall | 230 | 26.08 | 8.33 | 85.34 | 5.33 |

Source: Field survey.

Irrigation has crucial gender implications. The active participation of females in agricultural production along with managing the irrigation will help to increase the benefits. The revival and strengthening of institutions at household and societal level are needed that may help to minimise the social evils like illiteracy, unfavourable sex ratio and violence against women (Singh, 2003). Further, this will help to raise the status of women in the developing society.

Ownership and Distribution of Land Resources

Land is the major resource, which determines the economic status of households in the rural economy. It is essential to understand the pattern of ownership and distribution of land among different categories of farmers while discussing the benefits from irrigation facilities in a particular area. In overall terms, there exists some variation across different irrigation schemes. In Panwar project area, the overall average size of holdings was less than the small size of farm, i.e., less than 2

hectares whereas it was slightly higher than the small size in other project areas. The average size of marginal category was considerably lower than that in other project areas. In all the schemes the poor farmers, i.e., marginal and small were dominant. Their proportion varies from 61 to 69 per cent of the total number of holdings and they owned the limited proportion that varies between 18 to 33 per cent of the total area (see Table 4). The other categories of households such as semi-medium, medium and large those were in limited numbers owned larger proportion of land. The size and distribution of land ownership by the different size classes varies across the schemes.

The analysis shows that there exists unequal distribution of land holdings across the command areas. The unequal distribution of land holding not only determines inequalities in the rural economy but also influence the extent of benefits available or the irrigation facilities.

TABLE 4. SCHEME WISE OWNERSHIP AND DISTRIBUTION OF LAND HOLDINGS

| Schemes | Size of holding | Number of holdings | Area owned (ha.) | Average size of holdings (ha.) | Distribution (per cent) | |
|---------|-----------------|--------------------|------------------|--------------------------------|-------------------------|------------|
| | | | | | Number of holdings | Area owned |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Parsoli | Marginal | 114 | 63.90 | 0.56 | 38.51 | 10.65 |
| | Small | 84 | 119.94 | 1.43 | 28.38 | 19.98 |
| | Semi-medium | 63 | 177.66 | 2.82 | 21.29 | 29.60 |
| | Medium | 31 | 177.72 | 5.73 | 10.47 | 29.61 |
| | Large | 4 | 60.96 | 15.24 | 1.35 | 10.16 |
| | All | 296 | 600.18 | 2.03 | 100.00 | 100.00 |
| Ranpur | Marginal | 85 | 54.69 | 0.64 | 35.27 | 10.83 |
| | Small | 66 | 110.16 | 1.67 | 27.39 | 21.82 |
| | Semi-medium | 61 | 173.02 | 2.84 | 25.31 | 34.27 |
| | Medium | 27 | 142.74 | 5.29 | 11.20 | 28.27 |
| | Large | 2 | 24.29 | 12.15 | 0.83 | 4.81 |
| | All | 241 | 504.90 | 2.10 | 100.00 | 100.00 |
| Panwar | Marginal | 835 | 175.36 | 0.21 | 52.09 | 5.59 |
| | Small | 272 | 397.77 | 1.46 | 16.97 | 12.68 |
| | Semi-medium | 248 | 711.15 | 2.84 | 15.47 | 22.67 |
| | Medium | 210 | 1262.02 | 6.01 | 13.10 | 40.23 |
| | Large | 38 | 590.70 | 15.54 | 2.37 | 18.83 |
| | All | 1603 | 3137.00 | 1.96 | 100.00 | 100.00 |
| Awan | Marginal | 40 | 21.00 | 0.53 | 34.48 | 8.79 |
| | Small | 31 | 50.06 | 1.62 | 26.73 | 20.96 |
| | Semi-medium | 26 | 59.67 | 2.30 | 22.41 | 24.99 |
| | Medium | 19 | 108.07 | 5.69 | 16.38 | 45.26 |
| | Large | 0 | 0 | 0 | 0 | 0 |
| | All | 116 | 238.80 | 2.06 | 100.00 | 100.00 |

Source: Office of the Tehsildar in the respective area.

Economics of Livestock Economy

The livestock economy continues to be indispensably the major source of livelihood next only to crop production in most of the rural areas. In some areas, particularly less developed regions, livestock economy is more important than even agriculture. It is evident from the fact that after the operation of irrigation, livestock economy has also been changed. These changes may be in terms of its composition and productivity that are caused due to various factors like mechanisation of agricultural operations, availability of grazing space and shortage of labour for

grazing of animals (Reddy *et al.*, 1996; Singh 1998). The size and composition of livestock economy also varies with size of land holding.

An attempt has been made to study the economic viability of animals by calculating the costs and returns incurred in different irrigation scheme areas. The costs include cash expenses and imputed value of items used in animal rearing like fodder, concentrates, etc. On the returns side, the estimates of output of milk and milk products, value of dung and other items including wool, meat in case of small ruminants and draught power used for ploughing have been taken into account.

There exist wide variations in cost and returns across different types of animals and schemes. The study shows that rearing of cattle was not economically viable in all the schemes. It is because of the low productivity of animals on the one hand and high rearing cost on the other. Across the schemes, per animal net returns from cattle population were negative that vary between Rs. 114 to Rs. 497 (Table 5). The households living in Awan area were worse off in rearing cattle as compared to that in other areas due to the fact of higher cost of fodder. Rearing of buffaloes was economically viable. But, per animal benefits vary across the schemes. The households living in Ranpur project area were driving maximum benefits per buffalo animal as compared to other areas. It is because of the availability of efficient marketing facilities for milk at Kota City while availability of such facilities was absent in other areas. It has also been noticed that a household invests substantially in rearing of buffaloes that resulted in larger benefits.

TABLE 5. SCHEME WISE ANNUAL COST AND RETURNS OF LIVESTOCK ECONOMY

| Scheme/ Types of animal | Per animal average returns | | | | Per animal average cost | | | Net returns |
|-------------------------------|------------------------------|----------------|------------------|------------------|-------------------------|------------------------|---------------|----------------|
| | Milk and milk products | Other items | Value of dung | Total returns | Cost of fodder | Cost of concentrate | Total cost | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Parsoli | | | | | | | | |
| Cattle | 978 | 468 | 307 | 1,747 | 1,725 | 304 | 2,029 | -282 |
| Buffalos | 3,207 | 0 | 508 | 3,715 | 2,199 | 433 | 2,632 | 1,081 |
| Small ruminant | 374 | 103 | 88 | 565 | 185 | 32 | 217 | 348 |
| Ranpur | | | | | | | | |
| Cattle | 1,326 | 633 | 342 | 2,301 | 1,747 | 507 | 2,414 | -114 |
| Buffalos | 6,860 | 0 | 242 | 7,102 | 1,995 | 895 | 2,890 | 4,212 |
| Small ruminant | 269 | 189 | 108 | 566 | 221 | 25 | 110 | 320 |
| Panwar | | | | | | | | |
| Cattle | 1,058 | 332 | 380 | 1,770 | 1,724 | 425 | 2,149 | -379 |
| Buffalos | 3,981 | 0 | 475 | 4,456 | 2,182 | 663 | 2,845 | 1,611 |
| Small ruminant | 312 | 255 | 125 | 692 | 275 | 47 | 422 | 370 |
| Awan | | | | | | | | |
| Cattle | 752 | 560 | 401 | 1,713 | 1,885 | 325 | 2,210 | -497 |
| Buffalos | 2,927 | 0 | 401 | 3,328 | 2,015 | 259 | 2,374 | 1,477 |
| Small ruminant | 374 | 225 | 100 | 699 | 254 | 56 | 354 | 205 |

Source: Field survey.

Rearing of small ruminants, i.e., sheep and goats was also viable in respect of net returns that vary between Rs. 205 to Rs. 370 per animal across the schemes. The paid

out cost incurred in rearing small ruminants was considerably lower because they fed on grazing and common lands. That is why poor households intend to rear them (Singh, 1998). They treat them as cash in their hands because the possibility of marketing prevails everywhere and at any time whenever the need is realised by the households.

It emerged from the analysis that except for cattle population the rearing of animals is economically viable. But the extent of benefits varies across the regions. The factors that have caused these variations included the condition of feeding resources both on private and public owned lands, availability of animal health facilities on the one hand and households' access to marketing facilities on the other. To make the livestock sector viable, provision of the infrastructure facilities including transportation, marketing and health, etc., in the rural areas is the prime requirement (Acharya and Ahuja, 1999).

Access to Credit Facilities

Credit is a vital input for agricultural growth. Timely access to credit facilities and its efficient use will boost the rural economy. There exist variations in the proportion of creditor farmers, i.e., 23 to 47 per cent of the total farmers. It may be because of the availability of credit facilities and working of financial institutions on the one hand and farmer's requirement on the other as is evident from the fact that in case of Awan irrigation scheme where limited area under irrigation restricted the farmers to avail the facilities. There exists no systematic pattern between farm size and proportion of borrowers. Nearly, two-third and half of the borrowers belonged to the medium size in Parsoli and Panwar irrigation project areas respectively. In Ranpur and Awan project areas, small sizes of farmers were using credit facilities to a larger extent. With the exception of Panwar scheme, the marginal and large farmers were availing of these facilities in equal proportion with slight difference (see Table 6). It can also be noted from the fact that, largely, the farmers had taken loan in the range of Rs.10,000 to Rs. 50,000. The proportion of households varies between 11 to 36 per cent and 18 to 33 per cent who had taken loans up to Rs. 10,000 and above Rs. 50,000 respectively.

TABLE 6. ACCESS OF SAMPLE HOUSEHOLDS TO CREDIT FACILITIES ACROSS THE SCHEMES

| Particulars | Schemes | | | |
|--|---------|--------|--------|------|
| | Parsoli | Ranpur | Panwar | Awan |
| (1) | (2) | (3) | (4) | (5) |
| 1. No. of sample households | 60 | 44 | 55 | 40 |
| 2. Proportion (per cent) of borrower households | 78 | 89 | 65 | 56 |
| 3. Size classwise distribution of borrower households (per cent) | | | | |
| Marginal | 22 | 20 | 13 | 22 |
| Small | 14 | 47 | 25 | 45 |
| Medium | 64 | 33 | 50 | 33 |
| Large | 0 | 0 | 12 | 0 |
| 4. Distribution of loaners (per cent) | | | | |
| Upto Rs. 10,000 | 36 | 20 | 35 | 11 |
| Rs. 10,000- Rs. 50,000 | 43 | 47 | 47 | 56 |
| Above Rs. 50,000 | 21 | 33 | 18 | 22 |

Source: Field survey.

In all the scheme areas, commercial banks were the major source of rural credit from where about 87 to 92 per cent of the total credit requirement was met and the rest of the needs were fulfilled from the co-operative societies and local moneylenders. Public credit institutions including commercial banks and co-operative societies make available loans for productive purposes whereas the moneylenders meet the need of consumption requirement of the households. Sometimes, they also meet the immediate need of productive loan.

Credit institutions make available loans, both short and long term, to the households. Short-term loan is used for the use of agricultural inputs whereas long-term loan is available for making investment in the agricultural sector for purchase of tractors and installation of wells and other non-farm activities. Largely, the households were using the long-term credit facilities. The proportion of this kind of loan varies between about 77 to 90 per cent across the schemes. In Ranpur and Panwar schemes, about one-tenth of the total available credit was used for the purpose of agricultural inputs as chemical fertiliser, seed, and insecticide and pesticides. A similar proportion was also used for the implementation of anti-poverty programmes such as purchase of animals and other non-farm activities in Panwar and Awan project areas. A very limited proportion, i.e., about 2 per cent was utilised for consumption purpose in all schemes except Awan where it was about 6 per cent (see Table 7). Broadly, the analysis depicts that commercial banks finance the long-term investment in both farm and non-farm sectors. The co-operative institutions provide loans for agricultural inputs and the moneylenders meet the immediate needs of the households like purchase of animals and consumption requirements.

TABLE 7. SCHEME WISE SOURCE OF CREDIT AND ITS UTILISATION PATTERN

| Particulars (1) | Schemes | | | |
|---|----------------|---------------|---------------|-------------|
| | Parsoli (2) | Ranpur (3) | Panwar (4) | Awan (5) |
| 1. Per household average amount of loan (Rs.) | 57,447 | 40,588 | 42,875 | 39,778 |
| 2. Sourcewise distribution (per cent) of loan | | | | |
| -Commercial banks | 91.02 | 86.81 | 87.32 | 92.18 |
| -Co-operative societies | 4.31 | 5.75 | 11.52 | 1.40 |
| -Moneylenders | 4.67 | 7.44 | 1.31 | 6.42 |
| 3. Purpose-wise use of loan (per cent) | | | | |
| -Agricultural implements | 87.36 | 76.81 | 77.25 | 69.83 |
| -Agricultural inputs | 4.86 | 10.28 | 11.42 | 4.19 |
| -Purchase of animals | 2.75 | 6.38 | 10.06 | 9.78 |
| -Employment generation | 2.74 | 4.35 | 0 | 9.78 |
| -Consumptive use | 2.29 | 2.18 | 1.77 | 6.42 |

Source: Field survey.

It can be inferred from the these data that access to credit depends upon the availability of infrastructural facilities such as financial institutions and irrigation, etc. It is noted that the efficiency of financial institutions in terms of making available credit at the time when required was important for the farmers' accessibility to credit facilities.

Household Income

The following section deals with household income across the schemes. The average household income was the highest in Parsoli project area and lowest in Ranpur area. In all the project areas, the agriculture sector contributes a major share in the household income. In Ranpur and Panwar areas, the share of this sector was substantially lower than in other areas. In Ranpur project area, more than half of the total income was derived from livestock enterprise and wage employment. Due to its location near to Kota City, people get employment in the city. Similarly, rearing of milch animals was also one of the major sources of household income as this sector was profitable to the villagers. Except Panwar project area, livestock sector has been contributing substantially as compared to other trades. In Panwar area, the service sector has been contributing substantially of about 30 per cent and wage employment constituted about one-fourth of the total household income (see Table 8).

TABLE 8. SCHEME WISE DISTRIBUTION OF HOUSEHOLD INCOME

| Scheme/ size of farms | Total HH income (Rs.) | Per capita income (Rs.) | Source wise income distribution (per cent) | | | | | Other source |
|-----------------------------|-----------------------------|----------------------------------|--|-----------|---------|----------|--------------------|-----------------|
| | | | Agriculture | Livestock | Service | Business | Wage employment | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| | | | | Parsoli | | | | |
| Marginal | 27,371 | 4,639 | 32 | 22 | 3 | 2 | 29 | 14 |
| Small | 41,909 | 7,238 | 65 | 14 | 0 | 1 | 19 | 1 |
| Medium | 84,275 | 15,463 | 86 | 7 | 3 | 1 | 3 | 0 |
| Large | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Overall | 50,943 | 8,906 | 71 | 12 | 2 | 1 | 13 | 3 |
| | | | | Ranpur | | | | |
| Margin al | 44,135 | 5,229 | 15 | 30 | 15 | 4 | 36 | 0 |
| Small | 39,367 | 4,709 | 57 | 6 | 0 | 0 | 37 | 0 |
| Mediu m | 79,277 | 12,196 | 57 | 23 | 0 | 17 | 3 | 0 |
| Large | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Oveall | 47,655 | 5,840 | 33 | 23 | 9 | 6 | 29 | 0 |
| | | | | Panwar | | | | |
| Marginal | 19,591 | 3,455 | 30 | 8 | 0 | 1 | 53 | 8 |
| Small | 28,569 | 5,194 | 44 | 7 | 0 | 10 | 37 | 2 |
| Medium | 70,746 | 10,404 | 32 | 2 | 51 | 1 | 13 | 0 |
| Large | 59,294 | 5,647 | 96 | 4 | 0 | 0 | 0 | 0 |
| Overall | 40,801 | 6,560 | 38 | 4 | 30 | 3 | 24 | 1 |
| | | | | Awan | | | | |
| Marginal | 18,581 | 3,155 | 19 | 14 | 0 | 19 | 49 | 0 |
| Small | 32,884 | 5,481 | 48 | 6 | 10 | 21 | 16 | 0 |
| Medium | 71,910 | 9,905 | 74 | 5 | 11 | 3 | 6 | 1 |
| Large | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Overall | 52,106 | 7,635 | 66 | 6 | 10 | 6 | 10 | 1 |

Source: Household survey.

There is positive relationship between farm size and level of income with the exception of small and large size of farm in Ranpur and Panwar project areas respectively. Poor households (marginal) derive their major share of income from wage employment and non-farm activities. It is because of the fact that they have limited size of land holding and have to be dependent upon other sources for their

livelihoods whereas, the subsistence level of income is concerned, the marginal size of households in Panwar and Awan project areas were nearly at par marginally below from the annual required subsistence income estimate, i.e., Rs. 20,000 per rural family.⁵ The economic condition of the poor households was comparatively better in Ranpur and Parsoli project areas.

The per capita income in different schemes ranges from Rs. 5,840 to Rs. 8,906. In the comparison of state level estimates of per capita income, i.e., Rs. 9,819 during the reference period, the prevailing per capita income was lower with the certain exception of medium size of households in the different project areas. The condition of the poor households in respect of income was noticeable. In Panwar project area, the per capita income of larger size households was also very low that is because of the abnormal size of family, viz., 11 persons. With the given facts, it may be considered that existing irrigation facilities do not contribute to farm income as should be expected.

IV

FOOD SECURITY

Eradication of hunger and ensuring food security to all human beings has been recognised as the primary responsibility of the welfare state and repeatedly endorsed at regional, national and international levels. In practice, food security is, generally, equated with the absence of hunger, or at best provision of pre-determined number of calories at the household level. Food security becomes a reality only at the household level, in fact, at the level of each member of the household. As far as household food security is concerned, a consensus is emerging favouring "the entitlement approach" to explain access to food by the households (Vyas, 2002). In the present context, we focus on the strategies in ensuring food at the household level.

Access to Food at Household Level

An attempt has been made to understand the consumption level of different food items at the household level (Table 9). The existing consumption level has also been compared with the state level estimates. The consumption level of vegetarian foods is fairly similar in all four model schemes, but significantly different with regard to milk, milk products, eggs meat and fish.

TABLE 9. LEVEL OF PER CAPITA MONTHLY CONSUMPTION OF FOOD ITEMS

| Scheme/ State | Cereals | Pulses | Oil | Fruits | Vegetable | Milk and milk products | Meat, eggs and fish |
|---------------|---------|--------|------|--------|-----------|------------------------|---------------------|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Parsoli | 10.50 | 0.38 | 0.22 | 0.30 | 0.99 | 5.89 | 0.10 |
| Ranpur | 11.52 | 0.37 | 0.25 | 0.32 | 1.05 | 4.58 | 0.06 |
| Panwar | 11.70 | 0.41 | 0.24 | 0.37 | 1.20 | 7.18 | 0.29 |
| Awan | 12.25 | 0.41 | 0.24 | 0.41 | 1.10 | 7.52 | 0.02 |
| State | 16.11 | 0.67 | NA | 0.53 | 2.37 | 5.62 | 0.15 |

Source: Field survey and the state level estimates were obtained from Dyson and Hanchate, 2000.

The consumption of non-vegetarian food items was very low in Awan as compared to other schemes, which may be due to consumption habits and religious factors. In other schemes, this was very high as compared to state estimates. The consumption level of milk and milk products was very high in certain cases as compared to state level estimates. It may be due to the fact of a livestock based economy that enables the individuals to consume these products.

In case of other food items, the consumption level was substantially lower in the areas of selected schemes as compared to the state level estimates. It appears, therefore, that the population living in the project areas is not meeting its food requirement. Certainly, there is need of raising the income level and availability of food items at the household level.

Strategies for Household Food Security

To ensure food security and eradicate hunger, different strategies were adopted at the household level. Broadly, risk minimising and loss management were the major strategies adopted by the households. Under risk minimising strategies households manage their resources as land and livestock in such a way that help them in minimising the unforeseen risk which may be required to face in future. With regard to loss management, the household took most appropriate actions to minimising the losses. The strategies also to combat the hazards related to risk and loss are briefly discussed in the following sections.

Risk Minimising Strategies

These strategies include (i) modification in the land use pattern, making arrangement for alternative sources of income, (ii) adoption of mixed farming, (iii) modification in farming and cultural practices, etc.

The households put their available size of land under different competitive uses in such a way that helps to meet the urgent needs of his family. The use of land depends upon the agro-climatic conditions and available infrastructure facilities like irrigation. Generally, farmers allocate their land to cereal crops from which that get the maximum proportion of intake of protein, i.e., 67.74 per cent (Government of India, 1996). They also allocate the area to such crops that are more profitable in the prevailing conditions on the principle of comparative advantage. This not only helps to generate household income but also in ensuring food security.

There exist variations in the allocation of cropping area among different crops. In Parsoli and Ranpur project areas, about two-third was allocated to cereal crops while this allocation was half of the total irrigated area in Panwar project area followed by oilseeds crops. The farmers in Awan area allocated only one-third area to cereal crops due to lack of irrigation facilities. The larger proportion of area was allocated to oilseeds, which were profitable to them (see Table 10). In case of limited supply of irrigation water farmers prefer to grow less water intensive crops. The priority of the farmers was to meet the immediate food requirement of their family. But, due to certain constraints the farmer allocates his land keeping in view the available facilities like irrigation and marketing on the one hand and the needs of the family on

the other. It has also been found that the cropping system was more diversified in the area where canal irrigation facilities were available.

TABLE 10. SCHEME WISE CROPPING PATTERN

| Scheme (1) | Distribution (per cent) of area under different crops | | | | | | Gross cropped area (ha.) (8) |
|---------------|---|---------------|-----------------|-------------------|---------------------|--------------|------------------------------------|
| | Cereals (2) | Pulses (3) | Oilseeds (4) | Vegetables (5) | Fodder crops (6) | Other (7) | |
| Parsoli | 67 | 6 | 16 | 3 | 4 | 4 | 331.69 |
| Ranpur | 65 | 0 | 25 | 7 | 3 | 0 | 310.12 |
| Panwar | 50 | 8 | 34 | 2 | 2 | 4 | 1009.64 |
| Awan | 32 | 0 | 56 | 0 | 0 | 12 | 118.06 |

Source: Office of the Tehsildar in the respective area.

Mixed farming system was prevalent across the schemes. Agriculture and livestock sectors are complementary to each other. The poor households who have lower size of holding have to depend upon the animal husbandry. Some social groups were absolutely dependent on livestock farming.

Loss Management Strategies

The households adopt such measures that help them to compensate the expected losses in meeting their food requirements. These include compensating nutritious value of food, changing sources of food, diversification of income sources and sale of productive resources as land and livestock and access to loans.

Irrigation schemes play an important role in enabling the households to maintain the grain reserves, which make their life easy during adverse conditions. Not only the resource rich farmers were in position to make such reserves but also poor households (marginal and small) adopt such loss management strategies. These schemes also provide food items as fish, etc. In Parsoli scheme, about twenty families were fully dependent on irrigation scheme for livelihood as they were involved in water nut cultivation. Thus, such food was also available to the population living around.

Irrigation facilities also contribute to the diversification of income sources within and outside the households. With the changes in agricultural production, changes in marketing pattern also take place, which generate income and employment opportunities to the households. It also makes available the wage employment within and around the villages for the weaker section of the society.

The emergence of unavoidable circumstances within households like natural hazards include drought conditions, social-economic problems, etc. within the households, the individuals have to dispose off their owned assets like land as well as jewellery. It is noticed that at the first instance the individual disposes the jewellery, etc. and then other productive assets like land. An attempt has been to understand such type of management strategies. The analysis shows that in Ranpur project area, a considerable proportion that is around half of the total households was involved in such transactions of household assets, while their proportion was about one-fifth in Parsoli and Panwar project areas and more than one-fourth in Awan scheme area (Table 11). The disposal of land assets was at a larger extent in Ranpur

area as compared to other scheme areas. The proportion of households who sold the jewellery also varies across the schemes. It has emerged that the households had also disposed off their animals during drought conditions at a lower price. The availability of irrigation facilities helps in minimising these types of losses, as the farmers may be in a position to grow fodder crops for their animals. However, the

TABLE 11. SCHEMEWISE SALE OF LAND AND OTHER ASSETS

| Scheme | Size of farms | Total no. of households | Proportion of HHs who sold assets | Proportion (per cent) of households who sold | |
|---------|---------------|-------------------------|-----------------------------------|--|-----------------|
| | | | | Land asset | Jewellery asset |
| (1) | (2) | (3) | (4) | (5) | (6) |
| Parsoli | Marginal | 307 | 22 | 24 | 76 |
| | Small | 237 | 27 | 28 | 72 |
| | Medium | 182 | 4 | 43 | 57 |
| | Large | 2 | 0 | 0 | 0 |
| | Overall | 728 | 19 | 27 | 73 |
| Ranpur | Marginal | 140 | 60 | 45 | 55 |
| | Small | 108 | 56 | 36 | 64 |
| | Medium | 61 | 8 | 0 | 100 |
| | Large | 1 | 0 | 0 | 0 |
| | Overall | 310 | 48 | 40 | 60 |
| Panwar | Marginal | 495 | 19 | 8 | 92 |
| | Small | 170 | 38 | 8 | 92 |
| | Medium | 137 | 4 | 0 | 100 |
| | Large | 18 | 0 | 0 | 0 |
| | Overall | 820 | 20 | 7 | 93 |
| Awan | Marginal | 97 | 37 | 8 | 92 |
| | Small | 73 | 37 | 4 | 96 |
| | Medium | 60 | 3 | 0 | 100 |
| | Large | 0 | 0 | 0 | 0 |
| | Overall | 130 | 28 | 6 | 94 |

Source: Field survey.

drought situation all over the state resulted in sharp decrease in value of animals due to fodder scarcity. In scarcity conditions, households set free their animals so that they can be fed elsewhere.⁶ This resulted in major loss to the livestock economy in general and non-command area. Migration of animals from fodder scarce area to command area caused damage to crops. Similarly, Panwar project area was adversely affected by these practices.

The household has also to adopt loss management strategies through depending on the credit facilities. Across the schemes the dependence on credit facilities varies. This was the highest in Panwar project area followed by Parsoli, Awan and Ranpur project areas (see Table 7). Broadly, there are three types of loans: (i) for agricultural implements, (ii) purchase of animals and (iii) crop loan as short-term loan and other purpose. The purpose wise distribution of loans also varies across different schemes. Largely, the farmers availed the short-term credit facilities. The limited proportion of households about 2 to 6 per cent across the different schemes were involved in managing the loss in their daily family requirements by borrowing from informal credit institutions.

V

CONCLUSIONS

The issues that emerge from our in-depth analysis provide some meaningful insights that have wider policy implications. The main conclusions that emerge from the study are as follows:

(a) The socio-economic conditions of the households living in command areas of old irrigation schemes were similar in non-command (newly proposed project) area. There exist no considerable variations across the different categories of households and schemes in the adoption of livelihood strategies in the form of work participation access to resources as land, livestock and credit facilities. In certain cases, the level of income was also very low as compared to state level per capita income estimates. It is considered that the old projects have lost much of the potential impact on improving livelihoods conditions of the households living in command areas. Hence, the rehabilitation of such schemes will have a decisive impact on raising the household income level and ensuring food security which is presently deprived of the potential benefits of the schemes.

(b) The gender relations are noticeable in terms of sex ratio, level of education and work participation. The situation of females was worse off rather than their male counterparts. Without the active female participation in the formal and informal village institutions that play an important role in managing water resources, it is difficult to improve the conditions of rural households in general and that of women in particular.

(c) Agriculture and animal husbandry are complementary activities. As irrigation is the major factor affecting the agriculture sector, similarly, it also affects the livestock economy in a particular region. The rearing of buffaloes is economically viable across the schemes. But, there exist wide variations in the gains from livestock enterprise. The various factors that are responsible for these variations include the condition of feeding resources, lack of animal health facilities and inadequate households' access to marketing facilities. To make the livestock sector viable, it is important to provide infrastructural facilities in the rural areas.

(d) Today, Irrigation Management Transfer (IMT) is the major concern of the water sector reform that will help to make the efficient use of irrigation facilities through empowering the water users (Mitra, 1996). IMT will bring the desirable results only when the irrigation structures will be in efficient condition that is possible through the rehabilitation of the schemes. The problems relating to livelihoods of the poor those are in larger proportion and living in the command areas will be minimised.

Received May 2003.

Revision accepted January 2004.

NOTES

1. The selected schemes were constructed long back. The specific year of construction of these schemes was not available. But, the available record and villagers' perceptions show that these projects

were constructed by then Kings of the respective States. Parsoli and Panwar schemes were constructed about 150 and more than 200 years back respectively. The history of Ranpur project was old as about 650 years. It was constructed by then Ruler to control flood in the area. These schemes were undertaken by the Department of Irrigation during late 1950s after reorganisation of the states and used for irrigation purpose. From time to time, some repair work was done on these schemes. Awan is a newly proposed scheme that was considered as non-command area.

2. During the year 1989-99, there was drought situation in Rajasthan. However, as per the information available with the Department of Relief, Government of Rajasthan, the selected project areas were non-affected from the prevailing drought conditions during the reference period.

3. Based on National Sample Survey Organisation (NSSO) Survey, 1997.

4. Females used participatory method to understand the reasons for heading the households. It emerged from the fact that some males those were supposed to be responsible for managing livelihoods for their family. Experience shows that they use intoxicants like liquor, etc. and kept themselves away from performing their responsibilities towards their domestic affairs. In such situation, female counterparts have to take the responsibility of heading the households and managing livelihoods.

5. Based on the Notification No. 37 (98) dated 3rd August 1998, Government of Rajasthan, Jaipur. According to the notification the substance level of annual income was determined as Rs. 20,000 per family in rural area and Rs. 21,400 per family in urban area.

6. During drought situation, rearing of animals becomes difficult for the households in general and poor in particular due to fodder scarcity. In such conditions, their owners for feeding elsewhere leave animals free so that they can be survived and escaped from starvation.

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