IMPACT OF AN IRRIGATION PROJECT ON DEMOGRAPHIC BEHAVIOUR OF RURAL MAHARASHTRA

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Abstract

The impact of an irrigation project on demographic behaviour through agricultural development and socio-economic characteristics of the rural population are of special importance for developing country like India. The present paper is an attempt to study the effects of an irrigation project on demographic behaviour of rural Maharashtra. The data has been used from IIPS Research Project entitled "Impact of an Irrigation Project on Demographic Behaviour of Rural Maharashtra" conducted in 2001-2002. The reference period was 2000. The data has been collected from two irrigated and two non-irrigated villages in Bhandara district using both quantitative and qualitative techniques. The complete enumeration of the populations of the villages was conducted. The research is a combination of matched perspective and case control studies. Anthropological approach was used for collection of extensive information on population change and development. It is revealed from analysis that the irrigation project has change demographic behaviour of the population in irrigated area. The irrigated area has lower fertility and higher child survival as compared to non-irrigated area. The higher fertility and higher child loss is found to be in non-irrigated area. The mean number of children ever born varies significantly with respect to mother's education, husband's education, husband's occupation, household income, caste of the household and marital duration in both irrigated and non-irrigated villages. The knowledge of at least one modern method of contraceptives is almost universal in irrigated villages whereas 88 percent of the respondents in non-irrigated villages had knowledge of at least one modern method of contraceptives. Female sterilization is found to be mostly known method followed by condom, pill and male sterilization in both irrigated and non-irrigated villages. The paper concludes with some population policy reflections and emphasizes the potential importance of rural development related irrigation project on demographic behaviour in irrigated area and negative consequences in non-irrigated area. Population Policy aimed to change demographic behaviour should certainly include efforts to co-ordinate development projects with demographic behaviour.

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INTRODUCTION

The development of programmes and projects, including infrastructure improvements (roads, electrification, irrigation), education, health, agriculture and industry is key to overall economic development in the countries like India where majority of population live in rural areas. Many countries including India are committed to reducing the birth rate by means of family planning. There is a growing emphasis that economic policies also affect demographic trends and patterns. These effects need to be explored to understand the linkages between socio-economic development and demographic change. Unfortunately, the population and socioeconomic plans have not been fully integrated with various departments for socio-economic development and though many development projects have intrinsic value, they have been undertaken without coordinated plans.

The impact of an irrigation project on the demographic behaviour through agricultural development and socio-economic characteristics of the rural population are of special importance for developing countries like India. It may be stated that in spite of no direct relationship between these two, the fact remains that infrastructure development can help to an increase in agricultural production, which also contributes to overall development. This development invariably leads to the improvements in the quality of life in terms of better standard of living.

It may be recalled that the awareness of the possible linkages between development and population parameters gained momentum after the World Population Conference held in Bucharest in 1974. The conference gave the slogan "development is the best contraceptive". The subject is, therefore, not new. However, developing countries experiences high population growth had then little time to wait for development to curb their rapid population increases. Perhaps, this could be the reason why only a few researchers in India in the past investigated the linkages between population and development. Dhongade, M. P. et. al. (1985) in their baseline survey studied the

socio-economic situation in the command area of the irrigation project. They found that intensity of cropping was more in the irrigated area than in the unirrigated area. Mukerji and Kulkarni (1989) conducted an analysis of secondary data and found significant relationship between child deaths and CBR among the demographic variables. The effect of amenities index is more prominent than the irrigation variable. Literacy has emerged in 1981as a significant variable influencing demographic variables. Mohanty. (1999) concluded that investment in irrigation had helped to improve the socio-economic conditions of households. It had helped to raise productivity, total production, literacy level, standard of living and found to influence demographic behaviour at household and at aggregate level. Patil et. al. (1978) conducted socio-economic survey of Girna irrigation project area in Jalgaon district of Maharashtra. They found that cash crop occupied an important position. Roy (1983) in his study found changing cropping pattern, changing agricultural practices and higher returns per unit of cropped area as a direct effects of irrigation. Prasaratkul et. al. (1985) conducted anthropological study to evaluate the impact of large irrigation project on the surrounding population. They found that irrigation project change ways of life of the population in the irrigated areas. The contribution of irrigation in augmenting the agricultural production is vital and well recognised. Yet the attempts to examine the effects of an irrigation project on demographic behaviour through changes in social and economic variables at the community and at household levels are quite a few in India.

Irrigation projects are among several rural developmental activities in India designed to elevate agricultural performance. They do not have direct demographic objectives. However developmental activity such as an irrigation project may have important impacts on demographic variables as well as social and economic effects. In this paper, an attempt has been made to study the effects of an irrigation project on demographic behaviour through changes in social and economic variables at the community and at household levels.

DATA AND METHODS

The Study Area and Study Design

For this study, it was essential to select an irrigation project, located in a district, which does not have any other prominent feature that substantially explains the development of that district. The large Itiadoh dam and irrigation project in Bhandara district and recently in Gondia district was chosen for which the demographic consequences could be investigated. The population in the districts of the project area has been increasing rapidly during the past two decades. The main reason for selecting Bhandara district was because levels of fertility and mortality are still relatively high and changes would be easier to detect and at the time of selection of irrigation project Gondia district was part of the Bhandara district. The economy of the district mainly depends on agriculture.

It has been recorded that in order to check the damage caused by the high floods of Wainganga river to the villages as well as to utilize its water for irrigation the dam was constructed on the river Gadvi (Tributary of Wainganga). The project consists of the main storage dam in Bhandara (recently Gondia) district. The total length of main dam is 420.60 meters. The maximum height of the dam is 29.85 meters above lowest foundation. The gross storage capacity in the dam is 382.56 mm^3 and the effective storage capacity is 318.85 mm^3. The dam was completed in the year 1970-71. The total irrigation potential by the project is 18097 hectares in Bhandara and Gondia districts and 12064 hectares in Gadchiroli district. Out of this area, the total irrigable command is 17500 hectares, which is spread over 94 villages in 3 districts. The irrigation in Arjuni (Morgaon) taluka in Gondia district is 5800 hectares, Lakhandur taluka in Bhandara district is 4600 hectares and Aarmori taluka in Gadchiroli district is 7100 hectares.

Two villages in the irrigated area namely: (1) Pratapgad, and (2) Dharmapuri have been selected to represent the experimental villages. Both the villages have water for agricultural use year round. The degree of benefits each gains from the irrigation project, however, varies according to the geographic factors, such as the distance from dam site. Common benefits from the irrigation

project are flood control in the monsoon season and a supply of water in the dry season. The

Itiadoh irrigation project has raised productivity in the regular farming season and enables farmers

to have second crop in the dry season, which consequently have increased their income and standard of living. Two villages namely Saigaon and Pendhari have been selected as control areas because they are located outside the irrigation project area and production in both the villages is totally depended on rainfall.

Irrigated Villages

1. Pratapgad

The village Pratapgad belongs to Gothangaon block in Arjuni Morgaon Taluka in Bhandara district (now Gondia district). Among the four selected villages, Pratapgad is the closest to the main canal and nearest from the dam site. A compact cluster of households surrounded by rice field characterizes the settlement pattern of the village. The village had been long rich in natural resources because of the large numbers of big trees. Some key informants confirmed village prosperity. Pratapgad village differs from majority of the villages in the block in that it has never had serious water shortage. Before the irrigation project, there was a shortage of water for irrigation purposes. However, before the irrigation project, only single crop cultivation in the kharif season due to the natural rain was possible, and the village suffered from drought several times. Besides local paddy production, villagers cultivate high yielding varieties of paddy, wheat, tur, gram moong, udid, lakh, kultha, groudnut, linssed, sugarcane, spices, vegetables and fodder crops. Because of the short distance from the dam site, the village receives an adequate water supply throughout the year, which makes second cropping possible.

Some other infrastructure projects that were introduced into Pratapgad village following the irrigation project included agricultural extension services, health services, roads and electrification. The village is having pucca road from village to taluka and district headquarter and the new roads built simultaneously with and along the main irrigation canal are in much better condition and facilitated contact between the village and district market town. Electrification was made possible by connecting an electric power line with the

main power line leading to the headquarters of the irrigation project. Another development project directly related to irrigation is the agricultural extension programme of the Directorate of Agriculture, Ministry of Agriculture,

which introduced new agricultural technology, new high yielding varieties and new crops appropriate to local soil and climatic conditions. Because of the irrigation project, a good future seems to be assured for villagers. There are now no droughts; enough water for the second crop in the rabi season, new agricultural technology, easier accessibility to and from the market town and the village has been electrified. The Itiadoh irrigation project changed Pratapgad village into a highly developed village as compared to non-irrigated villages in adjacent areas. Several informants perceived that the economic status of inhabitants was relatively high after the irrigation project.

2. Dharmapuri

Dharmapuri village belongs in the Lakhnadur block and taluka. Dharmapuri is the second village in the irrigated area. It is away from the irrigation canal. Irrigated water reaches only for kharif season and half of its agricultural area in rabi season at the alternate year and thus farmers are cultivating mostly paddy and some farmers cultivate wheat, tur, gram moong, udid, lakh, kultha, groundnut and vegetables to a small extent. Because of the long distance from the dam site, the village is not receiving an adequate water supply during dry season. The presence of an irrigation canal, though, has enabled the village to increase its agricultural production. Before the irrigation project, the villagers were cultivating single crop and local paddy was grown in the village. If there were no adequate rain in the village then people were facing drought condition. Irrigation brought many changes in the Dharmapuri village. Now there is no drought condition in the village, agricultural production is greater, vegetables and other crops production also has increased household incomes as compared to before irrigation project. Villagers of Dharmapuri are no longer forced to find work outside the village.

Non-Irrigated Villages

Two villages Saigaon and Pendhari, outside the irrigation project were selected as control areas.

Saigaon

Saigaon village is located in Gothangaon block of Arjuni Morgaon taluka. The village is situated outside the irrigation project area. The farmers in Saigaon village were cultivating rice only in the field, and production was totally dependent on rainfall during before and after irrigation

project. The natural stream, runs past the village and provides water for paddy production. During

the drought season, the water level of stream dropped off but was still high enough to provide for some agricultural production. In the last ten years, there is water in water tank only during the rainy season and the water level is low, watering only to the nearby paddy fields, leaving other areas dependent on rainfall. In summer season the stream is dry. The decrease in water available from stream (due to less rainfall) resulted into the shortage of water and lower agricultural productivity to many villagers. There are no pucca road and health facilities in the village. The village is backward as compared to irrigated villages. The young persons migrating out of the village in search of employment to meet their livelihood.

Pendhari

Pendhari village belongs to the Palandur block of Lakhandur taluka. Pendhari is situated outside the irrigated project area, 10 kilometers by road from the irrigation canal. The cultivation of paddy depends on rainfall. During the dry season water tank (Talav) in the village is used. The villagers suffer from natural rainfall at the time of harvesting season and at times during the dry season there are severe droughts. The shortage of water in the village resulted into lower agricultural productivity. The people in the village work in nearby town on daily wages to meet their livelihood. The village is not having health facilities. The village is economically poor and most of the young couples forced to migrate to meet their livelihood expenses. The village is backward as compared to irrigated villages.

Profiles of Sample Villages

The basic demographic information such as total population, sex ratios, number of eligible women interviewed, mean children ever born, mean children

surviving and crude birth rates are important in regulating and determining demographic behaviour. The demographic profile of sample irrigated and non-irrigated villages is depicted in Table 1. The proportion of population in 0-4 years and 0-14 years is higher in case of non-irrigated villages as compared to irrigated villages. For the two sexes combined, the proportion of population in 0-14 ages in 2000 for the two irrigated and two non-irrigated villages were 33.51 percent and 37.64 percent respectively. The women who have given birth is almost universal as more than 96

Table 1: Demographic Profile of Households from Study Villages (Irrigated and Non-Irrigated), 2000

Characteristics	Irrigated	Non-Irrigated
Total number of households covered	320	282
Total population	2998	2609
Sex ratio	989	987
Proportion of population in 0-4 years	10.17	11.33
Proportion of population in 0-14 years	33.51	37.64
Total number of eligible women interviewed	320	282
Total number of eligible women who have given birth	308	279
Mean children ever born	2.74	3.44
Mean child surviving	2.56	3.12
Mean household size	4.96	6.02
Mean female age at marriage	17.7	16.6

percent of the eligible women in irrigated villages and 99 percent of the eligible women in non-irrigated villages had given birth in the surveyed villages. The mean number of children ever born (MCEB) is found to be 2.74 and 3.44 while the mean child surviving is 2.56 and 3.12 in irrigated and non-irrigated villages indicating more child loss in non-irrigated villages as compared to the irrigated villages. The mean household size is found to be bigger (6.02) in non-irrigated villages as compared to 4.96 in irrigated villages. The mean female age at marriage 17.7 years is higher in irrigated villages as compared to 16.6 years in non-irrigated villages.

The Conceptual Framework

The conceptual framework attempts to show changes at three levels according to which irrigation project affects fertility through a number of intervening variables (Figure 1).

The conceptual framework is a modification of the conceptual framework given by Prasaratkul et. al. (1985). Complexities in this conceptual framework are obvious because not all inputs are necessarily related to irrigation. However, it may provide a general notion of the ways in which the irrigation project (and related changes) affects the population, both at the community and individual levels.

1. Changes at the community level: The agricultural inputs such as the introduction of an irrigation, use of high yielding variety seeds, use of other inputs such as fertilizers and pesticides into a

relatively unproductive area, leads to an increase in agricultural production. It becomes possible to

cultivate more than one crop by providing the sufficient supply of water. The cultivation of more than one crop, besides increasing production, also can be expected to increase the employment and

income of farmers, raising the standard of living. Also, because of irrigation, intensification and extensification of arable land is possible, adding even more to production.

The availability of an all weather road accompanied with the irrigation project helps to increase marketing and trade with other villages and towns due to easier transportation of goods and people. In addition, dam construction is often tied to electrification which, combined with increase in income, may generate new investment in agricultural technology and resource transfers

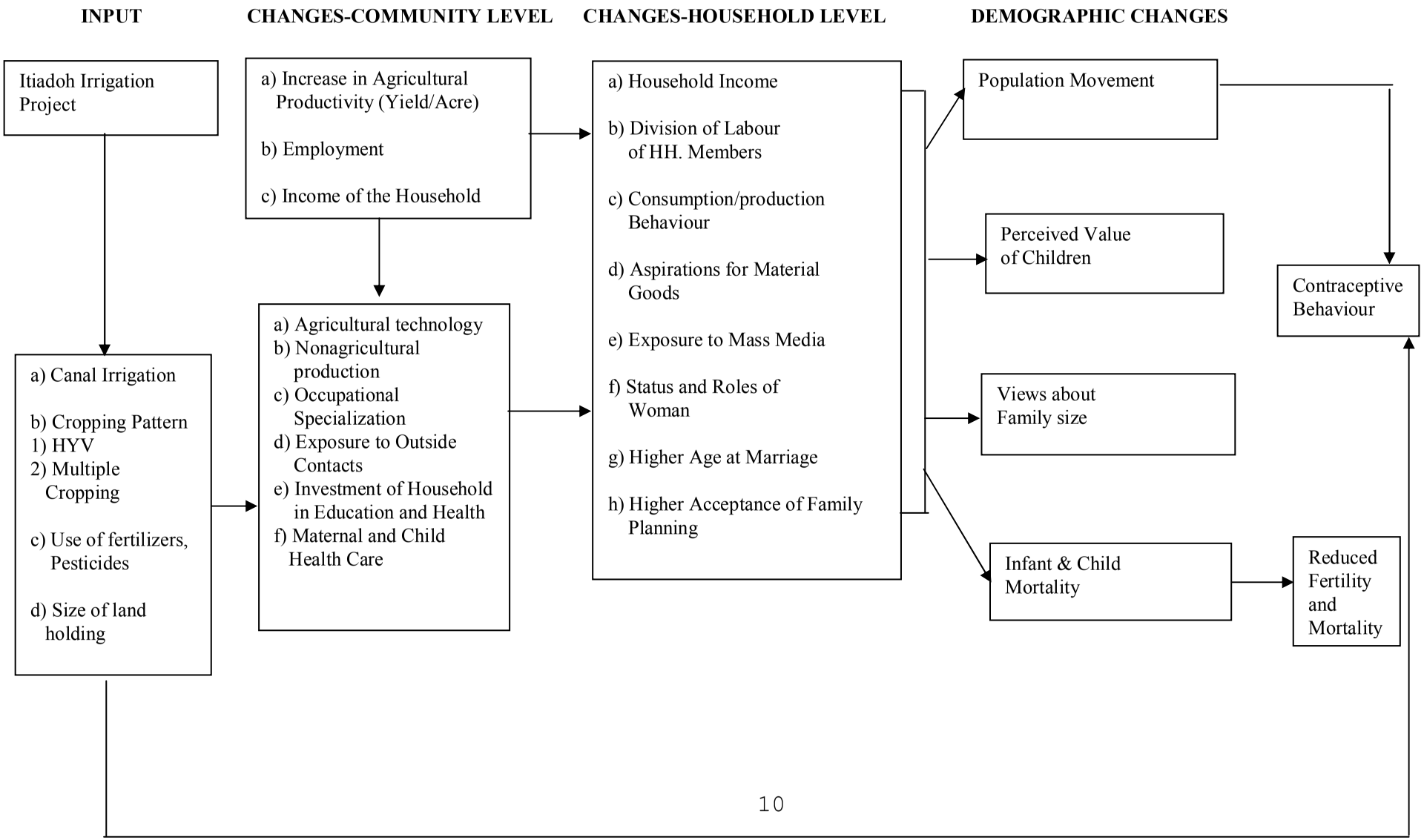
to the non-agricultural sector.

2. Changes at household level: The utilization of agricultural inputs leads to higher return from agriculture. This may lead to increase in household income, increased division of labour and changes in productive and consumption behaviour, often culminating in the desires (and possibilities for fulfilling the desires) for more material goods, more education and/or exposure to mass media. The higher status and roles of women leads to higher age at marriage and higher acceptance of family planning. The greater prosperity of the community increases demands for improved health and social services and may lead to better family and individual health.

3. Demographic changes: The improvements in health conditions helps to reduce infant and child mortality rates. With the reduction of mortality, newer forms may replace traditional forms of old age security. Parents may feel that a small number of well-educated children with the means to acquire higher income would offer better security to them than a large number of uneducated children. Though there is a time lag, a decline in mortality trends eventually results in a decline in the desired number of children.

Aspirations for material goods such as a television, radio, motorcycle, refrigerator, or gas stove, or for better agricultural implements and more land, also can contribute to changing attitudes toward family size because a small family can acquire such goods more easily. On the basis of above-mentioned facts, it is expected that an input such as an irrigation project would cause a change in familial attitudes and behaviour toward family size.

FIGURE 1
The Conceptual Framework



Research Hypotheses

In this research, the following hypotheses have been formulated and tested.

1. The irrigated area would experience net in-migration while non-irrigated area would experience net out-migration.
2. The health and sanitation of the population in the irrigated villages will improve, which will result in lower mortality.
3. The perceived cost of children would tend to increase. With higher social and economic development, parents would have greater expectations for their children such as higher education and better health. As a result, the value of children as a farm labour in irrigated areas will decline.
4. Due to the increasing cost of children benefits will decrease and it is expected that a higher rate of contraceptive practice in irrigated areas, with the outcome of lower fertility.

Research Methods

In order to test the hypotheses in the study, it was originally proposed to use both sociological and anthropological approaches. Due to the difficulty of obtaining reliable time series data on the irrigated communities, the complete enumeration of the populations of the selected villages was conducted from 20th December 2001 to 28th March 2002 and The reference period was 2000. The research was designed as a combination of matched perspective and case control studies. It is felt that the anthropological study was useful in illuminating developmental and demographic changes. It is also felt that participant observers could describe these changes more clearly and give them a more human dimension than statistical research.

The anthropological approach was applied for the collection of extensive information on population change and development. Four investigators stayed for two and half months each one in four villages and observed and in depth interviewed villagers. For generalization of research, the modified anthropological approach have been used to facilitate its integration with the sample survey method by 1) increasing the number of communities to be observed; 2) shortening the period of stay in communities; 3) using sampling to select communities to be observed. These modifications enabled us to collect comparable information from four villages

within a short period of time and it was possible to avoid individual interpretation bias.

Use of Key Informants

In order to illustrate the different perspectives in village life, the informal interviews were spread over three different age groups. The older males (over age 45) may be current and previous village Sarpanch, long-term residents and traditional doctors. The older females may be either wives or previous wives of the older men or long term residents of the village. The middle-aged informants were in the age group of 30-44 years, agricultural and non-agricultural farmers, wage workers and their wives. The young group consisted of wage workers, temporary and seasonal migrants. The husbands who resides matrilocally, and their wives.

Four men and four women in each age group were selected for interview both from irrigated and non-irrigated villages. The informants in the older group were selected to collect relatively detailed background information about village life before and after the construction of Itiadoh irrigation project dam, as well as about social norms and values in the village. The middle age group informants were selected in such a way that who could provide detailed information about their agricultural and non-agricultural occupations. For the young group, the assumption was there would be a higher frequency of wage workers (persons with no land of their own who hired out their labour) as well as high frequency of seasonal migrants. There also would be a more newly weds, and since a majority of marriages take the form of matrilocally residence, such persons (husbands who reside matrilocally) could be good informants because they could identify certain norms and values different from those of their own village (if they came from another village).

The indepth interviews of the irrigated and non-irrigated villagers focused on the following main topics:

- For the oldest informants, the detailed background information about history of village before and after the construction of Itiadoh irrigation project dam, as well as about social norms and values in the village.
- The middle-aged informants were interviewed to collect detailed information on general changes in households and the community as well as demographic changes.

- While the young-aged informants were asked about the detailed information on temporary and seasonal migration and changes in family size norms, the perceived value of children and so forth.

RESULTS

Migration

The initial hypothesis was that the irrigated area would tend to experience net in-migration while the non-irrigated area would tend to experience net out-migration. However, the data shows that agriculturally dominated irrigated villages experienced net out-migration whereas migration in the non-irrigated villages is in the expected direction. The non-irrigated villages experienced net out-migration (Table 2).

Table 2: Population and Migration in Irrigated and Non-Irrigated Villages, 2000.

Villages	Population	In Migrants	Out Migrants	Net Migrants
Irrigated Villages				
Pratapgad	1217	22	26	-4
Dharmapuri	1781	17	22	-5
Non-Irrigated Villages				
Saigaon	1222	7	46	-39
Pendhari	1387	12	78	-66

It is found that, there is an out-migration from both the irrigated and non-irrigated villages but the magnitude of out-migration from irrigated villages was lower as compared to non-irrigated villages. The irrigated and non-irrigated villages have experienced net out-migration. Thus, the initial hypothesis that the irrigated villages would have net in migration proved to be incorrect. However, a limited agricultural land can support only a certain number of people. In the irrigated villages, people may have maximized economic returns from the land through development inputs, such as irrigation, fertilizers and agricultural

extension. There may be equilibrium between the productivity of land and the size of the population. An

increase in the population would have become surplus that would cause decline in per capita land and benefits, leading to out-migration. The irrigation project brought about an agricultural breakthrough to the irrigated villages. As a result, the utility of land for agriculture was increased several times and the value and price of land increase accordingly that close off possibilities for in-migration to relatively poor farmers from adjacent rural areas. The agricultural development that resulted from the irrigation project did not increase demand for labour. The cultivation of more than one crop requires more agricultural labour within a year, but residents could easily meet this demand because considerable unemployment existed in the area.

In the non-irrigated villages the process is different, there is a subsistence situation with a set of technological conditions lower than those of the irrigated villages. There have been few developmental inputs and because of climatic changes and the drying of water tank and stream, partly because of the irrigation project, productivity has actually declined. Reasons for out- migration from non-irrigated villages are the same as irrigated areas, to maintain the balance between population and land. The difference is that the population in the non-irrigated villages has to decrease to compensate for the decreasing per capita agricultural land and agricultural productivity. Thus, loss of population through out-migration is found in non-irrigated villages, as hypothesized. This may be a reflection of a process found in most agricultural areas in India that are still underdeveloped. It is common to have a population surplus because of high birth rate and declining death rate. The relative deprivation of people in these villages is clear to them through exposure to mass media (Radio, T.V. and Newspapers), from the improved transportation system and from their friends who have migrated earlier. Seeing no future in farming, young people move away to meet their livelihood.

Although the control villages are situated outside the irrigation area, it cannot be said that irrigation had no effect on them. Saigaon is a good example of the migration effect of a development programme in a village outside but adjacent to the project areas. Changes in

the availabity of water for agricultural purposes may have influenced out-migration.

A key informant at Saigaon states:

> Ten years ago all that was grown in this village was paddy. In earlier times (ten years ago), we grew paddy in paddy field. We depended on rainfall and on a nearby stream that flows through the village from the east. The level of the water was about a meter high during the rainy season (April), this level decreased in November but was still enough for our uses all year round. Now stream does not flow all year round, the only available water is during the
>
> rainy season and that water is limited. The level of the water depends on the rains each year. If there is not much rain, there will be no water for the village; now the water level at its highest is only half a meter. At this height, it is only enough for the paddies in the field nearby to water tank and stream. Elsewhere the paddies depend totally on rainfall. Now, even when it rains the water the level is low.

One purpose of the construction of the Itiadoh dam was to control floods. This has been successful and there are now no floods in the rainy season in either irrigated or non-irrigated villages. But, as a result it has also blocked the flow of water by natural streams to villages outside the irrigated villages. This means that the dam affects areas outside the irrigation area. Controlling the water supply for the benefit of irrigated villages had a negative effect by lessening the amount of water for Saigaon and Pendhari villages; the land has not been as fertile as before. Therefore the control of water by the Itiadoh dam resulted in deteriorating condition for inhabitants of Saigaon and Pendhari by blocking their water supply.

The people in Saigaon and Pendhari have not associated their problems with the construction of the dam as an inevitable natural change. One can imagine the tremendous social impact of irrigation project in villages like Saigaon, which is outside but adjacent to the irrigated area. Many nearby villages from Saigaon and Pendhari are enjoying the benefits gained from the government irrigation project. The villagers at Saigaon visualize this clearly because they pass those villages on their way. Exacerbating the problem is the spread of a higher cost of living in irrigated areas, which affects those who live in non-irrigated areas, too, even as they are becoming less productive. For these reasons, it is not surprising to find adjacent non-

irrigated villages experiencing heavy out-migration since completion of the dam.

Mortality

The number of deaths in a small population is usually too small to be analyzed meaningfully. The village population and crude death rates in selected irrigated and non-irrigated villages is given in Table 3.

Sizes of villages in this study ranged from 1217 to 1781 and the number of deaths ranged from 9 in Pratapgad village to 20 in Pendhari village. Because of these small numbers,

Table 3: Village Population and Crude Death Rates in Selected Irrigated and Non-Irrigated Villages, 2000.

Population Characteristic	Irrigated Villages		Non-Irrigated Villages	
	Pratapgad	Dharmapuri	Saigaon	Pendhari
Village Population	1217	1781	1222	1387
No. of Deaths during last one year	9	14	18	20
Crude Death Rates per '000 population'	7.4	7.9	14.7	14.4

much statistical analysis could not be performed. However, suggestive findings can be presented.

Differential Mortality

The crude death rates have been calculated in each study village. It is found that the crude death rates in irrigated villages is below the state average and the crude death rates in non-irrigated villages above the state average as compared to the state average of 9.9 in rural area of Maharashtra calculated by National Family Health Survey, 1997-98.

This may be because of small sample sizes. However, intention was not to use these death rates to measure mortality but to compare mortality between irrigated and non-irrigated villages. Death rates in irrigated villages were lower than in non-irrigated villages. Crude death rates per thousand in

irrigated villages were 7.4 in Pratapgad and 7.9 in Dharmapuri, while in non-irrigated villages they were 14.7 in Saigaon and 14.4 in Pendhari. It may be said that lower death rates in irrigated villages resulted from better health conditions. A more meaningful indicator of the standard of health can be seen in the availability, usage of, and attitude towards health facilities within each village.

Differentials in Mean Number of Children Surviving and Mean Number of Children Loss in Irrigated and Non-Irrigated Villages by Selected Background Characteristics

The differentials in MCS and mean number of children loss (MCL) by selected socio-economic variables in irrigated and non-irrigated villages are given in Table 4. It may be observed from table that the MCS and MCL varies with respect to given variables indicates their significance in irrigated and non-irrigated villages.

The MCS is found to be 2.56 while MCL is found to be 0.18. This indicates that selected irrigated villages had experienced a proportion of child loss. The MCL varies from 0.20 for women in the age group 15-19 and is found to be 0.67 for women in the age group 40 to 44 indicating the extent of child loss experienced by older cohort of women in the selected irrigated villages. It is also observed that the difference in MCS and MCL declines with the increase in level of mother's education and household income. Similarly, this difference increases with age and marriage duration. The MCS is found to be 3.12 while MCL is found to be 0.32. The MCL varies from 0.20 for women in the age group 15-19 and is found to be 0.88 for women in the age group 40 to 44. It indicates larger proportion of child loss for older cohorts of women.

The MCS and MCL is lowest up to 5 years of marriage duration and highest 16 years and above marriage duration. There is a positive relationship between MCS and MCL in both irrigated and non-irrigated villages. The MCS and MCL decrease with increase in mother's education and husband's education in both irrigated and non-irrigated villages.

The higher MCS is observed among nomadic tribe in irrigated villages and among scheduled tribe in non-irrigated villages. The MCS and MCL decline with the increase of mother's education. This indicates importance of mother's education in child survival. The MCS is found to vary with husband's educational level. But, it does not show any consistent variation.

Table 4: Mean Number of Children Surviving and Mean Number of Children loss in Irrigated and Non-Irrigated Villages by Selected Characteristics of the Household, 2000.

Background Characteristics	Mean Number of Children Surviving		Mean Number of Children Loss		N
	Irrigated Villages	Non-Irrigated Villages	Irrigated Villages	Non-Irrigated Villages	
Age					
15-19	0.80	0.80	0.20	0.20	5
20-24	1.20	1.42	0.06	0.09	51
25-29	1.92	2.44	0.13	0.31	55
30-34	2.40	2.95	0.21	0.35	61
35-39	3.12	3.79	0.36	0.38	37
40-44	3.42	3.90	0.67	0.88	42
45-49	4.27	4.98	0.73	0.70	31
All age group	2.56	3.12	0.18	0.32	282
Marriage duration					
Up to 5 years	1.08	1.42	0.14	0.14	61
6-10 years	2.18	2.52	0.32	0.32	40
11-15 years	2.46	3.02	0.21	0.36	45
16 years and above	3.13	3.98	0.81	0.64	136
Mothers education					
Illiterate	2.68	3.38	0.50	0.42	96
Primary school	2.59	3.24	0.49	0.48	89
Middle school	2.54	3.16	0.34	0.36	37
High school	2.18	2.98	0.34	0.18	32
Above high school	2.00	2.22	0.10	0.22	28
Husbands education					
Illiterate	2.86	3.36	0.32	0.36	78
Primary school	2.66	3.12	0.28	0.46	93
Middle school	2.66	3.22	0.22	0.30	51
High school	2.64	3.06	0.18	0.38	36
Above high school	2.35	2.78	0.18	0.24	34
Caste					
Scheduled Caste	2.80	3.03	0.16	0.43	69
Scheduled Tribe	2.92	3.76	0.26	0.66	30
Nomadic Tribe	2.96	3.54	0.16	0.64	21
Other Backward Class	2.27	2.96	0.37	0.42	102
Others	2.42	2.86	0.12	0.47	62

Husbands occupation					
Cultivators	2.42	3.12	0.34	0.42	178
Agricultural Labourer & others	2.96	3.22	0.30	0.34	32
Service	2.34	2.96	0.19	0.28	30
Business	2.50	3.02	0.13	0.46	44
Land holding size					
No land	2.15	2.48	0.40	0.30	61
Up to 2 acres	2.60	3.04	016	0.40	138
2.01-5 acres	2.65	2.98	0.18	0.48	68
5.01-10 acres	2.33	3.09	0.32	0.23	15
Above 10 acres	2.58	3.98	0.21	014	2

The MCS and MCL with respect to size of land holding has not shown any significant variation. It is minimum for land less labourers, increases for land holding up to five acres. It declines for land holding of 5.01 to 10 acres and again increases for land holding of more than 10 acres. This might be because mostly all categories of people cultivating land.

Health care facility use

Pratapgad village is having nursing home in village and Dharmapuri is having health facilities within five kilometers. The road to the nursing home and health facilities can be traveled throughout the year, but it is still underused. This may reflect: (1) the degree of monetary prosperity of the villages (and few illnesses), or (2) the villager's attitudes toward the health facilities. Though the health facilities is available in village or nearby, many villagers in need of medical attention travel much farther to Arjuni Morgaon, Sakoli, Lakhandur and Bhandara to private doctors or to the taluka/district hospital, even though services there are more expensive. The villagers in irrigated villages believe those facilities provides better treatment than the local health facilities. Their bypass of the local health facilities also may indicate that they have enough money to buy what they perceive to be better service. The local health center appears to be used by the villagers only for acquiring contraceptives and simple medication. It is found that proximity to the irrigation area, as well as to an urban area, determine to a large extent the degree of knowledge of health practices, availability of services, and subsequent health standards of the villagers

Causes of Death

The causes of deaths are divided into four categories based on the statements of the head of household about the causes of death in their household. The villagers do

not have a high level of differentiation among the causes of deaths so the categories "unknown" contain a high proportion of deaths. The causes of deaths within irrigated and non-irrigated villages are presented in Table 5.

The first cause of death, "fever" or tap must be understood within its context of village society. Fever as perceived by the villagers has a certain relationship with heat of body. If a person's forehead feels hot, then he has fever or tap without differentiation as to what is

Table 5: Causes of Deaths Within Irrigated and Non-Irrigated Villages, 2000.

Causes of Deaths	Irrigated Villages		Non-Irrigated Villages	
	Pratapgad	Dharmapuri	Saigaon	Pendhari
Fever	3	4	6	5
Diarrhea	-	-	3	4
Cholera	-	-	1	2
Unknown	6	10	8	9
Total	9	14	18	20

causing the fever. When a villager is sick, peer and kin consultation is more prevalent than direct, immediate medical consultation, so people may not know the diagnosis of most illness. Fever accounted 28 percent of deaths in irrigated villages and 42 percent in non-irrigated villages. A complication of the digestive system due to an inadequate diet, from the wrong kind of food and contaminated water, was prevalent only in non-irrigated villages.

There were no reported cases of diarrhea and cholera infections in the irrigated villages while three and one (four cases) were reported in Saigaon village and four and two (six cases) were reported in non-irrigated villages respectively. This may be because of the source of water. The irrigated villages in closer proximity to the irrigation canal have much cleaner water than non-irrigated villages. The irrigated villages experienced lower death rates as compared to the non-irrigated villages.

Fertility

The mean number of children ever born (MCEB) is one of the cohort measure used in fertility analysis. The children ever born to currently married women in reproductive ages may indicate actual child bearing performance of the population.

Mean Number of Children Ever Born in Irrigated and Non-Irrigated Villages by Selected Characteristics of the Household

The MCEB in irrigated and non-irrigated villages by selected socio-economic characteristics is presented in Table 6. It may be observed from table that MCEB varies with respect to given variables indicates their significance in irrigated and non-irrigated villages. The MCEB for all age groups found to be 2.74 and 3.44 in irrigated and non-irrigated villages respectively. In case of 40 to 44 age group of women the MCEB is found to be 4.09 in irrigated villages as compared to 4.78 in non-irrigated villages.

The MCEB by marital duration of 6 to 10 years is found to be 2.5 and 2.84 while for 16 years and above is 3.94 and 4.62 for irrigated and non-irrigated villages respectively. The group of women with 10 or less than 10 years of marital duration would reflect the current preferences and trend of child bearing.

The MCEB varies significantly with respect to mother's education indicates its importance. There is inverse relationship between women's education and MCEB. The MCEB declines gradually with increases in level of mother's education. The MCEB for high school and above is 2.10 in irrigated villages as compared to 2.44 in non-irrigated villages whereas the MCEB in case of illiterate is found to be 3.18 in irrigated villages and 3.80 in case of non-irrigated villages. The difference in MCEB declines with the increase of mother's education. This indicates importance of mother's education in MCEB. The MCEB is found to vary with husband's educational level. But, it does not show any consistent variation. The analysis of MCEB with respect to caste in both irrigated and non-irrigated villages showed that scheduled tribe has higher MCEB followed by nomadic tribe,

scheduled caste, other backward caste and others. The husband's occupation showed marginal difference in determining the MCEB in both irrigated and non-irrigated villages.

The differential in MCEB with respect to size of land holding has not shown any significant variation in both irrigated and non-irrigated villages. It is minimum for land less labourers increases for land holding up to five acres. It declines for land holding of 5.01 to 10 acres and again increases for land holding of more than 10 acres in both irrigated and non-irrigated villages. This might be because mostly all categories of people cultivating land.

Table 6: Mean Numbers of Children Ever Born in Irrigated and Non-Irrigated Villages by Selected Characteristics of the Household, 2000.

Background Characteristics	Mean Number of Children Ever Born		N
	Irrigated Villages	Non-Irrigated Villages	
Age			
15-19	1.00	1.00	10
20-24	1.26	1.51	110
25-29	2.05	2.75	122
30-34	2.61	3.30	115
35-39	3.48	4.17	76
40-44	4.09	4.78	78
45-49	5.00	5.68	91
All age group	2.74	3.44	602
Marriage duration			
Up to 5 years	1.22	1.56	129
6-10 years	2.50	2.84	105
11-15 years	2.67	3.38	101
16 years and above	3.94	4.62	267
Mothers education			
Illiterate	3.18	3.80	169
Primary school	3.08	3.72	164
Middle school	2.88	3.52	98
High school	2.52	3.16	93
Above high school	2.10	2.44	78
Husbands education			
Illiterate	3.18	3.72	142
Primary school	2.94	3.58	155
Middle school	2.88	3.52	124
High school	2.82	3.44	105
Above high school	2.53	3.02	86

Caste			
Scheduled Caste	2.96	3.46	145
Scheduled Tribe	3.18	4.42	69
Nomadic Tribe	3.12	4.18	48
Other Backward Class	2.64	3.38	213
Others	2.54	3.33	129
Husbands occupation			
Cultivators	2.76	3.54	358
Agricultural Labourer & Others	3.26	3.56	76
Service	2.53	3.24	72
Business	2.63	3.48	98
Land holding size			
No land	2.55	2.78	86
Up to 2 acres	2.76	3.44	307
2.01-5 acres	2.83	3.46	166
5.01-10 acres	2.65	3.32	40
Above 10 acres	2.79	4.12	5

FAMILY PLANNING

Knowledge and Use of Family Planning

After examining the preference and actual child bearing of eligible women, an attempt has been made to examine the knowledge and use of family planning methods among these women. The question on knowledge and use of modern family planning methods was asked to

the entire selected eligible woman in the household of both irrigated and non-irrigated villages.

The knowledge and ever use of contraceptive methods for eligible women is given in Table 7. It is revealed from table that the knowledge of any method is universal in irrigated villages whereas 88 percent of the respondents in non-irrigated villages had knowledge of any method. The female sterilization is found to be mostly known method followed by condom, pill and male sterilization in both irrigated and non-irrigated villages. The ever use of any contraceptive methods is higher 62.8 percent in irrigated villages as compared to lower 54.6 percent in non-irrigated villages. The female sterilization is most popular and widely prevalent among the

Table 7: Knowledge and Ever Use of Contraceptive Method for Eligible Women in Selected Irrigated and Non-Irrigated Villages, 2000

Any Methods	Irrigated Villages		Non-Irrigated Villages	
	Knowledge Number (Percent)	Use Number (Percent)	Knowledge Number (Percent)	Use Number (Percent)
Any Method	315 (98.44)	201 (62.81)	248 (87.94)	154 (54.61)
Condom	290 (90.63)	16 (5.00)	232 (82.26)	14 (4.96)
Pill	285 (89.63)	24 (7.19)	223 (79.07)	18 (6.38)
Copper T	242 (75.63)	12 (3.75)	176 (62.41)	10 (3.55)
Female Sterilization	306 (95.63)	139 (43.43)	234 (82.98)	105 (37.23)
Male Sterilization	256 (80.00)	10 (3.12)	203 (71.98)	7 (2.48)
Not using any Method	5 (1.56)	119 (37.19)	34 (12.06)	128 (45.39)
N	320	320	282	282

users of family planning methods in case of both irrigated and non-irrigated villages. Among 320 eligible women interviewed in irrigated villages 139 of them are found to have accepted female sterilization i.e. 43.43 percent of the total respondents. Out of the total 282 respondents in non-irrigated villages 105 accepted female sterilization i.e. 37.23 percent of the total respondents. This clearly indicates that acceptance of female sterilization is highest in both irrigated and non-irrigated villages.

Socio-economic Differential in Current Use of Family Planning in Irrigated Villages

After examination of the knowledge and use of family planning methods, it would be appropriate to see differentials in use of family planning by selected characteristics in irrigated villages. The socio-economic differential in current use of family planning methods in irrigated villages is depicted in Table 8.

The selected variables are broad age groups of women, mother's education, caste, husband's occupation and total income of the household. The use of modern contraceptive method varies with broad age groups of the women showed that it is

lowest in 15 to 24 age group and maximum for older age groups. The contraceptive prevalence rate (CPR) is found to be 62.19 percent in irrigated villages. The differential in use of female sterilization with respect to educational level indicates that it is higher among illiterate as compare to other temporary methods and educated groups.

The differential in use of current method of contraceptive by main occupation of the husband shows that cultivators and agricultural labourers mostly use female sterilization. The use of contraceptive by total household income showed that the use is less in middle-income groups with annual income of 15000 to 50000 as compared to other income group. It is further found that female sterilization is mostly prevalent in lower income groups.

Table 8: Socio-economic Differentials in Current Use of Family Planning Methods in Irrigated Villages, 2000.

Characteristics	Female Sterilisation	Male Sterilisation	Condoms	Pill	IUD	Any method	Not using any method	No. of women
Age groups								
15-24	-	-	7.81	12.50	4.69	25.00	75.00	64
25-39	53.75	3.75	4.38	5.63	5.00	70.01	29.99	160
Above 40	54.16	4.16	4.17	10.42	1.04	73.95	26.05	96
15-49	43.12	3.13	5.00	7.19	3.75	62.19	37.81	320
Education								
Illiterate	57.53	-	2.74	4.11	1.37	65.75	34.25	73
Primary	54.67	2.67	4.00	5.33	4.00	70.67	29.33	75
Middle School	47.54	3.28	3.28	4.92	4.92	63.93	36.07	61
High School	40.98	-	8.20	9.84	8.20	67.22	32.78	61
Above High School	40.00	-	10.00	8.00	6.00	64.00	36.00	50
Caste								
SC	46.05	1.31	6.58	3.95	2.67	60.53	39.47	76
ST	41.02	2.56	-	7.69	-	51.28	48.72	39
NT	40.74	3.70	-	11.11	-	55.56	44.44	27
OBC	50.45	1.80	6.31	8.11	6.31	72.98	27.02	111
Others	52.24	-	2.98	4.48	4.48	64.18	35.82	67

Husbands occupation								
Cultivation	57.22	2.22	5.55	6.66	2.22	73.89	26.11	180
Agril. Labourer and	45.45	2.27	4.54	6.82	4.54	63.64	36.36	44
others	42.86	2.38	9.09	4.76	7.14	66.67	33.33	42
Service	48.15	-	5.55	7.41	5.55	66.67	33.33	54
Business								
Total income								
Less than 15000	60.61	3.66	-	3.03	-	66.67	33.33	99
15000-30000	48.54	1.94	3.88	7.77	4.85	67.00	33.00	103
30000-50000	45.45	-	9.09	6.06	7.57	68.18	31.82	66
Above 50000	48.15	3.70	7.41	7.41	3.70	70.37	29.63	27

Socio-economic Differential in Current Use of Family Planning in Non-Irrigated Villages

After examination of the knowledge and use of family planning methods and differentials in use of family planning by selected characteristics in irrigated villages, it would be appropriate to see differentials in use of family planning by selected characteristics in non-irrigated villages. The selected variables are broad age groups of women, mother's education, caste, husband's occupation and total income of the household. The socio-economic differential in current use of family planning methods in non-irrigated villages is depicted in

Table 9. The use of modern contraceptive methods in non-irrigated villages varies with broad age groups of the women showed that it is lowest in 15 to 24 age group and increases for older age groups. The contraceptive prevalence rate (CPR) is found to be 55.67 percent in non-irrigated villages. The differential in use of female sterilization with respect to educational level indicates that it is higher among illiterate as compare to other temporary methods and educated groups.

Table 9: Socio-economic Differentials in Current Use of Family Planning Methods in Non-Irrigated Villages, 2000.

Characteristics	Female Sterilisation	Male Sterilisation	Condoms	Pill	IUD	Any method	Not using any method	No. of women

Age groups								
15-24	-	-	7.14	10.71	5.36	23.21	76.79	56
25-39	45.75	3.27	5.23	5.23	3.92	62.09	37.91	153
Above 40	50.68	4.11	2.74	8.22	1.37	67.12	26.05	73
15-49	37.94	2.84	4.96	6.38	3.55	55.67	44.33	282
Education								
Illiterate	48.96	2.08	4.17	5.21	3.13	63.55	36.45	96
Primary	47.19	3.37	4.49	4.49	3.37	62.92	37.08	89
Middle School	43.24	2.70	5.41	10.81	-	62.16	37.84	37
High School	38.23	-	2.94	14.71	2.94	58.82	41.18	32
Above High School	35.72	-	7.14	17.86	7.14	67.86	32.14	28
Caste								
SC	49.28	1.45	5.80	4.35	2.90	63.78	36.22	69
ST	43.33	3.33	-	13.33	-	60.00	40.00	30
NT	42.86	-	-	9.52	-	52.38	47.62	21
OBC	52.94	1.96	5.88	8.82	4.90	74.50	25.50	102
Others	53.23	-	1.61	4.84	4.84	64.52	35.48	62
Husbands occupation								
Cultivatour	56.74	2.25	5.62	6.74	2.25	73.60	26.40	178
Agril. Labourer and	43.75	6.25	-	12.50	-	62.50	37.50	32
others	40.00	6.67	10.00	10.00	3.33	70.00	30.00	30
Service	25.00	6.82	13.64	18.18	6.82	70.46	29.54	44
Business								
Total income								
Less than 15000	40.41	2.07	7.77	10.88	1.04	62.18	37.82	193
15000-30000	29.41	5.88	8.82	11.76	5.88	61.76	38.24	68
30000-50000	15.38	-	15.38	38.46	7.69	76.92	23.08	13
Above 50000	-	-	10.00	60.00	10.00	80.00	20.	10

The differential in use of current method of contraceptive by main occupation of the husband shows that cultivators and agricultural labourers mostly use female sterilization. The use of contraceptive by total household income showed that the use is less in middle-income groups with annual income of 15000 to 50000 as compared to low- income group. It is further found that female sterilization is mostly prevalent in lower income groups.

The female sterilization is mostly prevalent in lower income group of both irrigated and non-irrigated villages. The comparison of irrigated and non-irrigated villages showed that contraceptive prevalence rate is higher in irrigated villages i.e. 62.19 percent as compared to lower 55.67 percent in non-irrigated villages. The use of temporary methods is higher in irrigated villages as compared to non-irrigated villages. From the analysis, it may be concluded that promotion of other spacing methods among low-income group, illiterate, agricultural labour would increase contraceptive use and reduce fertility in

both irrigated and non-irrigated
villages. This would also improve the mother's health and enhance child survival.

SUMMARY AND CONCLUSIONS

The present paper is an attempt to study the effects of an irrigation project on demographic behaviour. As expected, the irrigation project changes demographic behaviour of the population in irrigated areas. The mortality is lower in irrigated area as compared to non-irrigated area. The irrigated area has lower fertility and higher child survival as compared to non-irrigated area. The higher child loss is found to be in non-irrigated area and older cohorts of both irrigated and non-irrigated area. The MCEB varies significantly with respect to mother's education, husband's education, husband's occupation, household income, caste of the household and marital duration in both irrigated and non-irrigated villages. The difference in MCEB and MCS declines with mother's education.

The knowledge of any modern method is almost universal in irrigated villages whereas 88 percent of the respondents in non-irrigated villages had knowledge of any method. Female sterilization is found to be mostly known method followed by condom, pill and male sterilization in both irrigated and non-irrigated villages. The use of family planning by background characteristics such as age groups, wives education, caste, income of household, operational land holding and husbands occupation has shown substantial variation in both irrigated and non-irrigated villages.

The differential in use of female sterilization with respect to educational level indicates that it is larger among illiterate as compared to other temporary methods in both the irrigated and non-irrigated villages. Similarly, the differential in use of current method of contraceptive in both the irrigated and non-irrigated villages by occupation of the husband reflects that use of female sterilization is mostly popular among cultivators and agricultural labourers.

The hypothesis, the irrigated villages would have net in-migration because irrigation would create better economic opportunities, which would attract migrants, or at least influence natives to
remain. However, factors affecting migration were more complicated, and the hypothesis of net in-migration into irrigated villages was not confirmed. The second hypothesis

stated that health and sanitation in the irrigated villages would tend to be better than in the non-irrigated villages and would result in a lower mortality rate. Though it was difficult to gather reliable data on health status and causes of death, it is found that deaths from fever and cholera illness were lower in the irrigated villages and unknown deaths higher. The perceived cost of children would be higher in irrigated villages because, with grater social and economic development, parents would have higher expectations for their children (more education, better health, etc.). The value of children as farm labour in irrigated villages would also tend to be lower. For these reasons it was expected a higher rate of contraceptive practice in irrigated villages and a final outcome of lower fertility. It is found that indeed the cost of children was higher in the irrigated villages. Childbirth, as well as child rearing, included many costs not found in the non-irrigated villages, such as transportation costs, hospital bills, medical expenses, store-brought clothing, children's play equipment, etc., higher education was expected of the children, and this was costly too. With the increasing costs and decreasing economic utility of children, contraception became more readily accepted among villagers in the irrigated villages. These demographic changes might be due to the socio-economic development induced by irrigation project. Population differentials between the irrigated and non-irrigated villages were caused by various developmental inputs in combination, not just any single one. Irrigation was only one among a number of factors contributing to the observed population changes.

POLICY IMPLICATIONS

1. Out-migration may occur in areas adjacent to those directly influenced by a development scheme such as irrigation. In-migration into the irrigated area may be minimal due to the considerable unemployment and increase in land values.
2. Due to the limited land resource base and increasing population, there is a considerable amount of out-migration from irrigated and non-irrigated areas. If the intention is to

   decrease out-migration from rural areas then transformation of excess population to other non- agricultural sector is needed. Hence,

government should encourage people in

rural areas for cottage and small-scale industries by providing credit and marketing facilities.

3. Several factors are responsible for differentials in mortality between the two types of areas that cannot isolate at this stage, but rural development provides people with higher income and the ability to seek better health services. Proximity of a health center may be an important factor, but wide dispersion of health centers alone may not cause wider use or better health.

4. The irrigation project helped to lower fertility through increased agricultural production, which resulted in increased incomes and mechanization, which led to less labour needed and, therefore, less demand for child labour. Thus, the economic benefits of children declined, resulting in a lower demand for children. These new attitudes, together with access to family planning information and techniques, contributed to a lower birth rate. Since this phenomenon was not observed in the non-irrigated areas.

5. The existence of a family planning programme in itself does not necessarily lead to a decline in fertility. Therefore there is a need to popularize male sterilization and temporary methods like condom, pill and IUD in both irrigated and non-irrigated villages.

6. Higher level of mortality and morbidity in the non-irrigated areas were a major obstacle towards the development of norms regarding a smaller family size. There, any attempt to reduce the fertility should be implemented in conjunction with an attempt to decrease mortality and morbidity. In the irrigated areas, apparently improved health and nutrition affected the number of births required to meet desired family size.

From the above analysis, it may be concluded that rural development can more effectively reduce the fertility rate if it emphasizes more equal distribution of benefits. This would entail a more widely dispersed development programme, stressing wider improvements in conditions that influence fertility reduction, such as sanitation and health, income, education, and the overall standard of living. The study shown that how development projects,

though beneficial for the population they are to serve directly, may cause problems to nearby. It is important for planners to recognize such possibilities in order to minimize the unintended negative consequences of rural development projects.

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