CHANGE, PERSISTENCE, AND THE IMPACT OF IRRIGATION: 
A CONTROLLED COMPARISON OF TWO NORTH INDIAN VILLAGES

by

David John Groenfeldt

A Dissertation Submitted to the Faculty of the 
DEPARTMENT OF ANTHROPOLOGY 
In Partial Fulfillment of the Requirements 
For the degree of 
DOCTOR OF PHILOSOPHY 
In the Graduate College 
THE UNIVERSITY OF ARIZONA

1984

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ACKNOWLEDGEMENTS

During the rather long process of training, research, analysis, and writing, many people and institutions have contributed time, advice, resources, and/or moral support. I went to India in September 1980 under the auspices of the Berkeley Professional Studies Program in India. Additional funding was provided by a USAID Title XII Strengthening Grant administered by the Office of International Agriculture, University of Arizona, by a grant from the Graduate Student Development Fund, and by a National Resources Fellowship administered through the Department of Oriental Studies.

During my 19 months in India, the staff of the Berkeley office provided the concern and support which made it possible to concentrate on my research. I would like to thank them, and in particular the director, Mr. Vijayan Puliampet. I was affiliated as a research scholar with the Department of Geography at Kurukshetra University (Haryana). Prof. Jasbir Singh, department chairman, served as my advisor during the course of fieldwork, and offered invaluable advice. Dr. R. L. Sharma, also of the Geography Department, patiently tutored me in Hindi and prepared the maps found in Appendix A.
The task of locating suitable study villages was made easier by the hospitality of Mr. P. C. Chawla, then lecturer in Geography at Government National College, Sirsa. I had decided to concentrate my search in Sirsa District, and used Mr. Chawla’s home as a base of operations. Mr. Bahadur Singh Kaswan, also of Government National College in Sirsa suggested that I consider the two villages of Kutiana and Janania, located on either side of his native village of Jamal. After visiting the villages in his company, I took his advice. The research which ensued owes much to Bahadur Singh’s assistance in getting me started, and his continued support throughout.

Doing fieldwork is an experience that few are prepared for, perhaps because so little has been written about it. I received brief and invaluable advice from Prof. Joan Mencher whom I met in Delhi just before embarking on fieldwork. Rather than offering advice on interview techniques, she addressed the more basic issues of food, shelter, and language: Hire a cook; arrange for a separate house; hire an interpreter. Though I had studied Hindi for one year, I knew she was right. I moved into Kutiana a few days before Christmas, 1980, accompanied by Mr. Kulwant Singh as interpreter. Kulwant helped me adjust to Bagri customs (though he is himself Punjabi) and uncomplainingly translated mundane questions on crop inputs and yields.
I spent 6 months in Kutiana in three segments: (1) December to January, (2) March to June, and (3) August to October. My wife, Pamela Stanbury, was with me for all but the first month. Our cook, Mr. Keher Singh Bhaker, was a resident of the village, and became a close friend and informant, as well as language instructor. When a second interpreter quit unexpectedly (Kulwant left earlier for a bank post), Keher Singh served the additional function of transforming the local dialect into the simple Hindi I could understand. He moved along with me to the second study village of Janania where I spent 4 months (from New Year’s Day 1982 to April 27), this time without my wife, who had returned to her graduate studies.

Though it is not possible to acknowledge the help of all the villagers who made this study possible, I would like to express my gratitude, mixed with a bit of surprise, that everyone was so friendly, patient, kind, and seemed to find it quite natural that I should be asking them odd questions. It was also natural that I be served tea and offered hookah and, of course, be asked not to explain my presence, but to provide information about my country, my people, and my customs. Of the many people to whom I am obligated, but am never required to repay (and this is the nature of Indian hospitality) a few individuals deserve special mention. Mr. Barat Singh Bander opened his house
to me during my first week in Kutiana, and helped immensly in making me feel at home in his village. Mr. Devi Lal Bander made me a part of his family, and became an important source of information and insights about village life. In Janania, I owe a sepcial debt to my friend, Mr. Beli Ram Beniwal who helped me become a "true Bagri" at least for a while.

Dr. John Westley, program officer at the USAID office in Delhi encouraged me to look at the development issues of irrigation, an exercise which influenced both my research and my career. Using data from Kutiana, I wrote a report for the USAID/India office describing the impacts of irrigation and received much advice and support, as well as a visit, from him. In Delhi, I benefited from conversations with David Seckler, Roberto Lenton, and Robert Chambers at The Ford Foundation, and Gil Corey at The World Bank, who encouraged me to focus on irrigation as a specialty within anthropology.

Preliminary write-up in India was facilitated by Prof. M. L. Sharma, Chairman of the Rural Sociology Department at Haryana Agricultural University (HAU), Hissar, who provided accommodations as well as council on several occasions. Dr. Amar Singh Chharia, also at HAU, transcribed a number of songs and stories which I had recorded on tape.
In writing the dissertation, I have been fortunate to have as my advisor Dr. E. Wesley Jernigan, who has offered understanding, advice, encouragement and support, and was instrumental in guiding my general interests into what I hope is a focused dissertation. Drs. Roger Fox and William Martin helped shape my economic thinking, both in courses and as members of my preliminary paper committee. I thank them for their patience. Dr. Robert Netting, who also served on the "prelim" committee, provided several critical readings of my paper which helped clarify my research orientation at a critical point. Dr. Robert Hunt (Brandeis), though not on the prelim committee, read my paper and challenged my thinking on controlled comparisons. I have benefited from his advice, even where I have not followed it. Dr. Richard Henderson served on both the prelim and dissertation committees and has offered encouragement throughout. Dr. Tim Finan has helped me understand something about development anthropology and has convinced me that we, as anthropologists, really do have a role to play.

For support through the ages, and encouragement in educational pursuits, I thank my parents. They are also the source of my Kaypro computer which has lessened the burden of dissertation writing. My brother, Tom, has helped me along the way by taking an interest in what I am
doing. By far the biggest acknowledgement, of course, goes to my wife, Pamela Stanbury. For the past several years she has been involved in this study, by living in one of the study villages, by writing about it, and by talking about it, especially while jogging. My understanding of the Bagri people owes much to her insights into the lives of the women, her insights as a woman, and her insights as another anthropologist. She has played the role of advisor, critic, editor -- everything but typist. And finally, our dog, Lucy, who has played no role in my dissertation, takes little interest in the work I do, and thereby provides a perspective we all need.

A Note on Caste Names

Caste names are translated into common occupational terms for those castes that pursue their traditional occupations. Thus, the "Carpenter" caste is used rather than the khāti caste, but chamar is left untranslated, since the occupation of "leather worker" does not exist in either study village. A distinction is also made between "Carpenter" (referring to the caste) and "carpenter" (referring to the occupation per se), since only some Carpenter households follow their traditional calling.
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ABSTRACT

Anthropological fieldwork conducted in two North Indian villages focused on cultural differences attributable to recent irrigation development. The study of introduced irrigation systems is distinguished from studies of traditional irrigation systems. The varieties of impacts due to irrigation development are reviewed from the literature and hypotheses formulated relating to economic change (cropping patterns, labor demand, profitability), socio-economic behavior (occupations, patron-client relations, household composition), and cultural values (modernization and traditionalization).

The methodology of controlled comparison was adopted as a means of isolating the effects of canal irrigation (Bhakra canal) in the Bagar region of Northwest India. A mostly unirrigated village served as a control to measure the effects of irrigation in a "wet" village. Data on agricultural practices, labor use, occupations, household composition, and material culture were collected from a systematic sample of 40 households in each village.

The primary irrigation effects have been economic: higher yields, new crops (wheat and cotton), and much higher
profits. Labor demand is much higher in the irrigated village, though cropping intensity is actually lower. Residents of the drier village have diversified into non-farm work both within and outside the village. A few families have migrated out, in contrast to the wet village which has experienced a dramatic rise in population, largely from immigrants. Sociocultural measures, including jajmani relations, household composition, and religious shrines show relatively few contrasts between the villages. Both villages have undergone significant changes in the past generation, in one case due primarily to agricultural intensification, and in the other case due to economic diversification. The villages are more remarkable for their present similarities than their differences.
CHAPTER 1

INTRODUCTION

This study presents a comparative analysis of the cultural changes brought about by recent canal irrigation in two North Indian villages. A relatively "wet" village is contrasted with an otherwise similar but drier village as a means of isolating specific impacts of irrigation. Though irrigation development begins as a primarily economic alteration to the cultural landscape, the effects are far-reaching and extend to social relations between groups, labor relations within the family, and also into the realm of values and beliefs. This situation is not surprising, since basic cultural theory suggests mutual interaction among the subcomponents comprising culture. Indeed, it would be rather shocking to find that irrigation development did not have consequences beyond the purely economic.

The theoretical perspective adopted in this study is derived from Tyler's famous definition of culture: "...that complex whole which includes knowledge, belief, art, law, morals, custom, and any other capabilities and habits acquired by man as a member of society" (1871; cited in Kroeber and Kluckhohn 1952:81). What is perhaps unusual about this study is not the theoretical underpinnings (that
culture is holistic, interactive, and complex) but rather that the analysis attempts to do justice to the holism of the culture concept. Even so, no claim is made that the whole of the culture under study has been analyzed. Instead, a broad range of specific topics is discussed, grouped among the categories of (1) economic behavior, (2) socio-economic behavior, and (3) cultural values.

These categories derive from the three-part division of culture into economic, social, and ideological components, which have been modified for the requirements of comparison, i.e., that the data be comparable, and preferably quantifiable. The emphasis on economic data in this study reflects both the nature of irrigation development, and the amenability of economic data to quantification. The short shrift given to ideology (it is subsumed under the category of "cultural values") also reflects the practicalities of data collection rather than any materialist bias. The effects of irrigation development on world view and religious attitudes are difficult to measure, though an attempt has been made. The perceptive reader will notice that the sections on cultural values are relatively shorter than those dealing with economic and socio-economic behavior.

The distinction between behavior and values, which is evident in the three categories, suggests the greater accessibility of behavioral data. Even in the section on
"cultural values" the data used are primarily behavioral rather than attitudinal, with values deduced through my own interpretation. While I agree with Geertz that "culture" is first and foremost a phenomenon of meaning rather than one of behavior, it is through behavior that culture is expressed and can be known. In this study, the term "culture" implies both explicit behavior and the values motivating that behavior.

The fieldwork on which this study is based was conducted in two villages in the Bagar region of northwest India, during 1980-82. The two villages are just 5 km apart, straddling the Haryana and Rajasthan border about 250 km west of Delhi. The Bagar region comprises the northern periphery of the Thar Desert. The landscape is marked by small scattered sand dunes; rainfall is meagre (300 mm/year) and highly variable. The heat and aridity rendered agriculture precarious prior to irrigation, and the inhabitants relied on a mixed economy of pastoralism and farming.

Water from the Bhakra Canal, which started flowing in 1954, has transformed the regional economy. The canal system begins in Himachal Pradesh, where the Bhakra-Nangal dams contain run-off and snow melt from the Himalayas, and

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1. "Culture is the fabric of meaning in terms of which human beings interpret their experience and guide their action..." (Geertz 1973b:145).
from there the water is distributed among 3 other states: Punjab, Haryana, and Rajasthan. In terms of expected local-level impact from the Bhakra Canal system, three features are significant: (1) the system is organized by outside political structures and imposed on the village, (2) the affected farmers are responsible for maintaining watercourses and field channels, but not the main system, and (3) the climate is relatively arid. This last feature is important, since the marginal value of irrigation water is usually correlated inversely with the amount of natural rainfall.

The aim of this study is to determine the extent of cultural change brought about by large-scale canal irrigation in the two study villages. Significant changes have taken place since irrigation was introduced: new cash crops (e.g., cotton) and food crops (e.g., wheat) can be grown with relative security from drought. Agricultural production in the area has increased dramatically and even the weather has improved, since the irrigated fields inhibit the development of duststorms. Clearly, irrigation has had important effects on the lives of the Bagri people.

However, since canal irrigation is inextricably linked to other critical agricultural inputs such as fertilizer, HYVs, and mechanization, and since the agricultural economy as a whole has been affected by credit, extension, roads, and education, separating out the specific
role of irrigation in agricultural production is highly problematic. To attempt an account of the full range of irrigation effects on cultural behavior in general is many times more difficult. The approach taken in this study is to address these difficult issues obliquely rather than directly. Through a controlled comparison of an irrigated village with an unirrigated village, cultural differences are measured empirically. The analysis presented in Chapter 6 then seeks to explain the role which canal irrigation has played in creating these empirical differences, and in some cases (particularly in the social realm) similarities, between the two villages.

Although economic impact studies are fairly routine in irrigation development, either to ascertain project feasibility or post hoc effects, most implementing agencies are not as concerned with social impacts, nor have academic anthropologists shown much interest. Knowledge of the socio-cultural impacts of irrigation development depends on a few detailed studies of indigenous irrigation systems (of dubious relevance to development situations), some cursory observations by anthropologists working in irrigated areas but focussing their research on other topics, and a variety of studies by economists and geographers which deal peripherally with socio-cultural variables.

One notable exception to the general lack of cultural research is Scarlett Epstein's comparative study of
two villages in Mysore, India, reported in her 1962 book, *Economic Development and Social Change in South India*. Epstein points out that social change can occur in a village that has not been specifically targeted for economic development (irrigation). Residents of the unirrigated village in her study found wage opportunities in a nearby city. Because of the urban influences and cash influx, there was relatively more social change in the dry village than in the wet village.

Epstein’s study is complicated by the proximity of a large urban center and by the location of the dry village along a major highway. In the present study, I have followed Epstein’s methodology of a controlled comparison, but I have also attempted to control for communication factors (roads, bus service) as well as the variables of caste composition, village size, and environmental setting (see Chapter 3, Methodology).

In both Epstein’s research and my own study, explicit recognition is given to the fact that “development” is a phenomenon that is much broader than irrigation alone. While the dry village, which functions as a control, is not influenced directly by irrigation, it shares in the regional economy and is thereby influenced by all other forces of development except those directly associated with irrigation water. The dry village does not represent the pre-irrigated condition of the wet village, but rather a
condition similar to that of the wet village had irrigation development stopped just short of that particular village.

The following section considers the relationship between irrigation systems and social systems in an indigenous context, i.e., situations where the irrigation system has evolved along with the social system of which it is a part. In Chapter 2, the relationship between introduced irrigation systems (irrigation development) and social systems is considered under the title, "Cultural Consequences of Irrigation Development." The chapter is divided into three main sections dealing with: (1) economic effects, (2) socio-economic effects, and (3) cultural values. In each section, the relevant literature is reviewed and specific issues are identified as research hypotheses. In Chapter 3, the methodology of the field study is discussed. Chapter 4 outlines the environmental and historical setting, based mostly on District Gazetteers from the British era. The ethnographic data are presented in Chapter 5; the two villages are described separately, and organized according to the three categories used in Chapter 2. The analysis of Chapter 6 combines data from the two villages, again following the same three categories of economic, socio-economic, and cultural values.
Indigenous Irrigation and Traditional Culture

A causal relationship between irrigation systems and social systems is proposed by Wittfogel (1957) in his book *Oriental Despotism*. His basic thesis is that the political evolution of "despotic" governments in Asia was a function of the organizational requirements inherent in large-scale canal irrigation. The debate inspired by his ideas have centered around the issue of causal priority (Adams 1966; Lees 1973; Kappel 1974) and the relation between centralized authority and centralized irrigation systems (Hunt and Hunt 1976). Amidst the arguments, however, is an underlying consensus that there are important connections between irrigation systems and social systems, and that whatever the evolutionary sequence, there are enough features which all irrigation-based societies hold in common to justify their partitioning as a single topic.

These cultural commonalities stem from the natural properties of water—bulk, weight, propensity to flow—which constrain the ways it can be managed (Wittfogel 1957:15; Gray 1963:7), and also from the inherent features of all irrigation systems which necessitate certain management functions: (1) the canal channels must be constructed and maintained, (2) water must be allocated, and (3) conflicts must be resolved (Hunt and Hunt 1976:390-391; Coward 1980:20). Thus, any society which depends on canal
irrigation must solve the same kinds of problems, though the solutions can vary.

Two themes from the literature on indigenous irrigation systems are helpful in understanding the broad issues of irrigation's impact on society: (1) the degree of integration between the irrigation system and the social system, and (2) the effects of changes in the irrigation system through either indigenous expansion or outside control.

1. Degree of Integration. Several ecologically oriented studies have treated the integration between irrigation and society as a function of environmental forces. For example, Mencher (1966) compares the mountainous, well-watered state of Kerala (India) with the erstwhile state of Madras which was drier and relatively flat. A strong centralized state evolved in Madras, facilitated by a road network and large-scale irrigation systems. In Kerala, road communication was difficult, irrigation, when needed, was necessarily small-scale, and the political units that evolved were small and decentralized.

Hackenberg (1962) recounts the indigenous development of the Pima and Papago Indians of Arizona. From an initially homogeneous group, the evolution of socio-cultural distinctiveness is linked to the Piman propensity for riverine irrigated agriculture, and the
Papago focus on much smaller water sources outside the river basins. The more complex political integration of the Pimas is seen as an outgrowth of a multi-village water supply which encouraged cooperation.

Geertz (1973a) describes irrigation systems in Bali and Morocco as closely fitted to the total social system, with both sets of systems tuned to the local environment. In Bali, both irrigation and social relations are highly corporate and well organized; in Morocco, both irrigation and social relations are individualistic and competitive.

A more complicated situation is described by Netting (1974) for a Swiss village. The irrigation system was not understood clearly by the users; each farmer knew when his turn was, but could not explain the total rotation system. While there appear to be functional as well as historical reasons for this situation, the overt organizational messiness of the irrigation system contrasts sharply with the apparent orderliness of other aspects of the culture. This example suggests that the structure of irrigation systems is not necessarily a microcosm of the social structure or even the environmental structure. There may well be more leeway in the degree of fit between irrigation

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2. Netting (personal communication) notes that the users' poor understanding of the system masks a real inequity of water allocation rights, while centuries of land and water right transfers by sale and/or inheritance have contributed to the complexity.
and society than the more doctrinaire ecological statements would have us believe.

2. Effects of Change. The concept of a relatively flexible relationship between social systems and irrigation is given further weight by accounts of changes in scale of irrigation which seem to have no significant social impacts. For example, Bacdayan (1974) describes a case of a Bontoc village in the Northern Luzon highlands of the Philippines. As their traditional irrigation system proved increasingly inadequate to meet the growing demands placed on it, the villagers of Tanowong undertook a considerable expansion of the system, running a new and much longer canal from a different river source. The village requested and received government assistance and in return relinquished some of their irrigation autonomy. Bacdayan (1974:258) concludes that the successful expansion of the system reveals, "the flexibility of traditional Bontoc social organization incorporating greatly enlarged communal tasks without a change in its structural form."

In a survey of 26 irrigated villages in Oaxaca, Mexico, Lees (1973:6) suggests that, "...canal irrigation itself has little, if any, effect upon community political organization...In other words, water control is completely incorporated into the larger system of public administration" (Lees 1973:81). Noting that the community irrigation systems are gradually coming under the
jurisdiction of the state government as the systems are upgraded and expanded, Lees (1973:121) suggests that the real locus of irrigation-linked political change is where the local political structure meets the state structure.

These studies imply that the social impact of changes within the indigenous irrigation systems may not be very significant, and that the political impact of contact with outside government structures is relatively more important. In other words, the socio-cultural changes stemming from indigenous irrigation are evolutionary in nature, as might be expected since the irrigation system and social system have "grown up" together. The changes stemming from introduced systems of irrigation, however, tend to be revolutionary, with the shock to the economic and political spheres rippling through the rest of the cultural system. The following chapter examines the effects of irrigation development.
CHAPTER 2

CULTURAL CONSEQUENCES OF IRRIGATION DEVELOPMENT

Irrigation plays an important role in the development process for two reasons. First, the complicated linkages inherent in irrigation result in socio-cultural changes not easily anticipated from the initial economic effects. Second, much of Third World development is focused on the agricultural sector, which often entails irrigation development.

The development process of which irrigation is an important component implies a set of goals and the progress made toward those goals. Todaro (1981:56) describes development as, "...not purely an economic phenomenon. In an ultimate sense, it must encompass more than the material and financial side of people's lives." Hoben (1982:352) notes that development, "...requires a far-reaching and fundamental transformation of society from 'traditional' forms which constrain economic growth to 'modern' forms which promote it and resemble our own."

The abstract nature of development takes on a more real and immediate sense when the concept is employed as an adjective modifying something concrete—viz, "development project." In this case, the meaning is clear; the project
will result in benefits such as greater yields, higher incomes, better health, or some other benefit which is spelled out in a project statement. Gittinger (1982:3) describes projects as "the cutting edge of development."

An analogy can be drawn between development and culture. Like culture, development consists of values, and just as behavior is the expression of cultural values, projects are the concrete expression of development values. An irrigation project is a particular kind of development project. The explicit aims of irrigation projects are nearly always economic, but the actual effects extend much further. The concern of this paper is not with the aims but the effects--the impacts--of irrigation development.

This chapter is divided into three sections representing the three categories of impact on which this study focuses: (1) economic behavior, (2) socio-economic behavior, and (3) cultural values. The section on economic impact is subdivided into the (a) cropping pattern, (b) labor, and (c) rent; the socioeconomic section is subdivided into (a) occupations, (b) patron-client relations, and (c) household composition; the section on cultural values is subdivided into (a) modernization and (b) traditionalization.

The cultural perspective assumed in this study rejects two extremes: the Harris (1979) thesis of
materialism, that cultural phenomena can be reduced to material determinants, and that, "Economic man always operates within a cultural framework that is logically prior to his existence as economic man" (Cancian 1974:145). The assumption is that man is neither purely economic nor solely cultural, but adaptive. Bennett (1969:19) advocates an approach which focuses on "the problem-solving, creative, or coping element in human behavior that permits a dynamic approach to environment." The many separate adjustments that become patterned as strategies form part of a group's "cultural style" (Bennett 1969:16). The concept of adaptive strategies implies a continual adjustment process as groups are both shaped by, and learn to exploit, the natural environment.

Two features of the adaptive strategy approach are important. First, there is no implication that the cultural solution to an environmental problem is the "best" one, but merely that it is a workable one (Barlett 1980:549). Second, a particular adaptation can lead to a complex of interaction effects as the total system adjusts (Linton 1936:353-358). Viewing irrigation's impact in terms of adaptive strategies suggests that there can be a range of economic responses constrained not only by pre-existing traditions, but also by the maxim of "whatever works", and that initial responses toward reaching a workable solution can have long term consequences.
Economic Consequences of Irrigation Development

This section begins with a theoretical discussion of irrigation's economic impacts. Following is an overview, based on published accounts, of irrigation-related changes in (a) cropping pattern, (b) labor demand and wage levels, and (c) economic rent. The conclusions drawn from these studies provide hypotheses to be tested in later chapters.

The initial and most obvious economic change brought about by irrigation development is an increase in agricultural production. If a prior situation of subsistence farming is assumed, the effect of irrigation will be the creation of an unprecedented agricultural surplus. Nicholls (1969) presents an economic model of the interaction between an agricultural surplus and population levels which offers a useful sketch of the basic economic forces unleashed by irrigation development. A modified version of the Nicholls model is given in figure 1.

The pre-irrigation production function is represented by line OSU. A single sector economy is assumed, with the entire labor force committed to agriculture. At a population of OP, the wage rate is given by \( w \), defined by the marginal product of labor and slightly higher than the institutional wage. Institutional forces will prevent the wage rate from dropping below a certain minimum (the institutional wage) even if the marginal product drops to
Fig. 1. An Economic Model of Irrigation Effects
zero (Ranis and Fei 1961:536). Irrigation technology inflates the production function as shown by line OTV, with the agricultural surplus at P defined by the difference between T and S. The wage rate under irrigated conditions is $w'$ for a population level of $OP$. If the population increases, the wage rate as defined by the marginal product will decline to the pre-irrigation rate at a population of $OP'$. In other words, the surplus which irrigation makes possible can be used in either of two ways: (1) it can provide a higher standard of living for the existing population, or (2) it can support an increased population level at the pre-irrigation standard of living.

The effect of irrigation on the agricultural sector stems not only from the surplus per se, but more importantly from the creation of new, higher pay-off conditions. The major contribution of Schultz's (1964) book, Transforming Traditional Agriculture, was to point out the need for new technology to overcome the inherent economic (not cultural) constraints in agrarian economies: "...the crucial feature of traditional agriculture is the low rate of return to investment...In order to transform this type of agriculture

\[ \text{1. Product price is ignored in this analysis. In a real case, the prices of agricultural commodities would be expected to decrease as production increased; thus the increased quantity of the surplus is not a predictor of the value of the surplus.} \]
a more profitable set of factors will have to be developed and supplied" (Schultz 1964:viii).

This conclusion is the good news of the Schultz model, that traditional farmers, who are assumed to be rational, will invest in agriculture if the technology is provided to make that investment profitable. However, the model assumes an equitable agrarian economy of free landowner-cultivators who receive the surplus in the form of economic wages and have an incentive to reinvest in their own farms. The model does not have the same results in the case of large landowners and numerous tenant farmers. As predicted by Nicholls (1969) and observed by Nair (1979) in Bihar, India, if the surplus accrues to the landowners as rent, rather than to the tenants as wages, there is apt to be little or no development in the agricultural economy.

Irrigation and Cropping Pattern

Mellor (1967:272) includes a quotation from an address by Dr. Richard Bradfield that nicely summarizes the agricultural impact of irrigation:

...when you supply plenty of water to a soil-crop complex, you do more than merely add water; you change the effectiveness of every other factor in the system, and consequently, need to develop a new system of management. The varieties of crops grown before irrigation had probably been selected for generations for drought resistance...But the drought resistant variety is seldom capable of making maximum use of the improved water supply. A new variety which will give the highest yields under the new moisture regime is needed.
"Cropping pattern" refers to the varieties of crops grown and their relative proportions, and also to the annual cropping intensity. Assuming the farmer to be economically rational (and ignoring risk) he will opt for the highest value cropping mix which often means substituting non-food cash crops for food crops. This strategy can adversely affect national food grain goals, but from an individual farmer's standpoint may be economically necessary to raise the additional cash he needs for water fees and fertilizer (Myrdal 1968:1287).

The increase in agricultural production associated with irrigation is widely recognized. In Indian agriculture, irrigated lands are commonly twice as productive as dry lands (Tata 1982:51). Even in areas where irrigation water is insecure, or where complementary inputs of fertilizer and pesticides are lacking, the results are also impressive. Table 1 shows irrigated versus non-irrigated yields of wheat in the Punjab between 1901-1924. Table 2 presents yield differences by crop, again from Punjab data, between 1951-1956, before the large-scale use of fertilizers. An important aspect of irrigation-related cropping shifts is that farmers can respond to commodity supply prices much more effectively than they can without irrigation. Under non-irrigated conditions, "...it is not so much the past year's relative
TABLE 1

IRRIGATION EFFECTS ON WHEAT YIELDS FROM EIGHT DISTRICTS IN PUNJAB, IN QUINTALS PER HECTARE

<table>
<thead>
<tr>
<th>Year</th>
<th>Unirrigated</th>
<th>Irrigated</th>
<th>% Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>1901-02</td>
<td>6.6</td>
<td>9.3</td>
<td>41%</td>
</tr>
<tr>
<td>1906-07</td>
<td>6.8</td>
<td>9.8</td>
<td>45%</td>
</tr>
<tr>
<td>1912-13</td>
<td>6.3</td>
<td>9.6</td>
<td>53%</td>
</tr>
<tr>
<td>1917-18</td>
<td>6.4</td>
<td>10.3</td>
<td>62%</td>
</tr>
<tr>
<td>1923-24</td>
<td>6.6</td>
<td>10.9</td>
<td>65%</td>
</tr>
</tbody>
</table>

Source: Paustian (1968:109)

TABLE 2

IRRIGATION EFFECTS ON AVERAGE CROP YIELDS, PUNJAB, 1951-52 TO 1955-56, QUINTALS/HECTARE.

<table>
<thead>
<tr>
<th>Crop</th>
<th>Unirrigated</th>
<th>Irrigated</th>
<th>% Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>7.3</td>
<td>14.0</td>
<td>93%</td>
</tr>
<tr>
<td>Gram</td>
<td>4.2</td>
<td>7.1</td>
<td>67%</td>
</tr>
<tr>
<td>Maize</td>
<td>9.5</td>
<td>19.5</td>
<td>103%</td>
</tr>
<tr>
<td>Millet</td>
<td>7.5</td>
<td>14.9</td>
<td>99%</td>
</tr>
<tr>
<td>Groundnut</td>
<td>6.0</td>
<td>8.0</td>
<td>33%</td>
</tr>
<tr>
<td>Barley</td>
<td>9.5</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

Source: Day and Singh (1977:248).

prices as anticipations regarding the behavior of the climatic factor at the time of sowing that influence the cropping pattern" (Bharadwaj 1974:49). However, as Epstein (1973:94) notes, even on irrigated lands, subsistence food crops take first priority. Only after the farmer has assured his family's food supply, will he adjust his cropping pattern to market conditions.
Irrigation affects cropping patterns by increasing crop production, increasing annual cropping intensity, and by providing an expanded set of planting options. The shift from subsistence to cash crops is an important element in the transformation of the traditional farmer. Irrigation provides the necessary conditions and incentives for this transformation since the farmer needs more cash to engage in irrigated, fertilized agriculture. At the same time, irrigation provides greater returns to investment, rendering it economically worthwhile.

A more intensive cropping pattern requires more inputs of all kinds, not only fertilizer and perhaps pesticides, but also more plowing, planting, weeding, harvesting, threshing, and winnowing. This requires more labor, which is the next topic.

Irrigation and Labor

In developing countries, labor is often the most plentiful agricultural factor of production. Lewis (1954) went so far as to claim the supply to be "unlimited" with a marginal productivity of zero or perhaps even less. Most development economists with first hand experience, however, would probably agree with Mellor (1966:157) that the marginal product of labor is generally positive: "...increased labor input within the traditional framework
of production can increase output significantly in most low-income countries."

Whatever the actual value of labor's marginal contribution, it is certainly beyond dispute that irrigation-induced production increases cause a higher demand for agricultural labor in the short run. In the long run, labor inputs may be replaced by other kinds of inputs such as power threshers, tractors, and herbicides.

A generalized model of labor supply and demand before and after irrigation is given in Figure 2. The model deals only with human labor and does not take labor substitution into account. However, the model does assume a mobile population which can migrate in to take advantage of wage opportunities. Thus, after an initial jump in the demand for labor (from DD to D'D'), the supply of labor also shifts out (from SS to S'S') as migrant labor, either seasonal or casual, moves in. The wage level rises from \( w \) to \( w'' \) in the short run, but then falls to \( w' \) as the labor supply is supplemented by migrants. In the long run, the natural increase of the indigenous population would add to the labor supply, presumably bringing wages down even further. Because the irrigated economy is linked to unirrigated economies, the otherwise dramatic wage effects of irrigation are buffered through a redeployment of labor from unirrigated regions.
Fig. 2. Irrigation Effects on Labor Demand and Wage Rates
In considering specific examples of irrigation's effect on labor use, it becomes difficult to separate out the purely irrigation effects from other influences such as high yielding varieties, fertilizers, and mechanization. Each factor, including irrigation, has either a positive or negative influence on human labor, and while some factors are closely associated (e.g., fertilizer and HYVs are normally used only on irrigated land), other factors are independent of irrigation (e.g., power threshers and tractors can be used on non-irrigated land). Raj Krishna (1974) attempts to "decompose" the various labor effects of technological inputs per hectare in wheat, using Punjab data (Table 3). Between 1968-69 to 1973-74, a 6% increase in the proportion of land irrigated resulted in an extra irrigation labor demand of 16.28 manhours/hectare, an increase in total labor demand of 3% over the 1968-69 figure. In spite of the positive labor effect of irrigation and higher yielding varieties, mechanization variables had a much greater negative effect. The cumulative result was a net decrease of 16% in total labor inputs over the five year period.

If irrigation development is taken to include the mechanization of irrigation technology, then these data would indicate a net negative impact of irrigation on labor use. For example, the "irrigation technology effect" in Table 3 describes the shift from irrigation by hand-drawn or bullock-drawn wells to power pumps on the 22% of irrigated
land which was well-irrigated in 1968-69. However, it is likely that power pumps would have replaced human labor regardless of whether or not the proportion of irrigated area expanded. The conclusion from the Punjab case is that irrigation does indeed increase the demand for labor, but its positive effects are drowned out by the overwhelming forces of mechanization.

TABLE 3

DECOMPOSITION OF THE CHANGE IN LABOR INPUT PER HECTARE IN WHEAT, ASSOCIATED WITH A 6% INCREASE IN IRRIGATION INTENSITY; PUNJAB, 1968-69 TO 1973-74

<table>
<thead>
<tr>
<th>Effect</th>
<th>Manhours/hectare</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigation effect</td>
<td>+16.28</td>
</tr>
<tr>
<td>Variety effect</td>
<td>+17.35</td>
</tr>
<tr>
<td>Tractor-ploughing effect</td>
<td>-5.26</td>
</tr>
<tr>
<td>Irrigation technology effect</td>
<td>-34.59</td>
</tr>
<tr>
<td>Threshing effect</td>
<td>-70.58</td>
</tr>
<tr>
<td>Interaction effect (irrigation and variety)</td>
<td>+2.08</td>
</tr>
<tr>
<td>Negative interaction effects</td>
<td>-16.89</td>
</tr>
<tr>
<td>TOTAL</td>
<td>-91.61</td>
</tr>
</tbody>
</table>

Source: Raj Krishna (1974:280)

In a similar but more elaborate approach, Bell, Hazell, and Slade (1982) use a computer simulation model to decompose the effects of a large scale irrigation scheme in Malaysia, the Muda River Project. The "pure project effect" of the irrigation water is distinguished from the effects of
HYVs, the price of rice (the sole crop) and input prices, by comparing data from before (1967) and after (1974) project implementation. Their results show that, "the introduction of irrigation accounts for about two-thirds of the increase in the output of paddy and inputs of labor, and about half the rise in the inputs of nitrogen" (Bell et al. 1982:87).

The data in Table 4 present the irrigation effect as a percentage of the 1967 values.

The analysis of the Muda Project data provides a relatively well controlled example of irrigation's impact. Although some of the baseline data used are of dubious accuracy, since they were taken from an uneven mix of published sources, the computer analysis shows the qualitative trends of irrigation effects quite distinctly.

Under rainfed conditions prior to the project, a single annual crop of paddy could be grown. High yielding rice varieties were just beginning to be used, as were tractors and nitrogen on a small scale.

With irrigation, double cropping became standard procedure, creating a great demand for labor. Some of the increased labor was supplied by the household, but the rest had to be provided by hired labor and to some extent, mechanization. Data cited by Bell et al. (1982:37-38) indicate a 60% increased use of labor in double-cropping paddy farming (reflecting mechanization and labor shortcuts). Hired labor filled 59% of the new labor
demand, with family labor filling in the remaining 41%. The 382% irrigation-effect increase in total wages (in Table 4) is the projected trend assuming a 100% increased labor use with double cropping at the higher real wage rate prevailing in 1974.

### TABLE 4

DECOMPOSITION OF IRRIGATION EFFECTS, MUDA RIVER IRRIGATION PROJECT, MALAYSIA, 1967-1974

<table>
<thead>
<tr>
<th>Variable</th>
<th>1967 Value</th>
<th>Irrigation effect</th>
<th>Irrig./1967 value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paddy output (piculs x 1000)</td>
<td>3,826</td>
<td>3,708</td>
<td>+97%</td>
</tr>
<tr>
<td>Labor use (days x 1000)</td>
<td>14,440</td>
<td>6,762</td>
<td>+47%</td>
</tr>
<tr>
<td>Total wages ($1000)</td>
<td>2,285</td>
<td>8,737</td>
<td>+382%</td>
</tr>
<tr>
<td>Average wage ($/day)</td>
<td>1.46</td>
<td>0.55</td>
<td>+38%</td>
</tr>
<tr>
<td>Land rents ($/relong/year)</td>
<td>74</td>
<td>38</td>
<td>+52%</td>
</tr>
<tr>
<td>Nitrogen use (lbs. x 1000)</td>
<td>7,212</td>
<td>6,493</td>
<td>+90%</td>
</tr>
<tr>
<td>Aggregate net income ($1000)</td>
<td>43,526</td>
<td>19,444</td>
<td>+45%</td>
</tr>
</tbody>
</table>

Source: Bell et al (1982:88)

The Muda simulation model reveals the economic forces which irrigation brings to bear on local labor markets. Double-cropping with twice the labor inputs of single-cropping was not profitable because of high labor costs. Irrigation created a labor demand which the farmer was forced to deal with, though not necessarily meet. This
was done by skimping on cultivation practices, to save labor, and by increased mechanization, to save more labor. For the remaining labor demand, farmers had no economic option but to hire workers, pushing the real wage rate up in the process.

It seems clear from the literature that irrigation has a positive short-run effect on employment. The fact that irrigated agriculture is sometimes not labor intensive is a function of associated variables, the most notable of which is mechanization. Similarly, it is safe to assert that irrigation has a positive short-run effect on wages, but again, irrigated agriculture is not necessarily marked by high wages. Too many other variables are at work simultaneously, of which the most critical is migration. If the supply of labor is increased by in-migrants, the effects of irrigation on employment will still be positive, but the effect on wage rates might be minimal, or even negative.

Epstein (1973:138-139) reports that in the irrigated village of Wangala in Mysore State (India), competition from migrant day laborers is one reason that real wages have dropped. From the landowner's perspective, hiring migrant rather than local labor has several advantages. The workers tend to be more efficient, since their jobs depend on their immediate performance, and most importantly, they leave when the job is over. Unlike the village landless,
they do not require subsidies to tide them over during periods of slack employment.

In addition to mechanization and migration, there are other important, though less dramatic factors which dampen the labor effects of irrigation. Bell et al. (1982:91) note that the shorter maturation time of HYV rice reduces labor in weeding and tending the crop. In more arid regions, irrigation gives the farmer freedom to adjust his planting schedule and thereby his harvest schedule. By staggering the harvest, he can employ fewer hands for a longer period than would be possible under non-irrigated conditions.

Finally, the role of the labor market in the industrial sector has a bearing on agricultural wages. This effect can be seen from Epstein's (1962) comparative study in Mysore (India). The wage rate in the non-irrigated village was higher because of employment options in the nearby town of Mandya. The other village, while irrigated, was also more isolated from the urban labor market.

2 Irrigation and Rent

The model of labor use and wage rates presented in Figure 2 is also applicable to depicting irrigation effects.

---

2. For purposes of discussion, rent is defined simply as "surplus gains over real costs" (Schumpeter 1954:938), i.e. profit.
on economic rent. The pre-irrigation rent is given by the triangle formed by the demand curve DD and the wage level \( w \). The increased labor demand of irrigation raises the equilibrium wage rate to \( w'' \) so that all of the surplus is taken up by wages. Migrant labor is attracted by the high wage scales and raises the local labor supply to \( S'S' \), with a long-run equilibrium wage of \( w' \). The new rent triangle is formed by the demand curve \( D'D' \) and the wage level \( w' \).

Consideration of irrigation effects on economic rent builds on the equity issue in terms of the relative benefits accruing to landless versus landed, and within the category of landowners, small versus large farmers. The other issue involved is the general profitability of irrigated agriculture, in an absolute sense; i.e., to what extent do farmers as a group benefit from irrigation?

It is generally held that landowners have gained more than tenants and laborers from the adoption of Green Revolution technology (Ruttan and Binswanger 1978:390). It is intuitively reasonable to expect that the owners of the land which receives irrigation water will benefit more directly than those who work for wages on that land. However, as the model in figure 2 shows, if not for

3. This model assumes an inelastic supply of labor in the short term. While such an assumption is not realistic for most Indian villages, it serves to highlight the wage/rent dynamics and the role of migration in shifting the labor supply curve.
migration-induced increases in labor supply, the wage worker would benefit relatively more than the landowner. With a wage level at \( w \), the new rent triangle \( w'CD \) is not significantly larger than the old rent triangle \( wAD \); however, total wages have increased by the area \( wACw' \). It is to the landowners' advantage that the labor supply increases. In-migration depresses wage levels, thereby increasing economic rents to landowners.

Data on the absolute gains by landowners are surprisingly scarce in published accounts. While development studies tend to measure benefits to labor in absolute terms (rather than comparing their benefits against landowners), the gains of landowners are usually described in relative terms. Swenson (1976) attempts to quantify both absolute and relative gains of operators, tenants, and laborers in Thajavur district of Tamil Nadu. Nearly every group has made gains in real income since the introduction of high yielding varieties of rice. Very large operators benefited the most (18%) but the gain of landless laborers (13%) was also high. Translated into cash values, however, the gains are Rs. 4,471 and Rs. 59 respectively. Thus, inequality has remained virtually the same in relative terms, but is increasing in absolute terms. This situation is also reflected in the Gini coefficient which changed insignificantly from 0.71 in 1965-66 to 0.70 in 1970-71 (Swenson 1976:10).
Farm budget data comparing irrigated and non-irrigated farms from Amritsar and Ferozepur districts of Punjab are presented by Ansari (1968) and reproduced in Table 5. These figures show the effect of irrigation on farm profits before the advent of Green Revolution technology. While the input costs of irrigated agriculture have roughly doubled (216%), the costs are more than compensated by a tripling (336%) of returns.

<table>
<thead>
<tr>
<th>Input</th>
<th>Irrigated farms</th>
<th>Non-irrigated farms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human labor:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family</td>
<td>34.7</td>
<td>15.3</td>
</tr>
<tr>
<td>Hired</td>
<td>15.3</td>
<td>6.0</td>
</tr>
<tr>
<td>Bullock labor</td>
<td>41.7</td>
<td>21.3</td>
</tr>
<tr>
<td>Seed</td>
<td>9.0</td>
<td>6.7</td>
</tr>
<tr>
<td>Manure</td>
<td>3.7</td>
<td>0.0</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>1.7</td>
<td>0.0</td>
</tr>
<tr>
<td>Interest on capital</td>
<td>2.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Depreciation</td>
<td>5.7</td>
<td>2.3</td>
</tr>
<tr>
<td>Artisans</td>
<td>2.7</td>
<td>1.7</td>
</tr>
<tr>
<td>Rent</td>
<td>66.3</td>
<td>31.0</td>
</tr>
<tr>
<td>Land tax</td>
<td>1.7</td>
<td>1.3</td>
</tr>
<tr>
<td>Irrigation charges</td>
<td>7.7</td>
<td>---</td>
</tr>
<tr>
<td><strong>TOTAL VALUE</strong></td>
<td><strong>191.7</strong></td>
<td><strong>88.7</strong></td>
</tr>
<tr>
<td><strong>NET INCOME</strong></td>
<td><strong>88.3</strong></td>
<td><strong>26.3</strong></td>
</tr>
</tbody>
</table>

Source: Ansari (1968:166,169).
A less profitable picture is painted by Bharadwaj (1974:43-46), also using Punjab data (see Table 6). The farm losses she reports suggest that she has employed the market wage rate, rather than the opportunity cost, to estimate the value of family labor. Nonetheless, the consistency of relationships in her data reveals an interesting correlation between size of holding and profitability. For irrigated holdings, larger size is associated with higher profitability per acre, whereas unirrigated holdings show the opposite trend.

**TABLE 6**

<table>
<thead>
<tr>
<th>Size of holding (acres)</th>
<th>Irrigated holdings</th>
<th>Unirrigated holdings</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>-16%</td>
<td>+6%</td>
</tr>
<tr>
<td>5-10</td>
<td>-9%</td>
<td>-3%</td>
</tr>
<tr>
<td>10-20</td>
<td>-2%</td>
<td>-20%</td>
</tr>
<tr>
<td>20-50</td>
<td>+3%</td>
<td>-13%</td>
</tr>
<tr>
<td>&gt;50</td>
<td>+15%</td>
<td>-30%</td>
</tr>
</tbody>
</table>


4. The accounting system used to translate household labor into the going wage scale is a source of confusion here. Since the smallest irrigated farms use 33% more human labor and 46% more animal labor than the largest farms, the imputed value of inputs for small farms becomes quite high. However, it is significant that small irrigated farms commit more labor per acre. It is also significant that the smallest unirrigated farms use more labor per acre than the largest farms: 50% more human labor and 40% more animal labor.
Small farmers expend more labor per acre regardless of irrigation, but the value productivity of their labor is relatively greater without irrigation. Does this mean that small farmers have benefited less than large farmers? If viewed in terms of the marginal value of their labor, the answer appears to be yes; they would be better off without irrigation, working less and making a small profit. But viewed in terms of total production, the smallest farmers have certainly benefited. The fact that they choose to maximize their crop production rather than their labor productivity suggests that even the smallest farmers prefer irrigated conditions.

Green Revolution technology appears to be scale-neutral in the long run. For example, the adoption pattern of HYV grain is biased towards large farmers in the first few years following introduction, but small farmers adopt at an equal rate after a lag of 4-5 years (Ruttan and Binswanger 1978:387-388). Irrigation technology, however, may be inherently, though modestly, biased toward larger farmers. Bharadwaj (1974:46), citing the phenomenon that per acre yields are inversely correlated with landholding size, notes that the relation is statistically significant only for unirrigated farms (based on Punjab data). Irrigated farms, also show the same trend, but not to the extent of statistical significance. She suggests, "It is likely...that a well-irrigated large holding with its
relative superiority in terms of financial power to provide complementary assets and inputs may even obtain a differential advantage."

The economic rent which a farmer receives from the productive use of his land can increase substantially with irrigation. Returns to the landowning household that employs its own labor consist of both rent (to the "owner") and wages (to the family "workers"). Irrigation does not alter the different farming strategies of small versus large farmers. Small farmers continue to invest more labor per acre. However, the marginal value of that additional labor appears to decrease slightly in irrigated agriculture, as does the difference in yields between small and large farmers. These phenomena suggest that while all farmers benefit from irrigation, there may be a relatively greater benefit to large farmers.

Conclusions

The economic consequences of irrigation development can be summarized as follows:

Cropping Pattern. Irrigation raises the productivity of existing crops, allows greater cropping intensity, and gives flexibility to crop scheduling. Higher value cash

5. The present study does not address this interesting issue, since the sample is of inadequate size to support the necessary subsamples.
crops can be substituted for subsistence crops, resulting in generally higher costs and higher total/net returns.

**Labor Demand.** Irrigation by itself raises the demand for labor; this is the "pure" irrigation effect. However, the myriad other factors which tend to be associated with irrigation development, and also affect labor demand, can have a net result of lowering the demand for labor. These other factors include mechanization, crop types, harvest scheduling, as well as competing labor supply (migrants) and demand (industrial sector).

**Economic Rent.** Irrigation by itself has no effect on economic rent, assuming a fixed supply of labor. In practice, however, economic rents can increase due to an expansion of labor supply or mechanized labor substitutes. The relative profitability of irrigated vs. unirrigated agriculture is confused by problems of valuing household labor. Large farmers seem to have benefited relatively more from irrigation than small farmers.

**Socio-economic Consequences of Irrigation**

In the previous section, the pure economic effects of irrigation were traced from the agricultural surplus which irrigation makes possible. In this section, irrigation's impact on the social relations embedded in the activities of agricultural production is examined under three topics: (a) occupations, (b) patron-client relations,
and (c) household composition. As in the preceding section on economic impacts, the discussion will be for the most part limited to studies conducted in India.

To the aim of unravelling the interlinked cultural effects of irrigation, the partitioning of behaviour into discrete categories of economic and social is as artificial as it is necessary. The problem is compounded in the analysis of the Indian jajmani system which comprises an indissoluble mix of social and economic features (Freed and Freed 1978:9). This section is labelled "socio-economic" in recognition of the partitioning problem. The three topics of emphasis within this category range from primarily economic (occupations) to mostly social (household composition) with the jajmani system in between.

**Irrigation and Occupations**

Rural occupations in North India are a function not only of economic opportunity but caste affiliation as well. For example, only a member of the carpenter caste (khati) will work as a professional carpenter, but not all khatis are carpenters; that depends on employment opportunities. The effects of irrigation are different for the different occupational/caste groups, which can be divided into three categories: (1) farmers -- by far the largest group, consisting of nearly all landowners, most of whom belong to the upper castes, (2) agricultural laborers
-- a large minority of landless, generally low caste groups, and (3) service castes -- the smallest category consisting of workers pursuing caste-defined occupations such as the carpenter, blacksmith (lohar), cobbler (mochi), and others.

Farmers. The immediate effect of irrigation on farmers stems from the increased productivity and increased profitability of irrigated agriculture. The economic dynamics can be seen in Figure 1 (p. 17) as an increase in marginal physical product (MPP) from $P_w$ to $P_w'$. Taking the $MPP'$ curve as the market wage rate under irrigated conditions, it is clear that the wages which a farmer can afford to pay himself ($P_w'$) are much higher than previously ($P_w$); hence he will be more inclined to continue his occupational career as a farmer rather than diversifying into something else.

This pattern is reported by Epstein (1962:316-318) for the irrigated village of Wangala in Mysore. After 25 years of irrigation, Wangala remained wholly agricultural, and in spite of the change from a subsistence to a cash economy, the indigenous economic structure had not been significantly affected. The unirrigated village of Dalena, however, could no longer support its growing population, yet villagers were unwilling to migrate as long as they owned even small plots of land. The result has been occupational diversification:
Dalena's dry land economy has continued to force farmers to participate in the regional expansion. Previously this pressure was felt mostly by the village entrepreneurs on the one hand and the poorest on the other: the former did not want to be left behind by their counterparts in neighboring irrigated villages, whereas the latter, having lost the protection of traditional hereditary labour relations with Peasant landowners in the village, were forced to supplement their meagre subsistence income by wages earned outside (Epstein 1973:89).

The greater dependence on farming which irrigation encourages can be seen most clearly in arid regions which have been newly irrigated. Bharara et al. (1974) present data from northern Rajasthan where agriculture was tenuous prior to irrigation because of the risk of drought. The occupational effect of irrigation has been a shift from a reliance on animal husbandry and subsidiary agriculture. Since irrigation, agriculture has become the main occupation, with animal husbandry a strictly supplementary activity (see Table 7).

<table>
<thead>
<tr>
<th></th>
<th>Irrigated Hslds</th>
<th>Non-Irrigated Hslds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupation</td>
<td>Main</td>
<td>Subsidiary</td>
</tr>
<tr>
<td>Farming</td>
<td>87%</td>
<td>11%</td>
</tr>
<tr>
<td>Ag. Labor</td>
<td>6%</td>
<td>65%</td>
</tr>
<tr>
<td>Livestock</td>
<td>6%</td>
<td>21%</td>
</tr>
<tr>
<td>Caste work</td>
<td>-</td>
<td>1%</td>
</tr>
<tr>
<td>Other</td>
<td>1%</td>
<td>3%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: Bharara et al 1974:3
Agricultural Labor. Irrigation effects on the demand for agricultural labor were discussed earlier with no firm conclusions drawn; while irrigation by itself invariably increases labor demand, other developments associated with irrigation (e.g., mechanization) have the opposite effect. Apart from the question of irrigation's impact on the quantity of labor demand is the question of labor patterns: Who will meet the demand for labor and what form will the contracts take? Dasgupta (1977:65-66) lists four possible effects of irrigation on labor patterns: (a) a decline in 'participation' and an increase in 'duration', in other words, fewer workers for longer periods, (b) a withdrawal of family labor in favor of hired labor, (c) a particular decline in family female labor, and (d) the in-migration of workers from outside the village.

While the precise causal relations are murky, the points raised by Dasgupta are confirmed by other observers. Blyn (1983:715) reports that farms with tractors in Punjab use relatively more permanent labor and relatively less casual labor than do farms without tractors. Epstein (1973:138-139) also notes an increase in annual contract labor in Wangala, but this is related to the

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5. Dasgupta (1977:66) does not claim that these are effects but merely reasons that, "the pattern of labour demand in the village which results from irrigation is not predictable."
weakened bargaining position of village laborers. Faced with underbidding from casual migrant laborers (who are attracted by the irrigation-induced employment opportunities), the poorest village workers are forced into undesirable contracts assuring them of an income, however meagre it may be.

The rationale for linking irrigation with a decline in household agricultural labor is based on the well-documented correlation between prosperity and leisure in South Asian agriculture (Dasgupta 1977:12,35; Ahuja 1978:56-61; Myrdal 1968:994-1026). It would be more precise to state that prosperity allows the expression of cultural values which vary from region to region. For example, in Wangala, "...the labour contribution of the household's womenfolk to farming is declining among the richer farmers" (Epstein 1962:72), but "For the farmer himself there is no such correlation: the proportion of agricultural work performed by the farmer himself of all the labour that goes into farming his lands is in no way related to his social and economic status." Wealthy Rajput farmers in Khalapur (western Uttar Pradesh), however, prefer to substitute not only their women's labor, but their own as well, with hired workers (Minturn and Hitchcock 1966).

Service Castes. Service castes constitute a relatively small segment of the population in most Indian villages, and perhaps for this reason have been largely
ignored in studies of developmental impacts. The jajmani system of relations which tie the service castes to their farming patrons is well studied (see the discussion below), but the occupations which the service castes perform are often relegated to the analytical background. Hirashima (1977) presents a rare look at the economic strategies pursued by service castes in four villages in the Pakistan Punjab, and in spite of some difficulties with his data, several important qualitative trends can be inferred. The hereditary occupations which service castes pursue give them a partial monopoly which can be of economic advantage. In general, the hourly wages in traditional work are higher than in agricultural wage work.

**TABLE 8**

A COMPARISON OF TRADITIONAL CASTE OCCUPATIONS WITH OTHER EMPLOYMENT IN FOUR PUNJAB VILLAGES (PAKISTAN)

<table>
<thead>
<tr>
<th>% of Rs. per</th>
<th>% of Rs. per</th>
<th>% of income hour</th>
<th>income</th>
<th>hour</th>
<th>income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barber [n=11]</td>
<td>48%</td>
<td>.30</td>
<td>8%</td>
<td>.50</td>
<td>44%</td>
</tr>
<tr>
<td>Potter [n=16]</td>
<td>33%</td>
<td>.28</td>
<td>7%</td>
<td>.25</td>
<td>60%</td>
</tr>
<tr>
<td>Bard [n=8]</td>
<td>28%</td>
<td>.62</td>
<td>27%</td>
<td>.22</td>
<td>45%</td>
</tr>
<tr>
<td>Baker [n=11]</td>
<td>10%</td>
<td>.40</td>
<td>19%</td>
<td>.35</td>
<td>71%</td>
</tr>
<tr>
<td>Weaver [n=16]</td>
<td>38%</td>
<td>1.21</td>
<td>24%</td>
<td>.35</td>
<td>38%</td>
</tr>
<tr>
<td>Cobbler [n=11]</td>
<td>39%</td>
<td>.49</td>
<td>22%</td>
<td>.43</td>
<td>39%</td>
</tr>
</tbody>
</table>

Source: Hirashima 1977:65

6. Non-cash payments are not reflected in the figures given in Table 8, which may account for the variance in hourly wages within the category of traditional work.
It would appear that given a demand for their traditional labor, service caste specialists will follow their inherited professions and reap the relatively greater economic rewards that agricultural labor can provide. The constraints to this strategy stem not only from competition by their own kin, but from competing technologies as well. Elder (1970:123-124) reports that most of the service castes in the Utter Pradesh village he studied have been adversely affected by the combined forces of competitive technology and population increase (with no parallel increase in land area). Only the priest (Brahmin), barber (Nai) and sweeper (Bhangi) castes have remained aloof from the changes. The function of these castes is predominantly ritualistic, while the castes traditionally responsible for more practical matters (the carpenter, blacksmith, and potter castes) find their hereditary functions in direct and unsuccessful competition with new technologies.

Service caste households owning land can be affected by irrigation in two ways, as both farmers and service specialists. Epstein (1962:39) reports that to the service castes of Wangala village, "farming became a major if not a wholetime activity and their hereditary occupation assumed secondary importance." At the same time, the intensified village agriculture required the services of specialists, so that when the Wangala blacksmith proposed downgrading his traditional work to concentrate on farming, the village
elders demanded that he first find a replacement (Epstein 1962:37-38).

The effects of irrigation are quite predictable for farming households: they will intensify their agriculture. The effects on landless workers are more complicated, since they depend on a number of factors which may be associated with irrigation, for example, mechanization. In addition, their employment prospects depend on the social preferences of their would-be employers, e.g., whether household labor will be replaced by hired workers. The impact of irrigation on caste-linked occupational specialties is also dependent on both endogenous and exogenous factors. Whether or not the service castes own land, the supply of labor (i.e. the population of their caste group in the village), and competition from outside technologies, will have a bearing on how specific caste occupations can adapt to a changing village economy.

Patron-Client Relations

The occupational underpinnings of the caste system in India render any analysis of occupational categories an analysis of caste as well. Relations between patrons and clients nearly always involve economic interaction across caste lines. Two types of patron-client relations are distinguished in this section: (1) jajmani relations, which
involve hereditary occupational specialization, and (2) contract labor arrangements.

**Jajmani Relations.** Since first described by the Wisers in 1936, the cross-caste jajmani relations have been a popular topic for ethnographers. Freed and Freed (1976:120) provide a concise introduction to this uniquely Indian system of labor exchange:

Jajmani relationships were established between two families, one of which provided the traditional services of its caste for the other. The patron family made a traditional payment, principally in kind. Part of the payment might be made at the time when services were rendered, part was paid in grain at the harvest... and part was in the form of gifts at ceremonies. The client family usually had a monopoly in providing services to its patrons; a patron ordinarily could not discharge its client and hire another family of the same caste within the village; he might, however, break off relations and do the work himself or obtain the needed goods or services in impersonal urban markets.

Throughout India, the jajmani system appears to be on the decline (Berreman 1972:174; Kolenda 1976:51-54; Lewis 1958:82-84), not only in terms of occupations (as mentioned above), but in terms of the social and economic relations between patrons and clients. Some artisans choose to move into a town where they can find more work within their specialties (Orenstein 1962:313; Freed and Freed 1976:122) or wage work outside their traditional craft (Connell et al. 1976:149). Perhaps the most significant change is from payment in kind with a number of informal fringe benefits,

Ascribing a particular role to irrigation as an influence on jajmani relations is problematic, since the system is already in a state of flux. Epstein makes no mention of the jajmani system as an institution, but does note an overall decline in the craft industries of both the irrigated and unirrigated village. Artisans who owned land turned to agriculture, while some of their landless kin chose to migrate out (Epstein 1973:125). At the same time, the irrigated economy of Wangala attracted some artisan in-migrants (Epstein 1973:125), suggesting that irrigation might tend to slow the inevitable decline of craft specialists.

**Contract Labor.** Just as the jajmani system structures the relations between the service castes and the landowning patrons, various types of labor contracts structure relations between agricultural laborers and landowners. Historically, permanent labor relations were common such as the *hali* system in Gujarat (Breman 1974). In the village of Vilyatpur in Punjab, Chamars served as indentured agricultural laborers (Kessinger 1974:217). Chamars could also function within the jajmani system as leatherworkers; it was not their traditional caste occupation, but their relative caste rank as untouchables.
which made them socially and economically bound to their landowning patrons as agricultural laborers.

Contemporary examples of contract labor include monthly or seasonal labor agreements (Kolenda 1976:54) as well as annual tenant and sharecropping contracts (Michie 1981). As with artisans in the jajmani system, the general trend among agricultural laborers is to payments in cash rather than kind. Kessinger (1974:217) views this trend as resulting from outside competition for village labor services, with the laborer benefiting through higher real wages. Michie (1981) and Mencher (1978) see a net social and economic erosion of status for landless labor and an overall shift from a caste society, with its maze of vertical relations connecting the upper and lower castes through traditional obligations, to a more dichotomized class-based society. This process is tied to the monetization of agriculture:

The more a farmer enters the cash economy, becoming dependent on factor and commodity markets, the more he must calculate in its terms. He must also evaluate the social relations of production and distribution in the same manner, strictly as a cash equivalency, whether real or imputed (Michie 1981:33).

The impact of irrigation on labor contracts is linked to the monetization of irrigated agriculture. Epstein (1973:137) reports that annual contract laborers in Wangala have continued to be paid a ration of food and clothing, but their major portion of payment is in cash.
Irrigation has increased the demand for labor in general, but much of this demand has been met by in-migration of relatively destitute workers willing to enter into annual labor contracts which are unacceptable to most of the village laborers. Blyn (1983:715) notes a trend towards annual labor contracts for mechanized farms in Punjab (India). It may be that migrant workers are willing to underbid indigenous labor, but require the security of a permanent contract to do so. Irrigation increases productivity enough to make it economically feasible for the landowner to hire a permanent agricultural servant.

The jajmani system is on the decline both from commercial competition and from monetization. To the extent that irrigation encourages a cash-based economy, the irrigation effect on jajmani relations is a negative one. On the other hand, irrigated agriculture creates new demands for traditional services and can also be viewed as having a strengthening effect the jajmani system. Irrigation’s effect on contract labor is clearly to increase demand. The extent to which the contract worker benefits from the arrangement in the long run is not clear.

Irrigation and Household Composition

The household has become an almost universal unit of analysis in the Indian ethnographic literature. This reflects not only the mainstream of international social
science, but the reality of Indian social structure. Caste is too broad a unit for most purposes; clan or lineage too diffuse, partly because of the jajmani system of vertical obligations, and the individual too narrow. The household, on the other hand, is a real entity that can be observed empirically, and is considered by the people themselves to be of supreme importance in structuring their lives. This section discusses various definitions and classifications of households and then considers how irrigation development might induce changes in household composition.

Definitions of the household in India commonly refer to the concept of a hearth group, i.e., individuals who eat meals cooked from the same hearth. Other definitions rely more on residence, so that two hearth groups in one large house structure would presumably be considered as a single family (see Kolenda 1968:344-345 for a discussion of competing definitions). The census of India employs a hearth group definition, including non-related servants who are fed in their employer’s household. Freed and Freed (1976:60) also begin with the hearth group, but restrict it to relatives, and extend the concept of "hearth" to include members of the family who live outside the village but take their stable foods from the family larder: "...if the component nuclear families are separated, as when one lives in [the village] and the other in Delhi, they naturally cook separately, but are still one family."
Once a definition of the household is decided upon, it remains to create a typology of the various compositions of the households. As with the household itself, there is no standard system of classification, aside from the distinction between nuclear and joint. Kolenda (1968) reviews the literature on household types and proposes a 12 category system which accounts for the major permutations. Freed and Freed (1976; 1982) borrow Kolenda’s categories for describing their study village, but in their analysis collapse the 12 types into only three: (1) nuclear, (2) supplemented nuclear, and (3) joint (see Table 9, below). Epstein (1962) distinguishes only the two basic types of "elementary" and "joint", but in her restudy (Epstein 1973:207) introduces the concept of "share family" as an intermediate type. The share family, "involves a number of near kin—agnatic or affinal—who each live separately with their families, but who have agreed to share the responsibility for their incomes as well as their expenditure."

In appealing to functional rather than structural criteria for categorizing household composition, Epstein’s approach offers an escape from progressively more complex typologies. Conceptualizing household organization in relation to household activity, as advocated by Wilk and Netting (1984), allows an analysis of the process of change and not merely the end results of change. Hawkesworth
(1981) provides an example of the kind of typology which can be constructed around the activity functions of households. Based on data from a village in Utter Pradesh, Hawkesworth (1981:236) distinguishes "six domestic units on the basis of functions performed by kin groups of various sizes." Only two of these units comprise "households" in the sense of either a hearth-group or a residential unit. The remaining units are defined in terms of shared economic activities (cattle-owning unit, land-owning unit, and income unit) or shared ritual activities (ceremonial unit).

Implicit in Hawkesworth's approach is the notion that an understanding of what the household consists of depends on knowing what the household does; i.e., function explains structure. For the purposes of unravelling the social effects of irrigation development, however, the structure of the household still constitutes a crucial set of data. Only after delineating the structural changes associated with irrigation can a functional analysis suggest an explanation for those changes. These two aspects of household composition, structural and functional, are discussed in turn.

Structural Change. There is a general assumption in much of the literature on Indian households that the joint family is breaking down. For example, Bose (1974) presents synchronic village data from Rajasthan showing nearly half the families to be nuclear and most of the rest extending
lineally rather than laterally, and concludes that, "an increasing trend towards nuclearization is thus evident" (Bose 1974:355). Srinivas (1966:138) calls this kind of assumption "a gross oversimplification" of an extremely complex process. In fact, census data over the past century show a fairly constant average household size and if anything a slight increase in size (Mandlebaum 1972:52; Shah 1974:161-162). The joint family has never been very common in India, and the widespread belief that it has only recently given way to nuclearization probably stems from Sanskritic ideals and a tendency to romanticize the past, rather than from observations of social reality (Srinivas 1974).

<table>
<thead>
<tr>
<th>FAMILY TYPES BY LAND OWNERSHIP AND TIME PERIOD, SHANTI NAGAR VILLAGE, INDIA</th>
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<tbody>
<tr>
<td>Landowners</td>
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<tr>
<td>-------------</td>
</tr>
<tr>
<td>1958-59</td>
</tr>
<tr>
<td>1977-78</td>
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<tr>
<td>Landless</td>
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<td></td>
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Source: Freed and Freed (1982:195)
Data presented by Freed and Freed (1982) illustrate the diachronic stability of the joint family over a twenty year period (see Table 9). The Freeds' interpretation of their data is that the value placed on living jointly has not diminished, while increased longevity has allowed the ideal to be expressed. This has resulted in a higher percentage of joint families, especially among the landless.

The particular effects of irrigation on household composition are discussed by both Epstein (1962) and Orenstein (1960, 1965), and in both cases, irrigation is seen as leading to the breakup of the joint family. Epstein cites the new cash-based economy as the basic cause of the breakdown of the joint family system: "The new opportunities to earn cash induce young men to seek independence from the parental productive unit...The desire to raise one's family's social status feeds upon the opportunity to do so" (Epstein 1962:177). Orenstein uses survey data from 59 villages in Maharashtra and notes an inverse correlation between irrigated acres and jointness: "...those villages which have more irrigation are the ones which have a lower percentage of joint families" (Orenstein 1960:319). As does Epstein, he blames the tensions of the cash economy for this correlation.

The apparent contradiction between the negative effects of irrigation and the positive effects of cultural
values, as noted by the Freeds, can be partly reconciled by distinguishing among caste/class groups. Shah (1974:162, 170) suggests that the lower castes (who also tend to be landless) place a relatively higher value on the joint family in an attempt to emulate ideal upper caste behavior. The data in Table 9, which show a rise in the percentage of landless joint families as compared to landowners, would seem to support this view. As for the landed group, Epstein (1973:210) suggests that middle class farmers, who are more jealous of their cash resources, are more susceptible than the wealthy elite to the breakup of the joint family. Thus it appears that irrigation tends to promote the fissioning of the joint family, but the tendency is offset by (1) emulation by the landless of high caste ideals, (2) immunity of the wealthy to cash-induced tensions, and (3) increased longevity.

**Functional Change.** The effects of irrigation on the activities of the household can be conceptualized on the level of individual members, the household itself, and relations between households. Irrigation creates new labor demands at all three levels. The labor of household members has already been discussed in the section on occupations (above). At the household level, the increased demand for labor can have an effect on settlement patterns. Orenstein (1965:243) reports a tendency to move from the village settlement to field houses in Poona
District (Maharashtra). Nearly half the population lived permanently in their fields so the irrigated sugar cane could be more easily cared for.

Changing functions of relations between households are illustrated by the "share family" type described by Epstein (1973:210-211): "...the wider kin unit offers mutual advantages to the participating members which each would have to forego by operating in isolation from his extended kin..." Presumably the greater capital and labor investments required for irrigated agriculture create the need for inter-household pooling of resources.

The economic function of the household clearly changes as irrigation changes the economy. These functional changes are observable in the structural form of the household as well as in the activities of household members. The pure irrigation effect on household composition appears to breakup joint families, and to push families closer to their fields. This anti-social behavior is countered by the increased need for pooling resources among families, and by forces unrelated to irrigation which serve to maintain the joint family.

Conclusions

The literature on the socio-economic consequences of irrigation development can be summarized as follows:
**Occupations.** Irrigation encourages landowners to specialize in farming and intensify their agriculture. Employment opportunities for landless laborers depend on the level of competition from migrant laborers and from mechanization, and also on the social value placed on household labor. The artisan castes that compete directly with commercial substitutes (e.g. shoemakers) have been forced into other occupations, whereas service castes that play a ritualistic role continue to be in demand.

**Patron-Client Relations.** The jajmani system has been undermined by the cash-based economy, but to some degree irrigated agriculture may increase the demand for traditional services. The demand for contract labor has increased with irrigation.

**Household Composition.** Irrigation tends to disrupt the stability of joint families due to the cash-based economy. The share family may serve as the functional equivalent of a joint family in agricultural production.

**Irrigation Development and Cultural Values**

The impact of irrigation development on cultural values is indirect and, most importantly, is complementary to a host of other forces of change operating simultaneously. It is tempting to categorize the net effect of these cultural changes as "modernization," indicating an overall tendency away from traditional
cultural values. However, the central role which irrigation plays in the process of economic development is not matched by an equally central role in modernizing cultural values. In some ways irrigation can actually retard the impact of inevitable socio-economic change, as Epstein's (1962) research has clearly demonstrated.

In this section the effects of irrigation development on cultural values are considered from both perspectives, irrigation as both an evolutionary as well as a devolutionary causal force. The first topic will be a discussion of irrigation's "modernizing" effects, and the second topic a discussion of irrigation's "retardant" effect. The structure of this section has been adapted from Srinivas' (1966) three categories of social change: (1) westernization, (2) secularization, and (3) Sanskritization. I have combined (1) and (2) under the more familiar heading of Modernization, and have expanded his category of "Sanskritization" to include all changes which have reinforced traditional cultural values. In an effort to contrast this conservative aspect of irrigation development to the concept of modernization, I use the term, "traditionalization" (cf. Singer 1972; Kurin 1983).

Irrigation and Modernization

Rogers (1969:14) defines modernization as, "...the process by which individuals change from a traditional way
of life to a more complex, technologically advanced, and rapidly changing style of life." Lerner (1958:45) notes that modernization involves, "...the infusion of 'a rationalist and positivist spirit'..." The anthropologists, Poggie and Lynch (1974:4) describe modernization as, "a multi-processed phenomenon...broadly representing a single general 'stage' of cultural evolution."

Modernization theorists have been attacked for their static equilibrium approach which contrasts the overall structural regularities at two or more points in time (Long 1977:32). Tipps (1973:204) objects to the evolutionary model which he sees as a throwback to Gemeinschaft-Gesellschaft studies. Such criticisms, however, are directed primarily at the way in which the modernization concept has been used, and not at the underlying validity of the concept itself.

In spite of an embarassing reliance on unilineal evolution, the concept of modernization seems too obvious to deny and too convenient to ignore. In this section modernization is accepted as constituting a valid characterization of contemporary socio-cultural change following Steward's (1977:323) description of what the process entails:

...modernization is brought about by internal evolutionary processes which are initiated by factors in the larger context, mediated to local societies by various means, and manifested in a variety of sociocultural
transformations. The cause-and-effect relationship implied differs from more historical assumptions of diffusion, acculturation, and assimilation. The causality begins with factors in the context which are accepted without inquiry about their ultimate origins. Processes provide the causal links between the contextual factors and the substantive results which are observed in the field research.

A key aspect of this characterization is a continuing interaction between exogenous factors (e.g., irrigation and its immediate economic ramifications) and endogenous factors (e.g., traditional culture). The notion of a cultural system interpreting the outside world in its own terms is central to the basic concept of what culture is. The same argument used against Harris' (1979) rigid materialism comes into play here. The forces of modernization, whether in the form of media exposure (Lerner 1958), or international capitalism (Nash 1981) will doubtless have some effect on a given cultural system, but the nature of that effect depends on the internal workings of the system. Outside forces are influential, but they are not deterministic. By acknowledging relentless influences from the outside world, continually transformed by and interacting with the internal workings of the cultural system, the term "modernization" can be used safely without the implication of static equilibria.

Srinivas (1966:47) uses the term "Westernization" in preference to "modernization" to describe the Indian situation, and specifically, "...the changes brought about
in Indian society and culture as a result of over 150 years of British rule." The process he calls "secularization" is a particular aspect of Westernization, which is discussed separately in what follows.

Westernization. This concept is, "...inclusive, complex, and many-layered...Its incredible complexity is seen in the fact that different aspects of Westernization sometimes combine to strengthen a particular process, sometimes work at cross-purposes, and are occasionally mutually discrete" (Srinivas 1966:53). Implicit in Westernization are certain value preferences, e.g., the concept of equality, but the manipulation of Western technology can be quite distinct from the adoption of Western values. Srinivas (1966:55) gives the example of a bulldozer operator who also practices black magic. On the other hand, the adoption of such a simple Western practice as sitting on chairs and eating from tables (rather than the traditional method of sitting on a sanctified part of the floor) can have important religious implications: "...the new mode of eating contributes to an increase in secularization, as the table is not likely to be purified with cowdung solution after meals, and the ritual acts traditionally performed before and after meals tend to be dropped" (Srinivas 1966:54).

The adoption of alien technology for one reason (e.g., prestige) can encourage patterns of behavior
resulting in new changes. This is the complicated web of technology interfacing with cultural behavior. Material artifacts predispose their users to certain types of behavior, and that behavior may have cultural implications as in the case of eating from a table, or it may not have cultural ramifications, as in the case of the bulldozer operator.

Modern material items can also function as symbols of modernization, influencing cultural values more directly, if more subtly, than behavior. Darling (1947:146-147), suggests a symbolic function of irrigation canals in Punjab: "The man-made canal is beginning to take the place of fate in men's minds, and it is only a step from this to realize that if man can make the canal, he can make much else besides." Food, which is always a semantically rich category in Indian culture, can also symbolize development. Nair (1961:121) recounts the pride with which a farmer in Rajasthan told her, "everyone among us eats wheat" (an irrigated crop) rather than unirrigated barley or millet. Epstein (1962:40-41) notes that rice-eating is associated with high social status in South India: "Since irrigation [the traditional grain crops] have given way to rice as the staple diet. Wangla men are now ashamed to admit that they still eat ragi or jowar for some of their meals."
Secularization. Rationalism is an essential element of secularization; another is "...a process of differentiation which results in the various aspects of society, economic, political, legal and moral, becoming increasingly **discrete** in relation to each other" (Srinivas 1966:119). Both aspects, rationalism and differentiation, are likely outcomes of the monetization process, which in turn is associated with irrigation development. Michie's observation that a farmer who enters the cash economy must calculate in its terms (see quote above, p.48) is one aspect of secularization. When traditional jajmani relations are viewed by the farmer as an unnecessary economic burden, he is differentiating the economic from the social.

A different kind of cultural process, which is neither Western nor secular, is the adoption at the local level of customs traditional to the Great Tradition of Hindu culture, but not formerly part of local experience. Epstein (1962:96) reports a trend to identify with an All-India Hinduism rather than with the local variant, and she attributes this indirectly to irrigation: "This emphasis on All-India deities over and above the lineage and village deities reflects the greater integration of present Wangala villagers into All-India Hinduism, following their economic integration as consumers into the wider economy now that they are able to grow a cash crop."
Irrigation and Traditionalization

Irrigation creates relative wealth, and wealth allows the expression of traditional values which were once of necessity merely latent. One example is the practice of giving dowry. Epstein (1973:199) identifies four factors leading to the practice of dowry in Wangala, two of which can be attributed to irrigation: (1) increased wealth and (2) prestige for women not to work in the fields (the other two factors are education and Sanskritization). Other behaviors which are associated with irrigation and reflect local prestige values include the practice of contracting annual laborers to serve as agricultural servants, and the preference for certain foods.

Summary

Irrigation can be viewed as a type of modernization in the sense that it promotes changes in cultural values. However, irrigation can also reinforce pre-existing customs and values and in this sense constitutes a type of traditionalization. While it is difficult to predict the precise effects of irrigation on cultural values, there is little doubt that some connections do exist.

Research Hypotheses

This chapter has provided an overview of the kinds of cultural effects—both direct and indirect—which can be attributed to irrigation development. The components of
culture have been discussed separately under the categories of (1) economic impacts, (2) socio-economic impacts, and (3) cultural values. In this section, the basic issues already outlined are presented in the form of general questions and specific hypotheses. These comprise the research objectives of the present study and serve as a framework for the data analysis presented in later chapters.

Economic Issues

**Cropping Pattern.** What is the effect of irrigation on cropping intensity, on land productivity, and on the mix of crops grown?

Hypothesis 1. Both cropping intensity and land productivity will increase with irrigation.

Hypothesis 2. There will be a greater emphasis on cash crops under irrigated conditions.

Hypothesis 3. There will be an increase in the use of capital inputs such as improved seeds, fertilizer, pesticides, and mechanized equipment under irrigated conditions.

**Labor Demand.** How is the demand for labor affected by irrigation?

Hypothesis 1. There will be a net increase in total agricultural labor demand following the introduction of irrigation.

Hypothesis 2. Under irrigated conditions, labor demand will be relatively more even throughout the year, with decreased harvest bottlenecks.

Hypothesis 3. There will be a net increase in real wages for agricultural labor under irrigated conditions.
Economic Rent. What is the profitability of irrigated as opposed to unirrigated agriculture?

Hypothesis 1. Irrigated agriculture will be less profitable than unirrigated agriculture, if household labor is valued at the market rate. However, with household labor valued at its wage opportunity cost, irrigated agriculture will be more profitable than unirrigated agriculture.

Socio-Economic Issues

Occupations. To what extent does irrigation encourage specialization in agriculture? How are the artisan castes affected by irrigated agriculture?

Hypothesis 1. Under irrigated conditions, there will be a high degree of economic dependence on agriculture, among both farmers and landless labor.

Hypothesis 2. Among wealthier farmers, there will be a decline in household participation in agriculture, and a corresponding increase in the use of hired labor.

Hypothesis 3. Under irrigated conditions, artisan castes that have traditionally constructed or repaired agricultural equipment will find decreased demand for their products, but greater demand for their repair services. Other artisan castes that were not connected with agriculture will be less successful in meeting technological competition.

Patron-Client Relations. In what ways has irrigated agriculture affected jajmani relations and labor contracts?

Hypothesis 1. The greater cash-orientation of irrigated agriculture will result in a monetization of jajmani relations and a weakening of the social bonds obtaining between patrons and clients.
Hypothesis 2. There will be an increasing preference for long-term labor contracts rather than daily wage work, because of the relatively more constant labor demands of irrigated agriculture.

**Household Composition.** Does irrigated agriculture encourage the fissioning of joint families? Are there any adaptive advantages to specific household forms?

Hypothesis 1. Joint families will be less stable and will fission more readily under irrigated conditions.

Hypothesis 2. Systems for interhousehold exchange of labor and equipment will emerge to provide a functional substitute to the joint family and/or to meet the requirements of irrigated agriculture.

**Cultural Issues**

**Modernization.** To what extent do the changing patterns of behavior associated with irrigated agriculture represent changes in underlying values?

Hypothesis 1. The market orientation of irrigated agriculture will result in the transmission of urban value systems displacing traditional village values.

Hypothesis 2. Irrigated agriculture will tend to promote cultural identity with the national level (All-India) at the expense of village and regional identity.

**Traditionalization.** In what ways has irrigation served to reaffirm traditional cultural values?

Hypothesis 1. With irrigated agriculture, purdah values will become more pronounced in structuring relations between the sexes.
Hypothesis 2. Concepts of caste hierarchy will become reinforced between landless service castes and landed agricultural castes, forming a more class-like character.

In the chapters which follow, these hypotheses are applied to the two study villages in the Bagar region of Northwest India. The method of controlled comparison is employed, with the irrigated village compared to an otherwise similar but unirrigated village. The approach I take does not draw "diachronic inferences from synchronic data," but rather employs synchronic observations to (1) show how the two villages differ, and (2) suggest the role of irrigation as a contributor to these differences. These methodological issues are considered more fully in the next chapter.
CHAPTER 3

RESEARCH METHODOLOGY

The aim of this study, as stated in Chapter One, is to measure the extent of cultural change brought about by large-scale canal irrigation in northwest India. This aim may be somewhat misleading for two reasons: (1) there is little historical data with which to reconstruct a pre-irrigation cultural baseline and (2) both villages have been affected by significant changes not directly linked to canal irrigation (e.g., paved roads and bus service). The approach which I have followed is a synchronic study of two different situations, one irrigated village and one unirrigated village. The procedure involves documenting the differences between the two situations and then seeking an explanation of those differences with reference to irrigation.

In the first section of this chapter I discuss the overall research approach, which borrows heavily from Eggan's (1954) "controlled comparison". I review the selection criteria for choosing the study region, and for choosing the study units (two villages) within that region. In the second section of this chapter I outline
the sampling strategy and discuss data collection in terms of the research objectives.

**The Controlled Comparison of Irrigation's Impacts**

Comparison is an essential feature of anthropological observation and analysis, as of human thought generally (Sarana 1975:12). Lewis (1953:463) notes that, "the comparative method is the nearest approach we have in cultural anthropology to the experiment." The concept of "controlled comparison" is a particular type of comparison proposed by Eggan (1954) to address the "middle range of theory". Eggan is critical of both the "flat" descriptions of American ethnography, as well as the sweeping comparisons of the British social anthropologists. In his words:

> My own preference is for the utilization of the comparative method on a smaller scale and with as much control over the frame of comparison as it is possible to secure. It has seemed natural to utilize regions of relatively homogeneous culture or to work within social or cultural types, and to further control the ecology and the historical factors so far as it is possible to do so (Eggan 1954:750).

The method of controlled comparison allows investigation into the impact of irrigation by comparing an irrigated situation with a "control" situation which has not been irrigated, but is similar in other respects. However,

if the comparison is to be made within a constricted region, and this would seem to be necessary if environmental and cultural variables are to be well controlled, then how can we control for the indirect effects of irrigation on the regional economy? In Epstein's (1962, 1973) comparative study, which was also "controlled" to some extent, the dry village located on the periphery of an irrigated region was found to have experienced relatively more economic and cultural change than had the directly irrigated village. I have already suggested in Chapter One that Epstein's study was flawed as a controlled comparison because of the dry villagers' easy access to a large town nearby. Nonetheless, her study clearly shows the dramatic changes that can take place due to the indirect stimulus of irrigation on the regional economy.

Since large-scale canal irrigation necessarily affects a large region, it would seem impossible to control completely for the indirect economic impacts. Even those residents of areas some distance removed from the irrigation zone would have the option of commuting or migrating to employment within the irrigated region. A controlled comparison which aims to delineate the cultural impacts of irrigation must therefore qualify its research claims: the comparison cannot reveal the total, but rather the differential impact of irrigation development in two situations—an irrigated situation which is affected
directly by canal waters, and an unirrigated situation which is affected indirectly.

Selecting the Study Region

The three primary criteria for selecting the study region were: (1) cultural homogeneity, (2) sparse rainfall, and (3) a relatively recently introduced canal irrigation system. A homogeneous cultural milieu was preferable both to minimize the amount of ethnographic data necessary for a basic understanding of the cultural dynamics, and also to simplify the method of controlled comparison. For example, if migrants from another cultural region were present in the study region, they would need to be represented in both sides or neither side of a controlled comparison. A relatively arid climate was preferable, since the economic effects of irrigation would be especially pronounced. The area needed to have adequate rainfall to permit dryland farming (and hence, a pre-irrigation farming tradition) but not so much rainfall that irrigation water would be superfluous.

Finally, the irrigation system had to be recent enough that the older residents could provide first hand oral histories of the pre-irrigation period. Yet it also needed to be an established system which had been operating long enough for the major long-term economic, social, and cultural adjustments to have been made already. My
decision to study an area irrigated by a large canal system followed from this timing consideration. Canal systems affect an area relatively suddenly and thoroughly, creating a marked distinction in the lives of all residents between "before" and "after" irrigation.

The region I selected for study is the Bagar region of Northwest India (see Appendix A, Map 1). The Bagar, literally "wasteland" is the local name for the northern fringe of the Thar Desert, along the border of Rajasthan and Haryana states. Average annual rainfall is a highly variable 300 mm with summer temperatures approaching 120 degrees before the onset of the monsoon towards the end of June. The Bagri people speak a dialect of Hindi which mixes elements of Rajasthani, Punjabi, and Haryanui. They are divided into a number of castes, of which Jat farmers are predominant. Traditionally the Bagri relied on a mixed economy of farming supplemented by pastoralism.

Parts of the Bagar region have been irrigated by the Bhakra Canal system, whose waters started flowing in 1954. The Bhakra and Nangal dams control water from the Sutlej River as it flows down from the Himalayas in the state of Himachal Pradesh. The Bagar region comprises the tail-end of the system, nearly 300 km away from the Bhakra dam. Irrigation technology was not previously unknown in the area; the eastern edge of the Bagar had been irrigated by the Sirhind and Western Jumna canals for many years, and in
the Bagar interior, the unreliable Ghaggar River had been tapped by canals since 1897 (Farmer 1974:40). For hundreds of Bagri villages which were within the Bhakra canal zone, however, the introduction of irrigation water in 1954 had a sudden and dramatic effect on the agricultural sector.

The Units of Comparison

Since the focus of study was to include the broad socio-cultural effects of irrigation, and not merely the economic aspects, I selected a unit of comparison which is also a significant social unit: the village. All farmers in the region participate in a shared economy; all inhabitants of the area (with the exception of a few migrants) share in the same cultural tradition. The village, however, stands as a unique and important social institution involving the residents in a system of mutual identity and obligation cross-cutting caste and class distinctions. Socially as well as spatially, the Bagri village forms a discrete unit. The populations of Bagri villages range from 400 to 5,000, and reside in tightly

2. There are certainly many important ties which cut across village boundaries (cf. Opler 1956), and there has been considerable debate as to the usefulness of village-level research (cf. Mandelbaum 1970:327-337). As a general methodology, the utility of a micro-level approach for studying culture is not in serious dispute (Hoben and Timber 1980); the question which then arises is whether the village is the best choice for dealing with specific research problems. For the study of irrigation impacts as outlined here, I believe it is.
nucleated, generally contiguous household compounds, with the village fields surrounding the habitation area.

The scope of comparison was limited to the minimal number of units, two villages, and the smallest sized villages which would still offer a caste complement representative of the region. Other criteria for selecting the study villages included: (1) proximity to each other, (2) distance from urban centers, (3) comparable transportation and communication links, (4) comparable educational facilities, and (5) either a very high or a very low proportion of land irrigated. The last three criteria are self-explanatory. The first criterion, proximity to each other, controls for micro-variations in both cultural and environmental variables. The second criterion, distance from urban centers, controls for the cultural and economic "noise" of a nearby town. Urban cultural values and employment opportunities complicate an understanding of the specifically irrigation-related impacts. I considered this factor to be adequately controlled if the villages were distant enough from the nearest town so that daily commuting was impractical (from the villagers' perspective).

The first stage in selecting a pair of study villages involved compiling a list of potential villages based on Indian Census material. At this point it became clear that the villages within the Bhakra irrigation zone were nearly all partially irrigated, but very few were 100%
irrigated. This situation reflects the governmental policy in constructing the irrigation project primarily as insurance against drought, i.e., an extensive rather than an intensive irrigation strategy (Vander Velde 1980:311).

The two villages which I eventually selected are 22% and 82% irrigated, and situated just 5 km apart on either side of the Haryana/Rajastahn state border (see Appendix A, Map 2). While it would have been possible to find a village with less than 22% irrigation, the close similarities of the two villages in other key features (e.g., size, caste composition, distance from town, transportation links, and educational facilities) provided an unusually well-controlled basis for research. The "wet" village of Kutiana (in Haryana) consists of 101 households divided among farming castes (72%), service castes (8%) and Harijan (Untouchable) castes (20%). It is connected to the district center of Sirsa, 25 km distant, by a paved road and daily bus service. The "dry" village of Janania (in Rajasthan) consists of 90 households of which 62% were farming castes, 7% service castes and 31% Harijan. It is connected to the market town of Nohar, also 25 km distant, by a paved road and daily bus service. There is a primary school in each village, and high schools in several adjoining villages.

3. Intensity of irrigation refers to the percentage of cropped land irrigated at least once during the agricultural year.
Research Methods

The overall research strategy was to collect comparable data from each village, which could then be analyzed to reveal differences attributable to irrigation. This section discusses the field methods used for studying the two villages. After outlining the sampling technique, I discuss the general techniques used for gathering data, and then the specific reasons, in terms of the research objectives, for gathering particular data.

Sampling Strategy

The household served as the primary unit of analysis. While the economic household was not always coterminous with the architectural household (e.g., brothers who lived separately but farmed communally), the concept of "household" was always valid, although its definition had to be flexible to fit the situation. Households were identified in the course of conducting the census. In this context, a household was defined by residence within a single compound and sharing meals from a common hearth.

Household numbers were assigned in linear sequence so that all houses in a given part of the village (with the exception of later corrections) had consecutive numbers (see Appendix A, Maps 3 and 4). Since caste and lineage groups form contiguous clusters or neighborhoods, a systematic, non-random sample would yield a representative cross-section
of caste groups. I decided to sample the village as an undifferentiated universe rather than stratifying the sample (e.g., by landholdings) for the following reasons.

First, a stratified sample would have required the inclusion of a larger total number of households than I felt was possible for one person to study intensively. I preferred to limit the total sample to 40 households in each village, a number which is too small to incorporate statistically useful subsamples. Second, since the unit of comparison was the entire village, an undifferentiated representative sample would provide a clear picture of the village as a whole. In addition, the high proportion of farming households in each village ensured a statistically adequate sample for specific analysis of agricultural practices.

A 40-household sample was drawn in each village by including every other house number, giving 50 houses and 45 houses in Kutiana and Janania respectively. The number of cases was then reduced to 40 by eliminating randomly selected house numbers. The final sample comprised 40% of all Kutiana households (n=101) and 45% of all Janania households (n=90).

Data Collection

The data collection involved three overlapping techniques: (1) questionnaires, (2) interviews, and (3)
participant observation. Two major sets of formal questionnaires were administered to the sample households. A set of agricultural forms included data on cropping pattern and inputs, household and hired labor, yields and marketing practices. A set of material culture forms included an inventory of agricultural equipment and household possessions, as well as architectural features and interior decorations.

Questionnaires provided factual information relevant to nearly all of the specific research hypotheses, but interpretation of the data depended on the broad-based information obtained through interviews and participant observation. Interviews were of a variety of types, ranging from casual conversations, to relatively standardized questions (e.g., on household history), to intensive questioning of informants. Accompanying farmers to their fields was a particularly effective interviewing situation for agricultural topics. Interviews comprised the primary source of information on socio-economic issues including work roles, attitudes towards employers or employees, and relations within the household.

4. An interpreter was used during the first 5 months of fieldwork; I conducted my own interviews after this. Though the local dialect of Bagri is distinct from pure Hindi, I was able to communicate adequately using textbook Hindi, modified by a few colloquialisms.
Participant observation involved living in Kutiana and Janania for 6 months and 4 months respectively. As a technique of data collection, participant observation contributed to all aspects of the research, but was most critical in studying the issues of changing cultural values. For example, while the values of purdah and caste could be discussed in interviews, observation provided necessary data on real behavior.

Material Culture. The documentation of modernization was approached through the study of material culture, and constitutes an unusual feature of the research strategy. Data on architectural features, agricultural tools, household possessions, and wall decorations were intended to provide a measure of changing cultural values.

The modernization process can be observed visually in new types of material items and greater quantities of these items. The cultural interpretation of material things, however, is problematic; in spite of its name, "material culture" has no necessary connection to particular cultural values. Some new material items may be of economic and social significance and can cause a real transformation of the existing cultural status quo (e.g., Sharp’s (1952) account of "Steel Axes for Stone-Age Australians"), while other items of new technology, digital watches, for example, might have no effect whatever.
Most studies which consider material items avoid the problem completely by merely presenting the data and not attempting a cultural analysis. For example, Lewis (1969) reports on the possessions of 14 families in Mexico City, providing documentation on consumer patterns (where and when purchased) but no cultural conclusions. Miller's (1975:100-105) study of social stratification in a Haryana (India) village uses items he designates as "luxury goods" to show economic differentiation by caste. These include radios, bicycles, sewing machines, chairs, tables, etc. which are, in fact, "modern" items as well as luxury goods.

Epstein (1962:96) emphasizes the prestige aspects of material items. Pictures of All-India deities and brass or stainless steel kitchen utensils represent attempts to express economic differentiation. Houses offer another medium for prestige display, as does the construction of a well or the installation of electricity (Epstein 1962:96,196). Finally, in a comparative study of two villages in Maharashtra (India), Hiramani (1977:295-296) presents data on modern kitchen utensils (stainless steel

5. The All-India deities are an example of modernization in the sense of shifting from the Little Tradition of local and village deities to the Great Tradition of All-India (Marriot 1955).
and chinaware) and household furnishings as a measure not of prestige, or even wealth, but of the "urban way of life."

As an index of cultural values, the role of material culture is problematic. However, as an eliciting device for collecting non-material data (i.e. behavioral information), material objects have several advantages: (1) material objects reflect real behavior rather than ideal behavior, (2) questions about common objects, plows, chairs, are innocuous and can easily lead to information concerning associated activities, and (3) nearly every type of behavior has some material correlate(s). While data on material culture can yield some direct cultural information, e.g. the number of tractors or style of dress, the indirect cultural information may be relatively more useful.

Conclusions

The field strategy employed the methodology of controlled comparison in order to examine a broad range of economic and socio-cultural changes associated with irrigation development. The comparison was oriented toward the differential, rather the total, impact of canal water, thus permitting tight control of cultural and environmental variables, while relaxing control of the irrigation variable. The control village has also been affected by irrigation, but the influence has been largely indirect.
The two study villages were treated as whole units from which a representative sample was drawn. Data collection addressed a wide spectrum of topics which sought to do justice to the culture concept itself. By selecting a sample of households representative of the entire village, and by focussing on a broad range of variables, the research aimed at a general understanding of irrigation's cultural ramifications.
CHAPTER 4

RESEARCH SETTING

The study villages of Kutiana and Janania are located on the northern fringe of the Thar Desert, along the Haryana-Rajasthan state boundary in northwest India. Geographically, the area is part of the Bagar region, and the people refer to themselves and to their Hindi dialect as Bagri. The Bagar region is transitional between the Thar Desert to the south and the Punjab Plains to the north; so too Bagri culture represents a transition between the

1. Discussion of the environmental and cultural setting of the Bagri area is hampered by the several different meanings of the term Bagar. There are three common meanings: (1) as a general noun, bagar means "wasteland"; (2) as a geographical term, Bagar refers to the outer fringe of the Thar Desert; (3) as an administrative term, Bagar was the name given to several assessment circles in British Punjab, and is currently used to refer to several development Blocks in Haryana. Adding to the confusion is an inconsistency in the geographic usage. Some authors consider the Bagar to include not only the northern fringe of the Thar Desert but the eastern and southeastern portions as well, or roughly half of Rajasthan (e.g., R.L. Singh 1971). The official Indian Census Atlas includes the Rajasthan districts of Churu, Jhunjhun, Nagaur, and Sikar (i.e. the northern and northeastern districts) in the "Rajasthan Bagar" (Roy 1971:166). For present purposes, "Bagar" will be used to refer to the geographic area in which Bagri culture predominates, i.e., most of Ganganagar, Churu, and Jhunjhun districts of Rajasthan, the southwestern portions of Bhiwani, Hissar, and Sirsa districts in Haryana, and the southern part of Ferozpur District in Punjab (See Map 1).
Marwari culture of central Rajasthan, the Deswali culture of east and central Haryana, and Punjabi culture to the north.

Environmental Setting

The Bagar region straddles the divide between the two major watersheds of the Indian subcontinent, the Indus Basin to the west, and the Gangetic Basin to the east. The land slopes very gently to the southwest, nowhere exceeding more than a two foot drop per mile, a feature particularly suited to large-scale gravity flow irrigation canals (Vander Velde 1971:62). The land surface is dotted with small shifting sand dunes alternating with shallow depressions. The area is "clothed with steppe vegetation...and has all the characteristic features of a prairie landscape" (National Atlas Organisation 1977:plate 25).

The dry bed of the Ghaggar River is the major environmental landmark of the region. Originating in the lower slopes of the Himalayas, the Ghaggar passes to the north of Sirsa (Haryana), and continues in a southwesterly direction through Hanumangarh and Suratgarh in Rajasthan. The Ghaggar Valley divides the Bagar from the Punjab Plain

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2. The Ghaggar is identified with the ancient Saraswati River which was a major tributary of the Indus and figures prominently in Hindu mythology. The name Sirsa is said to be derived from Sarsuti, a variant of Saraswati (Fagen 1893:6).
in Haryana; in Rajasthan it demarcates the true desert landscape of NW Rajasthan from the Bagar region east of the river bed. Writing from the Rajasthan perspective, Erskine (1910:341) describes the Bagar as a relatively lush region:

The northern limit of the actual desert may be roughly drawn at the old bed of the Ghagger, which runs in a westerly direction through the Suratgarh nizamat [district]; light soil is met with for some distance beyond it, but the lofty sand-hills characteristic of the central and western regions [of what was then Bikaner State] cease abruptly on its southern bank. The country beyond the Ghagger is the most fertile part of the State, the surface becoming more level and less sandy as one proceeds northward...The loamy soil stretches right across the upper portion of the Hanumangarh tahsil to the Hissar [Haryana] border, improving, if anything, as one goes eastward; it is of a yellowish tinge (pili mitti), retains moisture well and, with proper irrigation, would be capable of producing the highest class of crops.

The climate of the region is hot and arid. The mean maximum temperature for the two hottest months (May/June) is 41.5 and 41.9 degrees centigrade for Hissar (Haryana) and Bikaner (Rajasthan) respectively, with temperatures frequently reaching 45 C (120 F). The mean minimum temperature for the two coldest months (Dec./Jan.) is 5.8 and 5.3 degrees (NCA/Haryana 1976:6; NCA/Rajasthan 1976:8-9). Frosts do occur, but are seldom severe (J. Singh 1976:46). Rainfall follows a monsoon pattern with the months of July and August accounting for ca. 66% of the annual precipitation (NCA/Rajasthan 1976:8). Annual average rainfall is 32 cm for Sirsa (Haryana), and 31 cm for Nohar
(Rajasthan), with the mean number of rainy days only 21 and 18 respectively (NCA/Haryana 1976:15; NCA/Rajasthan 1976:45). Rainfall is highly variable from year to year and from locality to locality: "A general famine is expected once in ten years, and a local failure once in four..." (Erskine 1910:354). Precipitation sometimes occurs in the form of hail, which can devastate standing crops. During the 1980-81 rabi, hail damage to wheat and gram ranged up to 90% in parts of the Bagar, while crops in the two study villages were less severely affected. A more common danger is dust storms (andhi) which occur during the hot months of April, May and June before the onset of the monsoon. The shifting sands can either erode or bury planted fields, requiring a second or third sowing.

**Cultural Setting**

The cultural and linguistic features which distinguish the Bagri from their neighbors blend imperceptibly into classic Rajasthani/Marwari to the south, and into Deswali or Haryanui to the east. It is only to the north where a definite cultural boundary (though even here, not a clear spatial line) can be drawn between Bagri and Punjabi.

The Jat caste is predominant throughout the Bagri area, as well as in Punjab, Haryana, and Rajasthan generally. Bagri Jats sometimes intermarry with Deswali
Jats, but not with Sikh Jats, Marwari Jats, or Rajputs. The Bagri Jats continue to maintain their cultural identity as distinct from Deswali Jats partly due to their historically recent migration from Rajasthan, partly because of their distinct dialect, and also because of the physical distance separating most Bagris from most Deswalis.

There has been no full-scale ethnographic study of a Bagri village. Aside from the publications of the British colonial administration (e.g., Erskine 1910 for Rajputana; Fagen 1893, 1915 for Hissar; Wilson 1884 and Salusbury 1923 for Sirsa), the only published descriptions of Bagri villages are provided by Vander Velde (1971), a geographer, and by the Census of India (1961) which included a village in Ganaganagar District (Rajasthan) in their Village Survey Monographs series.

The Deswali region of Haryana and Delhi has been described in considerably more ethnographic detail. Oscar Lewis’ (1958) classic study of Rampur village, the series by Freed and Freed (1976, 1978) on Shanti Nagar, Mann’s (1979) account of Shampur, and Miller’s (1975) study of Badipur village are all within the Deswali area. Within Rajasthan, the ethnographic studies nearest to the Bagri region are those of Desai (1966) and Chakravarti (1975), both in Jaipur District, and Michie (1975) in Bharatpur District. While the environmental situation in Jaipur and Bharatpur has similarities to the Bagar region, the cultural setting is
quite different. Studies of Sikh Jat villages in Punjab, e.g., Kessinger (1974) and Leaf (1972) are of little relevance for drawing direct comparisons, since both the cultural and environmental setting are unlike the Bagri case.

**Historical Setting**

The two study villages of Kutiana and Janania are located along the northeastern portion of the Bagar culture area. Kutiana is in the Tehsil and District of Sirsa, in the state of Haryana. Janania is in the tehsil of Nohar, which is part of Ganganagar District in Rajasthan (see Map 1). Both villages were founded in the latter part of the 19th century and were part of a larger process of recolonization which had been taking place since the devastating famine of 1783. "That fatal year is the era from which every social relation of the people dates. Few villages have a history which goes back uninterruptedly to a period before the famine, and there probably is not one which does not date its present form of tenure from the time when cultivation was resumed" (Fagen 1915:181). In 1803 when the British laid claim to the area which is now Haryana, there was not a single village in the Haryana Bagar south of the Ghaggar River valley (Fagen 1893:40). However, "within ten years after the British annexation, Bagri Jats of the Bahniwal [Beniwal] clan from Bikanir [Bikaner] had fully
occupied the sandy tract south of the Ghaggar now in Sirsa tehsil" (Fagen 1893:53).

The process of village colonization is described by Baden-Powell 1892:678-692. At the local level, most of the land was controlled by jagidars who received their authority from the state. Establishing a new village required the support of the local jagidar, either as a formal grant (if he had claim to the land), or for the sake of protection, if the land was as yet unclaimed.

The colonist would then gather together a body of his relations and dependents and proceed to the neighborhood indicated, and there found a village in the prairie. Usually the site chosen was close to some natural hollow in the ground where the rain-water would collect, and which could easily be made into a permanent pond, and the new village was generally founded with some ceremony....Aparently they adopted no specified boundary to begin with, and one had to be defined at the Settlement in 1837. The excess waste areas were afterwards separated off at the regular Settlement of 1852-63; and very often the original village undertook the Settlement of the separated area, and so several contiguous villages held by the same people, have come into existence. And so within the villages:--the right of individual cultivators was at first undefined. Land was so plentiful that there was no call for a division...each man took what he had ploughs, cattle, and labour to clear and manage (Baden-Powell1892:689-90).

The agricultural economy of the early Bagri villages was characterized by a farming strategy which was land and

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3. Sirsa was first annexed into the British domain as a district, then in 1884 incorporated as a tehsil (subdistrict) of Hissar District, until 1975 when it was re-established as a district.
labor extensive. The natural conditions of the region rendered agriculture a precarious enterprise. Well irrigation was impractical since the water table was generally 100' below the surface, and usually brackish as well. In addition to the danger of drought was the possibility of violent downpours, hailstorms, and dust storms.

But against all these disadvantages there are compensating advantages. The labour of ploughing is next to nothing owing to the lightness of the soil; again the light soil requires less rain for the production of a crop than the heavier soils of Hariana, so that there will be a crop, scanty indeed, in the Bagar when the richer soil to the west lies unsown; moreover with a moderate rainfall the loamy valleys of the Bagar benefit largely by drainage from the sandhills (Fagen 1893:5).

In an unusually good year, farmers could harvest a surplus to tide them through the next drought, or pay their debts from the previous drought. "The population is so scattered that one bumper crop will feed them for three or even four years, and a total failure of the kharif would not cause very great suffering unless it succeeded several partial failures" (Erskine 1910:343).

The major crops grown in Bikaner were (in order of importance) spiked millet (bajra), a species of kidney bean (moth), barley, gram, wheat, and sorghum (jowar) for fodder (Erskine 1910:343). The kharif (summer season) crop of millet, moth, sorghum, oilseeds, and a few minor pulses was often the only crop planted in Bikaner; however, in the
northern portions of the Bagar where the soil is more loamy, a winter crop (rabi) of gram and barley as well as a little wheat, was more feasible. "The kharif mainly supplies grain for domestic consumption and fodder for cattle while the rabi staples are more grown for the market...There is little double cropping, and little stress is laid on rotation of crops" (Salusbury 1923:3).

Within the Bagar assessment circle of Sirsa tehsil, the rabi season gradually took precedence over the kharif in terms of annual cropped area. Salusbury (1923:3) attributes this change to "...a gradually progressive advance from a largely pastoral to a more agricultural economy as well as to the increased commercial value of the rabi staples." The changing cropping pattern might also have been a result of lessons learned from Punjabi farmers who had a longer agricultural history. During periods of famine, Bagri men would migrate to irrigated or less affected regions to seek work. During the 1920-22 famine,

4. Temporary as well as permanent adaptive migrations have always characterized the Bagri. During slack seasons or poor harvests, "...the Bagri Jat and the Bishnoi will go off with their camels to carry for hire or to do a little speculation in grain on their own account" (Fagen 1893:94). In the drier parts of Bikaner where only one harvest (the kharif) could be grown, the men migrated seasonally, preferring "...a journey to Sind or the Punjab (where they cannot only earn a living but save a little money) rather than an idle and unprofitable time at their own homes" (Erskine 1910:332).
Salusbury (1923:4) estimates that 15% of the Bagar circle population emigrated to Central Punjab.

The significance of rabi dominance stems both from the emphasis on market crops, and also from the more intensive agriculture which rabi crops required. Erskine (1910:4) notes that "More trouble is taken in the cultivation of the rabi or spring crop in the loamier soils. The land receives two preliminary ploughings...and is harrowed and levelled after each with a flat board (called sohagga) in order to keep in the moisture...and considerable attention is paid to weeding." Although the specific socio-economic correlates of rabi dominance are beyond the scope of the present study, it is instructive to view the irrigated agriculture of the present as not the only development in Bagri farming technology, but rather as the latest stage in a century-long process of agricultural intensification.

In addition to farming, the Bagri economic strategy included livestock. "The whole of Bikaner may be said to be a vast pasture ground..." (Erskine 1910:345). Writing of Hissar District (including Sirsa tehsil), Fagen (1893:203) notes: "A very considerable portion of the agricultural capital of the district is locked up in the form of cattle. The principal drawback to this is that in times of scarcity when fodder is short, cattle can only be sold with difficulty...and the zamindar can only convert his
cattle into grain or hard cash at a heavy, sometimes ruinous loss."

Famine conditions were generally more severe in Bikaner than in the Sirsa or Hissar districts of British-controlled Punjab. As a result, "the first shock of famine will bring in a crowd of starving immigrants from Bikaner, and at the same time the greater scarcity which will prevail there will induce export of grain from this [Hissar] district" (Fagen 1915:186). By the time of the next famine in 1891-92, the impact on local food prices in Bikaner State was buffered somewhat by the newly completed railroad which opened supply routes to the granaries of the Punjab and Sind (Erskine 1910:349).

Famine conditions were again experienced in 1896-97, and during 1899-1900. The monsoon of 1899 failed almost completely with only 0.13 inches of rain recorded at Sirsa from July to the end of the year (Fagen 1915:188). The decade from 1925-35 saw a succession of poor harvests (Punjab Govt. 1936:ii) followed shortly by the famine of 1938-40 (Vander Velde 1971:63-64). The next conditions of

5. A case in point is the famine of 1868-70 in Sirsa and Hissar districts. Though food was in short supply, there were apparently no cases of human starvation; it was the supply of fodder that was the more critical. "In Sirsa the Sikh Jats at great expense and trouble managed to keep the cattle alive. The Muhammadan Bhattis, on the other hand, slew and ate them, while the Bagri Jats let theirs loose on the countryside" (Fagen 1915:185). Nearly 150,000 cattle were estimated to have perished in Sirsa district.
near famine occurred during (1950-51); in Hissar District, some farmers found employment relief as laborers on the Bhakra Canal which was then under construction.

The arrival of irrigation water along the fringes of the Bagar region put an end to the threat of famine within the canal command zone, but crop failures continued, and still continue, to affect the non-irrigated areas of the Bagar, as when the monsoon rains failed in 1965 (Vander Velde 1971:64). The spectre of actual famine is, however, greatly reduced in the region as a whole, including the unirrigated areas, because of the proximity of canal water. In the event of local crop failure, farmers can seek temporary employment in the irrigated fields of nearby villages; it is no longer necessary to journey all the way to the central Punjab.

Irrigation Development in the Bagar

The recorded history of canal irrigation in the Bagar region begins in 1356 A.D. when Feroz Shah extended the Western Jumna Canal to Hissar (Fagen 1893:12). After the British annexed the region in 1803, this canal, long since abandoned, was reconstructed, and began operations in 1826, bringing irrigation water to villages in the eastern part of Hissar District. By the end of the 19th century, a small part of Sirsa Tehsil was also irrigated by the Sirhand Canal (Fagen 1893:13). Within the Bagar assessment circle,
however, less than one-tenth of one percent of the cultivated land was irrigated (Salusbury 1923). In Bikaner State, the only irrigation source, aside from scattered wells, was the Ghaggar River. In 1897 a weir was built jointly by the Government of India and the Darbar of Bikaner, at Otu (8 miles west of Sirsa). The weir diverted the seasonal Ghaggar River into two canals which carried the water into Bikaner territory, providing partial irrigation to several villages (Erskine 1910:310).

A dam along the Sutlej River to irrigate the southeastern Punjab was first proposed in 1908 (Vander Velde 1971:87). After much deliberation, construction finally began in 1945 on a pair of dams, the Bhakra and Nangal, to control the flow of the Sutlej within the foothills of the Himalayas, at the present-day border of Himachal Pradesh and Punjab states. Independence in 1947 and the ensuing partition of Pakistan left Indian Punjab with only 20% of the irrigation facilities developed in pre-partition Punjab, but nearly half its population, plus a growing number of refugees. With an obvious need for speedy implementation, the Bhakra Dam project became a prominent part of the First Five Year Plan, starting limited operations in 1952. By 1954, the entire extent of the canal system was receiving seasonal water, although it was not until 1965 that the 8 million acre foot reservoir behind the Bhakra dam was completely filled (Farmer 1974:73).
The primary goal of the Bhakra system, as well as most other irrigation projects of British India, was to provide agricultural security from drought, rather than maximum total production (cf. Gustafson and Reidinger 1971). The strategy of extensive irrigation, coupled with overly optimistic predictions of the effective command area, has resulted in chronic underattainment of design goals: "Simply put, the project was planned to cover too large an area given the supplies of water that would be available (Vander Velde 1980:309). The planned irrigation intensity for the system as a whole is 62% of the command area, as the average for both winter and summer seasons (Ansari 1968:135). Studies conducted in the mid-1960s by Vander Velde (1971:102-112) and Reidinger (1980:269) found the proportion actually irrigated to be only about half this amount, or roughly one-third of the command area.

A second characteristic of the irrigation system which affects the cropping pattern is the rationing system:

...the water allowance was predetermined and rigidly fixed, and the new crop patterns then had to be worked out within those limits. This arrangement had major implications for the resulting patterns of agricultural land use in the area served by the Bhakra irrigation system. If maximizing agricultural productivity per volume of water provided by the system had been the goal, the water allowance for particular areas would have been adopted on the basis of water requirements per crop, the seasonal ratio of irrigation, and the area planted to each crop...(Vander Velde 1980:310-11).
The system was designed to function "more or less automatically" (Reidinger 1980:268) so that physical control facilities such as gates and checks are minimal. This lack of flexibility is an artifact of 19th century British irrigation technology, but has the compensatory advantages of being relatively simple to operate.

The canal system includes 690 miles of canal and branches and 2,100 miles of distributary canals and minors. The total discharge of 18,000 cusecs supplies water to nearly ten million acres in Punjab, Haryana, and northwestern Rajasthan. The Bhakra Main Line feeds three main branches, one of which, the Fatehabad branch, supplies water to areas of the Haryana-Rajasthan border. The Kutiana Distributary, which supplies the study village of Kutiana (as well as a number of other villages along the way), takes off from the Fatehabad Branch near the village of Nahrana, 14 miles east of Kutiana. The maximum discharge at the Distributary head is 97.2 cusecs. Two Minors branch off from the Distributary reducing the flow to 50 cusecs at the 28,000 feet mark. The tail gauge is located at 80,500 feet, just beyond the Kutiana village boundary (see Map 2). and is designed for a maximum flow of 11 cusecs. The

6. One cusec = 28.3 litres/sec.

7. The discharge rates cited are the design specifications and are not normally attained even when the canal is running (see p. 151).
"dry" study village of Janania receives irrigation water from the Jasana Minor which takes off from the Jasana Distributary in Rajasthan. Upstream, on the Haryana side of the border, the distributary is named Baruwali, (See Map 2) and is also fed from the Fatehabad Branch.

This network of irrigation channels comprises the main system level of operations, defined as that portion of the irrigation system upstream from the watercourse outlets. Watercourses (nalli) take off from either a Distributary or a Minor, and serve an area ranging from 400 to 700 acres (ca. 20-80 farmers), known as a chak. The main system is controlled by the Central Board of Irrigation and Power of the national government, administered through state-run "canal circles" which in turn are broken down into divisions. The Hissar Bhakra Canal Circle is one of two Bhakra circles in Haryana state. The Sirsa Division which manages the Kutiana Distributary, is one of four divisions of Hissar Circle.

The watercourses comprising the chak-level (often referred to as simply the "farm-level") of the system are administered separately from the main system. When the canals were initially constructed, only the main system was put into place; it was the responsibility of the individual landowners to build the watercourses and field channels for each chak. The landowners, who might belong to several villages (chaks often cross village boundaries) elected one
of their number as morhab to supervise water allocations and to maintain the watercourse. This administrative structure has now been largely replaced by the Haryana State Minor Irrigation and Tubewell Corporation (HSMITC). This state-level body was instituted partly in response to the need for lining the dirt (kaccha) watercourses with brick and mortar to reduce seepage. HSMITC, with World Bank financing, is building brick (pukka) watercourses and will be partially reimbursed by the farmers over a seven year period, after which time the management of the pukka watercourses will be handed back to the landowners. Changes in how the watercourses are administered has not affected the warabandi system of water distribution within the chak whereby each shareholder (landholder) receives the whole stream of the watercourse in turn, on a weekly rotation.

Irrigation at the farm-level is discussed in the following chapter. The outline given thus far provides a general picture of the irrigation system whose impact is the focus of this study. A critical examination of the Bhakra Canal system reveals problems (e.g., inflexibility) and shortcomings (e.g., water supply). When viewed against the backdrop of recent Bagri history, however, the system,

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8. For a general discussion of warabandi, the reader is referred to Reidinger (1980:275-283).
imperfect as it is, can be better appreciated as the most powerful and far-reaching change ever to affect the region.

Summary

The Bagar region, comprising the northern fringe of the Thar Desert, is hot, arid, and dusty. Average annual rainfall is a highly variable 32 cm; daytime temperatures often approach 120 degrees in May and June, which is also the season for dust storms (andhi). The Bagri people are predominantly of the Jat caste, originating from Rajasthan. Traditionally the Bagri relied on a mixed economy of farming supplemented by pastoralism. Villages were abandoned during prolonged droughts and re-established during better times. The research setting is perhaps best summarized in the words of a local poem:

May my parents die for giving me birth in the Bagar
Weeds infest the fields; thistles cause much pain;
Even the water is brackish in the Bagar...
The fields go up and down over high sand dunes;
Black boys spend all day carrying camel loads;
Their dhotis are tied above their knees,
Their turbans are askew.
They seldom have chappatis [bread] to eat,
But drink sour rabardi [mixture of fermented buttermilk and millet flour].

And from a women’s song:

I forbid you from ever going into the Bagar.
Your hands are [smooth] like rubies;
They will become rough.
Your skin is golden; It will turn black.
CHAPTER 5

AN ETHNOGRAPHIC DESCRIPTION OF TWO BAGRI VILLAGES

The culture of the Bagri people is for the most part the culture of the dominant Jat caste. Jat "tribes" (as they were referred to during the British era) first settled the region, and it is the contrasting cultural features of Bagri Jats with neighboring Jat groups (Sikh Jats, Deswali Jats, and Marwari Jats) which serve to delineate the Bagri culture area. Bagri Jats have a reputation for being backward, quarrelsome, and unrefined. Not surprisingly, this characterization is undeserved, but it continues to shape the relative standing of the Bagri in the eyes of outsiders, particularly government development agents. An early expression of the Bagri's poor reputation is found in Fagen (1915:108):

The Bagri Jat is probably behind all the other tribes in intelligence, and there is a certain coarseness about his manner which seems to mark his intellectual inferiority to most of the other tribes of the district [Hissar] -- a result no doubt of the hard conditions of life in his native sand-hills in Rajputana. He makes up for his want of intellect, however, by thrift and industry.

The social institutions of the Bagri are virtually indistinguishable from those of the Deswali Jats, with whom,
as noted above, they may intermarry. It is in the realm of agricultural adaptations and religious observances (in addition to dialect) that Bagri culture comprises a way of life which is significantly different from the Deswali culture of central and eastern Haryana.

This chapter presents an ethnographic overview of Bagri culture as seen in the two study villages of Kutiana and Janania. In the first section, the agricultural practices and cultural institutions common to both villages are described in general terms. This cultural outline then provides a framework for presenting the ethnographic data specific to each village. The irrigated village of Kutiana is presented in the second section; the mostly unirrigated village of Janania is described in the final section. These descriptive data provide a basis for the analysis presented in Chapter Six.

1. For detailed accounts of Jat social organization, the reader is referred to Freed and Freed (1976) and Lewis (1958).

2. The southern and western boundary of Bagri culture is ill-defined. Some informants claimed that Bagri was synonymous with Marwari (i.e. classic Rajasthani), while conceding differences in dialect and dress; indeed, the notion of a distinct Bagri culture was much more pronounced on the Haryana side of the border than on the Rajasthan side. Some residents of Janania considered themselves "Rajasthani" and the Kutiana residents as "Haryanui", whereas Kutianans lumped themselves and the Jananians as "Bagri".
Bagri Culture and Agriculture

To a large degree, Bagri culture is defined in terms of its environmental setting and a certain "style" (Kroeber 1963:137) of agriculture. I do not wish to imply a form of environmental determinism, but rather a process of cultural identification with the environment, in the same way that, "...a chameleon tunes himself to his setting..." (Geertz 1973:38). In the Bagri case, semantic overlap between the culture (Bagri) and the region (Bagar) is linguistically evident: the Bagri are those people who live in the Bagar. But the identification runs deeper than this to encompass not merely a region but a way of life. In this section, the fabric of Bagri life is presented beginning first with the agricultural economy, followed by an outline of social institutions, and religious beliefs and practices.

Agricultural Economy

Bagri villages are farming villages; even unirrigated villages rely primarily on agriculture. The few occupations which do not directly involve agriculture consist of two types: (1) traditional service occupations such as carpenters, blacksmiths, etc. which are discussed in the section on social structure, and (2) employment outside the village which includes a variety of occupations in both traditional roles (e.g., a revenue patwari employed by the government) and modern roles (e.g., a truck
driver). Outside employment is not considered in this section, but will be discussed as part of the economic description of each study village.

Bagri farmers recognize the two main seasons of North Indian agriculture: Kharif (summer crop) and Rabi (winter crop). There is generally no planting of a third crop (zaid) in spring. The rabi season predominates over the kharif in terms of net acreage, a trend which was noted in the previous chapter.

Kharif Season, Major Crops. The major Kharif crops are: cowpeas (govara), spiked millet (bajra), desi cotton (kapas), "American" cotton (narma), sorghum (Jovar), moong and moth (varieties of lentil).

Cowpeas: An increasingly important fodder and cash crop, cowpeas are used as green fodder for cows and camels. The remainder is harvested to be used as cooked fodder, or else sold. Cowpeas are popular both as an irrigated and unirrigated crop, often for market. The desi variety is grown exclusively.

Spiked Millet: Once the staple crop of the Bagri area, millet is now losing some of its popularity to wheat. Even so, as a subsistence crop (very little is sold), it continues to be a mainstay of the local diet and a symbol of the rural lifestyle. In addition to the desi variety, a hybrid (BJ-104) was introduced in the mid-1970's and is especially popular in irrigated areas. Moth is
often intercropped with millet, and the two grains are eaten together as rabardi and kitchori.

Cotton: Desi cotton (kapas) and American cotton (narma) are grown only on irrigated land (with a very few exceptions). Cotton is primarily a cash crop, although a small quantity is considered an essential in most households for the manufacture of string cots (charpoys), cotton rugs used to cover the charpoys (daris), and blankets (kes). If cotton is not grown, it is purchased either in raw form or as thread. The manufacture of thread (done by the women using a spinning wheel), string (done by men using a spindle whorl), and rope (done by two or three men together) is a common pastime especially among old people who can no longer perform heavy work, and among the wealthy who can afford to hire labor. Kapas is more commonly grown, since it requires less water and is more resistant to insects. Narma commands a higher market price, but entails greater risk. Several improved varieties are available, including J-27, J-34, and H-777. In addition to cotton fiber, the crop also provides fuel (cotton sticks) and fodder (cotton seeds).

Sorghum: Though grown in very small quantities, sorghum is an important source of green fodder for the dairy animals during the summer months. It is grown alone in small plots, or mixed with millet, cowpeas, moth, and melons in larger plots (this composite crop is called terda). It
does not require irrigation, but responds well to inputs of water and fertilizer.

Melons: Paradoxically, melons are most bountiful in the unirrigated areas, and are considered much superior in both size and taste to melons grown in irrigated fields. Melon seeds are mixed with millet and sorghum seeds (and sometimes others as well) and planted together. Two varieties are grown: watermelons (mateera), and a type of muskmelon (kakri). "The former seem to spring into existence during the rains and are so plentiful that great quantities are thrown to the cattle" (Erskine 1910:344). Surplus muskmelons are preserved by drying and used as a vegetable in curry.

Rabi Season, Major Crops. The major Rabi crops are gram, wheat, and oilseeds (rapeseed (taramira) and mustard (sarson)). In addition, small plots of berseem are cultivated in irrigated areas.

Gram: Gram is by far the most important Rabi crop; its popularity has shifted the emphasis of the agricultural cycle away from the Kharif, a process which began around the turn of the century. It is both a staple food and a cash crop; it grows well under sparse rainfall, and abundantly with good rainfall and/or irrigation. The Bagar region is known for its gram production, and even in irrigated areas, gram is considered to be more profitable than wheat. The desi variety is grown exclusively, in spite of an attempt by
the Haryana government to promote an improved variety. Gram is an important source of protein in the Bagri diet. Gram flour is mixed with wheat to make a variety of chapati known as missi roti; pure gram flour is used to make papad. Gram flour cooked with whey (lassi) forms a classic Rajasthani curry known as kuddi. Picked green, gram is a popular vegetable for humans and fodder for camels.

Wheat: Wheat has an elevated status in the Bagar as a food of the wealthy and/or for guests. In unirrigated areas, wheat is sometimes grown in small quantities by those willing to risk a poor harvest. In irrigated areas it is a popular crop for home consumption, but is not considered profitable. It is a normal item of diet only for farmers who grow it; if grain must be purchased, millet is always less expensive. The symbolic value of wheat has been instrumental in its quick acceptance as an irrigated Rabi crop. The poor-yielding desi variety has given way to a popular improved desi strain (306) and several high yielding dwarf varieties.

Oilseeds: Mustard and rapeseed are often interplanted with gram. Rapeseed, a fast growing crop that requires no soil preparation, is used as a filler crop in the event of rain in December or January, when it is too late to plant gram. The seeds are used for oil, and the whole plant is used for fodder. Rapeseed requires very little water and is not irrigated. Mustard can also be
grown without irrigation, but only in wet years; the crop responds well to irrigation. While surplus harvest is sold, oilseeds are not an important cash crop.

Berseem: An irrigated crop only, berseem provides green fodder and is grown intensively in small plots, sometimes mixed with mustard. The crop is cut 4 to 5 times during the season and fed to the milch buffalo. It responds well to inputs and regenerates quickly.

Agricultural Cycle. The Kharif season begins with the planting of cotton in April and May. With the exception of occasional crops of millet or sorghum grown for green fodder, cotton is the only crop planted before the onset on the monsoon around the first week in July. Cotton may require several plantings because of the severe weather conditions of the season. In 1981, some Kutiana farmers had to plant their cotton three times; hail destroyed the seedlings of the first attempt, and a dust storm covered the second planting.

June is a month of field preparation and relaxation, especially during the heat of the day when temperatures normally reach 46 to 49 C. With the onset of the monsoon the Kharif planting begins in earnest. This work is mostly finished by the end of July and planting stops completely by mid-August. The last crops sown are moong and moth which are used to fill any gaps in the cotton fields.
During August and September, the farmer is engaged in weeding, irrigating and plowing, preparing his current fallow for gram planting in October. There is a good deal of slack time during these two months; the major event of the season is the annual camel fair and religious mela held in Guga Medi (Rajasthan), ca. 25 km southeast of the study villages. Festivities last for several weeks, culminating on a date which varies according to the lunar calendar, but is usually the last week in August or first week in September. The Guga mela attracts pilgrims/visitors from the entire Bagar region, and from parts of eastern Haryana and western Uttar Pradesh where the Guga cult is widespread (cf. Lapoint 1978; also the section below on religious practices). The travel to the mela provides an opportunity to visit relatives and be visited by them; as a result, this is the most socially active time of the year.

The millet harvest begins at the end of September. For about 10 days prior to harvest, the crop must be protected from birds during the two hours of dawn and dusk. This task entails shouting periodically or firing small crackers. Cotton becomes ready for the initial picking just as the millet is finished. The cotton harvest extends over a 5 to 6 week period with about five pickings required for kapas and only two for narma which ripens more uniformly.
The planting season for gram begins while cotton and cowpeas are still being harvested. In 1981, the first day of planting (which according to tradition should be a Wednesday) was 7 October for irrigated fields. In unirrigated fields planting is adjusted for rain; if it rains, the crop will be planted quickly, but a recent rain is not required. By deep-planting the seed, the residual moisture from the summer monsoon is generally sufficient to start the crop (although subsequent winter rains are necessary for a harvest). The cowpea harvest begins in mid-October and continues to mid-November, at which time wheat can be planted. Late varieties of wheat, as well as rapeseed, can be planted through the first week of January. However, planting the wheat crop too late can jeopardize a timely planting of cotton (in the same field) in April.

From January until the gram harvest around the end of March, the farmer enjoys his Rabi holidays. Wheat and gram do not demand much weeding, and there are generally few, and in a good year none at all, fallow fields which require plowing. This season is a time of marriage arrangements and relaxation for the men -- playing cards, chatting, and smoking hookah (in which only tobacco is used). The Holi festival in March comes just before the Rabi harvest, though the timing is not consistent. The date of Holi depends on the lunar calendar, and the ripening of the gram crop depends on rainfall conditions. The Rabi
harvest is more intensive than the Kharif, both because of the large area planted in gram, and because of the potential for hail and dust storms. Wheat, which ripens in early to mid-April must also be harvested quickly. No farmer feels secure until his crop is harvested, threshed, winnowed, and stored inside his house. In unirrigated areas, the gram harvest is followed by a relatively inactive period, although field preparation is required for the Kharif crops. In irrigated areas, the harvest ends later (because of wheat) and the sowing of cotton must begin immediately. For farmers without these concerns, and even for farmers with them, the months of April and May mark the beginning of the second marriage season which continues until the onset of the monsoon.

Livestock. Livestock continue to play an important role in agricultural work and the domestic economy. Cultivation depends on camel traction, and milk and ghee, the most prized of Bagri foods, require dairy animals; even the poorest families rely on their own animals to provide a daily supply of milk. In a typical landowning family, the livestock consist of a camel, a buffalo, and a cow. Landless families have no need for a camel, and cannot usually afford a buffalo. One or two cows and several goats are the typical livestock of the landless. A few households keep flocks of sheep. There are no pigs or chickens in either study village.
Camels: Camels characterize the ecological adaptation of the Bagri to their environment. Indeed, the boundary between the Bagri and Deswali Jats can be measured by this single index. In the Bagri area, camels are used for plowing; in the Deswali region, as in most of North India, bullocks are used.

The camel is used in a variety of ways and is looked on by the agriculturalist more as a member of the family than a dumb animal. He is harnessed to the plough (where he is far more useful than a bullock would be in the light sandy soil); he carries water, grain, etc., and is let out on hire; he is both ridden and driven; a fair profit is made from the sale of his wool, and when he dies, his skin is made into jars or bottles for holding ghi and oil (Erskine 1910:345).

In spite of the availability of tractors, nearly all agricultural work is still done with camels. Female camels (sahnd) are preferred for their mild temperament, males (kant) for their greater strength. The Guga Mela is the major camel market in the Bagar, though small-scale trading is also common. Prices range from Rs. 1,800 for a young camel to more than Rs. 3,000 for a healthy adult. The useful plowing life of a good camel is about 15 years for a male, and several years longer for a female.

Buffalo and Cows: Buffalo are highly valued both for the quantity of their milk and its high fat content. The milk that is not consumed is churned into butter, and then clarified into ghee. Of all foods, ghee is the most prized; it is used to cook curries and as a coating on
chapati. Ghee is a sign of prosperity as opposed to vegetable oil purchased in the market, considered a sign of poverty and associated with the low castes (who generally cannot afford ghee). Ghee is considered to be a general tonic to promote health and overcome illness; it is given to baby boys, to the sick, to guests, to camels during plowing season, and to women, cows, and buffalo after giving birth.

Cows are kept as substitutes for buffalo for those times when the buffalo is not giving milk, or because a buffalo is too expensive. Cows are much cheaper to maintain and are about half the purchase price of a buffalo, although the prices overlap. Milch animals are valued according to the milk they produce, and this varies widely. A cow might produce between 2 to 8 liters/day and cost from Rs. 500 to Rs. 2,000; a buffalo will yield between 5 to 12 liters/day with price ranging from Rs. 1,100 to Rs. 4,500.

The care and feeding of the milch animals is often, but not necessarily, done by women, involving no strict sexual division of labor. Children or old men may be responsible for leading the animals to the pond (separate from the pond reserved for humans and camels) twice a day. During the monsoon season there is enough pasturage for grazing, but most of the time animals are stall fed. Fodder is chopped with a mechanical device (masheen) and
includes a varied mixture of sorghum, berseem, millet stalks, wheat stalks, gram plants, and weeds. Cooked fodder of cotton seeds, gram seeds, and cowpeas is prepared daily by the women.

Goats and Sheep: Goats are to the landless what cows are to the landed — a back-up for the primary milk producer (cow or buffalo) or in the worst of times, the sole source of milk. Goats are considered unclean and many Jats will neither keep them nor drink their milk for this reason. Nearly every Harijan (Untouchable) family, however, has a few goats. The goat population changes regularly. Male goats are sometimes sold locally for meat (Rs. 16/kg. for dressed meat), or more often sold to itinerant traders. Few Jats eat meat, for both social and religious reasons. When a Jat does eat meat, it is usually consumed with liquor in a highly charged atmosphere of wrong-doing, shared by a small group of male friends. Harijans, who are permitted meat according to caste norms, generally cannot afford it. Women are said not to eat meat, although Harijan women will cook it for their husbands (Jat women refuse to cook it).

Sheep are generally not kept individually; a few families keep herds of sheep as business ventures, selling the wool twice annually at Rs. 15 per kilo. Several related families may pool their flocks and shepherd labor (usually children) to graze the combined herd on communal land, or along roads or watercourses. Sheep do not have
the same stigma of uncleanliness as do goats, and Jats as well as Harijans may enter the wool business.

**Agricultural Equipment.** In traditional Bagri agriculture (before Independence), farmers depended on two basic capital inputs: camels and plows. Today, the central importance of these two items has not diminished, but several new pieces of equipment have been added to the farmers' inventory. The most significant of these is the tractor which represents a qualitatively different approach to agriculture. Tubewells and power threshers are the other mechanized farming tools of which most Bagri farmers have direct experience.

Important changes have also occurred in non-mechanized equipment. The hand-powered fodder machine and the camel cart were both introduced after Independence. Even the traditional wooden plow has been redesigned into a new generation of more efficient iron plows. Most of the hand tools, however, remain unchanged.

**Camel-Drawn Cultivating Equipment:** There are five standard plow type which most farmers use, but do not necessarily own: (1) Moonah, the traditional wooden plow, (2) Morkha, used for most planting, (3) Tota, an improved version of the moonah, with an iron blade, (4) Noharwalla, an improved version of the morkha used for deep planting, and (5) Tirphalli, a three-pronged plow. Other camel draw equipment include the levelling board (karawa), smoothing
board (swagha) and cutting board (ronda). A description of these equipment types is provided in Appendix B.

Hand Tools: Agricultural hand tools include the ubiquitous kassi, a short handled, broad bladed hoe used for all digging, including irrigating, a smaller long-handled hoe (kasia) used for weeding, and the serrated sickle (danti). Threshing equipment consists of three types of wooden pitchforks having between 2-9 prongs; these are made by local carpenters. Winnowing trays (chhajh) are made by the Cheurda caste (See Appendix B for details).

Mechanical Equipment: Except for the bicycle, the fodder chopper and camel cart represented, until recently, the only mechanical items in most Bagri villages. The fodder chopper is a hand-powered device designed for one or two people. It is the most expensive item (Rs. 400) in the typical household inventory, and one of the most useful. No family, whether landless or landed, is without free access to one. This machine replaces the technology of a simple cleaver which was used when stall feeding was the exception rather than the rule, and grazing areas more plentiful.

Camel carts incorporate the relatively recent innovation of large rubber tires, and are the primary mode of short-haul transport in the Bagar region. There are two types: a wooden flat-bed (Rs. 3,000) and an enclosed metal trolley (Rs. 4,000). Few farmers can afford this investment,
so owners often hire out their transport services. Camel carts are used in agriculture (e.g., for hauling manure to the fields), in construction (e.g., moving bricks), and for transporting goods to and from market.

Mechanized Equipment: There are three types of mechanized equipment used in Bagri agriculture: tractors, tubewells, and threshers. Few farmers actually own any of these, but many more rent them, and their use is clearly on the rise. Tractors are the most popular item, and also the most versatile, serving functions of transport as well as cultivation. All three mechanized items are in greater demand in the irrigated village of Kutiana than in the drier village of Janania, and are discussed later in this chapter in the section on Kutiana agriculture.

Farming Practices. The farming practices discussed in this section are divided into pre-planting and post-planting operations. The major pre-planting operations include levelling (for irrigated fields only), plowing, smoothing, and spreading manure. Post-planting operations include fertilizer and pesticide use, irrigation, and weeding. The harvest and threshing/winnowing operations are discussed in the following section on labor practices.

Pre-Planting Operations: Levelling is generally required when fields are first brought under irrigation; additional levelling is needed for proper maintenance of the
field surface. Either a tractor-drawn blade or a camel
drawn levelling board can be used for this task. Levelling
operations are not performed on unirrigated (barani)
fields.

Plowing is a necessary part of soil preparation for
all irrigated fields and most but not all unirrigated
fields. Certain Kharif crops (e.g., terda) and the rabi
crop of rapeseed, are normally planted directly in unplowed
fields. The number of preliminary plowings for other crops
depends on the particular crop, the preceding crop grown,
rainfall, and also on the farmer himself. A typical
procedure is to plow all fallow fields at least once with a
tota, and once or twice with the cutting board (ronda) to
remove weeds. Smoothing generally follows each plowing,
and is particularly important for barani fields.

Manure, or desi khad, consists of animal dung plus
biodegradable garbage, ash, and household sweepings. It is
generally used on irrigated fields, and occasionally on
unirrigated fields as well. The manure is transported to
the fields on camel back (in large camel hair and cotton
sacks called bora), by camel cart, or by tractor trolley.

Post-Planting Operations: Commercial fertilizer use
is limited to irrigated crops, and particularly, to recently
introduced varieties. Gram and cowpea, both of which are
traditional crops, are never fertilized, even if
irrigated. Wheat is the only crop that is fertilized with
DAP at the time of planting. By far the most common type of commercial fertilizer used is Urea, applied to standing crops by the hand broadcast technique at the time of irrigation.

Pesticides are used to treat the seeds of some crops (e.g., wheat and gram) to protect against termites. Pesticide use on standing crops is limited to cotton and the oilseeds, mustard and rapeseed. Depending on insect activity, the cotton crop is generally sprayed once or twice by a single man using a backpack sprayer. The oilseed crop, including unirrigated plants, is usually dusted by hand several times during the season.

Irrigation water is applied by two or more men working together, using kassis (short hoes) to open and close the water channels. Each farmer within the chak receives water once each week, according to the warabundi schedule (see below for a discussion of the Kutiana system). At the appointed time, the farmer opens the watercourse outlet which sends water into his field channels. The farmer will have already constructed a series of small dams along the channels and bunds dividing each acre into eight plots. After the water flows into the first 1/8 acre plot, the men break the first dam in the channel, allowing the water to move down the channel to the second plot and so on.
Weeding is done with a sickle for those weeds which can be used as green fodder, and with a long hoe when the object is simply to remove and discard the weeds. Both men and women perform this task. Plow weeding is practiced on some crops (e.g., irrigated millet, cotton), using a wooden plow (moonah). Although an efficient method of weeding, it precludes the intercropping of moth and moong.

Farm Labor. Bagri agriculture is and has always been based on camels, men, women, and children—in that order. Mechanization is beginning to make a few inroads, but the agricultural strategy may still be characterized as labor intensive. The main tasks that must be performed are plowing, planting, irrigating, weeding, harvesting, and threshing and winnowing. Of these, the first three (plowing, planting, and irrigating) are performed exclusively by men. The other tasks (weeding, harvesting, and threshing/winnowing) are shared by both sexes. Within these gender parameters, labor is distributed among three categories of workers: (1) family labor, (2) wage labor, and (3) indentured servants (siris) who work on one-year contracts and are paid on a share basis, often 1/7 of the grain produce.

1. Family Labor: As a general rule, most landowning families perform most of their farm work with their own labor; about half the families hire no labor at all. Plowing and planting are men’s work, and more specifically,
young men's work. Although plowing the light soils of the Bagar is not difficult, especially with a well-trained camel, the long hours are wearing; it is considered a task for younger men in the prime of health. There is a degree of prestige associated with plowing/planting, perhaps because the person who performs these is responsible for the entire family's welfare. The preferred situation for a middle age farmer is to have his eldest son do the plowing; this spares the father from hard work, and gives a welcome mark of honor to the son. The father becomes a village elder, spending less time in the fields, while the son becomes a fully adult farmer.

Some years after the eldest son takes over the plowing responsibilities from the father, he will begin to share the work with a younger brother. The heavy work load which eldest sons often assume is a contributing factor to their eagerness to fission from the parental household. If the eldest son separates, he has responsibility only for his own share of the family land (in the case of 3 brothers, this would be a 1/4 share, since the father's portion is also counted). If the brothers remain together as a joint family, they may purchase a second camel so that they can share in the work and in each other's company. In the village of Jamal (between the two study villages), there is a joint family of three adult brothers who regularly plow together with their three camels.
Irrigation is also a men's task, but does not entail the physical rigors, nor the prestige, of plowing/planting. As a general rule, any healthy male can be called on to do the irrigating. Weeding is done by everyone -- men, women, and children. The weeding labor is determined by availability, and women tend to do a relatively large share, since they are excluded from other agricultural tasks. The sex ratio of weeders is also skewed in favor of young girls, because boys are often in school.

Harvesting is hard work and is done by everyone who is physically able to do it. Actually cutting the plants is the most difficult task and is usually done by the young men and their wives, along with their adolescent brothers and sisters. The younger children (below 14 years) and older men and women (over 40 years) may do a little cutting, but concentrate more on the piling and bundling of the harvest and other secondary activities. Threshing and winnowing are not as strenuous as harvesting and all ages and sexes participate.

2. Wage Labor: Occasionally wage labor is hired for plowing and planting (especially for cotton), but most agricultural employment is concentrated at the harvest. The crops need to be cut when they ripen, and they also need to be threshed and winnowed quickly to minimize the risks from rain, hail, and wind. With rare exceptions, the
laborers hired belong to Harijan castes either from the village proper or seasonal migrants from other areas.

Local Harijans are the first hired and last fired, for both social and economic reasons. There is a generalized feeling of village kinship, and often specific economic linkages between landowning Jat families and Harijan families. Many Harijans accumulate debts, in both cash and kind, with landowning families, and their employment is a form of loan repayment.

The non-harvest wage rate ranges from Rs. 10 to Rs. 15 per day; during the harvest labor bottleneck, the rate can go as high as Rs. 40, but this is unusual. Labor can also be hired at a fixed rate in grain, especially wheat. The rate depends on the condition of the crop, but a typical figure is 60 kgs of grain per acre harvested (the equivalent of 4 person days). Monthly contracts are another possibility for hired labor, though these are uncommon.

3. Siri Labor: Laborers may also work on a one year contract for a share of the produce. The share ranges from 1/4 to 1/13 depending on the size of the landholding. Payment is in kind, but is limited to the grain, not the byproduct (e.g., cotton sticks, wheat stalks). The siri invariably takes a cash advance of Rs. 3,000 to Rs. 5,000 just before starting work (usually in May or June). He agrees to a legally binding contract committing himself to a full year's labor on penalty of forfeiting any claim to a
share and repaying the loan at 24% interest. Depending on
the harvest, a siri can expect to gross between Rs. 4,000 to
Rs. 5,000 (i.e., a full loan repayment and perhaps a slight
profit). In addition, the siri takes all his meals at the
employer's house. The work of a siri is considered both
difficult and degrading. The work day begins well before
dawn and lasts until after dark; any days missed are
deducted at the rate of Rs. 15 per day; the siri must take
orders not only from the farmer but from the farmer's wife
and children. Men who work as siris do so as a last
resort; if they need a loan and have no collateral, a year
as a siri may be the only option. Most siris work for one
year only, unless they have an especially good relationship
with the landowner or have not repaid the loan. The
preferred strategy for the landless is to do wage labor as
it becomes available.

The farmer who hires a siri is freed from the
greater burden of agricultural work. The farmer continues
to work in his fields, but not every day and not all day.
The siri handles most of the camel-related work of plowing
and planting. He also cleans the irrigation ditches,
applies irrigation water, and does the weeding. In these
activities he may be working alone, with the landowner,
and/or with other family members, including the landowner's
wife. During the intensive work of harvest, the siri works
side by side with the landowner and a degree of comradery is
established, but for most of the year the relationship is clearly that of master and servant.

Every evening the siri returns home with the camel loaded with fodder for the cows and buffalo. While the landowner eats his dinner, the siri spends about 20 minutes chopping fodder on the machine. He then feeds the animals, puts away the tools, cleans up, and is given his meal before finally going to his home several hours after sunset. In the morning before dawn, the siri returns to take the camel out for another day of work.

**Sharecropping.** Two types of sharecropping arrangements are found. Landless households that do not own the full complement of equipment (and especially a camel for plowing) generally take land on a 1/3 share and use the landowner's tools and animals. The sharecropping household receives 1/3 of the produce, and must pay 1/3 of all expenses. Sharecropping among landed families is rare; the most common arrangement for land exchange among landed households is an outright rent, or a loan advance, with the rights to the land serving as interest. If the land is farmed on a share basis, the produce is divided equally among the owner and the cultivator. The cultivator, in this case, uses his own camel and equipment.

**Barsodi Contracts.** Some service castes enter into annual contracts with landowners for a specified payment of grain in return for their services. The Barsodi system is
the local equivalent of the Jajmani system, but is not hereditary, nor is it binding. Many landowners change their barsodis after a few years, or decide to drop them altogether. Barsodis belong to service castes that perform secular, rather than ritualistic functions. Carpenters, blacksmiths, cobbler and tailors receive between 40-60 kgs. of grain (usually half millet or wheat, and half gram); they do not receive gifts at festivals, marriages, and funerals as do the priest, barber, and sweeper.

The number of customers which one barsodi handles varies greatly. One cobbler claimed to have over 80 households, while a carpenter had only a few clients, earning most of his income from agriculture. Barsodis also mix their payment strategies, working variously for a daily wage, or by the piece, as well as on annual contract. One carpenter supplements his barsodi work with a retail shop in Jamal, where plows can be purchased ready-made.

Social Institutions

Bagri social structure is a variant of the Deswali Jat pattern described by Lewis (1958), Freed and Freed (1976, 1978), and Miller (1976). This section provides an outline of the major institutions of Bagri society which are of relevance to the agricultural economy. Five levels of social integration are considered: (1) caste relations, which divide villages into two major groups of Jats and
Harijans, (2) gotra (clan) relations, which divide the dominant Jat clan into kin-based factions, (3) affinal relations, which link villages through marriage, (4) hookah groups, which cross-cut gotra lines and to some extent caste lines as well, and (5) domestic groups.

**Caste Relations.** Caste is the most distinctive feature of Indian society both in the aggregate and at the village level. The operational term in Hindi is *jati* which refers to an endogamous named descent group subdivided into named subcastes or clans (*gotras*) which are exogamous. As a cultural category, "jati" subsumes connotations of occupational specialization, as well as ritualistic purity/pollution (Dumont 1980; Kolenda 1978). These aspects of jati are described by the term, *varna*, the Sanskritic system of four broad divisions: (1) *Brahmin*, the priests and scholars, (2) *Ksatriya*, the rulers and soldiers, (3) *Vaisya*, the merchants, and (4) *Sudra*, the peasants, laborers, and servants. The untouchables (whom Gandhi called Harijan or "children of God," a term which has been generally adopted) lie outside the varna scheme (Srinivas 1954).

Among the Bagri Jats, the dominant jati of the Bagar region, there is some confusion as to where they fit within the varna scheme, some gotras claiming to be Ksatriyas, others accepting the status of Sudras. At the village level, the primary distinction is that of Harijans and non-Harijans. All jatis of Harijan status reside in a
separate section (the Harijan basti) of the village and are restricted in their interaction with the higher castes. Harijans may enter the compounds but not the residence areas of the upper castes. When given food at an upper caste house, they must use only brass, bronze, or steel utensils which they must afterwards clean with sand. In theory, porcelain or glass must not be used by a Jat after being touched by a Harijan. In addition, Harijans may not smoke the same hookah, nor sit on the same cot (charpoy) with a member of a higher caste. Similar restrictions are practiced among the various Harijan jatis; a Chamar (traditionally leather workers), for example, will not smoke with a Dhanak (traditionally weavers), since the latter is considered polluting.

The Jats constitute the upper division of Bagri caste structure. All other non-Harijan castes (with the exception of Brahmins) are considered functionally equivalent to the Jats, although there are fine points of distinction. Thus a Jat will smoke hookah with a suthar (carpenter), nai (barber), and kumhar (originally potters, but now farmers), each of whom is of a distinct jati. Interestingly, Jats may also smoke with Rajputs who enjoy the undisputed varna rank of Ksatriya. Brahmins constitute a separate category both in the varna ideal as well as in village life. A Brahmin will not smoke with a member of any other jati.
Gotra Relations. The patrilineal clan, or gotra is an exogamous unit which is of particular significance in structuring relations among the numerically dominant Jats. Many Bagri villages have one or two dominant Jat gotras which can form an effective voting block in village panchayat (council) elections. Most other castes are not represented by enough families in one village for gotra relations to become politically important. For all castes, however, the gotra plays an important role in providing a network of kinship transcending village boundaries. Gotra exogamy includes ego's gotra, ego's mother's gotra, ego's father's mother's gotra, and sometimes ego's mother's mother's gotra as well. These three or four clans (or "subcastes" in Indian English) are thus differentiated as "kin" and since post-marital residence is patrilocal, the geographic extent of these kin is often quite broad.

Affinal Relations. The marriage pattern for all castes follows a system of village exogamy, gotra exogamy, and patrilocal residence. Affinal ties connect villages in a network which cross-cut gotra relations (indeed, many of ego's gotra relations are in the category of affinal relations as seen by ego's father and grandfather). One unusual practice which the Bagri Jats share with other Rajasthani Jats, but apparently not with Deswali Jats, is sibling set marriage (Kolenda 1978b:267). It is common for two brothers or cousins to marry two sisters or cousins in a
joint ceremony. In one household of Janania village, four brothers live jointly with their four wives, who are sisters. The reasons behind this practice appear to be economic; as my informants pointed out (in concurrence with Kolenda's informants), a joint ceremony is much less expensive than two separate ones. A reason not explicitly given, is the ease with which harvest labor can be exchanged between the two families. Young married women often spend part of the harvest with their own families, if permission can be obtained from the husband’s family. By concentrating the marriages, transportation problems of this sort are minimized, and labor arrangements simplified.

Hookah Groups. The hookah plays a unique role in Bagri male society. It serves to delineate caste boundaries and in this sense comprises a ritualistic marker between social categories. Its role goes far beyond this, however, as a cohesive force uniting small groups of men who sit and talk, as a companion to the farmer in his fields, as a sign of hospitality to the guest or relative, as a mark of respect to the elders who are served by their juniors. Sharing the hookah connotes a sense of comradery with the other smokers; social enemies will rarely smoke together, even when of the same gotra, while men of different gotras and castes (i.e., Jats and those castes that are of equivalent status) commonly smoke together if relations are friendly.
The "hookah group" takes on an economic significance in the sharing of money, tools, and work. Money is generally not lent to relatives, since the lender is socially bound to give rather than to lend within the extended family. A relative requesting money will be offered an excuse and told to ask elsewhere. He will then turn to friend -- a relationship that has been nurtured by the hookah.

The Family. The family is the basic unit of both the social system and the agricultural economy. The residential unit varies from single bachelors to the classic joint family, which is, however, statistically rare. Within the household, work and finances are pooled. Women and girls perform the domestic labor of carrying water, cooking, sweeping the compound, removing dung and making it into dungcakes for fuel, as well as caring for any infants. Young boys are either in school or at play; they are not expected to perform much productive work until they reach puberty. A farmer's most productive years begin at adolescence and continue to his middle age or when his sons begin to relieve him of his agricultural duties. During the slack seasons, the farmer is to be found in the house compound, in the "guest house" (kamara) adjacent to the

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3. A joint family, as used here, refers to a household composed of at least two closely related married couples (e.g., parents and a married son or two married brothers).
compound entrance, or among friends in the village square (choqaan). When his sons marry and bring their wives home, the farmer is more or less excluded from the recesses of the compound, because of the inconvenience he causes to his daughters-in-law who must veil their faces and refrain from talking in his presence. The old man spends most of his time in the kamara or outside on the porch or in the street, but not in the private areas of the house.

Relations within the family are reflected in the architectural layout of the house compound (Figure 3). The compound can be divided into three spatial regions. The most public area consists of the kamara (for old men, guests, and friends), and the attached darvaja where cattle are kept at night. The darvaja/kamara form a facade which is roofed, and through which the main entranceway passes. There is a large gate on the outer wall of the entrance which is locked at night. The second region is the area reserved for the cattle, the bakhel, where the animals spend most of the day. The third and main region consists of the kitchen, living rooms, storage rooms, and work rooms on three sides of a courtyard (ongan), the true residential focus of the compound.

The fissioning of a joint family typically begins with one of the sons moving into an existing room on one edge of the house, and beginning to eat separately. If the family has a separate cattle area (nora) some distance away
Fig. 3. A Typical Compound of a Large Jat Family
from the house, the son might move there. In many cases, however, the house architecture can be altered slightly to block off one part of the parental household, thus creating a separate spatial entity. While the total process is a gradual one, the defining feature, as in so much of Indian life, is food. The son is considered to be separate when his wife cooks his food on a separate hearth. Complete separation of finances and agricultural labor generally takes place over a period of several years.

Religious Life

Nearly all Bagri are Hindu. Although prior to Partition, there was a significant Muslim minority in the region (though not in either study village), Muslim influence is no longer highly visible. The Hinduism of Bagri villagers is ever present, but generally in a subtle form. Jats view themselves as practical farmers who are not given to superstition, and are not convinced of the natural superiority of the Brahmin priests. Nonetheless the family Brahmin is invariably called upon to perform his traditional services at marriages, deaths, and the major festivals.

The Brahmin is the guardian of the "Great Tradition" (Marriot 1955) of Bagri Hinduism. He is responsible for officiating at the major festivals of Holi (in March) and Divali (in October or November) as well as several minor
festivals throughout the year. He follows the lunar calendar and performs puja at auspicious times; he sets the dates for marriages and conducts the ceremony, travelling with the marriage party (barat) to other villages. Most Bagri villagers have only a vague knowledge of mainstream Hindu mythology which derives from an oral tradition and travelling drama troupes performing the Ram Lila (based on the Mahabharata). The Brahmin knows the stories and traditions of Hinduism, and what he does not know off hand, he can look up in his library, or ask one of his kinsmen.

The villager is also reminded of the Great Tradition when itinerant holy men (sadhus) pass through. In return for a meal, the sadhu will sing a song or tell a story. Occasionally a saint (maharaj) will ask to take up residence by the village pond for a few weeks, months, or years, with the villagers providing his sustenance. Upon the death of a family member, the villager acknowledges the Great Tradition in another way; one or two kinsmen carry the teeth and nails of the deceased to the holy city of Haridwar (in Uttar Pradesh) to throw the remains into the Ganges, and to record the name with the temple priests.

The religious environment of most immediate relevance to the Bagri family involves local traditions, beliefs and deities corresponding to Marriott's notion of the "Little Tradition." While Hinduism provides an overall, if poorly understood world view, and a generalized model for
ideal behavior (what Geertz (1973:127) terms "ethos"), local deities or their human intermediaries are relied upon for specific functions.

The usual village greeting invokes the name of the Hindu deity, Ram ("Ram Ram"), and farmers often preface or qualify any prediction with an acknowledgement of the abstract power of an unnamed God ("If it is God's (Bhagwan ki) wish"). But these grand deities are not appealed to directly. Perhaps the only common exception is Lakshmi, goddess of wealth, who is offered puja during the Divali festival, as an appeal for economic success. Lakshmi, however, will not protect the crops; she will provide only general good fortune. Ket Pal, a village deity, will watch over the fields.

A variety of common problems are addressed with highly specific supernatural solutions. In Janania, for example, when several cattle died in the course of several days, a carpenter from a nearby village was summoned. He was considered a guru, skilled in a ritual for protecting cattle; unfortunately he was not available, but his brother's son was an acceptable substitute. It was the knowledge of the ritual rather than the qualities of the person that were critical. The ritual took place at night with the assistance of the political head of the village. Following a complicated procedure involving a small piece of wood, bits of food, mantras, and a visit to the cremation
grounds, the two men tied the wood onto a rope, and then suspended the rope over the main village lane (tied to two houses). In the morning, residents led their animals down the lane and under the stick, which had now become a protective charm (dora). All informants, including the only college graduate in the village, had complete faith in the efficacy of the ceremony; it had worked two years previously, and was a commonly used approach in the area. This time too, the measure proved successful; no further cattle deaths were reported.

For personal ailments, a particular deity can be appealed to. In the village of Jamal (between the two study villages) the sati shrine is locally famous for curing warts and superficial skin problems. The deity invoked was the wife of a resident merchant who committed sati when her husband died sometime in the last century. Her particular identity as a deified person is now merged with the generalized spirit of "sati". Ket Pal, the protector of crops, can also protect and cure individuals. In the town of Rawtsar (see Map 1) is a large temple dedicated to Ket Pal, but he can also be entreated at a small shrine in Jamal, and a at sacred tree in Janania.

Nearly every Bagri house has one or more shrines to a local saint, and rarely, to an ancestor spirit (pitr). A pitr is usually the spirit of a recently departed relative which manifests itself by possessing the body of a living
person. In some cases the pitr speaks through the possessed person. Unusual illnesses may be diagnosed as possession, in which case propitiation is prescribed, treating the pitr as a deity and offering regular puja.

The most popular local deities are Ramdevji and Guga Pir, who are revered throughout much of Rajasthan, and elsewhere. Both appear to have been historical figures several hundred years ago, and both are recognized in annual festivals which have become pilgrimage attractions. The main Ramdevji center is in central Rajasthan, where a mela is held in February, but a number of smaller melas also take place regionally, at Rawtsar, and a very small festival in Jamal.

The Guga mela is held in August/September and is the most important festive event in the annual cycle. During the several weeks preceding the main festival, visiting Guga devotees (bhagats), as well as local residents, perform satsang marked by chants and dances. The center of the Guga cult, Guga Medi, is located just 30 km south of the study villages. Every village informant had been to Guga Medi, and most went every year, either for the festival


5. Lapoint (1978) reviews the geographical extent of Guga observances.
itself or for the camel fair which is held at the same time.

Pilgrimages constitute the most overt expression of Bagri religion. Within the household, religious behavior involves regular puja at the family shrines (usually twice in a lunar month), periodic fasts observed by the women, and special foods prepared by the women. As has been observed for other regions of India, women are the guardians of religious traditions. Their most important religious task is food preparation, since many of the "special" days in the religious calendar are marked by no observance, on the part of men, other than eating a particular food such as kheer (rice pudding), kitchori (millet pudding) or halava (flour, sugar, and ghee).

The religious behavior of the Bagri appears to have little importance in itself; there is minimal transmission of a body of ideas or values which Geertz (1973:87-125) considers "religion". Certainly the Bagri do have beliefs and hold values which structure their world view. These values underlie Bagri behavior in general, but are not to be found to any greater degree in behaviors normally categorized as "religious". It is more useful to approach the religious behavior of the Bagri in terms of social function, as it can also be revealing to approach their social behavior as a sort of religion.
Social Functions of Bagri Religion. The religious practices of the Bagri are not merely articulated with but actively structure and maintain social relations on several levels. When villagers travel to Guga Medi for the annual mela, they use the occasion to visit relatives and friends along the way. They may spend the night, or merely stay for tea, or, if travelling in a large group (e.g., a tractor trolley full of passengers), they might ask only for water for the whole group. In terms of information flow and social networks, there may be either an intensive exchange among a small group, or a brief, extensive exchange involving a larger group. Such incidents occur many times during the course of the pilgrimage, and most villagers play the roles of guest (while on their own pilgrimage) as well as host (entertaining relatives on their pilgrimage).

Another type of intervillage communication is the groups of Guga devotees (bhagats) who are active during the month preceding the Guga festival. They may spend one or two days in the village, performing night-time satsang, sometimes in collaboration with village kinsmen (who in Kutiana were Dhanaks, a Harijan caste). Such performances serve a dual function of inter- as well as intravillage

6. The following analysis does not imply any functional exclusiveness. Certainly Bagri religion is tied to economic life (e.g., the camel market at the Guga Mela), and also has important psychological functions (e.g., relieving anxiety).
communication, since the onlookers include segments from the entire village, with all castes, and all age groups represented.

During the two major All-India festivals which are observed in the villages, Holi and Divali, there are institutionalized forms of intervillage communication. The priest and barber visit their jajmans (the households to whom they provide services) and collect a ritual payment. The Holi festival also involves throwing colored powder and liquid on friends and/or enemies, and general horseplay primarily among peers, but also between castes and sexes (but not age groups). Drunkenness is condoned on this day, and rules for normal behavior are generally relaxed.

Religious behavior functions to define social groups in terms of caste, gotra, and faction. When the pandit and nai visit their jajmans during Holi and Divali, they do not go to any Harijan houses; the Harijan are outside this religious system. Similarly, when the Dhanak households in Kutiana hold an all-night satsang for the deity, Kalka Devi, their singing reminds themselves and the rest of the village of their separateness. At the gotra level there are customs and deities which particularize religion.

7. A general reversal of normal social relations does not take place. The Bagri practice of Holi appears much more tame than that reported by Marriott (1968:200-212) for the village of Kishan Garhi in Uttar Pradesh.
Households of the Bander gotra (Jat caste) in Kutiana have a shrine to the god, Sultan. Every second Thursday the women prepare kheer in his honor, which is served to the family as part of the evening meal. The Banders do not observe a custom of the Kaswan gotra which is to bring a lock of hair from a baby boy's first haircut to the temple in Pelu (Rajasthan).

Religious observances can provide a focus to social factions. A number of Kutiana households which migrated since 1950 have become disciples of a guru from a nearby village. This group constitutes a social and religious faction who revere their guru as a saint, while the majority of villagers claim he is a fraud. The faction includes three castes (Jat, Siami, and Khati), but no members of old (pre-1950) established households.

At the family level, the major religious festivals serve a social function similar to that of Christmas in American culture. The family is reunited with at least some of its married daughters, and enjoys time together, with a focus on special foods prepared for the occasion. The festival of Holi is of particular importance in justifying the return of married daughters just before the rabi harvest. A family requiring a daughter's labor can often come to an agreement with the son-in-law to return his wife at some point during, or even after, the harvest.
As religious behavior is tied to social functions, so too social relations and rituals are perhaps best understood as comprising a system of religious beliefs and values. The rites of passage—birth, marriage, death—require a much higher degree of input from ritual specialists such as the priest, barber, and sweeper than do ostensibly "religious" festivals. Even close friendships are sanctified with a religious label (dharm bhai/behen, "religious brother/sister") and a ritual exchange of clothes (though without the services of a priest).

Marriage is the major rite of passage in the Bagri life cycle, and a major focus of Bagri culture in general. The significance and functional complexities of marriage and its attendant ritual cannot be overemphasized, but lie beyond the scope of this study. Death rites are also of social significance. The death of an old man is treated as a festive, though sombre occasion. The twelve day period of mourning (moukhan) is a time when friends and kinsmen (as well as women) arrive from surrounding villages to pay their respects. Historically, the expenses incurred from the feasting of so many guests (in the case of an important man) could compete with marriage as a financial burden to the family.

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8. See Fagen (1915:126-130), for a description of marriage customs among the Jats of Hissar District.
The religious and the social cannot be separated in Bagri culture; indeed, the Bagri cultural style is rooted in this fusion. At the same time, social ties are at the heart of many economic relationships. A siri, in the eyes of his Jat employer is not merely an employee; he is also a member of a particular family which has a history of relations with the landowner's family, and the member of a Harijan caste which has a ritually defined relationship to the Jats.

In the following sections, data are presented for each study village describing (1) the irrigation system, (2) the agricultural economy, (3) the non-farming economy, (4) social structure, and (5) cultural behavior. The primary criterion for including specific data is to provide the information necessary to test the research hypotheses outlined in Chapter 2. At the same time, an attempt is made to point out relations which cross-cut categories. The objective of the following sections is to convey the holistic complexity of two Bagri villages, while setting the stage for the analysis presented in Chapter Six.
Kutiana Village

The irrigated village of Kutiana is a compact settlement of 101 house compounds situated on the northern edge of the village fields. The houses are predominantly mud brick (kutcha) compounds contiguously placed, forming neighborhood groups along caste lines. The oldest families in the village are grouped around the central plaza (chogan), which provides a spatial as well as political focus to the village (see Map 3).

Ten castes are represented, of which the Jats comprise two-thirds (67) of the households. The Siami caste (6 households), also traditional agriculturalists, are roughly equivalent to the Jats in social status. A variety of service castes include a Brahmin, a Sonar (goldsmith), five Suthars (carpenters), a Nai (barber), a Lohar (blacksmith), and a Cheurda (sweeper). Except for the Nai and the Lohar, all the service castes supplement their traditional incomes with outside agriculture or wage work. The 18 Harijan households are divided among three castes: Chamars (3), Dhanaks (14) and Cheurda (also included as a service caste). The caste composition of the village is summarized in Table 10. Except for the Lohar, who is Muslim, all households are Hindu.

The history of Kutiana is tied to that of its larger neighbor, Jamal, located 2.5 km distant. Both villages were founded in the mid-1800s. Residents of Kutiana claim
that it is the older of the two, but Jamal has outstripped it in importance, due to its permanent wells. Before irrigation water was available to supplement the Kutiana pond, villagers used to transport much of their drinking water from Jamal. That the two villages have grown up together is seen in the land holding pattern. The fields owned by Kutiana residents are interspersed with fields of Jamal residents, so that of the official land area of Kutiana village (3,957 acres), only 36% (1,368 acres) is actually owned by Kutiana residents.

### TABLE 10

CASTE COMPOSITION OF KUTIANA VILLAGE, 1981

<table>
<thead>
<tr>
<th>Caste</th>
<th>Number of households</th>
<th>Traditional occupation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brahmin</td>
<td>1</td>
<td>priest</td>
</tr>
<tr>
<td>Siami</td>
<td>6</td>
<td>farmer</td>
</tr>
<tr>
<td>Jat</td>
<td>67</td>
<td>farmer</td>
</tr>
<tr>
<td>Suthar (Khati)</td>
<td>5</td>
<td>carpenter</td>
</tr>
<tr>
<td>Sonar</td>
<td>1</td>
<td>goldsmith</td>
</tr>
<tr>
<td>Nai</td>
<td>1</td>
<td>barber</td>
</tr>
<tr>
<td>Chamar</td>
<td>4</td>
<td>leather</td>
</tr>
<tr>
<td>Dhanak</td>
<td>14</td>
<td>weaver</td>
</tr>
<tr>
<td>Cheurda</td>
<td>1</td>
<td>sweeper</td>
</tr>
<tr>
<td>Lohar</td>
<td>1</td>
<td>blacksmith</td>
</tr>
</tbody>
</table>

The founders of Kutiana were Jats of the Shoran and Kaswan gotras, who today represent the dominant village families. The Shorans migrated north from Bikaner state;
the Kaswans, though originally from Rajasthan, moved to Kutiana from villages ca. 50 km northwest in what is today part of Sirsa District. The village grew slowly as new migrants joined them; by 1945 Kutiana consisted of 22 houses comprising 5 castes: Jats, Suthars, Nai, Dhanak, and Chamar.

One reason the village grew so slowly, during what was a period of expansion throughout the Bagri region, was the land tenure arrangement. Nearly two-thirds of the land now owned by Kutiana residents was owned by a single absentee landlord, who also owned land in several other villages. Following the land reform measures imposed by the progressive Chief Minister of Punjab, Chhotu Ram, this land was declared "surplus" some years prior to Independence (1947). It was not until after Independence, however, that the new government took action in confiscating the land and began the complicated process of selling it to the customary tenants, both in Kutiana and Jamal. One family in Kutiana is still making payments to the government for 6 acres of land obtained in this way.

The availability of land in the area, as well as the promise of canal irrigation, attracted new migrants. At the same time, the partition of India and Pakistan caused large-scale population displacement. Only one Kutiana immigrant family (which has since become six families) moved directly from Pakistan, but many others may have experienced some "push" factors from the newcomers to their own areas.
The result was an increased migration into Kutiana, with 12 new households entering the village between 1946-1953. Table 11 shows the pattern of migration into Kutiana from 1940 to the ethnographic present (1981). Fully 40% of the present households derive from families that immigrated since 1946.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Hslds at arrival</th>
<th>Number of Hslds in 1981</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940-45</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>1946-53</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>1954-60</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>1961-70</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>1971-81</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>TOTAL</td>
<td>28</td>
<td>45</td>
</tr>
</tbody>
</table>

Kutiana today reflects a major effort by the Haryana government to bring the villages into the modern age. Kutiana is linked by paved road to the district center of Sirsa, 25 km distant. There is direct bus service four times daily. Electricity was introduced in 1971; today 20% of the houses are electrified, including one Harijan house. Aside from electric fans, there are no electric home appliances, such as fodder choppers, home flour grinders, or ghee makers. There are two commercial flour mills in the village which use electric power. A primary
school was started in 1964; there is a high school in the adjacent village of Jamal. In 1981, three village boys were in college, and two were in private high schools in Sirsa.

The Irrigation System

Kutiana fields are served by six watercourses which irrigate six chaks. Two of these watercourses service only Kutiana; the other four extend into adjacent villages. All six watercourses have been included in a World Bank-financed relining scheme carried out by the Haryana State Minor Irrigation and Tubewell Corporation (HSMITC). Four of the watercourses have been relined to an average length of 11,734 feet. Work on the fifth watercourse is underway (providing some local wage work), while the relining of the sixth is delayed pending a shareholders' dispute concerning its exact location.

Each watercourse is managed by the shareholders, i.e., the farmers whose land is irrigated by it. The number of shareholders varies between 20 to 85 and includes farmers from as many as four different villages. Prior to the formation of HSMITC, the shareholders had full responsibility for the irrigation water after it left the Distributary outlet (warabundi). They built and managed the original kaccha watercourses under the supervision of an elected morhab who distributed the water rights.
The last morhab position in Kutiana was dissolved in 1976, and now the role of the shareholders is limited to keeping their channels clean. The state (through HSMITC) builds and services the watercourses and provides a legal forum for any disputes. Cleaning is carried out as needed, ca. 3-5 times per year, with most of the work from March to September when dust storms are common. Informants claim that there are no difficulties with the work sharing arrangements. When the watercourse becomes noticeably obstructed, the farmer most affected notifies his neighbors and a time for cleaning is set. The decision is then passed on to the other members; there is no regular leader. One member from each shareholder's family is expected to work for a day, but no one complains if one or two terms are missed. If one family's absence becomes conspicuous, peer pressure is enough to remedy the problem.

All five of the pukka watercourses are legally owned by HSMITC. The shareholders are repaying a subsidized loan to HSMITC which will transfer title of each watercourse back to the shareholders after 7 years. When the title is transferred, the shareholders will again be responsible for repairing, and if need be, replacing the channel. As for the main Kutiana Distributary, it will continue to be maintained by the Irrigation Department. One villager (a landowning Jat bachelor) has been employed since 1962.
(current salary: Rs. 300 per month) to clean a 4 km segment of the channel.

Most of the village land is within the command zone of a watercourse and can be irrigated according to the discretion of the farmer, and subject to water availability. The land area owned by Kutiana farmers includes the 1368 acres within the official boundaries of Kutiana village, and 40 additional acres which are legally in Jamal (but border on Kutiana). Of these 1408 acres, the 40 households included in the research sample own 648 acres (which is 46% of the total).

Within the sample holdings, 82% of the land is under command. Of the cropped area, 70% was irrigated during the 1980 Kharif season and 40% was irrigated during the 1980-81 Rabi. Availability of canal water, however, is irregular and the flow is usually well below maximum. During Kharif 1980, the distributary was empty for an average of 11.5 days per month for a seasonal volume of only 45% of design capacity. During Rabi 1981, it was empty an average of 13.8 days per month for a seasonal volume of 47% (based on canal office records which measured water height at the tail gauge).

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1. The sample includes agricultural data for 42 residential households; two of the sample households are combined with parental households but reside separately.
Water is distributed according to the warabundi system in which (as noted in Chapter 4) each shareholder receives the whole stream of the watercourse in turn. The usual water allotment is 15 minutes for each command acre, but varies slightly according to the field's distance from the watercourse. The irrigation patwari (revenue collector), who is responsible for the adjoining village of Barasari as well as Kutiana, prescribes the timings according to fixed rules. Each year the timings are reversed so that those who were irrigating at night are moved to a daytime slot. This procedure appears to work smoothly; informants claim there is no tampering with the timings under the present system.

In most fields, 1.5 hours is required to irrigate one acre when the distributary (and hence the watercourse) is full. The average landed farmer owns 19.26 irrigated (command) acres. This provides him with 4 hours 49 minutes of water each week with which he can irrigate 3.21 acres. If a farmer has 9.18 cropped acres under command (the 1980 Kharif average), he will require 6.2 weeks to irrigate everything. In fact, the farmers receive much less than this because of canal closures and low volume. There is also a second element of chance; since the canal is sometimes closed for less than a week, some farmers will miss a turn while others will not.
The Farming Economy

Kutiana is a village of farmers and, economically speaking, little else. Families who earn their primary livelihood from their own land constitute 72% of the village; the other families are engaged primarily in agricultural labor (19%) or in various intra-village service occupations (6%) such as the priest, blacksmith, and carpenter. Only 2% of the households are sharecroppers and only three individuals are employed full-time outside the village.

Land Tenure. The landholding patterns mirror caste distinctions to a large degree; most of the landed are Jat, and most of the landless are Harijan. Only two Jat households are landless. One is a bachelor who lives alone, having lost his landholdings through poor investments and country liquor. The other is a man who also lost hereditary land, apparently a result of opium addiction. His wife supports him as the village prostitute. Other non-Harijan landless include the Barber, the Blacksmith, one Carpenter, and one Siami who is employed as a patwari outside the village. Of the 19 Harijan households, 12 are completely landless and only one is a full-time farmer (sharecropper) who does not do supplemental wage work. Table 12 summarizes the relationship between landholdings and caste.
TABLE 12
KUTIANA LANDHOLDINGS BY CASTE

<table>
<thead>
<tr>
<th>Caste</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jat (n=67)</td>
<td>20.86</td>
</tr>
<tr>
<td>Siami (n=6)</td>
<td>9.67</td>
</tr>
<tr>
<td>Service (n=9)</td>
<td>6.04</td>
</tr>
<tr>
<td>Chamar (n=4)</td>
<td>4.63</td>
</tr>
<tr>
<td>Dhanak (n=14)</td>
<td>0.63</td>
</tr>
<tr>
<td>Cheurda (n=1)</td>
<td>0.00</td>
</tr>
</tbody>
</table>

For purposes of discussion, the term "landless" is used to refer to all households which may have nominal landholdings but depend on wage labor as the primary source of income. The term "farmer" is used to describe household economies based on farming, whether or not the land is owned by the farmer, provided that he makes the cropping decisions. Sharecroppers are considered farmers if they receive more than 50% of the produce, but not if they receive less (usually one third), since in the latter case they serve as workers rather than managers. Farmers, in this sense, comprise 26 of the 40 sample households. Their average land holding is 23.2 acres of which 19.2 acres are under irrigation command. Because of the government land consolidation in 1960-62, the average number of plots is only 2.8.

In most cases, farmers farm their own land. Only 15% of the sample farmers rent more land than they
themselves own. In all, 44% of the farmers rent land in, while only 22% rent land out. The reason for this net gain is that most of the rented land is taken from landowners who live in Jamal, but own land in Kutiana where it is inconvenient for them to cultivate.

Though landholdings are inequitable, the most critical variable distinguishing a farmer from a wage earner is not land but caste. One Jat family owning 1 acre of land rents 5 additional acres rather than resort to wage labor, while a Dhanak family with 5 acres of land is nonetheless primarily dependent on wage labor. The sample farmers do not include any Harijan households, but do include three Jat household with 6 acres or less.

**Cropping Pattern.** The cropping pattern of the sample farmers is given in Table 13 (Kharif) and Table 14 (Rabi). The kharif season is less important in terms of cropping intensity, reflecting the higher profitability of gram, which accounts for nearly 80% of Rabi cultivation. Total annual cropping intensity is 116%. Of this, the Kharif accounts for 49% and the Rabi for 67%. Though less land is planted during the kharif, there is greater crop diversity. Cowpea and cotton (both desi and narma)

2. Annual cropping intensity measures the percentage of cropped area against the total area controlled, combining this figure for both the Kharif and Rabi seasons for a maximum of 200%.
TABLE 13
KUTIANA: RABI CROPPING PATTERN
(1980/81) FOR SAMPLE FARMERS, IN ACRES

<table>
<thead>
<tr>
<th>Gram</th>
<th>Wheat</th>
<th>Mustard</th>
<th>Rape</th>
<th>Barley</th>
<th>Misc.</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigated</td>
<td>114.5</td>
<td>57.9</td>
<td>5.0</td>
<td>0</td>
<td>2.5</td>
<td>10.0</td>
</tr>
<tr>
<td>(% of crop)</td>
<td>(33.9%)</td>
<td>(100%)</td>
<td>(100%)</td>
<td>(56%)</td>
<td>100%</td>
<td>(44.2%)</td>
</tr>
<tr>
<td>Unirrigated</td>
<td>223.5</td>
<td>0</td>
<td>0</td>
<td>14.2</td>
<td>2.0</td>
<td>0</td>
</tr>
<tr>
<td>(% of crop)</td>
<td>(66.1%)</td>
<td>(100%)</td>
<td>(44%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL (n=26)</td>
<td>338.0</td>
<td>57.9</td>
<td>5.0</td>
<td>14.2</td>
<td>4.5</td>
<td>10.0</td>
</tr>
<tr>
<td>(% of Rabi)</td>
<td>(78.7%)</td>
<td>(13.5%)</td>
<td>(1.2%)</td>
<td>(3.3%)</td>
<td>(1.0%)</td>
<td>(2.3%)</td>
</tr>
</tbody>
</table>

TABLE 14
KUTIANA: KHARIF CROPPING PATTERN
(1980 AND 1981) FOR SAMPLE FARMERS, IN ACRES

<table>
<thead>
<tr>
<th>Millet</th>
<th>Cowpea</th>
<th>Kapas</th>
<th>Narma</th>
<th>Sorgum</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irrigated</td>
<td>37.5</td>
<td>51.5</td>
<td>72.5</td>
<td>35.5</td>
<td>12.5</td>
</tr>
<tr>
<td>(% of crop)</td>
<td>(59.1%)</td>
<td>(43.8%)</td>
<td>(100%)</td>
<td>(100%)</td>
<td>(100%)</td>
</tr>
<tr>
<td>Unirrigated</td>
<td>26.0</td>
<td>66.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>(% of crop)</td>
<td>(40.9%)</td>
<td>(56.2%)</td>
<td>(30.5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL (n=25)</td>
<td>63.5</td>
<td>117.5</td>
<td>72.5</td>
<td>35.5</td>
<td>12.5</td>
</tr>
<tr>
<td>(% of Kharif)</td>
<td>(21.1%)</td>
<td>(39.0%)</td>
<td>(24.0%)</td>
<td>(11.8%)</td>
<td>(4.1%)</td>
</tr>
<tr>
<td>1981</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irrigated</td>
<td>26.5</td>
<td>43.0</td>
<td>61.4</td>
<td>6.2</td>
<td>7.9</td>
</tr>
<tr>
<td>(% of crop)</td>
<td>(45.3%)</td>
<td>(40.2%)</td>
<td>(100%)</td>
<td>(100%)</td>
<td>(100%)</td>
</tr>
<tr>
<td>Unirrigated</td>
<td>32.0</td>
<td>64.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>(% of crop)</td>
<td>(54.7%)</td>
<td>(59.8%)</td>
<td>(39.8%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL (n=21)</td>
<td>58.5</td>
<td>107.0</td>
<td>61.4</td>
<td>6.2</td>
<td>7.9</td>
</tr>
<tr>
<td>(% of Kharif)</td>
<td>(24.3%)</td>
<td>(44.4%)</td>
<td>(25.5%)</td>
<td>(2.5%)</td>
<td>(3.3%)</td>
</tr>
</tbody>
</table>
together account for about 75% of the cultivation, with millet accounting for most of the remainder. During the Rabi, wheat is the only other major crop besides gram.

<table>
<thead>
<tr>
<th>Crop</th>
<th>Irrigated acres as % of command area</th>
<th>Mean irrigation Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millet</td>
<td>8.0%</td>
<td>1.5</td>
</tr>
<tr>
<td>Cowpea</td>
<td>11.0%</td>
<td>1.0</td>
</tr>
<tr>
<td>Kapas</td>
<td>15.5%</td>
<td>2.8</td>
</tr>
<tr>
<td>Narma</td>
<td>7.6%</td>
<td>4.0</td>
</tr>
<tr>
<td>Sorghum</td>
<td>2.7%</td>
<td>*</td>
</tr>
</tbody>
</table>

**KHARIF TOTAL** 42.1%

<table>
<thead>
<tr>
<th>Crop</th>
<th>Irrigated acres as % of command area</th>
<th>Mean irrigation Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>11.6%</td>
<td>5.8</td>
</tr>
<tr>
<td>Gram</td>
<td>22.9%</td>
<td>1.7</td>
</tr>
<tr>
<td>Misc</td>
<td>3.5%</td>
<td>*</td>
</tr>
</tbody>
</table>

**RABI TOTAL** 38.0%

* indicates data not available

Irrigation water is available in roughly the same amounts during both seasons. During the rabi season, farmers tend to concentrate their irrigation on wheat, a high water-use crop which generally receives 5 to 6 irrigations. Because of the limited supply of water during the Rabi, only 38% of the command area can actually be irrigated. During the Kharif, irrigation is applied more extensively to crops with lower water requirements, and 45%
of the command acreage is actually irrigated (see Table 15). In terms of the proportion of cropped area irrigated, 70% of the Kharif acreage is irrigated, and only 44% of the Rabi acreage (since more total area is planted during the Rabi).

Livestock. Differences in livestock ownership among Kutiana residents reflect both occupation and wealth. Every farming household has a camel, and a few households have two, because a camel is essential to agriculture. The ownership of a buffalo, however, is not an absolute necessity to any family; it is a luxury which only the landowning households can afford to purchase, and more importantly, to maintain. Most farming families sell surplus ghee if they have it, either to a neighbor or to a local merchant (bania), but no family deliberately pursues a dairy enterprise. Even at Rs. 40 per kilo, farmers claim that ghee production is not profitable. Milk is never sold, with the exception of a few farmers who arrange to sell milk (mixed with water) to concessionaires at the Guga mela in August.

Only one household keeps sheep as a business enterprise. A Jat family (not in the sample) with six sons and only 13 acres purchased 45 sheep on credit, as a means of economic diversification. Goats are kept mainly by Harijans who use the milk, and occasionally sell one for slaughter. Most of the village goats are tended by a Dhanak boy, and graze on the communal land surrounding the
village, along the road, and along watercourses. It is only during the monsoon months that these areas offer pasturage suitable for cows; thus, goats are the only animals that can be productively grazed throughout the year. Table 16 summarizes the livestock population.

TABLE 16
LIVESTOCK IN KUTIANA SAMPLE HOUSEHOLDS (n=40)

<table>
<thead>
<tr>
<th>Animal</th>
<th>Mean # per household</th>
<th>Farming Hslds (Mean #)</th>
<th>Landless Hsld (Mean #)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camels</td>
<td>0.75</td>
<td>1.15</td>
<td>0.10</td>
</tr>
<tr>
<td>Buffalo</td>
<td>1.08</td>
<td>1.40</td>
<td>0.10</td>
</tr>
<tr>
<td>Cows</td>
<td>1.05</td>
<td>1.22</td>
<td>0.80</td>
</tr>
<tr>
<td>Sheep</td>
<td>0.08</td>
<td>0.07</td>
<td>0.10</td>
</tr>
<tr>
<td>Goats</td>
<td>0.80</td>
<td>0.41</td>
<td>1.94</td>
</tr>
</tbody>
</table>

Agricultural Equipment. Traditional Bagri agriculture does not require much equipment besides a camel, a plow, and a hoe. The most dramatic addition to the equipment inventory has been the tractor, which is just beginning to play an important role in agriculture. The first tractor in the village was purchased in 1973 by a wealthy young Jat who, with two years towards a Bachelor of Commerce degree, is still the most educated man in the village. He sold it in 1977, claiming it was not profitable. A second tractor appeared in 1975, purchased by an elder cousin who is also the largest landowner (82
acres) and most powerful political force in the village. After 1977, his was the only tractor in Kutiana until Spring 1981 when three new tractors were purchased.

Irrigation greatly increases the utility of a tractor, a point which is discussed in the following chapter. The sudden purchases of 3 tractors in 1981 had less to do with utility per se than with subsidized terms of credit and a new appreciation for the entrepreneurial possibilities of renting out the tractor’s services. The case of Tulsi Ram, one of the sample farmers, is typical.

With 30 acres of irrigated land, Tulsi Ram lives jointly with one brother. Two other married brothers each live separately, and farm 15 acres apiece. Descendants of one of the founding Jat families, Tulsi Ram and his brothers seem to typify the Bagri farmer. Having had no education themselves, their sons are now being sent to school; even Tulsi Ram’s 10 year old daughter goes to school. Ten years ago Tulsi Ram purchased a metal Persian wheel to lift irrigation water from the watercourse to a field which was otherwise too high to irrigate. He powered it by camel, but the arrangement was unsatisfactory, and has not been used for several years. Now he will try powering it with his tractor.

Tulsi Ram and his brother have hired a siri for at least 10 years (usually a different one each year) at 1/7 share. They always hire siris from outside Kutiana,
because, he explained, that way they will live in his household, and be available on demand. Most of the routine agricultural work is performed by the siri along with Tulsi Ram’s younger brother (age 40). Tulsi Ram spends his time in the village plaza and is occasionally engaged in the wood business, buying trees, cutting them, and marketing the wood.

There are several important elements in this portrait of a tractor buyer: (1) While his own landholdings are not unusually large, he can be assured of a demand for his tractor services from his brothers, since altogether, the four brothers own 60 irrigated acres. The two separate brothers do not own any shares in the tractor, but have probably lent money, and can be relied on to provide future support (though they do not pay directly for the tractor services they use). (2) Tulsi Ram has an entrepreneurial history. His Persian well device represents the only attempt in the village at lift-irrigation. His calculated reasoning in hiring outside siris flies in the face of accepted wisdom on jajmani-type relations and intercaste village solidarity. (3) Tulsi Ram has time on his hands as well as available cash; a tractor represents a diversion from his normal life. Prestige is probably a factor as well, but difficult to document. [In the view of one bank manager who advances tractor loans (in Jamal village), prestige is the primary factor, next to the availability of
The price of his tractor was Rs. 64,985, and the accessories were an additional Rs. 14,650 consisting of the following:

- trolley Rs. 7,000
- harrow 2,500
- levelling board 1,000
- cultivator 1,200
- seed drill 1,800
- diesel drum 150
- spare tire 1,000

To finance these purchases, Tulsi Ram has taken a loan from the Sirsa Land Development Bank for Rs. 59,900 at 11.35% interest, and paid the remainder in cash. One additional expense is a tractor driver. Tulsi Ram has hired a Harijan from Jamal at Rs. 250/month. The rental charge for plowing is Rs. 40/acre, which normally takes one hour and uses Rs. 12.5 of diesel fuel. During the September planting season (which is also the Kharif harvest season), the tractor was rented between 6 to 10 hours per day. Thus, it does appear that there is a market demand for tractors in Kutiana, and that there is a potential for profit. Tulsi Ram can use his tractor on family land and rent it out when convenient. In addition, tractors are used for transporting people (e.g., to marriages, funerals,

3. The implications for labor are not reflected in the survey data collected, since these are based on the previous rabi season when there was only one tractor in Kutiana, which was not rented.
and the Guga Mela), and produce to market (Rs. 3/50 per quintal to Sirsa).

Tubewells are the other big capital item in Kutiana and, like tractors, their use is just beginning to be appreciated. Whether this is due purely to a time lag between introduction and acceptance is unclear. It is more likely due to a rising water table from unlined canal seepage. The pre-irrigation water table of 90 feet or more has risen to 40 feet, and the water quality has improved. There are three tubewells in the village, all built since 1979. The cost is Rs. 12,000 for the well shaft and another Rs. 10,000 for the diesel engine. All wells have been financed by bank loans.

Agricultural Credit. Nearly every farmer in Kutiana has a loan outstanding, taken from either a bania or a bank -- the two competing lending institutions. Banias, who comprise a caste as well as a profession of merchants and money lenders, are the traditional source of credit and usually have a longstanding, and in some cases hereditary, relationship with a farmer (cf. Michie 1978). Banks, a more recent development, have taken precedence over the banias in financing large loans at lower interest, yet the banias continue to play an important role. One farmer of the Siami caste, when asked why he took a Rs. 2000 loan from his
artya in Sirsa at 24% interest, rather than from the Cooperative Society at 11.5% explained as follows: Usually they have no need for loans, but when they do it is only for a few months (until the harvest). The Cooperative Society requires money for bribes, the officials harass the farmer about proper signatures, and it requires trips to Sirsa which means bus fares and lost work days. The bania, on the other hand, advances cash immediately. It is only in the case of a substantial loan, or one taken over a longer period, that the extra steps required by official channels become worthwhile.

There are three banias in Jamal village who handle most of the Kutiana business. About 20% of the farmers have a regular artya, who can handle larger loans and are preferred by wealthier farmers. Nearly all the bank loans in the village come from three sources: (1) the Kutiana Cooperative Society, which is affiliated with the Sirsa Cooperative Bank, (2) the New Bank of India, a commercial bank which has operated a branch in Jamal since 1978, and (3) the Sirsa Land Development Bank (formerly the Land Mortgage Bank) which advances loans only to landed farmers. Table 17 shows the breakdown of loans and amounts based on bank records.

4. An artya is a licensed trader who buys and sells grain at established market centers, and also extends loans to his clients.
The average debt level for the village as a whole (101 households) is Rs. 7,125, excluding personal borrowing and debts to banias and artyas. With Rs. 1,000 as a conservative estimate for these other debts, the average household debt level exceeds Rs. 8,000. The average debt for the 73 farming households is much higher. Farmers account for 91% of the Cooperative Society total debt, 100% of the Land Development Bank and other commercial bank debt, and probably 80% of the New Bank debt. Average farmer debt is thus Rs. 9,180, and adding Rs. 1,000 to adjust for personal and bania debts brings the figure to over Rs. 10,000.

**TABLE 17**

**KUTIANA BANK LOANS OUTSTANDING AS OF SEPT. 1981**

<table>
<thead>
<tr>
<th>Bank</th>
<th># of loans</th>
<th># of Hslds</th>
<th>Average per Hsld</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coop Society</td>
<td>97</td>
<td>49</td>
<td>Rs. 4,402</td>
<td>Rs. 215,722</td>
</tr>
<tr>
<td>New Bank</td>
<td>55</td>
<td>--</td>
<td>Rs. 2,938</td>
<td>149,160</td>
</tr>
<tr>
<td>Land Dvlp. Bank</td>
<td>25</td>
<td>17</td>
<td>Rs. 15,933</td>
<td>270,867</td>
</tr>
<tr>
<td>Other Banks</td>
<td>5</td>
<td>4</td>
<td>Rs. 20,975</td>
<td>83,900</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>182</td>
<td>53</td>
<td>Rs. 13,578</td>
<td>Rs. 719,649</td>
</tr>
</tbody>
</table>

Bank credit is extended for large capital items such as tractors, as well as for routine farm expenditures or "crop loans". Most of the Cooperative Society credit is in 5. Officials at the New Bank would not divulge borrowers' identities.
the latter category. The actual use to which loans are put can be divided into three categories: (1) the purpose stipulated by the bank, (2) some other economic purpose and (3) social expenditures, e.g., dowry and gambling. About half the credit funds are spent on agricultural production and about half go to consumption.

Cases of economically productive loan misuse arise from the bank practice of requiring loans to fit predefined categories. For example, one farmer who wanted Rs. 7,500 to buy a herd of sheep and goats found that the maximum small stock loan was only Rs. 4,000. His solution was to take a Rs. 9,000 loan for a threshing machine, which he then used to buy the sheep and goats.

Taking agricultural loans to meet social expenses invites corruption because the bank inspectors can sense their advantageous bargaining position. One ostensible tubewell loan reportedly required a Rs. 700 bribe to a bank inspector who knew that the money (Rs. 20,000) would be used for gambling rather than for a tubewell. The misuse of specifically targeted loans is widespread. A common practice is to take a Rs. 3,000 "dairy loan" to purchase a buffalo. The farmer then "purchases" the buffalo he already owns, and the bank inspector clips the ear of the animal to indicate it is on loan. In effect, the buffalo has been mortgaged.
**Farming Operations.** Table 18 summarizes the major farming operations for each crop. Wheat and narma receive more attention than other crops. Wheat is the most irrigated crop; narma is the most often weeded crop. It is interesting that wheat, which is grown primarily for subsistence, receives such a high level of inputs. In large part this is probably due to the responsiveness of wheat to water and fertilizer, but may also indicate the high value placed on eating wheat rather than millet.

<table>
<thead>
<tr>
<th></th>
<th>Gram</th>
<th>Wheat</th>
<th>Millet</th>
<th>Cowpea</th>
<th>Kapas</th>
<th>Narma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plowing</td>
<td>1.70</td>
<td>2.25</td>
<td>1.44</td>
<td>1.60</td>
<td>1.85</td>
<td>2.17</td>
</tr>
<tr>
<td>Hand weeding</td>
<td>1.05</td>
<td>0.89</td>
<td>1.05</td>
<td>0.95</td>
<td>1.83</td>
<td>2.17</td>
</tr>
<tr>
<td>Plow weeding</td>
<td>--</td>
<td>--</td>
<td>0.27</td>
<td>--</td>
<td>1.78</td>
<td>1.83</td>
</tr>
<tr>
<td>Irrigation</td>
<td>1.70</td>
<td>5.80</td>
<td>0.85</td>
<td>0.80</td>
<td>2.64</td>
<td>3.67</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>--</td>
<td>1.74</td>
<td>1.46</td>
<td>--</td>
<td>1.32</td>
<td>1.50</td>
</tr>
<tr>
<td>Pesticide</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>0.21</td>
<td>1.00</td>
</tr>
</tbody>
</table>

*Figures apply to irrigated crops only.

**Farm Labor.** About half (48%) of the sample farmers hired no labor at all during the 1980-81 seasons, and most of the families that did hire labor still performed much of
the work themselves. Plowing and planting operations are performed by men only. The average age for family plowers is 28.6, whereas the average age for adult males (>15 years) working on the harvest is 33.9.

Female labor is an important part of the family's harvest workforce. During the 1981 Rabi harvest, females comprised 36% of adult family workers. These women tend to be younger than the men (average age = 26.1) reflecting the role which older women play in the household, preparing meals both for family members and for any hired workers. In the age group between 11-15 years, girls outnumbered boys 2:1 (n=15) in full-time family harvest labor, because boys outnumber girls (by an even greater margin) in school.

Over half (52%) of the sample farmers hired labor at some point during the 1980-81 Rabi for an average of 29.5 person days. With rare exceptions, the laborers hired were Harijans, most frequently from Kutiana. Rajasthani migrants were hired by 19% of those landowners who hired labor, at an average of 16 person days per farmer. In addition, a few Jamal workers were hired.

Wage rates varied between Rs. 10-15 per day, with an average of Rs. 13.4. In about half the cases, wages were not paid in cash but were figured against a prior grain debt. There were three cases of monthly contracts among sample farmers. One Chamar was on the payroll of a wealthy Jat for the full year at Rs. 100/month (plus meals) and another
Chamar worked during the harvest only at Rs. 300/month. In addition, one tractor driver was paid Rs. 250/month.

There were 19 siris working in Kutiana during 1981, employed by 27% of the farming households (n=72). All the farmers hiring siris were Jat, and all but one siri were Harijans (the exception was a landless Jat). Of the 19 siris, 10 were from Kutiana; the rest were from villages within a 20 km radius. Only one man from Kutiana worked elsewhere (Jamal) as a siri. The average debt level for siris (the payment they took in advance) was Rs. 3,682. Only 27% of the siris worked for the same farmer for over a year, with 3 years being the maximum.

Yields. The average yields for major crops is given in Table 19, showing data for sample farmers combined and also by landholding. The 1980 Kharif season experienced a partial drought, so that yields are below normal. Farmers claimed that in an abnormally good year, their yields would be roughly twice these figures. The 1980-81 Rabi season was an average year for rainfall, but was unusual in another way. In March, just before the harvest, a violent hailstorm caused 5-25% damage to the gram, and slightly less to the wheat. The storm was very localized in intensity; in the adjacent village of Jamal, most of the gram suffered damage ranging from 20-80%. Three weeks later, a second hail storm caused some water damage to the harvested gram, but this too was minor.
The yield figures show that in Kutiana, as has been observed elsewhere in India, small farmers are more productive per acre than larger farmers. The farmer's diligence in attending to peripheral agricultural activities may be a factor in accounting for the productivity advantage of small farmers. For example, field sparrows can cause damage to millet during the last 10 days before harvest. Farmers claim that scaring them away at dawn and dusk can make a 10% difference in yield.

TABLE 19
YIELDS OF MAJOR CROPS FOR KUTIANA SAMPLE FARMERS
BY SIZE OF LANDHOOLDING (KHARIF 1980, RABI 1980-81)
IN QUINTALS/acre

<table>
<thead>
<tr>
<th></th>
<th>Millet</th>
<th>Cowpea</th>
<th>Kapas</th>
<th>Narma</th>
<th>Wheat</th>
<th>Gram</th>
</tr>
</thead>
<tbody>
<tr>
<td>All farms</td>
<td>3.6</td>
<td>2.5</td>
<td>3.5</td>
<td>2.2</td>
<td>11.0</td>
<td>3.7</td>
</tr>
<tr>
<td>Small farms</td>
<td>3.68</td>
<td>2.82</td>
<td>4.17</td>
<td>2.30</td>
<td>12.56</td>
<td>4.15</td>
</tr>
<tr>
<td>(&lt;21 Acres)</td>
<td>(n=12)</td>
<td>(n=11)</td>
<td>(n=11) (n=8) (n=11) (n=12)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large farms</td>
<td>3.51</td>
<td>2.10</td>
<td>3.96</td>
<td>2.13</td>
<td>9.58</td>
<td>3.41</td>
</tr>
<tr>
<td>(&gt;21 acres)</td>
<td>(n=11)</td>
<td>(n=11)</td>
<td>(n=11) (n=6) (n=11) (n=11)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% difference</td>
<td>5%</td>
<td>26%</td>
<td>5%</td>
<td>7%</td>
<td>24%</td>
<td>18%</td>
</tr>
</tbody>
</table>

6. The small size of the subsample precludes statistical tests of significance (e.g., the t-test), but the consistency of the data for all crops suggests a real, nonrandom trend.
Marketing. The main cash crops are gram, kapas, narma, and cowpea. The relative role of these crops in marketing and subsistence is summarized in Table 20. Cowpea is the least important of the cash crops. Most farmers sell only 4-6 quintals for a gross income of Rs. 1200-1800. Gram and cotton are the dominant cash crops. A farmer who planted just 2 acres of Kapas during the relatively poor 1980 Kharif grossed ca. Rs. 2,500. In a good year, he might make Rs. 5,000 on the same acreage.

TABLE 20
MARKETING PRACTICES FOR KUTIANA 
SAMPLE FARMERS (KARIF 1980, RABI 1980-81) 

<table>
<thead>
<tr>
<th></th>
<th>Millet</th>
<th>Cowpea</th>
<th>Kapas</th>
<th>Narma</th>
<th>Wheat</th>
<th>Gram</th>
</tr>
</thead>
<tbody>
<tr>
<td>% farmers who marketed crop</td>
<td>24</td>
<td>78</td>
<td>100</td>
<td>100</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>Amount sold (qts.)</td>
<td>4.87</td>
<td>6.71</td>
<td>9.87</td>
<td>4.61</td>
<td>17.51</td>
<td>22.83</td>
</tr>
<tr>
<td>% of crop sold</td>
<td>58</td>
<td>71</td>
<td>95</td>
<td>100</td>
<td>36</td>
<td>58</td>
</tr>
<tr>
<td>% sales to local banias</td>
<td>100</td>
<td>100</td>
<td>86</td>
<td>87</td>
<td>*</td>
<td>77</td>
</tr>
<tr>
<td># months stored</td>
<td>2.17</td>
<td>1.31</td>
<td>1.35</td>
<td>1.08</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

* insufficient data

One of the most interesting aspects of the farmers' marketing behavior is the general practice of selling to local banias rather than taking the produce to market centers in Sirsa (25 km) or Bhattu (19 km).
several explanations for this. First of all, the banias offer nearly the same price as the Sirsa market. Because of daily bus service, farmers are kept up to date on commodity prices and demand a competitive rate. Secondly, it is more convenient to sell to the bania, since he picks up the produce in his own tractor (and if not, he lives only 3 km away). Thirdly, most farmers have current debts to a bania, either from a cash loan or (more commonly) in the form of goods purchased from the bania on credit. Selling produce to the bania repays past debts, establishes credit, and maintains a sense of social obligation. The choice of a market is guided by economic considerations extending far beyond the selling of a specific crop. A useful analogy can be drawn with the behavior of the landless in marketing their labor. Just as the landless offer their labor to farmers in repayment for loans of grain, the farmers offer their produce in repayment for loans taken from the banias. In both cases, the meeting of old obligations (repayment) is the process by which new obligations are formed.

Finally, a note on storage behavior. The timing of a sale depends not only on the farmer's financial needs, but also on his storage capacity. Cotton is generally sold soon after harvest; it is bulky to store, and the market price is fairly stable. Gram is the longest stored crop,
both because it is easy to store and because the price tends to fluctuate considerably during the year. Many farmers sell their gram in stages so they can have some immediate cash, while waiting for the market price to rise before selling the rest. Some farmers treat their gram store as a bank account, drawing on it as needed to buy supplies from a local bania, paid in gram instead of cash.

The Non-Farming Economy

One fourth (26%) of Kutiana household economies depend wholly or partly on local wage work (both agricultural and non-agricultural), traditional caste services, or outside employment. This section describes the occupational strategies of the non-farming population. Nearly all workers earn their livelihood within the village boundaries, but a few have found employment in other villages and towns. These two categories of in-village and outside-village form the basic division for the following discussion.

In-Village Occupations. Employment opportunities within Kutiana center on daily wage work and particularly agricultural wage work. Table 21 outlines the non-farming

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7. All grains are stored in open rooms, either in separate bins or in living rooms. Insect damage is common, but generally less than 5% (farmer estimates). Neither the traditional mud storage containers (kotalia), nor modern steel bins are used.
occupational strategies by caste group. With few exceptions, all wage workers belong to Harijan castes, and are functionally landless. One notable exception is the Brahmin priest (a Service caste), who farms 4 acres of his own land and fulfills his priestly obligations, but also engages in occasional wage labor (both construction and agriculture) with no apparent damage to his high social status. Aside from this case, the village labor pool consists of 17 Harijan families, one landless Jat family and one landless Jat bachelor. Only one Harijan family does no wage work at all, because they are share-cropping 53 acres belonging to a wealthy Jat.

TABLE 21
IN-VILLAGE OCCUPATIONS FOR KUTIANA HOUSEHOLDS, BY CASTE (1981)

<table>
<thead>
<tr>
<th>Caste</th>
<th>Agricultural Labor</th>
<th>Non-Agricultural Labor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wage Monthly</td>
<td>Wage Craft Govt.</td>
</tr>
<tr>
<td></td>
<td>labor contract Siri</td>
<td>labor Shop salary</td>
</tr>
<tr>
<td>Harijan</td>
<td>95% 5% 37%</td>
<td>95% 5% 5% 5% 5%</td>
</tr>
<tr>
<td>(n=19)</td>
<td>(18) (1) (7)</td>
<td>(18) (1) (1) (1)</td>
</tr>
<tr>
<td>Service</td>
<td>11% 0 0</td>
<td>11% 67% 0 0</td>
</tr>
<tr>
<td>(n=9)</td>
<td>(1)</td>
<td>(1) (6)</td>
</tr>
<tr>
<td>Jat/Siami</td>
<td>3% 0 0</td>
<td>3% 0 4% 3%</td>
</tr>
<tr>
<td>(n=73)</td>
<td>(2)</td>
<td>(2) (3) (2)</td>
</tr>
<tr>
<td>Total</td>
<td>21% 1% 8%</td>
<td>21% 7% 4% 3%</td>
</tr>
<tr>
<td>(n=101)</td>
<td>(21) (1) (8)</td>
<td>(21) (7) (4) (3)</td>
</tr>
</tbody>
</table>
Of the wage earning Harijan families, two own 6 acres of land, but in one case it is unirrigated and in the other case is still being paid for; both families require additional income. One Chamar man holds disputed title to 12.5 acres of irrigated land, but is afraid of farming it until his legal suit is settled (a process which could take several more years). In the meantime, he rents the land to the village sarpanch (who retains a 2/3 share) since only he is sufficiently powerful politically to fend off the rival claimant. The remaining 14 Harijan families are all clearly landless in a functional sense; one has 2 acres, another has 1 acre, and the rest own no land at all. Except for the Sweeper (Cheurda), all are Dhanaks. These families have neither the equipment, the animals (there is only one elderly camel among them), nor the financial resources to rent farm land at the market rate of ca. Rs. 500/acre.

The village panchayat allots 16 acres of common land to the Harijans as a group, at a rate of Rs. 200/acre; the Harijan elders are responsible for dividing it among the various households. The panchayat land is located in distant fields, 4 km away, and camels must be hired from the Jats at a rate of 3 person days per camel day. In spite of some difficulties, however, this land, which is partly irrigated, is an important asset for some families. Of the 7 wage
earning Harijan households in the survey sample, 5 rented between 1-3 acres of panchayat land.

The importance of siri employment to the Harijan community is seen from the fact that 37% of the households have one or more members engaged in siri work. There are a total of 11 Kutiana residents employed as siris; two households each have two sons working for different landowners, and a third family has a son working as a siri in Jamal.

Wage labor opportunities in agriculture are mostly limited to the harvest season (including threshing). Plowing and planting is done primarily by the landowner and/or his siri. Less than 10% of agricultural wage labor involves weeding or other maintenance such as digging or cleaning irrigation field channels. During the rabi harvest, which lasts about 5 weeks, and the kharif harvest, which lasts about 8 weeks, the wage labor force is well employed. During the remaining 9 months, the landless workers are mostly idle, unless they can find non-agricultural work in the village or farm work elsewhere. One landless Dhanak family regularly leaves Kutiana after the rabi harvest, and return before the kharif harvest, seeking work in other villages. Besides this family, only one other sample household left the village to seek agricultural work in 1981.
Non-agricultural wage labor opportunities come primarily from two sources: (1) individual farmers and (2) state financed construction. The most common job offered by the landed farmers is brick making for household additions, at wage rates equivalent to that of agricultural labor. Four sample households had at least one member employed in brick making or house construction during the 1980-81 rabi season, accounting for 9% of the non-agricultural person days. If the landowner has a siri, however, the siri will be put to work first. Those siris who have been imported into the village by Kutiana landowners displace local wage earners.

Government construction projects which hired local labor during the rabi season included the watercourse relining project and paving the road which runs by Kutiana into Rajasthan. The relining project alone accounted for 63% of the sample households' non-agricultural labor during the 1980-81 rabi. At the peak, 10 men and 8 women were working at daily wages of Rs. 10 and Rs. 8 respectively. The road project accounted for 28% of the sample households' non-agricultural labor during the rabi. Wages were Rs. 10 for both men and women.

There are 7 service caste families in Kutiana who are engaged in their traditional occupations: the goldsmith, priest, two carpenters, a barber, a blacksmith, and a sweeper (who is included as a "Harijan" in Table 10,
above). Three of them (goldsmith, priest, and one carpenter) are also farmers, and use their craft specialty as a supplemental income; the other four household are landless.

Service caste specialists receive payment in one of three ways: (1) cash for services, (2) annual payments in kind, and (3) ritualized payment on weddings and festivals. The goldsmith works only on a cash basis. The two carpenters and the blacksmith sometimes work for cash, but most of their business is with families for whom they serve as barsodi. The usual fee is 80 kgs. of grain for each household. The blacksmith, a recent migrant to Kutiana, services 40 families. The carpenters rely on barsodi contracts for less than half of their income, having between 10 and 20 families apiece. A major source of income for carpenters is as builders (mistri) supervising house construction.

The priest, barber, and sweeper perform ritual services as well as practical ones, and are paid in like manner. Cash gifts are given at Holi and Divali, as well as at weddings and funerals. In addition, the priest and sweeper collect daily rations of flour from upper caste families.

Except for one carpenter, all the active service caste specialists migrated to Kutiana since irrigation. Before their arrival, farmers depended on Jamal's services,
as they still do today for cobblers and tailors. Itinerant blacksmiths from Rajasthan, who still visit Kutiana on occasion, were once the main source of metal implements.

Other occupational pursuits of Kutiana villagers include 4 shopkeepers (one of whom is landless), a Jat Ved (doctor trained informally in Vedic medicine, and even more casually in Western medicine), a Jat farmer hired by the panchayat to inspect the relining construction and verify proper use of rationed cement (which contractors have a reputation for stealing), a canal cleaner (Jat), hired by the Irrigation Department, a peon (Dhanak) hired by the panchayat, and a prostitute (Jat) who, according to villagers, is hired infrequently by village men.

Outside Occupations. Only three Kutiana men have full-time employment outside the village. Two are brothers from a Siami family having 6 sons and only 15 acres of land (all irrigated). In order to protect the integrity of the land, the family educated two of the sons to the matriculation level (10th class). One of them is now a patwari in Rajasthan; the other is with the Border Security Force based in Bikaner (Rajasthan). Both maintain homes in Kutiana where their wives and children continue to live. The only other case of outside employment is the second of four sons of a Jat farmer. The son passed his matriculation, and again the motivation appears to have been preserving the integrity of a small landholding (12
acres). The young man has become a bus mechanic and commutes daily (by bus) to Sirsa.

Social Structure

The 748 residents of Kutiana are divided among 10 caste groups, 25 clans (gotra), and 101 households. These levels of social structure are reflected in the spatial layout of the village (see Map 3). Each caste group constitutes one or more neighborhoods (basti) which are not separated in any overt way, but have grown over time. The unit of growth is the lineage (karumbah), an unnamed group tracing its history back two or three generations to the ancestor who first came to Kutiana. Most of the gotras in Kutiana are represented by a single lineage; indeed, most castes, with the important exception of the Jat, are represented by only one gotra. This section discusses Kutiana social structure on two levels: (1) Village social structure (the broad patterns of village social groups) and (2) Household structure.

Village Social Structure. The caste complexity of Kutiana changed dramatically after the 1947 Partition, as new groups moved into the village. The social fabric was perhaps not greatly stretched, however, since every immigrant household had pre-existing social ties with either Kutiana or Jamal. The original Siami immigrant family, for example, followed a sister who had been married into Jamal.
The immigrant Dhanak lineage were also drawn by an affinal link to Jamal (and there was also an indigenous Dhanak family in Kutiana which was of a different gotra). Many of the incoming Jat gotras (Bhaker, Banadua, Dudi, Saharen, and one of the Beniwal families) moved directly from Jamal, in order to be near their fields, which had always been in Kutiana.

Whereas the landed immigrants actively sought out Kutiana, the immigrant service castes were invited by indigenous landowners, as the growing size of the village created a demand for their services. The Lohar (blacksmith) is the most recent example. Originally from a village ca. 20 km to the southeast, the Lohar had prior relations with the wealthy lineage of Bander families in Kutiana, who still own land in that village. The immigrant carpenter (Hsld #77 on the map) is not related to the indigenous carpenters (Hslds #62-65), but was recruited from a village in Punjab by the Siami families, themselves immigrants from Punjab, who had known the carpenter there.

The post-Partition immigrants settled on the edge of the village, since this was where house plots were available. The central core of the village is thus dominated by the old, established families surrounding the village plaza (see Map 3): Shorans, Kaswans, and one Punia. The indigenous Khati families are outside this central group, as are the indigenous Dhanaks. The first Bander
family moved to Kutiana before Partition, but were relative latecomers in the eyes of the Kawans and Shorans. It is interesting to note the attempt which they have made to squeeze onto the central plaza. The entrance of Hsld #14, which is the site of the original Bander house, provides a small but significant access to the public life of the plaza.

Social interaction among village men reflects both caste divisions and spatial "accidents" which are themselves underlain by historical developments and caste considerations. The Siami families, for example, constitute a social interaction sphere among themselves. The spatial loci, aside from individual homes, are the open area between Hslds #81-85, and the small plaza formed by Hslds #74, 60, 75, and 79. In these public areas, the men can be found smoking hookah and talking. The participants in these social contexts also include non-Siami neighbors: Bhaker (#76), Shoran (#60, 74) and Banadua (#79, 80) Jats, the Soni (#81), and the Khati (#77).

The social logic that brings them together is not caste (though no Harijans will be found among them), but spatial community and a shared history as relative newcomers to the village. The two Shorans (#60, 74), for example, immigrated ca. 1950, and have more in common with the immigrant Siamis than with the other Shoran lineage situated nearby (#98), but who represent the village founders. One
expression of an immigrant solidarity has been their joint participation as disciples of a reformist guru from a nearby village. As mentioned earlier, the established families dismiss the guru as a fraud, but he is deeply revered by these disciples. Their values, in this regard, distinguish them from the rest of the village, while their group satsang with the guru unites them as a social unit.

On the other side of the village, the Harijan basti forms a social unit defined by caste, by occupation, and by income. The households in the northeast corner of the village comprise an agricultural labor pool. All but one of the local siris lives here; nearly all the wage labor potential is to be found here. It is a place where the Brahmin priest never visits, nor does the barber; both minister to the upper castes only. Even the Vedic doctor, who is Jat, refuses to treat Harijan patients; a sick Harijan must call a Ved from Jamal.

The low economic, social, and ritual status of the Harijan community separates them from upper caste Jat society, structuring linkages in terms of economic dependence. Harijans depend on landowners for loans of grain during the lean months, and repay with their labor at the harvest. Harijan women plaster the homes of these same landowners, receiving used clothing and food, rather than cash, in return. At planting time, Harijan households
depend on the landowners to rent a camel and plow, with repayment again in the form of harvest labor.

In situations removed from immediate reminders of dependency, however, the two caste groups interact on more equitable terms. The Harijan shopkeeper has clients among both castes, selling vegetables to the same landowner for whom his brother is a siri. Harijans and Jats can talk freely in casual conversation, while following all the rules of caste propriety. Card playing, which often involves gambling, sometimes involves Harijans rubbing shoulders with Jats, and occasionally even drinking with them. Finally, the institution of dharm bhai or dharm bhen ("religious" brother or sister) offers a socially sanctioned means of circumventing caste rules. There is at least one case of intercaste dharm bhais in the sample households, a Jat landowner and a Chamar (who also has some land). There is also at least one case of cross-cultural dharm bhens (sisters), a wealthy Jat woman and a Dhanak.

The central portion of the village is dominated by Jats, and specifically by descendents of the founding families; the Banders are considerably more recent (ca. 1930), and also considerably more wealthy. The present sarpanch is a Shoran; his rival in the previous panchayat elections was a Kaswan, yet it is the Banders who carry the most political, as well as economic clout. When the Subdivisional Magistrate (SDM) came to dispense compensation
for hail damage, he came to the home of the leading Bander landowner (Hsld #14). Another Bander landowner is a member of the board of directors for the Land Development Bank and is partly the cause of the high level of debt in Kutiana. Farmers who need a loan approach him for assistance in acquiring credit.

The main village rivalry is between the Shorans and the Banders, yet neither group can be considered a true faction. While a sense of animosity does exist, it is often outweighed by rivalries between individual Bander households. The reasons appear to be particularistic. For example the leading Bander (#14) has close ties with his Kaswan neighbors in Hslds #15-17, but not with their cousins in Hsld #18. Relations at this level are visible as plaza hookah groups, and in the guest list for marriage celebrations.

Household Structure. The composition of Kutiana households ranges from single bachelors to large joint families with up to 19 members; average household size is 7.32. Nuclear families account for 52% of all households. Joint families usually take the form of one or more married sons living with the parents (40% of all households). There is only one case of married brothers continuing to live jointly after both parents have died. A summary of household types is presented in Chapter 6 (Table 43).
One significant feature of Kutiana households is the large number of bachelors. There are 15 bachelors, divided among 13 households; two live alone, the rest live with married brothers. The age of the youngest bachelor is 45 years, suggesting that the custom of bachelorhood is on the decline. Village elders all agreed that there was a severe shortage of women in the old days (the current ratio of 89 women per 100 men is considered normal). They attributed the shortage to outsiders' reluctance to marry their daughters into the hardships of a dry village.

Whether bachelors are also the result of a deliberate strategy to protect the long-term landholdings of the family, or simply the result of particular families being unable to attract brides for their sons, is not clear. The present day bachelors grew up in an era when bride price was the prevailing custom; today, dowry is the general practice (though marriages are expensive for both parties). It is now relatively easy for a poor family to find a daughter for their son simply by demanding low dowry; somewhere there will be a poor family with several daughters. In several Kutiana families, the failure to maintain the tradition of bachelorhood, for whatever reasons, is threatening the economic viability of the younger generation. For example, one Jat family has 6 sons and 12 acres of land; they will inherit only 2 acres apiece. The grandfather of these sons is reputed to have
once been the wealthiest man in Kutiana, owning 75 acres and the employer of the only siri in the village.

**Household Composition and Female Labor.** Table 22 shows the relationship between family type and participation in agricultural labor for women aged 11-45. Nearly all Harijan women work either on their own small plots, or as hired labor; economic necessity outweighs any effects of household composition on female labor. Among upper caste households, however, there is a clear difference between labor participation by family type. The joint family allows greater flexibility in household labor allocation, reflected in a higher proportion of women who are available for harvest work.

TABLE 22
PERCENTAGE OF WOMEN WORKING IN RABI HARVEST (1981)
BY FAMILY TYPE IN KUTIANA (FARM SAMPLE)

<table>
<thead>
<tr>
<th>Family Type</th>
<th>Upper Caste Women</th>
<th>Harijan Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nuclear</td>
<td>55% (n=20)</td>
<td>100% (n=2)</td>
</tr>
<tr>
<td>Joint</td>
<td>71% (n=39)</td>
<td>100% (n=9)</td>
</tr>
</tbody>
</table>

Religion and Cultural Values

Religious expression in Kutiana is generally a social phenomenon involving groups at the village or
household level; it is not a personal matter. Religious behavior is outlined briefly in this section, followed by a discussion of particular cultural values which motivate social behavior: (1) prestige values and (2) purdah and caste values.

Kutiana has its own resident Brahmin, who moved to the village in 1970. Except for a few families who have retained prior ties to Brahmins from Jamal, all upper caste households in Kutiana are jajmans to this Brahmin. His responsibilities include officiating at festivals, marriages, deaths, special ceremonies and daily puja at the village temple, which was built after his arrival. The temple is the village's most conspicuous symbol of an All-India Hinduism. The only other village temple is dedicated to Guga (and built in a distinctive style imitating the temple in Guga Medi). The Guga temple is presided over by a self-appointed disciple (bhagat), an elderly Dhanak man, and is a religious focal point only during the month preceding and following the Guga pilgrimage (August/September).

For the most part, Bagri religion is confined to the household, and is conducted by the family members themselves. Most households have a small shrine where they conduct a simple puja every two weeks. Only 19% of the sample households do not have a shrine, either because they have recently fissioned and still use the parental household shrine, or because they adhere to a reformist doctrine which
frowns on shrines. Several families identify with the national Arya Samaj movement, and several more with the regional Satcha Soda sect.

Households that have shrines usually have only one, with an average of 1.2 (maximum = 3). The 36 shrines in the sample households represent 8 different deities, in addition to 5 ancestor spirits (pitr). The most popular deity is Kalka Devi, who is revered by every Kaswan (Jat) in the sample, as well as by two Dhanak families and one Sou (Jat). She is identified with the Hindu goddess, Kali, an All-India deity. Her temple in Pelu, Rajasthan is a place of pilgrimage for Kaswan parents (as noted earlier). Guga is the next most popular deity, with shrines in households of several different Jat gotras, as well as Dhanaks.

Prestige Values. Prestige behavior in Kutiana takes traditional form in practices such as building elaborate entranceways and eating wheat instead of millet; it also incorporates modern items such as watches and radios. These practices are outlined briefly here, and will be considered again in Chapter 6.

Building a pukka (fired brick) entranceway is a high priority for Kutiana residents. The ideal residence is one that is completely pukka (an ideal attained by only 2 families), but an entranceway is almost always the first stage. Among sample households, 28% have pukka entranceways; among farming households, the figure is 39%.
No Harijan house has any pukka architecture. A different kind of prestige construction is the building of monuments (chattri) to the dead, with or without a statue of the deceased. There were two examples of this in Kutiana; a Jat widow built one in her fields, in memory of her husband and the Sweeper built one on the edge of the cremation grounds in honor of his father.

Material possessions which confer prestige include new technology (radios, watches, stainless steel utensils) as well as traditionally known items which have recognized status connotations. Examples of this include chairs and tables, which are associated with the "English" lifestyle. The latter types of prestige objects are encountered less frequently in Kutiana households than the former. Only 17\% of sample households own a chair; only 14\% own a table. However, 20\% own a radio, 63\% have at least one watch (a common gift at marriage), and 34\% own some stainless steel utensils (which are replacing the traditional bronze and brass).

Behavioral practices which are non-traditional do not necessarily confer prestige; however, they often reflect important value orientations. Two examples are movies and alcohol. Among sample household heads, 41\% had been to a movie (in Sirsa) within the past year. Drinking statistics were not available, but from observation, it is clear that drinking is highly prestigious behavior for a large minority
of village men, including the wealthiest and best educated. The prestige value of drinking derives from its opposition to traditional values and the social comradery of flouting those values in a group. Drinking has become an economic liability to some households; as an elderly widow observed, "In the olden days debt was caused by famine; now it is caused by whiskey." This issue is also discussed in Chapter 6.

Purdah and Caste Values. The cultural values which underlie the social behaviors of purdah and caste are firmly rooted in the Bagri ethos and the Hindu religion. A young girl is taught to equate her husband with God, and to honor the latter through the former. Veiling her face in front of her father-in-law and elder brothers-in-law is as natural as not accepting cooked food from a Harijan.

Both purdah restrictions and caste values are given concrete expression in the spatial layout of Kutiana's houses and neighborhoods. House compounds ensure privacy for the domestic area. Sample households were ranked in 25% increments according to the percentage of courtyard area visible from the public street (galli); the average privacy index is 76%. The architecture within the house compound serves to separate the activities of the father-in-law and any male visitors from the interior domestic activities. They are restricted to the outermost room bordering on the street. Thus, young wives who are most concerned about
veiling, can conduct most of their household duties without covering themselves, and are given adequate warning (usually by a discreet cough) if any men do intrude.

The rigidity of caste values is suggested by the spatial separation of the Harijan basti from the rest of the village. Some upper caste families will not walk through the Harijan area. Similarly, Harijans are not welcome in the main village area unless they have some particular business.
Janania Village

The predominantly unirrigated village of Janania lies 5 km to the west of Kutiana, with the fields of Jamal separating the two. Janania is slightly smaller (90 households) than Kutiana and has eight castes represented. Jats are the dominant caste group with 42% of the households. Other agricultural castes (Kumhar and Chimpa), of equivalent status to the Jats, comprise 20%. The two Harijan castes (Chamar and Nyak) constitute 31% and service castes (one bania, one Barber, and 4 Carpenters) comprise 7% of the households (see Table 23).

Janania was founded in the mid-1800's by a member of the Olakh gotra of Jats who had married his daughter to a Beniwal (Jat) family in Jamal, thus creating a social claim to move into the area. Kutiana had already been established, but there was an ample supply of unclaimed land throughout the region. A family of Kumhars joined the settlement soon after its establishment. Though originally potters, the Hindu Kumhars of the Bagar have become accepted as agriculturalists (Muslim Kumhars continue to be potters in other villages). Nyaks, a Harijan caste, arrived in Janania within a generation of its founding, when land was still available. Later on, Chamars and Sihag and Beniwal Jats from Rajasthan joined the village, and Janania took on the caste structure which it has today.
TABLE 23

CASTE COMPOSITION OF JANANIA VILLAGE, 1981

<table>
<thead>
<tr>
<th>Caste</th>
<th>Number of households</th>
<th>Traditional occupation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jat</td>
<td>38</td>
<td>farmer</td>
</tr>
<tr>
<td>Kumhar</td>
<td>12</td>
<td>potter</td>
</tr>
<tr>
<td>Chimpa</td>
<td>6</td>
<td>tailor</td>
</tr>
<tr>
<td>Khati</td>
<td>4</td>
<td>carpenter</td>
</tr>
<tr>
<td>Nai</td>
<td>1</td>
<td>barber</td>
</tr>
<tr>
<td>Bania</td>
<td>1</td>
<td>merchant</td>
</tr>
<tr>
<td>Chamar</td>
<td>15</td>
<td>leather worker</td>
</tr>
<tr>
<td>Nyak</td>
<td>13</td>
<td>sweeper</td>
</tr>
</tbody>
</table>

The history of Janania is unremarkable, a steady growth curve, no doubt punctuated by partial abandonments during droughts. Unlike Kutiana, Janania experienced no sudden immigration during the past few generations. At the time of the 1947 Partition, Janania was one of five villages controlled by a local Jagidarh, who received his authority from the Raja of Bikaner. All lands were owner-cultivated, with a tax going to the Jagidarh. The dissolution of the Jagidarh system in 1956 had little effect on Janania farmers; all village land was already owned by village residents (except for a few fields owned by farmers in neighboring villages).

Before Partition, Janania was larger than Kutiana (28 versus 22 households in 1945), but the situation has been reversed since then, as migrants have moved into Kutiana and out of Janania. Only three families (a
Carpenter, a Barber, and a Jat) have migrated into Janania since 1945, whereas at least 8 households have left since 1955. The emigrants include upper caste men who bought land elsewhere or moved to their wives' villages where land was available, and functionally landless Harijan families who left to seek wage employment opportunities elsewhere.

The 90 families that live in Janania today include only one totally landless household; the next poorest household owns 1.2 acres. While farming is the central focus of the village economy, non-agricultural activities are an important feature of many household economies. Occupational diversification both within and outside the village is discussed in a later section.

Janania is served by daily bus service to both Nohar, in Rajasthan, and to Sirsa and Bhattu in Haryana. The village is not electrified. For a time there was a diesel-powered flour mill but this proved unprofitable; residents have their flour ground in neighboring villages, or else grind it by hand. There has been a primary school since 1945 which had a 1981 enrollment of 92 of which 24% were girls.

1. The land unit used in northern Rajasthan is the bigha, equivalent to 5/8 acre. All land area figures in this report have been converted into acres, 1.2 acres being equivalent to 2 bighas.
Of the 1375 acres of Janania fields owned by resident villagers, 2
438 acres are within the irrigation command of a single chak served by the Jasana Distributary. Much of the command area is higher than the watercourse, however, and cannot be irrigated. The figures for land area actually irrigated are quite low. Only 6.7% (41.7 acres) of the acreage controlled by sample farmers was irrigated during the 1981 kharif. During the 1981/82 rabi season, 8.3% (54.1 acres) of the sample area was irrigated.

Since the irrigated area is confined to one section of the village fields, irrigated holdings are distributed unevenly among village farmers. Among the sample farmers, 35% own no irrigated land at all while 40% have more than half their lands within the command zone. Other than the limited canal water, there is no other form of irrigation in Janania (there have been two unsuccessful attempts at finding useable groundwater). Five sample farmers (20%) own an average of 6.75 irrigated acres outside Janania; three other farmers rent an average of 3.3 irrigated acres outside the village, and one farmer is a sharecropper on 42 irrigated acres in a nearby Haryana village. Thus, only 20% of the sample farmers do not farm any irrigated land.

2. Ca. 227 acres of Janania land are owned by residents of adjacent villages.
The Farming Economy

Agriculture is the dominant force in Janania's economy; with one exception, all households own at least some land. As in Kutiana, most residents are primarily engaged in cultivating their own lands. This section examines the agricultural economy, focusing on a subsample of farming households using the same criteria outlined for Kutiana, viz, those households in which owner-cultivation provides the major portion of household income.

Land Tenure. Average landholdings by household for each caste are given in Table 24. All caste groups, even the Harijan castes, have landholdings which are economically significant, though not necessarily adequate. There is no irrigated land among the Harijan landholdings. The 40 sample households own a total of 680.62 acres, of which 22.5% (153.13 acres) is within the irrigation command zone. Of the 40 sample households, 27 are "farmers" in the sense described above (i.e., that the major portion of their income derives from land which they own or rent, and for which they make all cropping decisions). Two of the 27 sample residential households are combined with a parental household for agricultural purposes; thus, the farm sample is reduced to 25 actual farms. Except for one Chamar, the sample consists of upper caste households, including 18 Jats, 4 Kumhars, 2 Chimpas, 2 Carpenters, and 1 Barber.
TABLE 24

JANANIA LANDHOLDINGS BY CASTE

<table>
<thead>
<tr>
<th>Caste</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jat (n=38)</td>
<td>23.64</td>
</tr>
<tr>
<td>Kumhar (n=12)</td>
<td>18.31</td>
</tr>
<tr>
<td>Chimpa (n=6)</td>
<td>7.71</td>
</tr>
<tr>
<td>Khati (n=4)</td>
<td>16.56</td>
</tr>
<tr>
<td>Nai (n=1)</td>
<td>8.75</td>
</tr>
<tr>
<td>Bania (n=1)</td>
<td>0.00</td>
</tr>
<tr>
<td>Chamar (n=15)</td>
<td>6.38</td>
</tr>
<tr>
<td>Nyak (n=13)</td>
<td>3.08</td>
</tr>
</tbody>
</table>

The average size of the 25 sample farms is 24.79 acres. The actual land area controlled, however, is slightly greater than this because of land rentals. Ten of the sample farms rent land in, and four farms rent land out. During Rabi 1981, the average area controlled by sample farmers was 26.21 acres.

Cropping Pattern. The cropping pattern for sample farmers is given in Table 25 (kharif) and Table 26 (rabi). As in Kutiana, the rabi season is cropped more extensively, with a disproportionate emphasis on gram; the kharif crops show more diversity. The major kharif crop in Janania is terda, a mixed crop consisting mostly of millet, with varying amounts of cowpea, lentils (moong, moht), oilseed (til), and melons. This is strictly an unirrigated crop, designed to minimize crop risk while maximizing total yields. Cotton was grown by only 9 sample farmers, and
### TABLE 25

**JANANIA: RABI CROPPING PATTERN**  
*(1980/81 AND 1981/82) FOR SAMPLE FARMERS, IN ACRES*

<table>
<thead>
<tr>
<th></th>
<th>Gram</th>
<th>Wheat</th>
<th>Mustard</th>
<th>Rape</th>
<th>Barley</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1981/82</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irrigated</td>
<td>24.1</td>
<td>27.2</td>
<td>2.8</td>
<td>0</td>
<td>0</td>
<td>54.1</td>
</tr>
<tr>
<td>(% of crop)</td>
<td>(4.3%)</td>
<td>(100%)</td>
<td>(100%)</td>
<td></td>
<td></td>
<td>(8.9%)</td>
</tr>
<tr>
<td>Unirrigated</td>
<td>538.7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>17.5</td>
<td>556.2</td>
</tr>
<tr>
<td>(% of crop)</td>
<td>(95.8%)</td>
<td></td>
<td></td>
<td></td>
<td>(100%)</td>
<td>(91.1%)</td>
</tr>
<tr>
<td>TOTAL (n=25)</td>
<td>562.8</td>
<td>27.2</td>
<td>2.8</td>
<td>0</td>
<td>17.5</td>
<td>610.3</td>
</tr>
<tr>
<td>% of Rabi</td>
<td>(92.2%)</td>
<td>(4.5%)</td>
<td>(4.6%)</td>
<td></td>
<td>(2.9%)</td>
<td>(100%)</td>
</tr>
</tbody>
</table>

| **1980/81** |      |       |         |      |        |       |
| TOTAL (n=15) | 201.3 | 15.7  | 1.9     | 36.2 | 22.8   | 277.9 |
| (n=15)      | (72.5%) | (5.6%) | (0.7%)  | (13.0%) | (8.2%) | (100%) |

### TABLE 26

**JANANIA: KHARIF CROPPING PATTERN**  
*(1981) FOR SAMPLE FARMERS, IN ACRES*

<table>
<thead>
<tr>
<th></th>
<th>Millet</th>
<th>Terda</th>
<th>Cowpea</th>
<th>Cotton</th>
<th>Sorgum</th>
<th>Peanut</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Irrigated</strong></td>
<td>5.6</td>
<td>0</td>
<td>13.1</td>
<td>13.1</td>
<td>0.8</td>
<td>9.1</td>
<td>41.7</td>
</tr>
<tr>
<td>(% crop)</td>
<td>(24.5%)</td>
<td>(12.6%)</td>
<td>(100%)</td>
<td>(100%)</td>
<td>(16.0%)</td>
<td>(100%)</td>
<td>(15.5%)</td>
</tr>
<tr>
<td><strong>Unirrigated</strong></td>
<td>17.3</td>
<td>114.7</td>
<td>91.3</td>
<td>0</td>
<td>3.7</td>
<td>0</td>
<td>227.0</td>
</tr>
<tr>
<td>(% crop)</td>
<td>(75.5%)</td>
<td>(100%)</td>
<td>(87.4%)</td>
<td>(100%)</td>
<td>(78.0%)</td>
<td>(100%)</td>
<td>(84.5%)</td>
</tr>
<tr>
<td><strong>TOTAL (n=25)</strong></td>
<td>22.9</td>
<td>114.7</td>
<td>104.4</td>
<td>13.1</td>
<td>4.5</td>
<td>9.1</td>
<td>268.7</td>
</tr>
<tr>
<td>(% Kharif)</td>
<td>(8.5%)</td>
<td>(42.7%)</td>
<td>(38.8%)</td>
<td>(4.9%)</td>
<td>(1.7%)</td>
<td>(3.4%)</td>
<td>(100%)</td>
</tr>
</tbody>
</table>
only in one instance was narma grown rather than kapas. Peanuts (mungfli) are also popular among farmers with irrigated land. Most farmers who plant cotton also plant peanuts. In terms of the proportion of cropped land irrigated, 16% of the kharif acreage was irrigated, 9% of the 1981/82 rabi acreage and 10% of the 1980/81 rabi acreage (this last figure based on extrapolation; see footnote below).

The 1980/81 rabi cropping data is presented in tandem with the 1981/82 data in Table 25. The former crop was largely destroyed by a hail storm on March 21, 1981 (while Kutiana fields were only mildly affected). The average yield information for that year is thus not representative, but the cropping pattern is given for purposes of comparison (in Chapter 6) with the Kutiana pattern of the same year.

Livestock. The economic significance of small stock can be seen from the livestock data presented in Table 27. Eight households have one or more members, usually children, involved full-time in tending flocks of sheep and goats.

3. The 1981/82 rabi season was the wettest in memory, resulting in an unusually high cropping intensity. Thus, all comparative analysis between the two villages which are based on rabi data, refer to either one season or the other, but do not mix data from the two rabi seasons. The two Kharif seasons (1980 and 1981) experienced fairly similar rainfall patterns (according to farmers) and the later comparative analysis is based on a mixture of data (in the case of Kutiana) from both Kharif seasons.
In addition, four other households are employed in trading goats regionally, buying in the surrounding villages and selling them in Punjab. This occupational strategy is described in the next section. Shepherding is generally a Harijan occupation, though as happened also in Kutiana, one Jat family has purchased a flock of sheep and goats. In Janania also, there is one Jat family which has designated a son to be a shepherd. All other cases are Harijan households: two Nyaks and five Chamars.

Janania households sell surplus ghee, but do not deliberately pursue a dairy-focused economy. One bania from the adjacent village of Phephana makes regular visits to Janania (in his Jeep) to collect ghee. There is always a demand for "desi ghee" in the towns, and the bania can make a profit on the transaction, while recovering partial payment from the farmers on debts incurred at the bania’s shop.

**TABLE 27**

LIVESTOCK IN JANANIA:
HOUSEHOLD AVERAGES (N=90)

<table>
<thead>
<tr>
<th></th>
<th>Farming hslds (n=63)</th>
<th>Non-farming hslds (n=27)</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camels</td>
<td>1.00</td>
<td>0.07</td>
<td>0.72</td>
</tr>
<tr>
<td>Buffalo</td>
<td>1.19</td>
<td>0.15</td>
<td>0.88</td>
</tr>
<tr>
<td>Cows</td>
<td>0.57</td>
<td>0.48</td>
<td>0.54</td>
</tr>
<tr>
<td>Sheep</td>
<td>1.00</td>
<td>6.81</td>
<td>2.74</td>
</tr>
<tr>
<td>Goats</td>
<td>0.59</td>
<td>3.07</td>
<td>1.33</td>
</tr>
</tbody>
</table>
Agricultural Equipment. Major equipment among Janania sample farmers consists of one tractor and one pump for lifting irrigation water from the watercourse to higher ground. There are no tubewells. The tractor belongs to one of the 3 largest landowners who uses it on his own land (31 irrigated and 34 unirrigated acres) and also rents out his services. In March 1982, a second tractor appeared in the village, owned jointly by a resident and his affinal kin. The motivation in purchasing it was strictly entrepreneurial; the Janania family owns no irrigated land, and has six adult sons who can easily handle the farm work by camel. The son who arranged the purchase has become a shopkeeper and trader, and will use the tractor primarily for transporting commodities.

The largest equipment investment in the village is non-agricultural. Two brothers (separate households) purchased two trucks (at a price equivalent to 10 new tractors: Rs. 500,000) which ferry merchandise between Delhi and the Tehsil center of Nohar. This enterprise is included under the description of the non-farm economy.

Agricultural Credit. The main source of credit for Janania farmers is the Cooperative Society, which extends loans at 15% interest. Commercial bank loans are rare, and are used only for major financing (e.g., the two tractors and trucks). The Cooperative Society has loans outstanding to 33 households at an average of Rs. 1,007 each. Most
households (62% of the village as a whole) have no bank loans of any kind. Ignoring the three commercial bank loans in the village (two tractors and trucks), the average level of bank credit for all Janania households is Rs. 369.

Two other important sources of credit to Janania villagers are: (1) banias and (2) land mortgages. Banias extend credit on goods purchased in their shops, and for some clients, will advance cash as well. There are three outside banias who provide credit to Jananians; two are based in Phephana, and one in Jamal. Informants claimed that most farming households have an account with one of these banias, with amounts ranging from Rs. 300 to Rs. 5,500. The only member of the bania caste who resides in Janania is an impoverished alcoholic who maintains a tiny shop in the village and is not a source of credit. One other shopkeeper, however, plays the role of a bania, though he is a Jat. In imitating the business behavior of caste banias (e.g., in combining retail trade with commodity trading and money lending), his case illustrates the economic function of banias in village society:

At age 18, with two older brother farming the family land, a third older brother employed outside as a truck driver, and two younger brothers, Mahabir has diversified into the world of business. Having established a village shop two years previously, Mahabir has steadily expanded his inventory and has extended credit. Recently he has begun
to trade in grain, capturing 71% of the Janania market for the 1981 kharif, and is half owner of the second tractor in the village. As small as his enterprise is by the standards of outside banias, it is a significant force within the village economy. In April 1981, he had extended Rs. 9,192 in credit to 68 households, or Rs. 135 per family.

Land mortgages involve personal loans between two landowners, with land serving as collateral, and the use of the land providing payment in lieu of interest. The standard rate is Rs. 1,000 per bigha (Rs. 1,600/acre) for unirrigated land, or an effective rental price (at 15%/year) of Rs. 150/bigha. In the only case of direct land rental among the sample farmers, the rate was Rs. 178/acre, equivalent to a mortgage rate of 18%. Four sample farmers \( (n=34) \) were indebted in this way, with loans ranging from Rs. 1,500 for two bighas, to Rs. 20,000 for 19 bighas.

**Farming Operations.** Table 28 summarizes the major agricultural operations by crop. For those farmers who plant wheat, it is their most intensively cultivated crop, receiving more soil preparation and irrigation water than either cotton or peanuts. The kharif crop of terda is the most labor extensive crop, in one fourth of the cases not receiving any pre-sowing plowings.
**Table 28**

Frequency of Major Agricultural Operations by Crop for Janania Sample Farmers

<table>
<thead>
<tr>
<th></th>
<th>Gram</th>
<th>Wheat</th>
<th>Millet</th>
<th>Terda</th>
<th>Cowpea</th>
<th>Cotton</th>
<th>Peanut</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plowing</strong></td>
<td>1.50</td>
<td>2.90</td>
<td>1.44</td>
<td>0.72</td>
<td>1.23</td>
<td>1.56</td>
<td>1.91</td>
</tr>
<tr>
<td><strong>Hand weeding</strong></td>
<td>0.41</td>
<td>1.00</td>
<td>0.92</td>
<td>1.00</td>
<td>0.95</td>
<td>1.56</td>
<td>1.45</td>
</tr>
<tr>
<td><strong>Plow weeding</strong></td>
<td>--</td>
<td>--</td>
<td>0.27</td>
<td>--</td>
<td>--</td>
<td>1.00</td>
<td>--</td>
</tr>
<tr>
<td><strong>Irrigation</strong></td>
<td>1.70</td>
<td>5.25</td>
<td>1.17</td>
<td>--</td>
<td>1.75</td>
<td>3.00</td>
<td>4.00</td>
</tr>
<tr>
<td><strong>Fertilizer</strong></td>
<td>--</td>
<td>--</td>
<td>1.47</td>
<td>0.83</td>
<td>--</td>
<td>1.50</td>
<td>0.71</td>
</tr>
<tr>
<td><strong>Pesticide</strong></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>0.33</td>
</tr>
</tbody>
</table>

* Figures apply to irrigated fields only.

**Farm Labor.** About half of the sample farmers (48%) hired no labor during the 1982 rabi harvest. Since the rabi harvest is normally the most intensive agricultural work period of the entire year, and since the 1982 harvest was particularly bountiful, this figure represents the upper extreme of agricultural labor demand in the village. Only 36% of the sample households reported hiring any labor during the 1981 kharif harvest and rabi planting season.

Family farm labor within the household is divided unevenly between the sexes, with men comprising two thirds (67%) of the adult (age >15) household labor force during the rabi harvest. The average age for adult male workers is 32.3, and for females, 27.0. As in Kutiana, boys are kept
out of the work force in order to go to school, and this is the main reason that girls between ages 11-15 outnumber boy workers of the same ages by more than 2:1 (n=13).

Hired farm labor during the kharif season is generally supplied entirely from within the village. The intensity of the rabi harvest, however, particularly the 1982 rabi harvest, created a level of demand which could not be met by the village labor pool. An average of 20.9 person days of labor was hired by sample farmers during the three weeks of harvest (n=22). Two thirds (65%) of this labor consisted of outside workers. Large farmers hired most of the migrant labor; three of the four largest sample farms accounted for 86% of the outside labor force. Nearly all village laborers hired by sample farmers were Harijans; in only one case which I observed did a non-Harijan work for harvest wages: one Kumhar man who owed Rs. 100 to a Jat landowner repaid the debt through five days of gram harvesting.

Wage rates fluctuate according to the intensity of the harvest (i.e., the demand for labor). A wage distinction is also made between outside migrant labor and local workers, the latter being paid more. Generally, 4

4. It is relatively more common, though still rare, for Jats and Kumhars to hire themselves out for planting operations; in one case a Chamar landowner hired two different Jats to help with the planting.
there is no wage discrimination by sex, though there may be a hiring preference for men. Average daily wage rates for the kharif harvest and rabi planting season were Rs. 11.3. During the rabi harvest, the wage rate for local labor within the sample varied from Rs. 20 to Rs. 25, with an average of Rs. 24.2. At the same time, the rate for migrant labor varied between Rs. 15 to Rs. 18.

Annual labor contracts in Janania are of three types: (1) sharecropping, (2) fixed salary, and (3) individual shares. Sharecropping commits the tenant to perform all tasks himself, but with the use of the landowner's equipment. The tenant's share is 1/3. Workers on a fixed salary or on an individual share are essentially servants to the landowner. They must perform whatever task the farmer orders, but they are not responsible for any management decisions, as the sharecropping tenants are.

Four sample households (all Chamar) are sharecroppers for three Jat households (one Jat landowner has two sharecroppers). Four other households have one member employed on an annual fixed salary with Jat and Kumhar landowners. Three are Harijans from Janania; the fourth is from outside Janania and has been employed to work in the (irrigated) village of Topria (Rajasthan) on land owned by a Janania Kumhar family. This represents the only case of permanent outside labor hired by a Janania farmer.
Eight siris work on an individual share basis. All are from the village, with shares ranging from 1/8 to 1/12. Three of these siris are of the Kumhar caste, two of whom are employed by wealthy households of the same caste. These two also work in the village of Topria on irrigated land owned by their employers (who are relatives). The remaining five siris are Chamars and work for Jat and Kumhar households.

Yields. The average yield for major crops is given in Table 29. Rabi yields were not available since the 1981 standing crop was largely destroyed by hail (as mentioned above). The kharif yields also require explanation. Because of the common practice of mixed crops of millet and cowpea (terda), as well as pure stands of the two crops, the yield data for millet and cowpea were combined and then divided equally at 1.5 quintals/acre.

| TABLE 29 |
|-----------------------|-------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| YIELDS OF MAJOR CROPS FOR JANANIA SAMPLE FARMERS | (KHARIF 1981, RABI 1981/82) IN QUINTALS/acre |
| Millet  | Cowpea  | Cotton  | Peanuts  | Wheat  | Gram  |
| 1.5     | 1.5     | 4.0     | 5.6      | --     | --    |
Marketing. The main cash crops are gram, peanuts, govara, and cotton. The data in Table 30 summarize the marketing significance of these crops. Note that the percentage of farmers who marketed the crop refers to all those who planted that crop; the percentage of crop sold refers only to those farmers who marketed some portion of their crop.

<table>
<thead>
<tr>
<th></th>
<th>Millet</th>
<th>Cowpea</th>
<th>Cotton</th>
<th>Peanut</th>
</tr>
</thead>
<tbody>
<tr>
<td>% farmers who marketed crop</td>
<td>9.5%</td>
<td>(100%)</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Amount sold (qts.)</td>
<td>2.30</td>
<td>4.75</td>
<td>6.52</td>
<td>5.45</td>
</tr>
<tr>
<td>% of crop sold</td>
<td>46%</td>
<td>89.1%</td>
<td>97%</td>
<td>95%</td>
</tr>
<tr>
<td>% sales to local banias</td>
<td>100%</td>
<td>93%</td>
<td>100%</td>
<td>91%</td>
</tr>
</tbody>
</table>

Nearly all of the local commodity sales are to Mahabir, the Jat shopkeeper who serves the role of bania. In addition to him, two other Jats, both of whom are full-time farmers, also engage in some commodity speculation, buying produce both in Janania and in other villages, and reselling it in the Nohar market.
The Non-Farming Economy

In the previous section, the agricultural economy of Janania was described using data from farm sample households. Part-time farmers, as well as sharecroppers, were not included; of the 40 sample households in which survey data were collected, 12 were excluded from the farming subsample. Most of these "non-farming" households engage in agriculture to some degree but their landholdings are too small (an average of 4.6 unirrigated acres per household) to rely on exclusively. Some households add to their incomes through sharecropping or agricultural labor, as was discussed above. Many others have diversified into the non-agricultural sector.

The non-farming economy of Janania is dominated by these land-poor "non-farming" families, all of whom belong to Harijan castes. However, the non-farm economy also includes some of the wealthiest landowning families of the village, as well as the traditional service castes (Barber, Carpenter). Occupational diversification is a necessity for the poor, an opportunity for the wealthy, and a tradition for the service castes. In this section non-farm employment is examined under the categories of (1) village occupations and (2) outside occupations.

Village Occupations. There are no public work schemes in Janania, and hence limited opportunities for casual non-farm labor. The only wage-earning activities
which are not entrepreneurial are construction-related. Four men from sample households (n=40), including one upper caste (Kumhar) man, were engaged as laborers in house construction during the five month Rabi season, for an average of 7.8 days, at Rs. 10 per day. All other non-farm employment in the village involves individual entrepreneurship covering a variety of occupations, listed in the table below.

**TABLE 31**

NON-AGRICULTURAL OCCUPATIONS IN JANANIA: NUMBER OF HOUSEHOLDS, BY CASTE (1982)

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Low Caste (Harijan)</th>
<th>Upper Caste (Non-Harijan)</th>
<th>% of Hlds (n=90)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tailor</td>
<td>2</td>
<td>3</td>
<td>5.6%</td>
</tr>
<tr>
<td>Doctor</td>
<td>0</td>
<td>4</td>
<td>4.4%</td>
</tr>
<tr>
<td>Shopkeeper</td>
<td>0</td>
<td>3</td>
<td>3.3%</td>
</tr>
<tr>
<td>Contractor</td>
<td>0</td>
<td>2</td>
<td>2.2%</td>
</tr>
<tr>
<td>Carpenter</td>
<td>0</td>
<td>1</td>
<td>1.1%</td>
</tr>
<tr>
<td>Barber</td>
<td>0</td>
<td>1</td>
<td>1.1%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>2</td>
<td>14</td>
<td>17.8%</td>
</tr>
</tbody>
</table>

The occupations listed in Table 31 represent vocational skills which require an investment of both time and equipment. A tailor, for example, typically spends one year as an unpaid apprentice; the price of a used hand-powered sewing machine is ca. Rs. 1,000. Of the 5 tailors in Janania, only two work full-time; these are the two Harijan (Chamar) tailors who cannot afford such a large
investment without steady returns from it. A contractor must purchase trowels, plumb bobs, and measuring tapes, and must have available cash to pay his labor. He is paid Rs. 25 to Rs. 30 per day, or three times the wages of the laborers who work with him.

The profession of "doctor" is rapidly growing in popularity in Rajasthan villages (Gandhi 1982). Young men who have passed their matriculation exams are often able to obtain a certificate as a Registered Medical Practitioner (RMP), or can claim the status of doctor even without it. Giving injections and dispensing tablets cater to a strong demand for "English medicine" which can be extremely lucrative to the doctor. There are no Harijan doctors in Janania; the Jat doctors willingly treat Harijan patients, but it is unlikely that a Jat patient would be willing to undergo treatment from a Harijan.

There are only two resident service caste households that engage in their traditional occupations: the Barber and one of the four Carpenters. Both have land and are primarily farmers (the barber is included in the farmer subsample). The barber works for 54 of the 62 upper caste households; the carpenter is barsodi to fewer than five houses, and does some additional carpentry work on a wage basis. All other service caste functions, including one priest, two carpenters, two cobblers, four sweepers, and two additional
tailors, are provided by specialists based in Jamal and other surrounding villages.

Outside Occupations. Non-agricultural employment outside the village covers a wide range of activities and is also caste-linked (see Table 32). One Harijan (Nyak) man has a full-time job with the canal department; this job is open to anyone, but it is only the low castes who are desperate enough to accept a salary of only Rs. 300 per month. Three other Nyak households are primarily goat traders, buying goats (for Rs. 150 each) from villages in the region, then shipping them by truck to Punjab, where they sell for ca. Rs. 200 each. This can be quite profitable, but is not done by the upper castes, since goats are considered ritually unclean, and are sold for slaughter.

TABLE 32
OUTSIDE NON-AGRICULTURAL OCCUPATIONS FOR JANANIA HOUSEHOLDS (1982)

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Low Caste (Harijan)</th>
<th>Upper Caste (Non-Harijan)</th>
<th>% of Hlds (n=90)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goat trading</td>
<td>3</td>
<td>0</td>
<td>3.3%</td>
</tr>
<tr>
<td>Truck driver</td>
<td>0</td>
<td>3</td>
<td>3.3%</td>
</tr>
<tr>
<td>Bus conductor</td>
<td>0</td>
<td>2</td>
<td>2.2%</td>
</tr>
<tr>
<td>Canal maintenance</td>
<td>1</td>
<td>0</td>
<td>1.1%</td>
</tr>
<tr>
<td>Tailor</td>
<td>0</td>
<td>2</td>
<td>2.2%</td>
</tr>
<tr>
<td>School master</td>
<td>0</td>
<td>2</td>
<td>2.2%</td>
</tr>
<tr>
<td>Bank inspector</td>
<td>0</td>
<td>1</td>
<td>1.1%</td>
</tr>
<tr>
<td>Revenue Patwari</td>
<td>0</td>
<td>1</td>
<td>1.1%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>4</strong></td>
<td><strong>11</strong></td>
<td><strong>16.7%</strong></td>
</tr>
</tbody>
</table>
Outside occupations generally require a specific skill and, in the case of most upper caste occupations, a minimum level of education as well. The school masters, bank inspector, and patwari are among the most respected, and the most educated, men in Janania. Though they are often out of the village for weeks at a time, they continue to play an important role in Janania society.

In addition to the full-time occupations listed in Table 31, several households engage in part-time enterprises outside the village. Both contractors, one of the tailors and one doctor (listed above in Table 30) divide their time between Janania and nearby villages. One of the village tailors, who is also a farmer, still finds time to trade in camels on occasion, travelling to camel fairs in Rajasthan and returning with up to 10 camels, to be sold locally. Another farmer owns a camel cart and earns extra money transporting produce to and from Sirsa (27 km).

Social Structure

The 658 residents of Janania are divided among 8 caste groups, 13 gotras, and 90 households. The socially motivated spatial structure of the village can be seen in Map 4 (Appendix A). As in Kutiana, the castes are grouped into neighborhoods (bastis) which are subdivided by lineage. This section considers social structure on two levels: (1) the village and (2) the household.
**Village Social Structure.** The original caste-based neighborhoods are becoming less rigid as recently fissioned households move to the outskirts of the village. Household #87, for example, a Nyak house, is isolated on the NE edge of the village, with Jats the nearest neighbors. Similarly, two Chamar brothers (Hslds #79 and #80) have moved to the southern edge of the village in the midst of a cluster of Jat and Chimpa fissioners (Hslds #81-84).

This process is part of the expansion which takes place as upper caste sons fission from their parental households. If there is no room for a new house immediately adjacent to (or sometimes within) the parental compound, the son typically moves into the family’s stable area (nora) which is usually on the outskirts of the village. Harijan households do not often own separate noras but may move into one if there is a social tie between the owner and the mover. The natural process of population expansion continually alters the spatial relations among caste and lineage groups.

The daily social intercourse of Janania is loosely structured by neighborhoods into three centers of interaction: (1) a Harijan group which includes both Nyaks and Chamars, (2) a large, amorphorous collection of Chamars, Jats, and Chimpas that gathers in the plaza area or in front of the main village shop, and (3) a neighborhood group of Kumhars, and Char Jats who socialize in the small plaza of...
their neighborhood. Card playing (but not gambling) and idle talk, or merely smoking hookah provide the focus of these groups.

No segment of the village, whether defined by caste or by neighborhood, is socially separate from the rest of the village (as the Siami caste is in Kutiana). There is only one major factional division in Janania which stems from, or is reflected in, a recent land dispute. Many years ago, an unscrupulous patwari from Phephana usurped 10 bighas (6.25 acres) of communal land, by simply changing the records. In 1978 he sold the land to three Beniwal Jat families. Two Janania families, one Kumhar and one Khati, brought suit against the Beniwals, a case which was still pending in 1982. There is now a rift between the Beniwals directly involved and those sympathetic to them, and the families bringing suit, along with their sympathizers.

The prevailing atmosphere in the village, however, is one of cooperation. One village-wide benefit of the limited irrigation water has been the capability of replenishing the drinking pond. During the dry Spring season, when the pond water becomes depleted, the canal department allows the villagers to excavate a temporary channel, ca. 2 km long, tapping into the canal. Each household pays a Rs. 5 tax for this service, and the villagers perform the labor themselves. In March 1982, the decision of when to dig the channel was reached by consensus
among the village elders and leaders (who are not all old); every household supplied (male) labor, and every worker dug equal portions as laid out by a measuring stick.

Village-level ties which cement social bonds across caste and neighborhood lines include the economic institution of siri, the social institution of dharm bhai/behen relations, and informal friendships. Siri contracts among some of the founding families take on an air closer to paternalism than exploitation, and can involve real friendships as well. One example is a Chamar siri who works for a Kumhar landowner. The Chamar is the closest friend of the landowner’s nephew, himself a wealthy young farmer; the Chamar goes to the uncle’s house as a servant, but visits the nephew’s home as a friend. Another case is the dharm bhai relationship between a Chamar and an Olakh Jat. Though the Jat died a few years ago, his sons and nephews mention their friendship and recognize a continuation of the fictive kin obligations.

Finally, a ritualized exchange of labor called lass provides landowner assistance to poor Harijans who lack the equipment to cultivate their landholdings. The Jat landowner is called upon to provide his camel for planting the crop, as well as ghee, sugar and flour to prepare halava, a food which ritualizes the procedure into a social rather than an economic event. In the only case of this reported, two Beniwal Jats provided the materials, and
planted seven bighas of terda for two Nyaks. When the planting was finished they celebrated with halava. Informants claim that the tradition was once common as a reciprocal exchange among all Jats, but is rarely practiced today.

**Household Structure.** The composition of Janania households encompasses a broad range of family types. There is one case of a Nyak man living alone, having been deserted by his wife and children; one Kumhar man has two wives, after the first wife bore only one daughter in their first twelve years of marriage (his second wife bore the long awaited son in 1982); one Jat family includes 4 sons married to 4 sisters, all living jointly with their children and parents; another Jat family is composed of 3 married brothers all with children, who have remained together even though both parents have died. There is only one bachelor in the village. The average household size is 7.20. A summary of household types is presented in Chapter 6 (Table 43).

A distinctive feature of Janania household arrangements is the fissioning of ancestral house plots resulting in a row of households each of which may be a joint family, all occupying the ancestral compound area. I refer to this phenomenon as the "joint lineage". Though each household is a separate economic entity, the heritage of direct kinship is shared; it is "joint" in a social
rather than a corporate sense. An example can be cited from the village map in Appendix A (Map 4). Households #39-42 are headed by four Olakh brothers who once lived jointly. They now share a semi-private alley where they socialize in the evenings. Three of the four households are themselves joint families having two or three married sons.

Religion and Cultural Values

The Brahmin priest who tends to the needs of Janania's upper castes lives in Jamal and visits Janania as needed. The only temple in the village is for Guga and is tended by a Bhagat who is a Kumhar farmer. There is thus no village-wide symbol of All-India Hinduism. The public places of religious importance include a small shrine to Baumia (founding spirit of the village), a sacred tree for Ket Pal, and a chauk (platform for donating grain to the birds).

All residents of Janania are Hindu, and except for a single Bishnoi family, the religious beliefs and observances are traditional, mainstream Bagri Hinduism. The

5. A Hindu temple was built in 1983, the year following fieldwork.

Bishnoi household and one recently fissioned Jat household are the only two cases (n=36) of households lacking a shrine. Of the 94% of sample households that have shrines, the average number is 1.3, with a maximum of 4. The shrines represent 13 different deities. Guga is the most widely worshiped deity (62% of sample households) among all caste groups, and particularly by Beniwal Jats. The Rajasthani deity, Ramdevji, is honored in 42% of households. Only three All-India deities are recognized with shrines: Kalka Devi (in 15% of households), Hanuman (21%), and Durga (3%).

**Prestige Behavior.** The use of domestic architecture as an indicator of prestige is a well-understood concept in Janania. The three largest landowners in the village can be readily identified from the houses they have built -- large rooms of pukka brick with upper story rooms. The great majority of villagers, however, including the middle-class farmers, have not attempted to compete in architectural displays of wealth. Only 19% of sample houses are embellished with a pukka entranceway; among farming households, the figure is 28%. There are no Harijan houses with any pukka construction.

Material possessions for the home tend to be traditional, utilitarian items. Only 17% of sample households own a chair, and only 8% own a table. Stainless steel utensils are found in 14% of the houses. Personal possessions incorporating modern technology are more
popular; 33% of sample households own a radio, and 67% of household heads own a watch.

Purdah and Caste Values. The architectural correlates of purdah restrictions can be seen in the arrangement of joint lineage house clusters which protect the inner courtyards from public view with an extra level of architecture. The privacy index for the sample households as a whole is 78%, and for farming households 93%. The higher level of privacy among farming households has to do both with their wealth (larger houses provide more scope for privacy), the practice of joint lineage arrangements, and the need for a larger cattle area which is always placed toward the front, thus creating greater seclusion for the living area.

Social divisions along caste lines are seen in the spatial grouping of caste neighborhoods. Recently fissioned Harijan households have moved beyond the traditional boundaries of their basti, but even their new locations reflect a caste-linked dependence on the wealthier upper castes.
CHAPTER 6

DATA ANALYSIS

This chapter presents a comparative analysis of the data outlined above for the two study villages. The overall objective is to test the hypotheses discussed in Chapter 2, i.e., to measure, insofar as is possible, the economic, social, and cultural effects of irrigation development within the study region. The comparison of the two villages is "controlled" in the sense that Kutiana and Janania have many similarities, with the important exception of irrigation intensity. However, as noted in the discussion of methodology (see Chapter 3), a simple comparison between the two villages cannot yield simple answers about irrigation's impacts.

Both study villages participate in the same local economy, and both villages have experienced significant change that can be traced wholly or in part to the introduction of canal irrigation in 1954. The primary difference in terms of the source of this impact is that in the case of Kutiana, the irrigation waters have had a direct effect on every farming household, whereas in Janania, only a minority of farmers own irrigated land. The indirect effects of irrigation on the regional economy, e.g.,
non-agricultural employment opportunities, have been relatively more important to the Janania economy than has the direct effect of irrigation in one portion of the village fields.

Since both villages reflect irrigation-induced changes, a "control" situation as commonly practiced in laboratory experiments -- in which one subject is totally isolated from the effects of some independent variable -- is clearly not possible. However, important elements of control do exist; the study villages have more common features than contrasting ones, in terms of culture, geography, and even economy. The research utility of a closely matched pair of villages is not that comparative analysis will provide ready answers to questions of impact by an independent variable; rather, the analysis of two sets of comparable data serves to structure an argument. The argument in this case is that canal irrigation will have certain repercussions on village life, as spelled out in the hypotheses.

The "settling of the argument" or "testing of the hypotheses" entails looking at two different situations: a village that is heavily irrigated and one which is much less so. The differences between the two sets of data can then be measured and, in so far as possible, explained. Since the research situation is something less than fully controlled, however, the validity of the explanation rests
more on reason than on proof. It is conceivable, for example, that the higher yields of Kutiana agriculture are due to a peculiarity of the soil in certain fields, rather than to irrigation. No soil tests were taken in either village; however, the consistency of the data from both villages, as well as farmer opinion, suggests that the soils are more or less identical; it would not seem reasonable to assume otherwise.

The utility of a comparative approach is in providing substantive data with which to apply a reasoned analysis. If Geertz' (1973a:38) characterization of a society as a "chameleon" is apt, an analysis of a single variant (e.g., one village) of a society should be fraught with difficulty. If "a society tunes itself to its landscape...until it seems to an outside observer that...it could not be otherwise than what it is," a comparative approach is useful in providing two (or more) variations on a single cultural theme.

The following analysis attempts to demonstrate the effects of irrigation development by comparing two villages that have been affected differently. For the most part, it is the villages, as represented by the 40 sample household in each, which are compared. The agricultural comparisons depend on a subsample from this of the farming households (26 and 25 in Kutiana and Janania respectively). At times, the villages are compared in toto, e.g., in considering
employment outside the village, since the number of cases within the sample households is insufficient. At other times, subsamples within one village are compared, e.g., by caste or landholdings.

This chapter follows the same organizational framework used in the preceding chapters. A discussion of irrigation's economic impacts, and analysis of the data is presented in the first section. The socio-economic impacts are considered in the next section, and the effects on cultural values are considered in the third and final section.

**Analysis of Economic Impacts**

The most obvious and immediate changes brought about by irrigation have been agricultural -- new crop types, new varieties of old types, and new techniques and practices. These kinds of changes are normally associated with irrigation development, but not necessarily to the degree experienced in the Bagri region. Because of the semi-arid climate, the pre-irrigation cropping pattern was mostly limited to drought-resistant varieties. Wheat, for example, was not generally grown at all, because of the high probability of crop failure. Cotton was even more uncommon for the same reason.

The fact that the availability of canal water was followed ten years later by the introduction of new high
yielding varieties of wheat, heralding the Green Revolution, meant that irrigated farmers were dealt a double dose of irrigation-related impacts. To farmers without irrigation, the package of Green Revolution inputs (HYV's, fertilizers, pesticides) was largely irrelevant to the Bagri farmer. Those farmers who had irrigated land, however, were confronted with a continual transformation of their agricultural world from the first introduction of canal water in 1954, to attainment of maximum canal capacity by the early 1960s, to the introduction of Mexican wheat varieties in the mid-late 1960s, and the increasing availability since then of commercial fertilizers, pesticides, mechanical threshers and tractors.

In this section, the nature of irrigation effects on the agricultural economies of the two study villages is analyzed using the comparative approach. Data on agricultural inputs and outputs are compared for one agricultural year (kharif and rabi seasons) and analyzed with respect to the hypotheses presented in Chapter 2. Each hypothesis is tested on two levels: (1) at an empirical level, documenting differences between the two study villages, and (2) at an inferential level, seeking to isolate the role of irrigation as a causal factor in those differences.

A particular difficulty with the agricultural data is the elusiveness of a representative season which can
provide a fair comparison. For example, my original research design called for data collection on the 1980/81 rabi season in both study villages, thus controlling for vagaries of rainfall. Unfortunately, a violent hailstorm in March, just before the harvest, destroyed from 20% to 50% of the Janania crop, while affecting Kutiana fields (which are only 3 to 6 km distant) only marginally. Although I was able to gather data on the Janania cropping pattern for this season, the data on yields were of little use, and have not been incorporated into the analysis.

The following rabi season (1981/82) was the wettest in memory, and again would not have provided a representative picture of crop yields in the "dry" village of Janania. In order to generate reasonable figures for rabi yields in the absence of representative real data, the rabi yields for Janania have been estimated from the Kutiana data. In the case of wheat, the Kutiana figure has been borrowed intact, since in both villages, wheat is always irrigated. For gram, the only other major rabi crop, the average yields for Kutiana were calculated for irrigated and unirrigated fields, and then applied to Janania according to the proportions of irrigated gram (5.5%) and unirrigated gram (94.5%) during the 1980/81 rabi season.

Comparison of the kharif seasons posed a different sort of difficulty. According to farmers, the two years experienced similar weather patterns; however irrigation was
disrupted for five weeks during May/June 1981 while the main Bhakra canal was cleaned for the first time since its construction. The disruption was announced well in advance so the farmers could adjust their cropping decisions; thus, the 1981 kharif cropping pattern in Kutiana and in the irrigated portions of Janania, is somewhat abnormal. For comparative purposes, therefore, the 1980 kharif in Kutiana is to be compared with the 1981 kharif in Janania.

To summarize the sources of agricultural data: Kutiana is represented by complete data for the 1980 kharif and 1980/81 rabi, and by data on cropping pattern and pre-harvest practices for the 1981 kharif. Janania is represented by data on cropping patterns for the 1980/81 rabi, complete data for the 1981 kharif, and cropping pattern and pre-harvest practices for the 1981/82 rabi.

The sample of "farming households" in each village consists of landowning households whose major source of in-village income derives from agriculture on their own land. The Janania sample consists of 25 households; the Kutiana sample is 26 households. As might be expected for a mostly dry village, the mean landholding for sample farmers is slightly larger in Janania (26.21 acres) than in Kutiana (24.75 acres).

The differences between the agricultural economies of the two villages is summarized by the data on costs and returns for two statistically average farms (see Table 33).
The average Kutiana farm of 23.2 acres, has annual capital expenses of Rs. 1,499 and labor costs of Rs. 4,536 against a total gross income of Rs. 30,940. The comparable figure for Janania is Rs. 20,889 (for an average farm of 24.28 acres having capital costs of Rs. 552 and labor costs of Rs. 3,382). Even with the much higher input costs of the Kutiana farm, net returns are 47% higher (Rs. 24,905 compared to Rs. 16,955) than for the average Janania farm.

While the contrast in agricultural net returns is profound, there are other differences which are perhaps more significant to an analysis of irrigation effects. The total labor demand of the average Kutiana farm, for example, is 56% greater than for the average farm in Janania (361 person days versus 232 person days). Furthermore, the labor demand in Kutiana is spread out over a longer planting and harvesting season, because of the flexibility and diversity of irrigated agriculture. Most of the agricultural labor demand in Janania takes place within a

1. In this analysis, household labor is valued at a wage rate of Rs. 12 per hour, which is higher than the slack season wage and lower than the harvest wage. The real opportunity cost of household labor, however, is generally much less than this figure.

2. These figures ignore certain costs such as camel labor, fodder costs, storage and transportation, which are more or less equivalent for both villages. Thus, the actual profit margins are somewhat less than these figures indicate.
two week period during the gram harvest (rabi season) and to a lesser extent, the millet and cowpea harvest (kharif season).

TABLE 33
AGRICULTURAL COSTS AND RETURNS FOR AVERAGE FARMS IN KUTIANA AND JANANIA, 1981/82

<table>
<thead>
<tr>
<th></th>
<th>Kutiana</th>
<th>Janania</th>
<th>Kutiana as % of Janania</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor costs (at Rs. 12/day)</td>
<td>Rs. 4,536</td>
<td>Rs. 3,382</td>
<td>134%</td>
</tr>
<tr>
<td>Capital inputs</td>
<td>1,499</td>
<td>552</td>
<td>172%</td>
</tr>
<tr>
<td>TOTAL COSTS</td>
<td>Rs. 6,035</td>
<td>Rs. 3,934</td>
<td>153%</td>
</tr>
<tr>
<td>Gross returns</td>
<td>30,940</td>
<td>20,889</td>
<td>148%</td>
</tr>
<tr>
<td>Net returns</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>per acre cultivated</td>
<td>879</td>
<td>519</td>
<td>168%</td>
</tr>
<tr>
<td>(# acres)</td>
<td>(28.63)</td>
<td>(32.66)</td>
<td></td>
</tr>
<tr>
<td>per acre controlled</td>
<td>958</td>
<td>647</td>
<td>148%</td>
</tr>
<tr>
<td>(# acres)</td>
<td>(24.66)</td>
<td>(26.21)</td>
<td></td>
</tr>
<tr>
<td>TOTAL NET RETURNS</td>
<td>Rs. 24,905</td>
<td>Rs. 16,955</td>
<td>147%</td>
</tr>
</tbody>
</table>

In years of good rainfall and a bumper crop, as in the 1980/82 rabi, much of the labor demand can be met only by outside workers. While Janania landowners can reap the benefits of a rich harvest, the brief period of intensive harvest employment, even at inflated wage levels, is
insufficient in itself to sustain wage workers through the long slack periods of the agricultural year. In Kutiana, by comparison, both the kharif and rabi harvests extend for more than one month, with threshing operations continuing for another month. The combination of greater demand for labor over a longer period of time has enabled the Kutiana village economy to support landless residents who, had they lived in Janania, would have been forced to migrate out.

A related issue is the higher yields and the greater security of yields in Kutiana. Security stems from irrigation which guarantees that a crop can be planted (whether or not there is any rainfall), and that the crop will grow to maturity. One indirect benefit from irrigation is the greatly reduced danger of a crop becoming covered with sand following duststorms. In Janania, as well as in unirrigated parts of Kutiana, this is a commonly offered explanation for poor yields. Landowners who can be assured of some minimum level of harvest can enter into long-term contractual agreements with laborers, either as siris or as employees paid an annual or monthly salary. The agricultural economy of Kutiana encourages such practices in that there is more work to be done, more time in which to do it, and higher returns from which to pay hired labor.

The specific economic effects of irrigation are discussed below in terms of the research hypotheses
presented in Chapter 2. The economic analysis is divided into three parts: (1) cropping pattern, (2) labor demand, and (3) economic rent. In each section, the original hypotheses are restated and the relevant data from the two study villages compared. Analysis of the two sets of data suggests the extent to which irrigation has been a causal factor in shaping the agricultural economies of both villages, and particularly the more irrigated village of Kutiana.

Cropping Pattern

The most immediate change brought about by the availability of canal water was on crop types and cultivation practices. Revenue records for Kutiana show that the pre-irrigation cropping pattern (1946-50 averages) was drastically different from the present situation; wheat and cotton were not planted at all; cowpea accounted for only 4% of the kharif crop (the 1981 figure in Kutiana is 44%), while moth, which is strictly a supplemental crop today, then comprised 14% of the kharif crop.

The historically documented changes in cropping pattern since 1946-50 reflect not only the impact of irrigation, but also the changes in farming strategy which have occurred simultaneously with but are unrelated to irrigation. The majority of cowpea fields in Kutiana, for example, are not irrigated; moth is not grown as separate
crop today, even by Janania farmers who have no irrigated land. The cropping effects of irrigation are interwoven with historical changes which cannot be isolated simply. Similarly, the synchronic cropping differences between Kutiana and Janania are relatively easy to measure, but to isolate the particular effects attributable to irrigation is more difficult.

**Hypothesis 1:** "Both cropping intensity and land productivity will increase with irrigation."

Contrary to expectations, the cropping intensity of Janania sample farmers is actually higher than that of Kutiana farmers. The Janania index of 125% is 9% greater than the Kutiana index of 116%. Taking a subsample of Janania farmers (n=6) who cultivate only unirrigated land gives an index of 119%, still higher than the Kutiana figure. A subsample of Kutiana farmers (n=14) whose lands are entirely within the irrigation command zone (though there is insufficient water to irrigate the entire area) gives a cropping index of 120%, less than the figure for Janania as a whole, and nearly the same as the unirrigated subsample. The annual cropping intensity in each village appears to have little to do with irrigation per se.

---

3. Annual cropping intensity measures the percentage of cropped area against the total area controlled combining this figure for both the kharif and rabi seasons for a maximum figure of 200%.
A comparison of cropping intensity by season reveals a more intensive utilization of the kharif in Kutiana and a relatively more intense utilization of the rabi season in Janania. The kharif figures are 49% for Kutiana (n=25) and 43% for Janania (n=25). Taking the smaller subsamples, the purely irrigated farms in Kutiana give an index of 52%, while the unirrigated subsample in Janania shows an index of 40%. Again, the subsamples reveal an exaggeration of a trend which is also apparent in the larger sample. Irrigated farms place a greater emphasis on the kharif season than do unirrigated farms. The rabi index for Kutiana is 67% and for Janania, 81%. Figures from the subsamples provide similar indices of 68% (Kutiana irrigated farms) and 79% (Janania unirrigated farms).

The kharif cropping intensities for the two villages can be explained in terms of irrigation, as suggested in the original hypotheses. Irrigation allows the planting of crops before the onset of the summer monsoon. Cotton sowing begins as early as mid-March and continues until May, whereas the monsoon rains normally begin at the end of June or beginning of July. Cowpea and millet are planted in July following the rains. Unirrigated fields generally cannot

4. As noted above, rabi figures refer to the 1980/81 season for both villages. During the much wetter 1981/82 season, the Janania cropping index (n=25) was 93%, and according to informant estimates, the index in Kutiana was between 85% to 90%.
support a healthy crop in two successive seasons; thus, most Janania farmers keep the major portion of their land fallow during the kharif, in order to conserve soil moisture and grow the higher value crop of gram during the rabi season. In Kutiana, where 34% of the gram crop is irrigated, such moisture conservation practices are not necessary, and as a result the kharif cropping index is somewhat higher than in Janania. The margin of difference, however, is very slim (49% versus 43%) and in any case, this type of argument cannot explain the higher rabi index of Janania.

Arguing from logic alone, it would seem clear that irrigation should permit greater cropping intensities because of flexibility in planting schedules, and the assurance of soil moisture for the second crop. Why then is the cropping intensity greater in the mostly unirrigated village of Janania? There may be three forces at work simultaneously. First, Janania farmers appear to be "overproducing", doublecropping unirrigated fields with the expectation of severely limited yields, but nonetheless some return for their labor. Since the opportunity cost of household labor is quite low, and often nil, during the planting season, even a sparse yield can provide a positive marginal return. During the 1981/82 rabi season, when nearly all the fields were under crops, farmers often pointed to the contrast between the gram plants in adjacent fields and explained that millet had been planted in the
previous season, accounting for the reduced size of the plants. Although the millet had used much of the soil moisture (soil nutrients were not considered to be a significant constraint), there was still enough residual moisture to support a weakened second crop of gram.

The second factor accounting for the relatively high cropping intensity of Janania is that Kutiana farmers may be underproducing. Because of the high yields of their irrigated fields, Kutiana farmers can plant fewer acres and still produce more than their Janania counterparts. Whether this strategy is one of choice or constraint is unclear; it may be linked to a problem of salinity build-up. Farmers in Kutiana claim that irrigated land becomes hard (pukka) over the course of many seasons, and gradually loses its ability to support unirrigated crops. Most farmers can irrigate only part of their irrigable area in any one season, depending on canal flow and the farmer's crop mix. As a result, nearly all the irrigable land has been irrigated during some but not all seasons. Water deposited salts may thus constrain Kutiana farmers from planting fields which they will not have sufficient canal

5. While farmers are aware of irrigation's detrimental effects, no real "conservation strategy" has yet evolved whereby farmers deliberately safeguard sections of their irrigable areas.
water to irrigate. In a sense, both the soil and the farmers have become "addicted" to irrigation.

A third and related factor in explaining cropping intensity is the contrast in cropping strategies between the two villages. The more intensive cultivation practices of Kutiana farmers — an emphasis on high value/high input crops such as cotton and wheat — requires more attention to fallow cycles and fertilization. Because of the time required to spread desi khad (manure mixed with compost) on the fields, this operation must be performed during a fallow cycle.

<table>
<thead>
<tr>
<th>TABLE 34</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVERAGE YIELDS FOR KHARIF CROPS</td>
</tr>
<tr>
<td>IN QUINTALS PER ACRE, 1980/81</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Kutiana (1980)</td>
</tr>
<tr>
<td>Janania (1981)</td>
</tr>
</tbody>
</table>

The higher cropping intensity of Janania farmers may also contribute to the relatively low average yields, although the simple fact of irrigation is clearly the primary factor involved. Yields for wheat and gram in Janania were not available, as explained above. However, a comparison of kharif crops demonstrates the basic
differences (see Table 34). It should also be noted that the Kutiana figures derive from the 1980 season which farmers claimed was somewhat drier than the 1981 season. The higher rainfall, as well as more intensive fertilization, may account for the higher cotton yields in Janania.

Hypothesis 2. "There will be a greater emphasis on cash crops under irrigated conditions."

A comparison of the cropping pattern of the two villages strongly supports this hypothesis (see Table 35 and Table 36). During the kharif season, the cash crops of cowpea and cotton account for 75% of Kutiana acreage, whereas in Janania, cash crops (including peanuts) are grown on 47% of the cropped land. When crop productivity and kharif cropping intensity are considered (both are higher in Kutiana), the distinction is even more pronounced.

<table>
<thead>
<tr>
<th></th>
<th>Millet</th>
<th>Terda</th>
<th>Cowpea</th>
<th>Cotton</th>
<th>Sorghum</th>
<th>Peanuts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kutiana</td>
<td>21.1%</td>
<td>---</td>
<td>39.0%</td>
<td>35.8%</td>
<td>4.1%</td>
<td>---</td>
</tr>
<tr>
<td>Janania</td>
<td>8.5%</td>
<td>42.7%</td>
<td>38.8%</td>
<td>4.9%</td>
<td>1.7%</td>
<td>3.4%</td>
</tr>
</tbody>
</table>

**TABLE 35**

**KHARIF CROPPING PATTERN IN KUTIANA AND JANANIA (1981)**
TABLE 36
RABI CROPPING PATTERN IN KUTIANA AND JANANIA (1980/81)

<table>
<thead>
<tr>
<th>Crop</th>
<th>Kutiana</th>
<th>Janania</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gram</td>
<td>78.7%</td>
<td>72.5%</td>
</tr>
<tr>
<td>Wheat</td>
<td>13.5%</td>
<td>5.6%</td>
</tr>
<tr>
<td>Mustard</td>
<td>1.2%</td>
<td>1.9%</td>
</tr>
<tr>
<td>Rape</td>
<td>3.3%</td>
<td>13.0%</td>
</tr>
<tr>
<td>Barley</td>
<td>1.0%</td>
<td>8.2%</td>
</tr>
<tr>
<td>Misc.</td>
<td>2.3%</td>
<td>--</td>
</tr>
</tbody>
</table>

The extent of cash cropping during the rabi season is less clear, however. Gram is the dominant crop in both villages, and has long served as a major cash crop, as well as a major subsistence crop. Indeed, all the rabi crops are grown for both market and domestic consumption. Even wheat, a newly introduced crop, is grown primarily for domestic use, with only 36% of the Kutiana crop going to market. For rabi crops, therefore, the hypothesis holds in the sense that a higher proportion of Kutiana's harvest will be marketed, because the surplus production in Kutiana is higher. Conversely, a higher proportion of Janania's rabi production goes to consumption.

**Hypothesis 3.** "There will be an increase in the use of capital inputs such as improved seeds, fertilizer, pesticides, and mechanized equipment under irrigated conditions."

Kutiana farmers use more capital inputs of all kinds. The difference between the two villages can be seen
by comparing the value of inputs used on the average farm (see Table 37). The average Kutiana farm invests nearly three times as much in fertilizer, more than seven times as much in pesticides, and more than twice as much in renting mechanical threshers. When the farms are compared on a crop by crop basis, however, Janania farmers are seen to invest more in certain crops than their Kutiana counterparts. Both wheat and cotton, for example, are given more fertilizer per acre in Janania fields. The reason may be that since irrigated land is relatively more scarce in Janania, farmers are more conscious of utilizing the resource to full capacity.

**TABLE 37**

CAPITAL INPUT COSTS FOR AVERAGE FARMS IN KUTIANA AND JANANIA, IN RUPEES

<table>
<thead>
<tr>
<th></th>
<th>Kutiana</th>
<th>Janania</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fertilizer</td>
<td>Rs. 873</td>
<td>Rs. 385</td>
</tr>
<tr>
<td>Pesticides</td>
<td>69</td>
<td>9</td>
</tr>
<tr>
<td>Threshing equipment</td>
<td>135</td>
<td>73</td>
</tr>
<tr>
<td>Irrigation tax</td>
<td>422</td>
<td>85</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>Rs. 1,499</strong></td>
<td><strong>Rs. 552</strong></td>
</tr>
</tbody>
</table>

Two important inputs which are not reflected in the value comparison of Table 37 are hybrid seeds and tractors. Hybrid seeds are sold at subsidized prices to
encourage their use, and normally cost no more than the going market value of the food grain. In the case of hybrid gram in 1980, the price of seed was actually less than the market price of gram, yet only three sample farmers in Kutiana planted it. The crops for which HYVs are used include wheat, millet, and narma. Of these, only bajra-104 (the only millet hybrid planted) can be used with or without irrigation, but in fact, its use is mostly limited to irrigated fields. In Janania, 39% of the sample farmers (n=18) plant at least some hybrid millet, but only on irrigated land. In Kutiana, 88% of the sample farmers (n=25) use the hybrid, in two cases on unirrigated land. Farmers in both villages said they prefer the taste of the native (desi) variety, but prefer the yields of the hybrid.

HYV wheat has replaced the indigenous variety almost completely. In Janania, the 15 sample farmers who plant wheat use two different hybrid varieties (147 and 2009); no desi wheat is planted. In Kutiana, every sample farmer plants wheat, including desi and 6 varieties of hybrid. Whereas Janania farmers plant one or the other of two types, Kutiana farmers show a tendency to plant two varieties, a hybrid version of desi wheat (C-306) for home consumption, and a dwarf HYV for market. Of the sample, 28% plant two or more varieties, including three cases of obvious
experimentation with three (two cases) and four (one case) varieties.

Tractors are just beginning to have a major impact on the agricultural economy of Kutiana, and to a lesser extent on Janania as well. The tractor population changed dramatically during the course of fieldwork, from one to five in Kutiana, and from one to two in Janania. The crop data collected, however, reflects a time slice during which only three tractors were active in Kutiana, and only one tractor in Janania. The market for hired tractor labor is still nascent; with some exceptions, the use of tractors by sample farmers in both villages is limited to farmers using their own tractor or a relative’s tractor, with no hiring fee. Because of the small number of cases, statistical correlations are not significant, but based on observation it appears that tractors are purchased by large landowners for use in their own fields, and by smaller landowners for hiring out. The reason for a sudden spate of new tractor purchases in Kutiana is probably traced to new subsidized loan schemes from the Haryana government, aimed at promoting tractors. At the same time, tractor accessories not previously available, e.g., seed drills and cultivators, have increased the utility of tractors. Perhaps of greatest importance is an increased familiarity with tractors; most farmers have at least ridden on a tractor, and probably have a relative who owns one.
Tractors can be used on both irrigated and unirrigated land, but like hybrid millet, are generally limited to irrigated fields. No farmer disputed the superiority of camels over tractors for deep-plowing unirrigated soil, a procedure which allows plant roots to penetrate into the moisture bearing soil strata. Furthermore, the weight of the tractor compacts the soil. The only farmer in either village who uses a tractor for unirrigated land is a Janania farmer who cultivates more unirrigated land than anyone else (49.5 acres) and has no sons of working age. The tractor he uses belongs to an affinal relation who is obligated (as a vaguely defined extension of the dowry principle) to offer his tractor at no charge.

On irrigated land, tractors can adequately fulfill all the functions of a camel, since the conservation of soil moisture is not critical, and can also provide services which camels cannot. Land levelling is not just a one-time land investment, but requires periodic maintenance because of sand build-up from duststorms. Camels can be used for levelling, but tractors are more effective. Perhaps the most useful feature of tractors is speed; tractor owners can plow one acre per hour, compared with one acre per day using a camel. In irrigated farming speed is sometimes essential. In double cropping cotton on a field that has grown wheat, for example, there is a leeway of only a few
weeks between harvesting wheat and planting cotton. For unirrigated agriculture it is water, not time, that is the constraining factor.

Irrigation’s Impact on Cropping Pattern. The higher yields of Kutiana agriculture are clearly due to irrigation. The use of commercial fertilizer and high yielding crop varieties also contribute to high yields, but without irrigation, fertilizers would not be used at all, and HYV use would be drastically limited. The fact that annual cropping intensity is higher in Janania can also be explained with reference to irrigation, although the relationship is complex. The low productivity of unirrigated agriculture in Janania encourages a labor intensive strategy of double cropping even when the expected returns are low (due to soil moisture depletion). At the same time Janania farmers use more capital and labor inputs on their irrigated land than do their Kutiana counterparts. Kutiana farmers appear to operate according to a slightly different utility function, preferring to invest less labor and accepting irrigated yields (of cotton, for example) which are below the level for Janania. The higher input requirements of irrigated agriculture may also be a factor in the higher incidence of fallow fields among Kutiana farmers.
Labor Demand

The relationship between irrigated agriculture and the level of labor demand provides a useful perspective for considering the contrasting migration patterns of Kutiana and Janania. Most of the immigrants that Kutiana has received have been landless laborers and service castes who have found employment in Kutiana's agricultural economy. In Janania, where emigration has been a common feature of the recent past, about half the emigrants were functionally landless and sought wage opportunities outside the village. The following analysis suggests that the migration of landless families into Kutiana and out of Janania is closely linked to the labor effects of irrigated agriculture.

Hypothesis 1: "There will be a net increase in total agricultural labor demand following the introduction of irrigation."

Data on total annual labor demand by crop are presented in Table 38 for Kutiana and in Table 39 for Janania. The number of person days required for major operations on the average Kutiana farm is 378 days, compared to 282 days on the average Janania farm, a difference of 34% over the Janania figure. The data presented slightly underestimate the labor demand in both villages by ignoring peripheral activities such as spreading manure, cutting cotton stalks, as well as the whole range of activities
### TABLE 38

**ANNUAL LABOR DEMAND BY CROP IN PERSON DAYS PER ACRE, KUTIANA, 1981-1982**

<table>
<thead>
<tr>
<th>Operation</th>
<th>Gram (av. #)</th>
<th>Misc. (av. #)</th>
<th>Wheat (av. #)</th>
<th>Millet (av. #)</th>
<th>Cowpea (av. #)</th>
<th>Kapas (av. #)</th>
<th>Narma (av. #)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plowing</td>
<td>1.7</td>
<td>1.7</td>
<td>2.2</td>
<td>1.4</td>
<td>1.6</td>
<td>1.8</td>
<td>2.2</td>
</tr>
<tr>
<td>Planting</td>
<td>0.8</td>
<td>0.8</td>
<td>1.0</td>
<td>0.8</td>
<td>0.8</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Hand Weeding</td>
<td>4.2</td>
<td>4.2</td>
<td>3.6</td>
<td>4.2</td>
<td>3.8</td>
<td>7.3</td>
<td>8.7</td>
</tr>
<tr>
<td>Irrigation</td>
<td>0.2</td>
<td>0.2</td>
<td>1.7</td>
<td>0.2</td>
<td>0.1</td>
<td>0.8</td>
<td>1.1</td>
</tr>
<tr>
<td>Plow Weeding</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.4</td>
<td>0.0</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>Harvest</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>2.3</td>
<td>2.7</td>
<td>13.9</td>
<td>5.6</td>
</tr>
<tr>
<td>Threshing/ winnowing</td>
<td>1.5</td>
<td>1.5</td>
<td>0.0</td>
<td>1.4</td>
<td>0.9</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>12.4</strong></td>
<td><strong>12.4</strong></td>
<td><strong>12.6</strong></td>
<td><strong>10.6</strong></td>
<td><strong>9.9</strong></td>
<td><strong>25.0</strong></td>
<td><strong>18.7</strong></td>
</tr>
</tbody>
</table>

**Labor Demand per Average Farm**

<table>
<thead>
<tr>
<th>(# acres)</th>
<th>160.8</th>
<th>16.5</th>
<th>28.1</th>
<th>27.0</th>
<th>46.4</th>
<th>72.5</th>
<th>26.6</th>
</tr>
</thead>
</table>

TOTAL person days per sample farm (28.1 acres)/year = 378.0
TOTAL person days per sample farm acre/year = 13.5

* Mechanized threshers are used for wheat.
### TABLE 39

**ANNUAL LABOR DEMAND BY CROP IN PERSON DAYS PER ACRE, JANANIA, 1981-1982**

<table>
<thead>
<tr>
<th>Operation</th>
<th>Gram</th>
<th>Misc.</th>
<th>Wheat</th>
<th>Millet</th>
<th>Terda</th>
<th>Cowpea</th>
<th>Cotton</th>
<th>Peanut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plowing (av. #)</td>
<td>1.5</td>
<td>1.5</td>
<td>2.9</td>
<td>1.4</td>
<td>0.7</td>
<td>1.2</td>
<td>1.6</td>
<td>1.9</td>
</tr>
<tr>
<td>Planting</td>
<td>0.8</td>
<td>0.8</td>
<td>1.0</td>
<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Hand Weeding (av. #)</td>
<td>1.6</td>
<td>1.6</td>
<td>4.0</td>
<td>3.7</td>
<td>4.0</td>
<td>3.8</td>
<td>6.2</td>
<td>5.8</td>
</tr>
<tr>
<td>Plow Weeding (av. #)</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.4</td>
<td>0.0</td>
<td>0.4</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Irrigation (av. #)</td>
<td>0.0</td>
<td>0.0</td>
<td>1.6</td>
<td>0.1</td>
<td>0.0</td>
<td>0.1</td>
<td>0.9</td>
<td>1.2</td>
</tr>
<tr>
<td>Harvest</td>
<td>3.2</td>
<td>3.2</td>
<td>4.0</td>
<td>2.3</td>
<td>2.3</td>
<td>2.7</td>
<td>16.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Threshing/Winnowing</td>
<td>0.9</td>
<td>0.9</td>
<td>0.0</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

**TOTALS**

<table>
<thead>
<tr>
<th>Gram</th>
<th>Misc.</th>
<th>Wheat</th>
<th>Millet</th>
<th>Terda</th>
<th>Cowpea</th>
<th>Cotton</th>
<th>Peanut</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.1</td>
<td>8.1</td>
<td>13.5</td>
<td>9.3</td>
<td>8.4</td>
<td>9.2</td>
<td>25.6</td>
<td>14.4</td>
</tr>
</tbody>
</table>

**Labor Demand per Average farm**

<table>
<thead>
<tr>
<th>(# acres)</th>
<th>124.1</th>
<th>37.5</th>
<th>16.0</th>
<th>8.4</th>
<th>38.6</th>
<th>38.2</th>
<th>13.6</th>
<th>5.4</th>
</tr>
</thead>
</table>

* Mechanized threshers are used for wheat.
associated with livestock (chopping fodder, cooking fodder, watering the animals) and domestic activities related to agriculture (e.g., making dung cakes, cooking food for hired labor). Generally such tasks (e.g., manure, cotton sticks) are relatively more important in Kutiana, and the real difference between the labor demand in the two villages is probably greater than 34%. When the greater acreage of Janania farms, and their higher cropping intensity are taken into account, labor demand per cultivated acre is 13.5 person days in Kutiana, compared to 8.9 person days per acre in Janania, a difference of 52%. Thus, Hypothesis 1 is supported.

The agricultural operations which underlie the greater labor demand on Kutiana farms include weeding, plowing, and threshing. The major differences, however, are limited to specific operations on particular crops. The greatest contrast in weeding labor is found in gram where the average weeding frequency for Kutiana is 1.05, compared to 0.41 for Janania. This translates into a per acre labor demand for gram weeding of 4.2 person days (Kutiana) versus 1.6 person days (Janania). Most gram fields in Janania are not weeded, whereas most gram fields in Kutiana are. However, the kharif crop of terda (millet intermixed with cowpea and lentils) is weeded in Janania nearly as frequently as is millet in Kutiana. The explanation for both cases -- gram and millet -- is water.
During the rabi season, unirrigated gram depends on residual soil moisture for growth; even in the unusually wet season of 1981/82, there was not enough rain to promote heavy weed growth. Irrigated gram, however, is nearly always weeded, and sometimes more than once. During the kharif season the monsoon rains nurture weeds that must be dealt with on unirrigated and irrigated fields alike.

A similar argument explains the difference in pre-planting plowing frequencies for terda and gram in Janania and millet and gram in Kutiana. Because terda (which is never irrigated) is planted on wet soil following the start of the monsoon, a pre-plowing is less necessary than is rapid planting while the soil is moist. The average number of pre-plowings is thus only 0.72. Fields of pure millet, which are usually (59%) irrigated in Kutiana and sometimes (24%) irrigated in Janania, are plowed more intensively: an average of 1.4 times in both villages. Gram fields are also plowed with approximately the same frequency: 1.5 in Janania and 1.7 in Kutiana. Unirrigated fields in both villages need to be plowed thoroughly to allow root penetration into the residual soil moisture. In

6. The survey questionnaire used crop type as the unit of information and did not break down farming operations by irrigated vs. unirrigated fields. Thus, data on gram, millet, and cowpea operations are somewhat confused, since many farmers have some irrigated and some unirrigated fields. All other crops are either always irrigated (e.g., cotton, wheat) or never irrigated (e.g., terda, rapeseed).
irrigated fields, plowing is perhaps most critical in softening the upper regions of soil which irrigation water has hardened. Finally, the difference in threshing and winnowing labor is directly attributable to yield differences, which in turn are due largely to irrigation.

Hypothesis 2: "Under irrigated conditions, labor demand will be relatively more even throughout the year, with decreased harvest bottlenecks."

A schematic representation of labor demand for planting and harvesting operations is given in Figure 4 and Figure 5 for Kutiana and Janania respectively. It is clear from visual inspection that there are harvest-time labor bottlenecks in both villages. The greatest intensity of labor demand occurs during the gram harvest in Janania, which supports the second part of Hypothesis 2. The kharif harvest demand, however, is greater in both intensity as well as in aggregate, in Kutiana.

In terms of the implications for labor, the relative consistency of labor demand in Kutiana, as compared to the strictly seasonal demands of Janania agriculture, is of critical importance. Planting and harvesting schedules are less concentrated in Kutiana, and render the hiring of

7. For the sake of simplicity, the diagrams in Figures 3 and 4 are confined to crops whose planting or harvesting operations require more than one person day for an average farm. Note also that neither threshing labor, nor weeding or irrigating, is included.
Fig. 4. Seasonal Labor Demand in Kutiana for Major Agricultural Operations
Fig. 5. Seasonal Labor Demand in Janania for Major Agricultural Operations
permanent labor more feasible, as is discussed in the socio-economic section below. In addition to the extra labor demands of irrigated cash crops (e.g., cotton, wheat), which spread out the total annual labor demand, Kutiana farmers are also less dependent on the monsoon for sowing the traditional crops of millet and cowpea. With irrigation, millet is sometimes planted in June, before the monsoon, and cowpea may be planted into early August, after the monsoon. When the tasks of weeding, irrigating, and spreading manure are considered, as well as threshing, both the quantity and duration of labor demand are higher in Kutiana, while the intensity of labor demand is slightly higher in Janania.

**Hypothesis 3**: "There will be a net increase in real wages for agricultural labor under irrigated conditions."

The annual fluctuations in wage rates mirror the pattern of labor demand: high during the brief harvests, but low during most of the year. The differences between the two villages as seen in the pattern of labor demand (Figs. 4 and 5) are also reflected in the wage rates. The maximum wage paid during the 1982 rabi harvest was slightly higher in Janania, but the overall harvest wage rate was greater in Kutiana, because of the longer harvest season. A number of factors are simultaneously at work in determining the harvest wage rate. These are discussed separately as a
basis for distinguishing the role of irrigated agriculture on wage rates.

1. Intensity of Labor Demand. The higher maximum wages paid to Janania labor can be explained in terms of the greater intensity of the rabi harvest. The first gram was harvested on April 2. The following day the wage rate was Rs. 14, and by the next day, Rs. 20. Three days later (April 7) one farmer hired 4 villagers at Rs. 40, although the going rate was by that time only Rs. 25. By April 11, the wage rate peaked at Rs. 30, decreasing to Rs. 25 a few days later, and holding steady until April 23, when it dropped suddenly to Rs. 15. Though the gram harvest had ended a week earlier, labor was required to transport the harvested piles (mandalies) to the threshing floor, while farmers with irrigated wheat required some harvest labor. Both these tasks were completed by April 23, and the wage rate of Rs. 15 reflects the more relaxed demands of threshing and winnowing operations.

The high wage of Rs. 40 is not representative of the Janania wage scale, but is indicative of the perceived importance of timely harvesting. The second highest wage in Janania was Rs. 30, which served as the going rate for about five days, and was reported as the maximum for

8. A regional maximum of Rs. 60 was reported from the village of Nithana, immediately to the south of Kutiana.
Kutiana. In both villages, the most common harvest wage was Rs. 25, for both men and women.

2. Migrant Labor. The major factor keeping wages down in both villages is migrant labor. Groups of outside laborers from central Rajasthan (where the rabi harvest is sparse even in good years) and from Bihar (reputed to be the poorest state of India) follow the harvests of gram and wheat in northern Rajasthan, Haryana, and Punjab. Gram harvesting is contracted on a daily wage basis. In the wheat producing areas further north, harvest contracts involve a share in kind, an enterprise which also draws labor from Janania, though normally not from Kutiana.

The migrant laborers who come to Janania and Kutiana work for a daily wage of Rs. 15 to Rs. 18 with meals and lodging provided by the landowner. During the 1982 rabi harvest peak there were 72 outside workers in Janania and ca. 130 in Kutiana, with some landowners employing as many as 13 (in Janania) and 18 (in Kutiana) workers at a time. In spite of the fact that migrant workers are paid less than local village labor, village workers are generally hired first and kept on longer. Farmers explain that their village neighbors are better workers than the outsiders, a sentiment in which all villagers concur. Another factor is that many local Harijans have accumulated debts of grain to one or more landowning families and their labor during the harvest is a loan repayment.
3. Annual Labor Contracts. Because of the relatively continuous demand for labor throughout the year in Kutiana (as well as in irrigated farms in Janania), annual labor contracts are feasible, and have become a common practice. There is no intrinsic effect of such labor contracts on the harvest wage rate. The contracted laborers are beyond the scope of daily wage negotiations. In Kutiana, however, where siris are relatively more common than in Janania (being employed by 30% as compared to 22% of farming households), the majority come from outside the village. They constitute a group of migrant laborers that is resident in Kutiana for the entire year. By contrast, all Janania siris are indigenous residents; in fact, Janania exports one man as a siri in another village. Thus, the dynamics of siri labor increase the total supply of labor in Kutiana, while decreasing the supply of labor in Janania.

4. Mechanization. Tractors and threshing machines are available to farmers in both villages. As noted above, tractors are just beginning to have a major impact on labor demand. Their role in the harvest is limited to crushing operations (especially for gram) as an alternative to camels, and transporting bundles of produce to the threshing floor, again in place of camels. The impact of threshers ———-

9. All three types of "siri" are combined in the percentages given here, including individual siri contracts, annual salary contracts, and sharecroppers.
has been more significant on harvest labor. Every farmer who grows wheat uses a threshing machine to thresh his wheat (winnowing is still done by hand in most cases). Although there are a few threshing machines in Kutiana and one in Janania, most farmers patronize itinerant thresher owners who, like the migrant laborers, make their harvest rounds. Wheat is the only crop which is always threshed mechanically. Cowpea is sometimes threshed by machine, and the stalks of millet (not the ear) are chopped into fodder by machine.

The hypothesis that the wage rate in Kutiana will be relatively higher than the rate in Janania does not hold for the rabi harvest, because of the factors outlined above. The intensity of Janania's harvest season keeps wages high (for a short time), while the inflow of migrant labor to Kutiana, both seasonal workers and siris, tends to depress wages there. Mechanization is a factor in both villages, but is of little explanatory value in comparing village wage rates.

The kharif is characterized by a much reduced cropping intensity as compared to the rabi. There is less to harvest, and more importantly, there is more time in which to harvest it, as can be seen in Figures 4 and 5. In spite of heavy labor demand for the cotton harvest in Kutiana, and the absence of migrant labor, the wage rate did not exceed Rs. 15 in 1981, and was generally Rs. 10 in both
villages. Since cotton is picked by children as well as by adults (payment is by weight), there is little competition within the labor market which could result in wages being bid up. As is the case for the rabi, while there is little difference between the two villages in terms of wage rates, the aggregate harvest earnings in Kutiana are higher because of the greater duration of the harvest.

Wage opportunities during the slack agricultural seasons are extremely limited. In Janania, house construction offers the only in-village demand for wage labor. In Kutiana there were additional labor opportunities on government-financed construction projects: watercourse relining and road work. The wage rate for house construction in Janania is Rs. 8 (plus one meal and tea several times), compared to Rs. 10 in Kutiana. This is a consistent difference and is probably significant. Whether the higher rate in Kutiana is linked to greater agricultural wealth, however, is problematic. It is possible that competition from the government construction projects (at Rs. 10/day for the watercourse relining and Rs. 8/day for road work) have forced wages up.

To summarize the apparent effects of irrigation on wage rates, based on the data presented:

1. Maximum wage rates are no higher, and perhaps even a bit lower, in Kutiana. Absolute wages are not directly affected by irrigation, but total wages are higher
because of the relatively more extended demand for labor throughout the year.

2. The availability of migrant labor depresses harvest wages in both villages, to approximately the same extent. The very presence of migrant labor, however, is encouraged by the regional irrigated economy. Following the gram harvest, the migrants move on to villages like Kutiana where they can find several more weeks of employment in the wheat harvest. Without the attraction of wheat, which ripens over a longer period of time (because of the several varieties used), it is likely that the supply of migrant labor would be considerably reduced.

3. Annual labor contracts have little direct effect on wage rates, but again there is an indirect influence. The economic security of a formal siri contract entices outside laborers into Kutiana who would not otherwise venture into the village labor pool. The presence of these outside workers adds to the village labor supply, while absorbing much of the labor demand. Since it is usually the large irrigated farms which enter into siri contracts, the example of labor contracts offers support to the hypothesis that irrigation is positively linked to wage rates.

4. Mechanization is an important labor substitute for threshing operations in both villages. Some of the labor demand created by irrigated agriculture (e.g., wheat
threshing) has been met by mechanical devices rather than human labor. The net labor effect of irrigation, however, is still positive (cf. Raj Krishna 1964 for the opposite situation). For example, even with threshing omitted, the human labor input for one acre of wheat is higher than that of any non-irrigated crop (see Figs. 3 and 4). Tractors have not yet had a major impact on farm labor, though their potential utility is clearly linked to the potential demands of irrigated agriculture.

Economic Rent

The concept of economic rent as outlined in Chapter 2, is defined as "surplus gains over real costs" (Schumpeter 1954:938) or more simply, profitability. As has already been discussed in the beginning of this chapter, Kutiana farms are substantially more profitable than Janania farms, in spite of greater costs. A single hypothesis is tested in this section.

Hypothesis: "Irrigated agriculture will be less profitable than unirrigated agriculture if household labor is valued at the market rate."

Contrary to the hypothesis, agriculture in Kutiana is dramatically more profitable than in Janania, as Table 33 (p. 230) demonstrates. Although Kutiana farmers have higher labor costs and spend nearly three times as much on capital inputs as Janania farmers do, the greater yields of
irrigated agriculture provide net returns which are 47% higher for an average farm. When calculated on the basis of acres cultivated annually, the difference is 68%, reflecting both the larger farm size and higher cropping intensity of Janania farms.

The figures in Table 33 assume an average wage rate of Rs. 12 for all labor, both hired and household. If a figure of Rs. 20 is used (which is certainly high for an annual average), the profitability picture does not change. Because the labor demand of Janania agriculture is quite substantial, raising the estimated wage rate actually increases the profitability gap between the two villages, giving a net return of Rs. 21,882 for Kutiana and Rs. 14,700 for Janania, or a difference of 49%.

The explanation for the greater profitability of Kutiana agriculture is irrigation. As was discussed above in considering land productivity, water is the critical variable in the higher yields of Kutiana agriculture. Although farmers in Kutiana have greater expenses, the relatively high yields of their irrigated crops more than compensate for input costs.

Irrigation’s Economic Impact. The higher yields of irrigated agriculture represent a physical response, and it is not surprising that yields in Kutiana are higher than yields in Janania. The response of crops to water, a basic fact of agronomy, is the primary link in drawing a causal
relationship between irrigation water and cultural change.

Irrigation water has increased the productivity of traditional crops and allowed the cultivation of cash crops (cotton), prestige food crops (wheat) and high yielding varieties (wheat, millet).

To the landowners, the productive aspects of irrigated agriculture are its most important feature. To landless laborers, it is the labor effects that are critical. The seasonal demand schedule under irrigated conditions is more even, and encourages full-time labor contracts. There is also an increased demand for casual day labor, which is the preferred type of employment for most landless men (and all landless women who work). Casual laborers find themselves in competition not only with mechanization (e.g., tractors), but also with annual workers on siri contracts and most importantly, with migrant laborers, both siris and seasonal migrants.

The landless residents of Kutiana have clearly benefitted from agricultural wage opportunities resulting from irrigation, yet the gains they have experienced since 1954 appear to be in jeopardy from labor competition. Similarly, the gains in productivity which the landowners have enjoyed are threatened to be overwhelmed by the continual land divisions among growing numbers of sons. The economic problems of Kutiana have not been solved by irrigation water, but they have certainly been postponed.
Analysis of Socio-Economic Impacts

The most important effects of irrigation on village social structure consist of adjustments necessitated by the changed agricultural conditions — the occupational opportunities available in the village, and the kinds of contractual labor agreements which are formed. Household structure does not appear to have been directly affected by irrigated agriculture. This section examines the hypotheses presented in Chapter 2 which relate to the following topics: (1) occupations, (2) patron-client relations, and (3) household structure.

Occupations

The increased labor demand of irrigated agriculture is reflected in a more pronounced occupational focus on the agricultural sector. For Kutiana landowners there is little incentive to pursue any occupation other than farming, since agriculture is both productive and profitable. In Janania, where agricultural productivity is much lower, a number of landowning families are diversifying their economic base off the farm. At the same time, Kutiana's irrigated agriculture has affected the demand for artisan services, and at the household level, the division of agricultural labor among family members.

Hypothesis 1: "Under irrigated conditions there will be a high degree of economic dependence on agriculture among
both landed farmers and landless laborers."

Canal irrigation has encouraged Kutiana farmers to focus on agriculture for their livelihood, while the limited supply of canal water in Janania has forced residents to diversify into the non-agricultural sector. Table 40 provides summary statistics of occupations in both villages. The comparison of non-agricultural employment outside the village shows that 17% of Janania households have one or more members engaged full-time, while in Kutiana the figure is only 4%. The real difference is even greater when the households that migrated out of Janania are considered (see discussion in Chapter 5), since many of these left to pursue full-time careers in the service sector. Indeed, the entire process of occupational diversification can be viewed as leading logically to emigration, as economic niches within the village and surrounding region become filled and job-seekers are forced to look further afield.

Within the villages, the data suggests there are more off-farm opportunities in Kutiana than in Janania (10% versus 7%). However, two of the non-agricultural Kutiana households (the priest and the sweeper) perform functions which are met in Janania by specialists living in adjacent villages. If these are omitted from the comparison, the figures become roughly equal (8% versus 7%). Additionally, there are 7 households in Janania where a member engages in
part-time non-agricultural work as a doctor (3 households), tailor (3 households), shopkeeper (1 household), and carpenter (1 household). In Kutiana there are only 3 households that pursue part-time work: the goldsmith and two shopkeepers. If part-time work is included, the extent of off-farm employment within the village is greater in Janania than in Kutiana.

TABLE 40

NUMBER OF HOUSEHOLDS ENGAGED IN FULL-TIME NON-AGRICULTURAL EMPLOYMENT IN KUTIANA (n=101) AND JANANIA (n=90)

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Kutiana Inside</th>
<th>Kutiana Outside</th>
<th>Janania Inside</th>
<th>Janania Outside</th>
</tr>
</thead>
<tbody>
<tr>
<td>Priest</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Carpenter</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Blacksmith</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Barber</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sweeper</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Shopkeeper</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Goat trading</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Truck driving</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Bus conductor</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Canal maintenance</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Tailor</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Doctor</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>School master</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Bank inspector</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Revenue patvari</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Flour mill</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Military</td>
<td>0</td>
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</tr>
<tr>
<td>Mechanic</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Builder (mistri)</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

TOTAL households (percent) | 10 (10%) | 4 (4%) | 6 (7%) | 15 (17%)
To summarize the figures presented in Table 40, in Kutiana 14% of the households (10% + 4%) have one or more members engaged in full-time non-farm employment; in Janania, the figure is 24% (7% + 17%). With part-time work included, the figures become 17% and 32% for Kutiana and Janania respectively. The hypotheses linking irrigation with agricultural dependence, and lack of irrigation with diversification, is thus supported; approximately twice as many Janania households as Kutiana households are involved in the non-farm economy.

**Hypothesis 2.** "Among wealthier farmers there will be a decline in household participation in agriculture, and a corresponding increase in the use of hired labor."

This hypothesis assumes a link between irrigation and wealth, with Kutiana farmers being wealthier, on the average, than Janania farmers. The economic data support this generalization. While average landholdings are slightly higher in Janania (24.79 acres) than in Kutiana (23.2 acres), a much greater proportion of Kutiana’s land is irrigated, and the sale value of irrigated land is roughly twice that of unirrigated land. Annual income is also higher in Kutiana; net returns per farm in Kutiana are Rs. 24,905, compared with Rs. 16,955 in Janania. To these figures must be added the income from off-farm sources, which is much higher in Janania (Rs. 2,688 per farm household) than in Kutiana (Rs. 23 per farm household).
Combining on-farm and off-farm income, Kutiana sample farmers enjoy a 27% advantage over Janania farmers in annual income.

Because of the small sample of farming households, analysis which isolates only the wealthiest farmers involves a subsample too small to provide a reliable indicator of real trends. Nonetheless, several cases of wealthy irrigated farmers in both villages are suggestive of a tendency to pull household labor, and in particular female labor, out of the mainstream of agricultural production. For example, the wealthiest farmer in Kutiana has 53 of his 82 acres rented out on a share basis; the remaining 29 acres are farmed by a siri. Neither he nor his wife and children participate significantly in harvest work.

There appears to be an element of individual preference in the degree of agricultural work performed by members of wealthy households. In one of the wealthiest households of Janania (having mostly irrigated land), all the women participate in harvest work, with the sole exception of the household head's wife (age 50). Though the family could easily afford to hire labor to substitute for the two sons' wives (a siri and many casual laborers are already on the payroll), they do not. This family represents an unusual case; more typical is another wealthy Janania household (also having mostly irrigated land) in which the two sons' wives perform no agricultural work at
all. One of the sons manages the farm and works alongside the siri and any hired labor. The elder son works only at harvest, devoting the slack season to managing his truck transport business (This is the family that owns two trucks). Though there is a clear demand for extra labor during the harvest, it is met by hired workers rather than by the wives of the landowners.

Finally, an example from Kutiana which may portend the future of irrigated agriculture. One farmer owning 25 irrigated acres is not wealthy, but can comfortably support his small family (3 children and a bachelor uncle). Several years ago he lost part of one arm in a mechanical thresher (a not uncommon accident, though the only case in either village). Because of his disability, he is limited in the work he can do, and rented out half his land to his brother, relying on his wife to help with the other half. In 1981 he hired a siri for the first time, and reclaimed the land previously rented to his brother, while relieving his wife of most of her agricultural work. Through the profits of his land, he is able to imitate the management style of wealthier landlords, substituting both his brother’s and his wife’s labor with a hired siri.

The hypothesis is not proved by these examples, but there does appear to be a tendency among wealthy farmers, and also among an upper-middle class of farmers, to withdraw
either their own labor or that of their wives, by substituting hired labor, usually in the form of siris.

A corollary to hypothesis 2 which is more amenable to quantitative analysis is the following: "Farming households which hire labor will show less family participation in agriculture than households which do not hire labor." Table 41 shows the average percentage of all household members who participate in the rabi harvest for both study villages. Figures are given separately for households that hire non-family labor, and for both groups the participation rate for household women is shown.

TABLE 41

<table>
<thead>
<tr>
<th></th>
<th>All Hsld members</th>
<th>Women's participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total farm sample:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kutiana (n=28)</td>
<td>73.2%</td>
<td>56.0%</td>
</tr>
<tr>
<td>Janania (n=23)</td>
<td>68.3%</td>
<td>54.6%</td>
</tr>
<tr>
<td>Farms which hire labor:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kutiana (n=16)</td>
<td>70.8%</td>
<td>60.4%</td>
</tr>
<tr>
<td>Janania (n=11)</td>
<td>59.7%</td>
<td>50.0%</td>
</tr>
</tbody>
</table>

When all farming households are considered together without separating those that hire labor, the data for the two villages show a close similarity. Kutiana has a slightly higher rate of family harvest participation (73%
versus 68%), a pattern which is less pronounced for female members (56% vs. 55%). When households which hire labor are considered separately, however, the two villages reveal important differences. A higher rate of family labor participation in Kutiana (71% vs. 60%) is also matched by a higher rate of female participation (60% vs. 50%).

Households in Kutiana which hire labor do so in order to supplement family labor rather than to substitute for it. Women’s participation rate is actually higher among households that hire labor than among those that do not hire. In Janania, the opposite pattern emerges; hired labor appears to supplant family labor in general and the labor of household women in particular. Thus, the Kutiana data contradict the expectations of the corollary to Hypothesis 2, while the Janania data support the corollary. What does this mean in terms of irrigation effects?

The explanation offered is that farmers in both villages share a prestige value of withholding household labor, particularly female labor. Under the predominantly unirrigated conditions of Janania, the lower labor demand allows these values to be expressed without jeopardizing the household economy. Though there is intensive demand for harvest labor in Janania, the period is brief enough to render hired labor a viable alternative to household labor. The higher total labor demand of Kutiana’s
irrigated agriculture, particularly during the extended harvest season, results in a much greater opportunity cost for the practice of withholding women's labor. It is a price which only wealthy irrigated farmers are willing to pay.

_Hypothesis 3._ "Under irrigated conditions, artisan castes that have traditionally constructed or repaired agricultural equipment will find decreased demand for their products, but greater demand for their repair services. Other artisan castes that were not connected with agriculture will be less successful in meeting technological competition."

The primary evidence for testing this hypothesis lies with the occupations pursued by residents in the two study villages. In Kutiana, one carpenter and a blacksmith have immigrated since irrigation. During the same period, one carpenter emigrated from Janania. At present there are two practicing carpenters in Kutiana; there is none in Janania. Farmers in Janania depend on itinerant blacksmiths for repairs to their equipment; Kutiana farmers encouraged their current blacksmith to immigrate three years ago. There are no other artisan castes (e.g., cobblers and potters) living in the study villages; residents depend on nearby villages for these services.

The effect of irrigation on the demand for artisan repair services follows logically from the increased levels
of production which irrigation has made possible. Sickles used in harvesting and wooden beaters used in threshing are more likely to break the more they are used, thus requiring the services of the blacksmith and carpenter respectively. Based on the inflow of these service castes to Kutiana, it appears that agriculturally oriented service castes do find a greater demand for their repair services in Kutiana, although some of the demand can also be attributed to the higher population of Kutiana.

The demand for the manufacturing services of the blacksmith and carpenter does not appear to be affected by irrigation per se. The number of wooden beaters used in threshing, the manufacture of which constitutes the major seasonal task for carpenters, is approximately the same in Kutiana and Janania. The iron-tipped wooden plow, which is still the standard item of cultivation equipment for farmers in both villages, is also found in similar numbers. Table 42 shows the frequencies of different plow types, indicating the percentage manufactured by local carpenters. Because of the popularity of the iron Norwalla plow (a recent innovation designed for unirrigated fields) the percentage of Janania plows made locally (27%) is slightly lower than the Kutiana figure (31%) (see Appendix B for a description of plow types).

The effect of technological change in cultivation equipment has thus far been less significant to Kutiana
carpenters than to Janania carpenters. Irrigation alone has had little direct impact on the demand for the kinds of equipment made by traditional artisans. However, the greater presence of active artisans in Kutiana suggests that there is more demand for their repair services. The extent to which this is due to irrigated agriculture as opposed to the higher population of Kutiana cannot be stated with assurity, though it is reasonable to conclude that irrigation is a factor.

TABLE 42

* PERCENT OF PLOWS MADE BY LOCAL CARPENTERS AND THEIR INCIDENCE AMONG FARMING HOUSEHOLDS IN KUTIANA AND JANANIA

<table>
<thead>
<tr>
<th>Plow type</th>
<th>% locally made</th>
<th>Incidence among Kutiana farmers</th>
<th>Incidence among Janania farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moonah</td>
<td>57%</td>
<td>54%</td>
<td>33%</td>
</tr>
<tr>
<td>Morkha</td>
<td>43%</td>
<td>88%</td>
<td>100%</td>
</tr>
<tr>
<td>Drill</td>
<td>0</td>
<td>12%</td>
<td>0</td>
</tr>
<tr>
<td>Tota</td>
<td>25%</td>
<td>77%</td>
<td>17%</td>
</tr>
<tr>
<td>Norwala</td>
<td>0</td>
<td>35%</td>
<td>92%</td>
</tr>
<tr>
<td>Plow</td>
<td>0</td>
<td>15%</td>
<td>4%</td>
</tr>
<tr>
<td>Total % plows made locally</td>
<td>31%</td>
<td>27%</td>
<td></td>
</tr>
</tbody>
</table>

* Based on data from Kutiana.

Summary: Irrigation's Impact on Occupations. There has been an intensive focus on agriculture among Kutiana households, whereas Janania farming households have diversified their occupational base to the non-agricultural sector. Irrigation has encouraged the exclusive reliance
on agriculture in Kutiana, while the lack of irrigation water in Janania has forced residents to diversify.

There is a greater demand for hired labor in Kutiana for two reasons: (1) irrigated agriculture requires more labor and (2) the prestige values of farmers encourage them to meet much of the extra demand through hiring labor rather than fully employing household labor, in particular women. The short-run effect of irrigation is to increase dramatically the demand for household labor. In the long-run, as the irrigated farmer becomes wealthier, he is able to replace household labor with hired workers. For the wealthiest households in the long run, the real effect of irrigation is a decrease in family labor participation and a corresponding increase in hired labor.

There appears to be a positive irrigation effect on the demand for artisan services. In spite of a trend away from locally manufactured plows, the demand for locally made threshing tools is undiminished, and the demand for artisan repair services has increased somewhat.

Patron-Client Relations

Three types of patron-client relations are found in both study villages: (1) Service castes that perform ritualistic as well as practical functions (Priest, Barber and Sweeper), (2) Artisan castes that perform specialized craft functions (Carpenter, Blacksmith), and (3)
agricultural laborers belonging to any caste, though nearly always a Harijan caste. The term, jajman, is reserved for the patrons of the village priest; it is not used for the other ritualistic patron-client relations. The general practice is for the patrons to refer to the priest as the "family priest" (ghar ki pandit); similarly, the barber is the "family barber."

Artisan castes that perform craft functions, as well as non-artisan caste men who have adopted a craft occupation (e.g., a Jat who works as a tailor), are traditionally bound to their patrons as barsodis, and are paid semi-annually in grain. As noted earlier, these contracts are not hereditary, but customary. They may continue indefinitely, or can be terminated by either party. The third type of institutionalized patron-client relation, siri contracts, are annual and must be re-negotiated each year. Harijan men, as well as destitute upper caste men, enter into these contracts with landlords, placing themselves in the role of agricultural servants.

Hypothesis 1: "The greater cash-orientation of irrigated agriculture will result in a monetization of jajmani relations and a weakening of the social bonds obtaining between patrons and clients."

10. The same usage of the term is reported by Freed and Freed (1976:120) for the village of Shanti Nager in Delhi.
Before considering the basic thrust of this hypothesis -- that jajmani-type relations will deteriorate under irrigated agriculture -- it is necessary to examine the assumption that irrigated agriculture is cash-oriented. The post-irrigation economy of Kutiana is clearly more of a cash economy than during pre-irrigation times; the introduction of cash crops and the level of agricultural input purchases is testimony to this. However, the predominantly non-irrigated economy of Janania is also marked by a relatively high level of cash exchange which can be attributed to the absence of irrigation water. The enforced economic diversification of Janania's residents has brought them into close contact with the outside cash economy through employment as bus conductors, truck drivers, school teachers, etc. (see the occupational categories in Table 40, p. 265). The annual cash income generated from all non-agricultural sources among farming sample households (n=25) in Janania amounts to Rs. 2,688 per household, as compared with only Rs. 23 per household in the Kutiana sample (n=26). In spite of the higher total income of Kutiana farming households, if cash is a factor in the breakdown of jajmani-type relations, it would be expected to influence relations among Janania residents as well as among Kutiana residents.

The ritualistic service castes play an important role in both study villages and do not appear to have been
adversely affected by recent economic change. Indeed, the opposite trend might be inferred from the fact that in Kutiana, all three ritualistic service caste households (Priest, Barber, Sweeper) have immigrated since irrigation, at the request of the indigenous residents. Similarly, in Janania, the Barber represents the only permanent immigrant to the village during the past 30 years. Though the services of the priest and the sweeper must be imported from Jamal, all upper caste families in Janania maintain formal relations with these functionaries. In both villages, these bonds are expressed through token gifts at major festivals, payments of grain, flour, or food throughout the year, and substantial gifts of cash and goods at funerals and marriages.

Barsodi relations between craft specialists (carpenters, blacksmiths, tailors) and their patrons continue to be important in both villages, but appear to be undergoing some changes which can be attributed to the cash economy. In Janania, these changes are most visible among the several full-time and part-time village tailors. Both the tailors and their patrons concur that payment on a cash basis, either by the piece or by the day, is advantageous. The tailors claim they can make more money; the patrons claim they can save. Only one tailor in Janania continues to serve as a barsodi; a second tailor switched to cash payments one year ago, but has retained his former patrons
as customers. One farmer explained that it is a waste of money to keep a tailor as a barsodi unless there is a wedding planned. And then if there is a wedding, it is difficult to induce the barsodi to work long hours, since his salary is already assured.

Tailors are somewhat unusual in that they comprise the only barsodi occupation that is not caste-specific, nor is it linked to the agricultural economy (even cobblers devote much of their labor to repairing camel harnesses). Thus, it may be that tailors are not a good indicator of general change in barsodi structure, or perhaps they are more sensitive to influences affecting other barsodi occupations. There does not appear to be a similar trend among carpenters and cobblers. The strongest evidence that barsodi relations are persisting in spite of the cash economy comes from the blacksmith in Kutiana. Though he arrived as an invited immigrant just three years previously, he now has over 50 patrons in the village for whom he makes any repairs for an annual grain payment of 40 kgs per camel; for new equipment such as plow tips, the landowner must pay for materials, but the blacksmith's labor is free.

Hypothesis 2. "There will be an increasing preference for long-term labor contracts rather than daily wage work, because of the relatively more constant labor demands of irrigated agriculture."
The contrast between Kutiana and Janania in the number of siri contracts supports this hypothesis. In Kutiana, 28% of the farming households (n=72) hire a full-time worker on an annual contract; in Janania, the figure is 16% (n=63). That irrigation is a primary causal factor in this contrast is indicated by the fact that all siris in both villages are hired by farmers with large irrigated holdings. Even in the predominantly unirrigated village of Janania, the smallest irrigated holding among siri employers is 21 acres.

Of greater social significance than the number of siri contracts is the form which they take. In Kutiana, all but one of the siris belong to Harijan castes, and, as mentioned earlier, half are from outside villages and live in the landowners' house as servants, until the completion of their tenure. In Janania, the relations between siris and landowners are much less asymmetrical. Three of the 10 siris are upper caste (Kumhar) and in two cases are employed by wealthy relatives. All Janania siris are from the village and in most cases there is a history of economic dependence between the two households which creates a sense of mutual obligation.

Irrigation's Impact on Patron-Client Relations. Ritualistic caste functions are similar in both villages, and do not appear to have been markedly affected by the irrigated economy. Cash payments are preferred by tailors,
but barsodi contracts continue to be the norm for carpenters, cobblers, and the blacksmith. The effect of irrigation on the structure of patron-artisan relations appears to be indirect at most. The post-irrigation immigration of Kutiana families has created a greater demand for artisan services, and the more constant demand for repair services throughout the season may predispose Kutiana farmers to maintain barsodi relations. The data available do not allow a measurement of irrigation's impact but do suggest the direction of influence: barsodi relations have become more important and not less, since the introduction of irrigation.

The prevalence of annual labor contracts in Kutiana appears to be a function, in large part, of the irrigated economy. Farmers without substantial irrigated holdings do not need, nor can they afford, a siri. Large landowning families hire siris both for their economic and their prestige value. The desirability of hiring siris, and the willingness of destitute laborers to enter into annual agreements, has resulted in an inter-village labor market, with irrigated villages importing siris and unirrigated villages exporting them.

Household Structure

In spite of the important differences between the two study villages in terms of agricultural production and
labor, there do not appear to be significant differences in household structure. Average household size in Kutiana is 7.3 compared with 7.2 in Janania; the similarity in household size is matched by the frequencies of structural types (see Table 43). If household structure is undergoing a shift away from joint families, the change is taking place in both villages to a similar degree.

**Hypothesis 1:** "Joint families will be less stable and will fission more readily under irrigated conditions."

This hypothesis cannot be directly tested with the available data. It is possible that irrigation has had no effect on household structure, but it is also possible that household form in both villages is changing in similar directions; the present similarities might mask trends which only diachronic data could document. The underlying logic of the hypothesis, that the commercial nature of irrigated agriculture will produce conflicts over cash which will tear at the fabric of joint families, presupposes that a non-irrigated village economy will be less susceptible to similar cash tensions. In fact, as discussed earlier, Janania residents have a close working relationship with the cash economy because of their diversification into outside employment.

The structure of a household at any particular time depends not only on economic functional needs and socio-cultural values (e.g., the ideal of living in a joint
family), but also on demographic factors such as longevity (cf. Freed and Freed 1982). Related to this is the developmental cycle of the household; a young married couple may fission off from the parental household, forming a nuclear family, which will grow into a lineal joint family when the first son marries and his wife moves in. When his younger brother also marries, the household structure becomes collateral joint. This is a highly valued ideal form among the Bagri, but it is also highly unstable. Often one of the brothers will fission and form a separate nuclear family at this stage. In other cases, the brothers will stay together as long as their father is still alive; mothers also have a cohesive influence but to a lesser degree. With the death of the second parent, brothers nearly always divide their households. There is only one case among the two villages (n=191 households) in which brothers are living jointly without a living parent.

The data in Table 43 show no significant differences in the frequency of joint families between the two villages. There is a higher incidence of collateral-joint families in Kutiana, and of lineal-joint families in Janania. It is not clear why there is this contrast in joint family form; when the two farm samples are isolated, even this difference disappears. The influence of cash on family structure appears to have little direct effect. Taking all Janania households in which one or more members
is employed in a non-agricultural wage or salaried position outside the village (n=18) shows an unusually high proportion of joint families: 33% collateral-joint, 17% lineal-joint, and only 50% nuclear. It may be that the joint family structure actually facilitates entry into the outside job market by providing both economic and social security to the worker's wife and children who remain at home.

TABLE 43

* PERCENTAGE OF HOUSEHOLD TYPES IN KUTIANA AND JANANIA VILLAGES, INDIA

<table>
<thead>
<tr>
<th>Household Type</th>
<th>KUTIANA Total (n=101)</th>
<th>KUTIANA Farm sample (n=28)</th>
<th>JANANIA Total (n=90)</th>
<th>JANANIA Farm sample (n=28)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nuclear</td>
<td>65.3%</td>
<td>64.3%</td>
<td>63.3%</td>
<td>67.9%</td>
</tr>
<tr>
<td>Lineal-joint</td>
<td>11.9%</td>
<td>10.7%</td>
<td>20.0%</td>
<td>10.7%</td>
</tr>
<tr>
<td>Collateral-Joint</td>
<td>22.8%</td>
<td>25.0%</td>
<td>16.7%</td>
<td>21.4%</td>
</tr>
<tr>
<td></td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

* The household types are based on Kolenda (1968:346-347). Nuclear includes Kolenda's types 1-4, Lineal-joint includes types 8-9, and Collateral-joint includes types 6-7 and 10-11.

Two variants of household structure which occur in both villages are the "economic joint family" and the "joint lineage". An economic joint family refers to a parent household and a recently fissioned household which continue to cooperate in agriculture. There were two cases of this
in the Kutiana farming sample (n=26) and three cases in the Janania sample (n=25). In all cases, the arrangement was recognized as the final stage of the fissioning process, rather than a permanent structure.

A "joint lineage" refers to three or more contiguous households belonging to one lineage, which share a common entranceway (usually in addition to a second entranceway on each house compound). The joint lineage provides some of the social intimacy of a joint household, while maintaining private space and economic autonomy (cf. the discussion in Chapter 5, pp. 218-19). In Kutiana there is only one such joint lineage consisting of three households. In Janania there are five joint lineages consisting of 17 households, or 19% of the total. Of these 8 are nuclear, 5 are lineal-joint, and 4 are collateral-joint.

One explanation for the lower incidence of collateral household forms in Janania as compared to Kutiana (17% vs. 23%) may be the prevalence of joint-lineage structures which allow the benefits of autonomy without the cost of social separation from immediate kin, as joint lineages generally consist of middle-aged brothers and their families. The question of why joint lineage arrangements

11. The joint lineages in Janania, by household number, are the following: <28, 29, 30>, <32, 33, 34, 36>, <39, 40, 41, 42>, <56, 57, 58>, and <61, 62, 63>. The joint lineage in Kutiana consists of households <15, 16, 17> (See Maps 3 and 4).
are popular in Janania and not in Kutiana does not have a clear answer, though it may be due to the availability of adjacent house plots and the spatial development of the two villages.

The evidence concerning the hypothesis -- that irrigated agriculture will select against the joint family form -- is inconclusive. It has been shown that there is no difference between Kutiana and Janania in the incidence of joint families, but in neither case is diachronic data available to reveal any trends. The deteriorating effects of cash on household cohesiveness (cf. Orenstein 1960, Epstein 1962) is not supported by the subsample of Janania households working in outside jobs. It is doubtful that agriculturally generated cash would, in itself, cause households to fission. In the prevailing folk belief of both villages, households fission because of arguments among brothers' wives. While this is certainly an explanation of expediency, it is conceivable that wives in Kutiana may be subject to modernizing influences which their Janania counterparts are isolated from (see discussion below on modernization), and this might affect domestic relations. The data, however, offer no evidence that there are irrigation-linked pressures on joint households.

Hypothesis 2: "Systems for interhousehold exchange of labor and equipment will emerge to provide a functional
substitute to the joint family and/or to meet the requirements of irrigated agriculture."

Whether or not irrigation can be causally linked to the break-up of joint families, it would be reasonable to ask whether there are particular arrangements for labor exchange which might be a response to the labor demands of irrigated agriculture. While several kinds of labor exchange are found in both Kutiana and Janania, these do not appear to be connected with irrigation, with the important exception of irrigation labor itself. Both for company during night irrigations and as insurance against the unlikely event of a major breach in the field channels, it is common practice for two landowners to informally share their irrigation duties.

Labor exchange among completely separate households, even if they are closely related, is rare. In Janania, two young men who are close friends helped in each other's rabi (1982) harvest for a few days. The ritual exchange of planting labor (lass) discussed in Chapter 5 (p. 217), provides another example, but was an exceptional case. Threshing operations which require the services of two or three camels from as many households is perhaps the most common form of labor exchange, but does not usually involve human labor.

The best claim for an irrigation-effect in labor exchange is found in the borrowing of tractors, a practice
which is related to irrigation inasmuch as the tractor can be considered a product of irrigated agriculture (see the earlier discussion in this Chapter, pp. 242-43). Three examples serve to illustrate this practice, one from Janania (where a tractor was borrowed for use on unirrigated land) and two from Kutiana. All three cases involve the borrowing of a tractor from a close kin, either actual or fictive. The Janania farmer used his wife’s brother’s tractor; one Kutiana farmer used his brother’s tractor, and another Kutiana farmer borrowed the tractor of his "religious brother" (dharm bhai) who lives in an adjacent village. In each case, no charge was levied on the use of the tractor, the farmer paying only for fuel.

The exchange of labor between households is unusual, but does occur in both villages. There does not appear to be any propensity toward increased labor exchanges because of irrigated agriculture. The borrowing of tractors is of potential significance in the farm economy, though it is uncommon; the three examples cited comprise a complete record within the farm sample. The examples given suggest that traditional social relationships, both kinship and fictive kinship, can become mechanisms to promote the use of productive technologies which are associated with irrigated agriculture.

Irrigation's impact on Household Structure. There is no clear relationship between irrigation and household
structure, based on the data available. The evidence for inter-household labor exchange, though meagre, reveals some irrigation effects, particularly in the application of water to the fields. Of particular significance is the sharing of tractors between consanguineal, affinal, and fictive kin. This practice suggests that at least some economic problems posed by agricultural development can be met by traditional social resources.

**Analysis of Cultural Impacts**

This section compares the cultural values held by residents of Kutiana and Janania and attempts to isolate differences attributable to irrigation. While the most obvious cultural changes tend to be linked with modernizing influences—as the farmer becomes involved in bank financing, chemical inputs, and hybrid varieties—the higher profit margin of irrigated agriculture provides the potential for realizing values once held only as ideals—the seclusion of women, for example. Both modernization and its converse, traditionalization, are considered in the following.

**Modernization**

The adoption of new behavioral patterns may be motivated by traditional values of social prestige, but can result in changes in those very values which initially predisposed the individual to alter his lifestyle. The
following analysis of these effects relies primarily on qualitative data gathered during the course of fieldwork. The use of material data provides a concrete measure for testing several hypotheses, but the validity of such measures depends ultimately on an interpretation of what particular material items (e.g., stainless steel utensils) mean in terms of cultural values.

**Hypothesis 1:** "The market orientation of irrigated agriculture will result in the transmission of urban values systems, displacing traditional village values."

Almost without exception, the major symbols of social prestige in both Kutiana and Janania reflect urban values which have been transmitted to the village in the form of outside visitors, trips to town, movies (in Sirsa and Nohar), radio, and perhaps most importantly, by the schools. A young boy may be encouraged to attend school for the very traditional motivation of attracting a higher dowry in his marriage. Yet in the course of his education he is exposed to urban values both in his textbooks (from which agricultural topics are almost totally absent), and through his teachers.

An important means of diffusing prestige values throughout the Bagri region is through marriages, both the wedding celebration and the peripheral activities leading up to and following the main event. Not only does a great deal of visiting take place, but the giving of gifts, and
particularly the dowry itself represent "models of" and "models for" (cf. Geertz 1973b:93-94) prestige behavior. That both Kutiana and Janania participate in the same basic system of prestige values can be demonstrated by comparing the inventories of selected household possessions, many of which originated as dowry gifts (see Table 44).

TABLE 44
MEAN FREQUENCIES AND t-TEST RESULTS FOR SELECTED HOUSEHOLD POSSESSIONS IN KUTIANA AND JANANIA (FARM SAMPLE)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Kutiana (n=28)</th>
<th>Janania (n=27)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bicycles</td>
<td>0.24</td>
<td>0.17</td>
<td>.27</td>
</tr>
<tr>
<td>Radios</td>
<td>0.24</td>
<td>0.46</td>
<td>.09</td>
</tr>
<tr>
<td>Watches</td>
<td>1.40</td>
<td>1.29</td>
<td>.37</td>
</tr>
<tr>
<td>Flashlights</td>
<td>0.48</td>
<td>0.58</td>
<td>.28</td>
</tr>
<tr>
<td>Coats</td>
<td>0.36</td>
<td>0.58</td>
<td>.06</td>
</tr>
<tr>
<td>Chairs</td>
<td>0.32</td>
<td>0.54</td>
<td>.25</td>
</tr>
<tr>
<td>Tables</td>
<td>0.32</td>
<td>0.21</td>
<td>.30</td>
</tr>
<tr>
<td>Stainless steel glass</td>
<td>1.48</td>
<td>0.54</td>
<td>.05</td>
</tr>
<tr>
<td>Stainless steel plate</td>
<td>1.52</td>
<td>0.08</td>
<td>.06</td>
</tr>
</tbody>
</table>

The mean frequencies per household of 9 modern household items were subjected to a one-tailed t-test analysis, the results of which are indicated in Table 44. There are no significant differences between the two

1. This interpretation assumes that farming households from the two villages are roughly equal in terms of wealth. In fact, Kutiana farm income is higher, an advantage which is not offset by Janania farmers' outside income.
villages at the 0.05 level of probability, with the exception of stainless steel glasses and plates ($p = .05$ and .06). The incidence of bicycles, watches, chairs and tables is nearly identical.

While the two villages appear to share in a regional system of prestige symbols (as evidenced by household possessions), certain differences do exist which can be attributed to irrigation. Two types of evidence are presented: (1) behavioral observations and (2) an inventory of household wall decorations.

An important feature of social behavior in Kutiana is best described with the Bagri adjective, nesari, which refers to "loose living" and includes behaviors of drinking, gambling, indebtedness, and adultery in approximately that order. This topic arose while asking an informant in Janania why the average debt level is roughly $1/15$ that of Kutiana. The explanation offered was that Kutiana residents are nesari; they drink and gamble and accumulate large debts as a result. With the price of a legal bottle of liquor equivalent to two days wages (Rs. 26), there is a logical connection between drinking and debt.

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2. The figures for average household debt are Rs. 369 in Janania and Rs. 5,643 in Kutiana. These figures ignore tractor loans in both villages and one extraordinary truck loan in Janania.
The distinction between nesari behavior and traditional behavior is not the quality of the behavior, but the quantity. Some Janania residents also drink, but it has not become a serious economic liability to any family. Perhaps this is because of the general absence of gambling, whereas it is common in Kutiana. Informants could not name any irrigated village that was not considered nesari. Only predominantly unirrigated villages, though not all of these, were deemed non-nesari (there is no specific term for its absence).

The apparent correlation between irrigation and nesari behavior might be due to an association between wealth and drinking/gambling behavior. Kutiana farmers have more money and can better afford relatively extravagant pastimes. The fact that average farmer income in Kutiana is 27% greater than in Janania, however, does not in itself account for the contrast in behavior. Perhaps the recentness and relative suddeness of Kutiana's wealth, compared to the more stable growth of Janania's economy, has also been a factor. Whatever the reasons, the practical effect on the landless in Kutiana is that they are tempted to compete in prestige behavior without possessing the necessary resources. It is probably significant that the landless men who were occasionally observed to be intoxicated were, without exception, working as siris, or had a history of siri work. They are caught in a vicious
cycle: participation in prestige behavior (drinking) can lead to further indebtedness with siri employment providing their only occupational option. Thus, the prestige values of the irrigated economy can serve to further differentiate the rich from the poor and contribute to the institution of heavily indebted siri laborers.

Behavioral contrasts between Kutiana and Janania are also evident in a rather different context: the decorative arts. Women of both villages paint decorations around the interior doorways of their houses using one or more colors of paint. Usually only a few rooms are decorated even if the house is quite large. The total number of walls decorated includes any wall embellished with a picture calendar or other large poster, papier mache bowl, or any other paintings or reliefs. The papier mache bowls are

### TABLE 45

<table>
<thead>
<tr>
<th>Variable</th>
<th>Kutiana (n=28)</th>
<th>Janania (n=27)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decordated doorways</td>
<td>1.46</td>
<td>2.40</td>
<td>.05</td>
</tr>
<tr>
<td>Colors used in doorways</td>
<td>0.93</td>
<td>1.32</td>
<td>.07</td>
</tr>
<tr>
<td>Decorated rooms</td>
<td>1.43</td>
<td>1.76</td>
<td>.09</td>
</tr>
<tr>
<td>Decorated walls</td>
<td>1.96</td>
<td>2.60</td>
<td>.05</td>
</tr>
<tr>
<td>Calendars/posters</td>
<td>2.28</td>
<td>7.96</td>
<td>.01</td>
</tr>
<tr>
<td>Papier mache bowls</td>
<td>4.54</td>
<td>6.21</td>
<td>.13</td>
</tr>
<tr>
<td>Colors used on bowls</td>
<td>0.77</td>
<td>1.05</td>
<td>.16</td>
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themselves decorated with paint, and the number of colors used is included as a variable. Janania sample farm households have higher mean scores in all the decoration variables tested, and significantly higher (p<0.05) mean scores in three variables: decorated doorways, decorated walls, and calendars/posters (see Table 45).

The fact that household decorations differ between the two villages, and that all decorations are made by women, indicates a difference in the behavior of Janania women as compared with Kutiana women. It is possible that these behaviors reflect the lighter labor demands for Janania women; in Kutiana, women have less time for painting decorations. A more speculative interpretation is that differences in decorative behavior reflect changing values of Kutiana women. When viewed against the close similarities of material possessions in the two villages, the following explanation can be offered:

In Kutiana, exposure to urban value systems is a by-product of agricultural change. Outsiders from the irrigation department, electricity board, health department, the cooperative society secretary, bank officials, and others visit Kutiana on a regular basis. Women and children, landed and landless, are all equally aware of the economic change taking place in their village, whether or not they actually benefit from it. In Janania, the major cultural changes are occurring within the individual workers
who go outside the village in search of work. In this case, change is localized in the men, and specifically in the men who have given up farming. The men of both villages have been exposed to urban values to similar degrees but in different ways. The women of Kutiana have participated in these changes, since the agents of change have come into the village. The women of Janania are relatively more isolated from urban values, and this is reflected materially in household decorations.

Hypothesis 2. "Irrigated agriculture will tend to promote cultural identity with the national level (All-India), at the expense of village and regional identity."

The available data do not permit a direct test of this hypothesis. Field observations suggest there is little difference between Kutiana and Janania in the general sense of national identification. Religious posters used to decorate interior walls were expected to serve as indicators of the popularity of All-India deities as opposed to regional deities such as Ramdevji and Guga (cf. Epstein 1962:96). However, most posters used in decoration depict All-India deities; this is a function not of the villagers' religious preferences but of the supply of posters locally available. In any case, the Janania farm sample used three times as many religious posters as did the Kutiana sample (household means of 8.2 and 2.6 respectively), suggesting a
difference in decorative values, and perhaps in the importance placed on religion, but not in the particular deities displayed. Similarly, while Janania households honor a greater number of deities (2.3 deities per household, compared with 1.2 deities in Kutiana), the proportion of All-India gods and goddesses is not significantly different (9.7% in Janania and 11.8% in Kutiana).

**Traditionalization**

The impact of irrigation on cultural values is not unidirectional. While there are modernizing influences associated with irrigated agriculture, as noted above, there are also ways in which economic change has reinforced the traditional system of values, particularly in the realm of gender roles and caste relations. Because both villages participate in a common cultural interaction sphere, intervillage distinctions become muffled, yet some irrigation effects can be discerned. Two hypotheses are evaluated in this section, the first dealing with purdah values and the second dealing with caste/class distinctions.

**Hypothesis 1:** "With irrigated agriculture, purdah values will become more pronounced in structuring relations between the sexes."
The evidence for purdah values derives primarily from data on women's harvest participation, which is discussed in an earlier section (see Table 22, p. 187). The data show an increased participation rate in Kutiana over Janania, particularly in the case of farm households that hire wage labor. In the short run, the labor demands of irrigated agriculture result in a greater rate of female participation. In the long run, however, it appears that women are gradually replaced by hired labor, as households become wealthy enough to pay for workers. Whether this practice should be classified as an expression of purdah values or prestige values is an open question. There is a sense of a work ethic, whereby both men and women are proud to point out their hard work, suggesting that farmers do not feel deeply about keeping their wives and daughters out of the fields; they do, however, take a serious view of the need for social prestige.

**Hypothesis 2:** "Concepts of caste hierarchy will become reinforced between landless service castes and landed agricultural castes, forming a more class-like character."

Cross-caste interaction was observed in both villages to approximately the same degree. For men, card-playing in a multi-caste group, including Untouchable castes, is not unheard of. Intercaste drinking is rare, but does occur. The underlying character of intercaste relations, however, must be viewed against both the social
and the economic relations obtaining across caste lines in the two villages. In Kutiana, the Harijan castes are predominantly agricultural laborers, dependent almost exclusively on the Jat landowners for employment.

In Janania, by contrast, households which were completely landless have, for the most part, migrated out of the village in search of better prospects. Thus, the Harijan households that remain in Janania comprise a wealthier set of families than the Harijans of Kutiana. At the same time, many of the landed families of Janania, who have no irrigated land, are quite poor, with some upper caste men working as siris for their more fortunate neighbors, and in some cases relatives. The association between caste and wealth is less stark in Janania than in Kutiana. Irrigation-linked labor opportunities in Kutiana have allowed the poorest of the poor to remain in the village; indeed, many of the landless families of Kutiana immigrated into the village because of the attraction of the irrigated agricultural economy. To the upper caste farmers of Kutiana, irrigation has brought relative wealth which has encouraged them to concentrate on agriculture rather than looking outside the village for employment. In Janania, the scarcity of irrigation water has severely limited the agricultural opportunities available to landless workers, and to a lesser degree, to landed farmers. The gap between rich and poor is thus much greater in Kutiana, and more
obviously caste-linked. The formation of a dual class system -- landlords and landless -- appears to be supplementing, rather than displacing, traditional caste distinctions.

**Irrigation's Impact on Cultural Values.** The primary influences of irrigation on cultural values stem from the greater income generated by irrigated agriculture, and from changes in socio-economic relations within the household (gender roles) and between castes. The behavioral style described as "nesari" is present in Kutiana and largely absent in Janania; it has been suggested that the irrigated economy is responsible. Intervillage contrasts in household wall decorations suggest that cultural change has affected the women of Janania to a lesser extent than the women of Kutiana, or the men of both villages.

The role of irrigation in reinforcing traditionally held value systems has been examined in terms of purdah values and caste relations. In both cases, the labor effects of irrigated agriculture have influenced social practices. Women from the wealthier households are being slowing reclaimed from the fields as the practice of female seclusion becomes once more affordable. Caste divisions are given new meaning as the economic gulf widens between low-caste landless laborers and upper-caste landed farmers.
CHAPTER 7

CONCLUSIONS

This study has attempted an understanding of the broad cultural effects of irrigation development. The focus has been on two villages of Northwest India, but the implications go beyond the specific villages studies. How far beyond? Because of the particular features of the irrigation system, the local environment, Bagri culture, and the study villages themselves, it would be imprudent to claim sweeping generalizations about irrigation's cultural impacts based on this study alone.

The analysis in Chapter 6 has tested a series of hypotheses aimed at isolating irrigation's cultural impacts in a specific context: the villages of Kutiana and Janania. Both villages have been affected by irrigation, as well as by other forces from the outside world. These "uncontrolled" elements complicate the comparison, but also serve as a caution against simplistic presumptions of irrigation causality. The analytical approach taken has been to document differences between the two villages and attempt an explanation in terms of the known differences in availability of irrigation water.
When applied to economic data, this procedure functions smoothly in isolating major contrasts between the villages which can logically be attributed to irrigation. Data on cropping patterns, yields, and labor use fall into the category of easily demonstrated irrigation effects. The data on cropping intensity, showing that Janania farmers practice double cropping even without irrigation, can be explained in terms of the absence of irrigation; since Janania farmers have generally low yields, they are forced to operate at a lower level of marginal labor productivity than their Kutiana counterparts.

The hypotheses relating to social relations, and particularly, cultural values, require more elaborate explanations to demonstrate an irrigation effect. Does the fact that household types are found in similar proportions in both villages indicate that irrigation has no effect on household structure? Or are Kutiana households being affected by irrigation while Janania households experience similar kinds of influences from the non-agricultural sector?

The significance of this study to the greater body of irrigation literature lies less in the answers to such questions than in raising them. The methodology of controlled comparison is best applied to orienting research rather than attempting definitive solutions to complex problems. Kutiana and Janania represent two extremes of
irrigation intensity in the Bagar region, as measured by proportion of land area irrigated. Their utility as units of comparison rests on this difference; because of it they have experienced quite different economic histories during the past 30 years. By looking at both villages in comparison, a perspective is gained into the range of possibilities available which could not be known from one village alone. Irrigation has encouraged some occupations (farming, agricultural wage work) and has discouraged others (service sector, construction, retail trade) by rendering them relatively less profitable than agriculture.

A controlled comparison places the "independent" variable of irrigation in two different contexts. In Kutiana, irrigation is present; in Janania, irrigation is largely absent. Both the presence and the absence can have important ramifications. It is the absence of irrigation which has forced Janania residents, both landed and landless, to diversify into the non-agricultural sector, and to emigrate if necessary. At the same time, it is the presence of irrigation in the wider region which has stimulated the employment opportunities which Janania residents are diversifying into.

The findings of this study point to two broad implications for understanding irrigation's impact which may be relevant beyond the Bagri case. The first point is the relativity, both spatial and temporal, of irrigation
impacts. At the village level, do the socio-economic effects of irrigation refer to effects on the existing population only, or to those who migrated in (Kutiana) or out (Janania) because of irrigation's presence or absence? Kutiana has been a magnet attracting landless families who were related to indigenous landless families. These recent migrants have been affected by irrigation in Kutiana, and have had an effect on others by competing in the labor market.

In Janania the opposite situation is found. The lack of irrigation water is one reason that landless families were not able to continue living in the village; there was too little agricultural wage work on which to subsist, and they were forced to migrate out. Their departure has affected the socio-economic composition of Janania, and has also affected the communities to which they migrated. By limiting consideration to irrigated villages without including the broader region, the picture of irrigation's impacts is not only incomplete but highly distorted.

A corollary to the concept of spatial relativity is temporal relativity. The impact of irrigation in the short run can be quite different, or even the opposite, of the long run effects. For example, the short run effect on the agricultural labor participation of women in the household is to draw women into agricultural work. In the long run,
this trend appears to be reversed, and women are gradually pulled out of labor to the extent that they may do even less than was the case before irrigation.

The second broad implication of this study is the utility of a holistic perspective of irrigation's cultural impacts. The primary economic effects of irrigation (e.g., productivity) have a strong influence on labor relations between households and on social roles within the household. The example of nesari behavior illustrates the kinds of inter-relatedness which irrigation effects involve. Drinking is largely an imitation of urban prestige behavior and reflects a growing awareness of the secular urban world, an awareness which has been enhanced by the dynamics of irrigated agriculture. When combined with gambling, drinking can lead to debt, and indebtedness results in a search for credit. A number of credit schemes have been introduced to encourage farmers to intensify the cultivation of their irrigated holdings. The indebted landowner can easily secure a loan under an agricultural pretext, leading to even greater debts. Irrigation effects are thus partly responsible for both the problem (drinking) and the short-run solution (credit).

The method of controlled comparison has revealed both similarities and differences between the two study villages. The greatest contrasts are found in the economic
sphere; Kutiana is a village of farmers, while Janania follows a more diverse economy. Some social and cultural differences have also been noted, but perhaps it is the similarities which are most remarkable. Both villages are closely linked to the regional economy, and residents of both villages are aware of the change taking place about them. Though the process of change has been different in Kutiana and Janania, the cultural effects are similar.
APPENDIX A

MAPS

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Map 1. The Bagar Region of India
Map 3. Kutiana Village
Map 4. Janania Village
APPENDIX B

AGRICULTURAL EQUIPMENT

1. Camel-Drawn Cultivating Equipment. There are five standard plow type which most farmers use, but do not necessarily own; these are listed first, followed by three types of soil preparation equipment. The wooden tools are generally made by local carpenters; the newer iron plows are purchased from outside markets. A strict sexual division of labor applies to these tools; according to all informants and my own observations, women never plow, nor do they participate in preparing the ground for planting, or in the planting operation itself.

Moonah
The traditional Bagri plow once made entirely of wood, but now incorporating two metal pieces: an iron rod for cutting the soil and an iron plate for spreading the soil. The moonah is used for general plowing and plow-weeding, but not for planting. Price: ca. Rs. 70.

Morkha
Used for most planting, the morkha is made mostly of wood but with a metal edge (morkh) to protect the wood and an iron rod to cut the soil. A seed pipe (pora) is attached to the back, and either seed or fertilizer is fed into the fresh furrow while plowing. Price: Rs. 70

Tota
The improved version of the moonah, this plow has a wide (ca. 30 cm) iron blade with rounded bow that pushes the soil to both sides. Introduced less than 15 years ago,
this is now the preferred plow for general plowing (but not planting). Price: Rs. 150.

**Noharwalla**

This improved version of the morkha, introduced six years ago, can be used for both plowing and planting. More narrow than the total, it plows deeply and breaks the soil more finely. This is the preferred plow for preparing unirrigated land where soil moisture must be carefully conserved. The name derives from the town of Nohar, its place of manufacture. Price: Rs. 130.

**Tirphalli**

With three prong-like blades, the tirphalli is used for quick, shallow plowing just before planting, or for plow-weeding when the crop is young. With the middle blade removed and a double seed pipe attached, it is used for shallow planting. Price: Rs. 150.

**Karawa**

Levelling board made of two or three wooden planks attached to form a wide board. This is an essential item for preparing irrigated fields. (no fixed price)

**Swagha**

Smoothing board made of two narrow planks with a gap in between. The farmer stands on top of the boards, holds on to the camel's tail, and is dragged across the field. This operation is important for preserving soil moisture by reducing the soil surface area. The karawa can also be used for this purpose. (no fixed price)

**Ronda**

Cutting board consisting of an iron blade held between two pieces of wood. It is dragged horizontally to cut weeds about 5 cm below the soil surface. The ronda is used on fall fields to remove weeds which would otherwise deplete soil moisture and nutrients. Price: Rs. 80.

2. **Hand Tools.** Three iron-bladed hand tools and four wooden threshing tools comprise the hand tool assemblage. There are no gender rules regarding any of these tools with the exception of the kassi, which women rarely, if ever
The iron tools are either purchased in outside markets, or the blades are purchased from itinerant blacksmiths and attached to a handle by the farmer or local carpenter. Nearly all the threshing tools are made locally.

**Kassi**
A broad-bladed, short-handled hoe used for general digging. In irrigation, the kassi is used to construct bunds and to dig and maintain water channels. Price: Rs. 30

**Kassia**
A small-bladed, long-handled hoe used for weeding by both sexes. Price: Rs. 10

**Danti**
Serrated sickle with a curved blade set in a wooden handle. The danti is the standard tool for all harvesting work. Price: Rs. 3 to Rs. 10.

**Javi**
Wooden pithfork with two prongs, used for piling mounds of the harvested crop on the threshing floor.

**Chosangi**
Wooden pitchfork with four prongs, used for threshing (i.e. beating the plants to shake loose the seeds).

**Tangli**
Wooden pitchfork with 7 to 9 prongs, used for winnowing (i.e. tossing the grain and chaff into the wind to remove the larger pieces of chaff).

**Chhajh**
Winnowing tray made of straw tied with leather sinew, used for the finaly winnowing operations. These are made exclusively by the Sweeper caste.
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