The Dark Zone:
Groundwater Irrigation, Politics and Social Power in North Gujarat

Anjal Prakash

Propositions

1. The relationship between groundwater irrigation and social differentiation starts with the basic inequality in the ownership of land (This thesis)

2. In Sangpura, two parties – the landlord and the tenant- contribute to cover the costs of a production process in certain proportion but benefits differently and disproportionately. The 'partnership perspective' does not problematise the social relations underlying the sharecropping arrangements and do not question the issue of disproportionate right in land and water (This thesis)

3. A system is class efficient if the more powerful class can maintain a higher income in its favour, despite the lower production efficiency of the system (Bhaduri 1997)

4. The rule of caste obeys the rule of power (Gupta 1991)

5. Caste is crucially concerned with determining access to the means of production, control over resources and institutions and forms of surplus extraction (Chakravarti 2001)

6. While farmers have long been dependent on the state for essential inputs to agriculture, in recent years politicians in the state governments have also become dependent on farmers (Dubash 2002)

7. There is a particular way in which the state has identified the problem (of resource depletion) and created programmes reflecting their political constituency (This thesis)

8. Knowledge, the object of knowledge and the knower are the three factors which motivate action; the senses, the work and the doer comprise the threefold basis of action. Bhagavad Geeta, Hindu Text

Propositions attached to the thesis
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Anjal Prakash
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Anjal Prakash

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माटी कहे कुम्हार से तू क्या रूँधे मोहे
इक दिन ऐसा आयेगा मैं रूँधूँगी तोहे

The Clay says to the Potter 'You do not dig and smother me.. for one day it will so happen I will swallow you into me'

Saint Kabir
15th century mystic Indian Poet
(English Translation Das 2003: 21-22)

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Glossary

adiwasi	indigenous people
araji	selling the land through bidding
aras-paras	mutual sharing of labour within households
bajri	pearl millet
balwadi	kindergarten
bandh	lockouts
barad	draught animal
beti	daughter
bhag	division
bhagidari	shareholding
bhagidars	shareholders
bhagwan	God
bhagiyo	tenant
bhajan	devotional songs
bhakti	devotion
bin-bhagidar	non-shareholder
boribands	small dams made up of sand filled gunny bags
chaa	tea
chana	chickpea
chaukidar	watchman
chawls	one-room houses
chikoo	a fruit, also called sapota, scientific name *Achras Sapota*
dhan	wealth
dhani	landlord
ghar ka dhani	historically landed class
ghat	platform

guthka	a form of chewing tobacco; it is made more attractive by adding sweeteners, flavourings and nuts
haath	literal meaning is hand, but it is a system of measurement. 25 haath equals around 1 meter
iter kaum	other castes
jajmani	a socio-economic system interrelating members of village community for inter-change of services and goods between the various castes
jiru	cumin
kabirpanthi	the followers of Saint Kabir
kalakwari	used in irrigation schedule denoting hours
kharif	monsoon season
khet talawadis	farm ponds
kos	irrigation device operated manually through the use of draught animals
kurta	a traditional piece of clothing common in India. A long shirt worn along with a pyjama
labh pancham	fifth day of the Gujarati new year; in mythology, it is called the day of Laxmi, the goddess of wealth, and is related with the day to resume business in the new financial year for Gujarati businesspersons
mag	green gram, a kind of legume (pulse) (scientific name *phaseolus mungo*), grown for food in India; also called gram, mung bean, Chinese mung bean, and green-seeded mung bean
majuri	wage labour
masala	spices
mehnatkash kaum	hardworking caste
mehsul	tax collection
methi	fenugreek
mukhi	the village headman in the British era
nath	traditional organisation of families within a caste group

navnirman	reconstruction
paan	an ethnic south-Asian chew mixed with spices such as cardamom, tobacco, anise and lime paste, grated coconut, different kinds of betel nuts and small pieces of various candies wrapped in betel leaf
padi	footman soldier
panchayat	the lowest tier in the structure of self-governance
panchrangi	five-coloured
parmarth	working without expectation of reward
puda	a bundle of grass
rabi	spring
rayotwari	rayot is a category meaning 'peasant'. The British introduced the Rayotwari system, which was based on full survey and assessment of cultivable land to get better revenue
rela	flow
reteelee	sandy
roti	flat bread
samaj	caste or kinship based social institution
sarpanch	head of the village council
savarna	upper caste
sukhi	well-to-do
swarth	greed
tal	sesamum seeds (*sesamum indicum*)
talhati	lowest level of administrative staff
taluka	sub-district
topi	cap
tukri ghaun	indigenous variety of wheat
ucchak	fixed rent for land under sharecropping
unnado	summer
vaniya	money-lender caste
variyali	fennel
vyavasthit	balanced

zamindar	the term zamindar comes from the Persian *zamin* or land, and *dar* ,which is an inflexion of the verb *dashtan*, denoting to have, hold or possess; zamindars were farmers of revenue - intermediaries created by the Permanent Settlement in British India

Abbreviations

AMC	Ahmedabad Municipal Corporation
BJP	Bharatiya Janata Party
BKS	Bharatiya Kisan Sabha
BPL	below poverty line
CGWA	Central Groundwater Authority
CGWB	Central Ground Water Board
CReNIEO	Center for Research on New International Economic Order
DAP	diammonium phosphate
GEB	Gujarat Electricity Board
GEC	Gujarat Ecology Commission
GERC	Gujarat Electricity Regulation Commission
GKSS	Gujarat Khdut Sangharsha Samiti
GOG	Government of Gujarat
GOI	Government of India
GSDP	gross state domestic product
GWRDC	Gujarat Water Resource Development Corporation
HP	horse power
HYV	high yielding variety
INC	Indian National Congress
IWE	Irrigation and Water Engineering Group
IWMI	International Water Management Institute
KHAM	combine of Khsatriya, Harijan, Adiwasi and Muslim
MAF	million acre feet

MHa	million hectare
MTI	Matching Technology and Institutions
NBA	Narmada Bachao Andolan
NGO	Non Governmental Organisation
NVDP	Narmada Valley Development Plan
OBC	other backward caste
SC	Supreme Court or Scheduled Caste
SDP	state domestic product
SSP	Sardar Sarovar Project
TISS	Tata Institute of Social Sciences
USA	United States of America
VIKSAT	Vikram Sarabhai Center for Development Interaction

Preface

In 1997, I joined the groundwater programme of VIKSAT soon after graduating from Tata Institute of Social Sciences (TISS), Mumbai. Along with my colleagues, we were researching the socio-economic impact of groundwater irrigation in an agriculturally prosperous village of north Gujarat. The fieldwork was planned for three days with a long questionnaire. We travelled everyday for hours to reach the village in the morning and came back after dusk to relax in the hotel room. In three days of fieldwork, I filled numbers of questionnaires asking straight questions and seeking short answers, sometimes in yes and no. We did not have much time! While analyzing the data we concluded that groundwater irrigation had a positive impact on income and employment. However, something inside me did not approve of the methodology adopted for the study. It was different from my earlier training where I was taught that the 'whole is always greater than the sum of its parts'. The present work stems from this critique of quantitative social research methods.

My close interaction with village social life started back in 1993 as a student of rural development. However, a prolonged stay was only feasible while working on the present project. Many people facilitated this process. I am thankful to Hiteshbhai who invited me to his village to stay and research issues of groundwater depletion. Joitaram and Dayeeben Prajapati, opened their home and heart for me and provided the social space to stay. Joita Kaka (as I call him) also accompanied me to places when I needed help and introduced me to the whole village community. He helped me to read old

Gujarati script while looking at land and tax revenue records in the village and in Mehsana town. This research would not have been possible without his active support, understanding and help. Masi (Dayeeben) cooked for me and waited until I returned from the field. I am also indebted to the residents of Sangpura village who shared their knowledge, history and life with me without hesitation. Some individuals were interviewed with the condition of anonymity and therefore their names and the name of the village have been changed to protect their privacy and identity. I would also like to state that I do not want to personally offend any one and that my concerns are purely academic for raising certain fundamental questions related to the process of resource exploitation.

My association with VIKSAT has been what I call the grounding of my ideological flight. Working with an interdisciplinary group helped to strengthen my own arguments. I am immensely thankful to Srinivas Mudrakartha for guiding me through this process.

This book is my PhD dissertation at the Irrigation and Water Engineering (IWE) Group, Department of Environmental Sciences, Wageningen University and Research Centre under the programme Matching Technology and Institutions (MTI). I am deeply indebted to Peter Mollinga for his supervision and guidance. He not only helped me to re-conceptualise the work, but also supported me through detailed methodological, theoretical and practical inputs. His responses were quick and direct, which taught me how to be concise, concrete and crisp in analysis and writing. No words can ever thank him for his encouragement and direction. I am immensely indebted to Dik Roth who was meticulous in appraising notes, checking on my writing apart from providing detailed conceptual inputs. Discussions with him for hours and over endless cups of coffee made me more confident about my work. Linden Vincent has steered my thoughts by what she says, being the 'devil's advocate'. She constantly questioned my idealism and taught me to look through technology and institutions beyond my ideological biases. I take this opportunity to formally thank her for all the support and guidance. I am also grateful to the Ford Foundation for granting the scholarship, which facilitated the fieldwork and writing in India and in the Netherlands.

During my fieldwork in India, I was associated with the Institute of Rural Management, Anand. I am grateful to V. Kurien, Chairperson, IRMA and Katar Singh, the then Director of IRMA for approving my candidature. Vishwa Ballabh steered my research and placed it in the local context. His sharp skills in dealing with issues of agricultural economics are reflected in two of the chapters, which was guided though his intellectual effort. Every time I went to discuss with him, I was not allowed to return without having an elaborate lunch at his house. I am also thankful to Binoy Acharya, Director, Unnati who provided opportunity to supplement the scholarship to stay in India. Interactions with J J Royburman of TISS generated my interest in social anthropology.

My participation in the MTI workshops have been a motivating factor to consolidate research findings and present them in workshops held every six months. Apart from the critical comments on the progress of research, these workshops were also helpful in building personal links with fellow PhD travellers and to draw strength. I am thankful to R. Manimohan, Pushpa Raj Kanal, Vishal Narain, Jyothi Krishnan, Preeta Lall, Bala Raju Nikku, Suman Gautam, Amreeta Regmi, Shriprakash Rajput, Pranita Udas, G. Mini and Sophia John for their help and support. Special thanks to Esha Shah and R. Parthasarathy for their critical comments and motivating discussions at various stages of my work.

I want to thank the staff of various libraries, which I visited during the course of research. I have used the libraries at VIKSAT, Centre for Environment Education, Sardar Patel Institute of Economic and Social Research, Gujarat Institute of Development Research at Ahmedabad, Institute of Rural Management, Anand and Wageningen University Library at The Netherlands. My special thanks to Gerda de Fauw and Maria Pierce of IWE for their invaluable administrative support.

My stay at Wageningen for initial conceptualisation and writing the thesis has been memorable and pleasant. Several people contributed to this process. I profoundly acknowledge my interactions with Margreet Zwarteveen, Flip Wester, Bert Bruins, Rutgerd Boelens, Alex Bolding, Gerrit van Vuren, Frans Huibers, Jeroen Warner and Kai Wegerich. Jeroen Vos helped me with research planning during my stay in 2000-2001. I acknowledge the

friendship of Foppe, Pieter, Martine and her friends. I would like to thank Arun, Ajay, Ganesan, Ranvir, Garima, Sharad and Anand for bringing me out of otherwise lonely evenings and nights. I am thankful to my family friends Sujit and Ranjan, Sunil and Jyothi and Jayant and Sudeshna for their continued support and love. Ajit has been a great friend who provided while sitting miles away.

With profound memory, I remember my farther, Shiv Kumar Narayan whose interest in art, music and literature tuned my thoughts. I thank my sister Suparna, my brothers Utpal and Dewal, their family and my in-laws Asha Prasad and Dinesh Kumar for their love, care and affection.

Last and foremost, I acknowledge the love and encouragement of Swati Sinha, my friend and companion. She coped with the several periods of separation during the study period while I was away either in the field or in the Netherlands. Her compassion and support went a long way in completing this book on time. The work related to this book had the privilege of being with me for many days, evenings and nights, which actually belonged to her. No words can exactly match my feelings and love for her.

This book is dedicated to my mother, Prabhawati Narayan Karan, who raised us with lot of difficulties by sacrificing her own life. She preferred my education in better institutions to her own pressing necessities and made me chase the quest for knowledge. It is only now that I understand how hard it was to raise four demanding children as a single parent. Her sacrifice to bring us up and make us stand on our own feet has been tremendous and remarkable. I remember how she wrote her PhD thesis in the kitchen while cooking for us, so much so that her supervisor complained about the stains and smell of spices from the chapter drafts. Writing my own PhD thesis while having access to the latest technologies, libraries and all the time for myself makes me realise how hard it must have been for her to write while working and cooking for her growing children. Apart from seeking higher knowledge, her main motivation to complete the thesis was a small increment in her salary, which helped us study further. *'Amma, this goes to you'.*

Wageningen, The Netherlands, October 2004

1

Introduction

From the second half of the last century, agriculture in India has gone through enormous changes because of the introduction of green revolution technology. The technology demanded more control over irrigation, which the large canal systems were unable to provide. Groundwater irrigation was seen as a feasible alternative to the bureaucracy-controlled canal systems. In addition, groundwater irrigation could cover areas that were historically not part of the surface irrigation schemes. These advantages of groundwater over surface irrigation led to sharp increase in its use. However, due to the large areas being irrigated by groundwater, over-development and depletion of aquifer systems is becoming common. Gujarat is no exception to this process where groundwater supports more than 77 per cent of its irrigation water requirements. Increased groundwater use coupled with a rising pollution level in surface water bodies has resulted in water scarcity, leading further to groundwater exploitation. The process transferred many regions from water abundant to water scarce areas in just four decades. With this increased groundwater use, a spurt in water markets was reported from the early1980s. Dense markets developed in alluvial central and northern regions of Gujarat, which were suitable for sinking deep tubewells. The growth in water markets led to debates over its nature and way of functioning, often to the level of rhetoric. A group of academicians advocated dense and competitive groundwater markets on the ground of efficiency and accessibility to the

resource - but without unpacking nuances of unequal social relationships, and natural and historical functions that shape and determine groundwater access and use. Apart from a few very recent studies, the debate lacked detailed methodological and empirical inputs for understanding, how groundwater irrigation and markets function at the ground level.

The present study fills this gap by focussing on the politics of groundwater markets and their interrelation with social differentiation and class-caste relations. It is based on an intensive village-based case study situated in the Mehsana district of north Gujarat, which is famous for its widely developed groundwater markets, and depletion of aquifer due to excessive pumping. The study shows how social relationships shape and determine access and use of groundwater in the context of a specific agro-ecology, prevailing social relations of production, ineffective regulation to check groundwater exploitation and inequality in resource ownership.

This chapter is divided into three sections. In the first section, I introduce the above concerns through a snapshot of two families that indicates the process of change taking place in villages of north Gujarat. Agricultural intensification and groundwater exploitation are important factors contributing to the changing prosperity of these two families, and brings one into a dependency relationship with the other. Following this, I sketch the social geography of the village where the study is located. The second section locates these issues in the theoretical arena. I begin with a review of the literature on groundwater irrigation from the perspective of agrarian change, showing the lack of detailed information on internal characteristics of groundwater irrigation institutions. I then locate the focus of the present work through a triadic framework of the theory of agrarian institutions, ecological variables in agrarian change and the domain of the state in influencing institutions, nature and society. The third section introduces the focus of research and the central research questions followed by the methodological design of the study and ends with an overview of the chapters.

Changing Prosperity: A Tale of Two Families

Mahendrabhai Patel[1] owns 2.3 hectare of land and a 20 per cent share in a tubewell in Sangpura village.[2] The tubewell has nine other partners and together they used to irrigate 21 hectares of land in 1986 at the time of its construction. Out of that, nine hectares worth of water for irrigation used to be sold to buyers. With the depth to the groundwater table being 35 meters, a 35 horsepower (hp) electric engine and 16 hours of electricity supply per day, the tubewell used to make a profit of more than Rs. 50000 per year. The profit used to be distributed among the shareholders proportional to their individual shares. The land was very fertile. Together with high yielding variety (HYV) seeds and timely irrigation, the returns from agriculture were significant. In 1990, when the electricity supply was reduced to 12 hours a day, the tubewell command shrank to 16 hectares. Subsequently the electricity supply was further reduced to ten hours a day and by this time the groundwater level had dropped to 88 meters. In order to sustain a similar level of water supply the capacity of the electric pump had to be increased to 51 hp. The command area of Mahendrabhai's tubewell was reduced to 11 hectares. He stopped the sale of water totally, as the shareholders of the tubewell could barely irrigate their own land. The stop on water sales had a significant impact on profit, as now Mahendrabhai had to pay the irrigation charges for his own crops. Earlier, the cost of irrigation water used to be paid largely from the profit that his share from the tubewell yielded. Furthermore, land productivity declined drastically due to three decades of intensive cultivation, resulting in crop failure and reduced agricultural production.

These problems led Mahendrabhai to take a very important decision. While visiting his relative's house in the neighbouring village, he heard about going to the USA, to where many of his cousin's relatives had migrated. He could see a perceptible change in their lifestyle, and hence was impressed with the idea. Long-distance migration became a strategy to be financially independent and diversify away from stagnating agriculture. Mahendrabhai contacted his relative and the agent who arranged visas for going to the USA. After 5 months of struggle and constant follow-ups, he reached Chicago in October, 2002 paying Rs. 800000 (approximately US$ 16842)[3] to the agent. The money paid to the

agent was borrowed from different sources at 24 per cent rate of interest per annum.

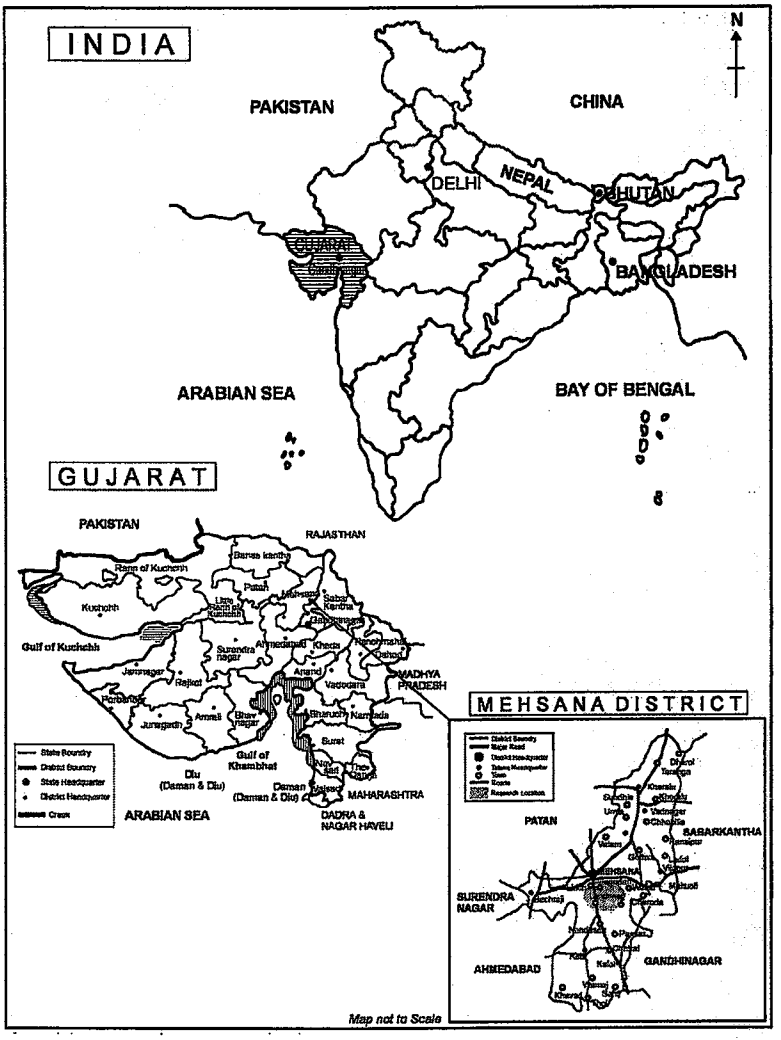
Mahendrabhai now works in a motel near Chicago, owned by one of his distant relatives. He earned UD$ six an hour in 2002 (approximately Rs. 285). He worked for 16 hours a day and had repaid the entire loan in the first two years. Back home, he left his two sons, a daughter, wife and aging parents. His elder son has finished an apprenticeship course in mechanical engineering while the younger one is going to attend college. His daughter, the eldest child in the family, is married to a wealthy businessman in Mehsana. Mahendrabhai's sons are not interested in agriculture and therefore the major part of their land has been given for sharecropping. A small proportion of the land is under the family's cultivation and is used for growing pearl millet and alfalfa, as dry and wet fodder for buffaloes. The family now keeps five buffaloes instead of two in 1990. The milk is sold at the village dairy cooperative. This gives an income of more than Rs. 10,000 per month. Mahendrabhai sends money every alternate month through illegal money transfer channels. He was the first person from the village to migrate to the USA and was followed by 99 others by the end of year 2002. Apart from repaying the loan amount and marrying his daughter into a wealthy family, Mahendrabhai invested in another tubewell, of which he owns a 30 per cent share, along with five others. The new tubewell is 200 meters deep while the water level is at a depth of 117 meters. The capacity of the electric pump is 72 hp and irrigates ten hectares of land. They sell water for around two hectares and the rest is utilised for the shareholders' land.

Lakhaji Thakore cultivates half of Mahendrabhai's land through a sharecropping contract. Lakhaji owns 0.34 hectare of land on the western side of the village. He used to irrigate his land through buying water from a Patel's tubewell, but for the last five years, the command area of the tubewell has considerably reduced. He could not buy water, as it was not sufficient even for the shareholders. Since then, Lakhaji and his wife have been cultivating land through sharecropping contracts. Lakhaji has an aging mother and two sons who are married. His sons are working as daily wage labourers in and around the village while the daughters-in-law help in agricultural operations. Under the contract, the total agricultural production is divided equally, one part each for the three major

inputs - land, labour and water. Two-thirds of the net production goes to Mahendrabhai as he owns the land and also has a share in the tubewell that supplies irrigation to the field.[4] The sharecropping, however, hardly meets the need of Lakhaji's family as the productivity of land has gone down in recent years. According to him, the land does not produce what it used to earlier. The returns from agriculture are divided and Lakhaji only gets a part of total production, which barely meets the necessities of his family. Lakhaji wishes to have a share in one of the tubewells, but this seems a far-fetched dream. He puts it precisely, 'If we could afford a share in a tubewell, we would be working on our own land. What do we get in sharecropping – only some grains for the household and weeds as fodder for the buffalo?' Since his own land is not irrigated, he can grow only non-irrigated pulses if there is a good monsoon. To feed his family, he has to grow irrigated crops such as pearl millet and wheat. This explains his decision to take land on sharecropping.

'Within the family, it is the women who bear the burden of work' says Taraben, wife of Lakhaji. She thanks God that she has two daughters-in-law who can work in the field that her husband takes on sharecropping. 'Who would do weeding, harvesting, gleaning, sowing and taking care of the buffalo if not women? These have never been men's jobs anyway,' says Taraben. For her two daughters-in-law, the work is never ending. They get up in the morning at five and after their usual work at home such as cooking, cleaning, milking the buffalo and going to the dairy, they go for work at 8:00 in the morning. Until 12:30, they work in the field after which they come back and cook for the family. Their mother-in-law looks after the children. After lunch, they again work from 2:30 to 5:30 pm in the field. The weeds cut in the field are brought back and are given to the cattle as fodder before milking them. After milking, they go to the dairy for selling the milk. Back home, they cook for their family, feed the children and take up other household work. Their husbands go out of the village to work in the brick-making factory nearby. Since they are women, they have to look after their children and family and work in the farm. This is the reason why they do not leave the village for wage work like their husbands. After all the hard work that the family members put in, they barely have enough to eat. The sharecropping does give them food security for four months but it is not sufficient for the

MAP 1.1: INDIA, GUJARAT AND RESEARCH LOCATION, 2001



family of six adult members and five children. Lakhaji's sons do not get work everyday and sometimes they come back empty-handed. The family earns Rs. 1000 per month from the sale of milk. Lakhaji admits that the burden of agriculture has been shifted to women, who are at the forefront of all the economic activities. For the family, it is an agrarian trap induced by lower productivity,

dependencies in agrarian relations, ever-increasing irrigation prices, crop failure and hard work without much return.

The varying prosperity of these two families point towards the process of transformation taking place in Sangpura village. Sangpura is located in the heart of groundwater-mined Mehsana district in north Gujarat in western India (see Map 1.1). The transformation has been brought about mainly through the green (crop) and white (dairy) revolutions, dating back to the 1960s. Agriculture was beginning to commercialise even a decade before the introduction of the green revolution technology in the village. The agricultural produce market, started in Mehsana town during the same period, helped peasants to cater to an expanding market and determined their cropping pattern. The dairy and primary agricultural cooperative started in the early 1960s enhanced this 'commercialisation' process. Ecological factors such as the large groundwater reserves in north Gujarat especially in the plains of Mehsana district, and the advent of tubewell technology, boosted this growth. Apart from this, larger developmental processes such as the spurt of the cotton mills of Ahmedabad from the early 20th century until the late 1970s, employment in the diamond polishing industries during the 1980s and employment in the diamond polishing industries during the 1980s and employment in small-scale industries after the 1980s helped in creating opportunities outside agriculture, and created many backward and forward linkages. Surplus created both inside and outside the village was reinvested in agriculture, making the new technology stand on a firm footing. Tubewells were dug in the early 1980s to access deep aquifers as the shallow dug wells started to dry up in the village. The productivity of agriculture was significant, which led to intensive cultivation. The 1980-1990 period, is referred to in the village as the 'golden years' of agriculture.

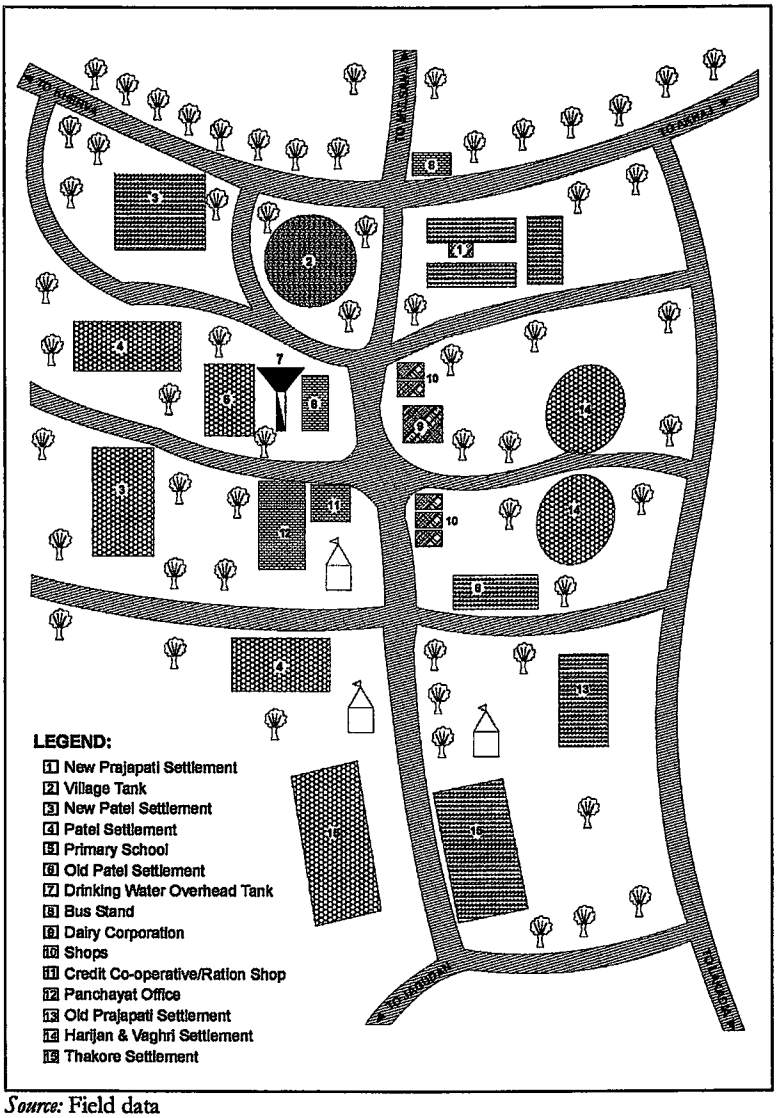
However, the developmental process did not enhance equity in a village characterized by social and economic inequalities. The dominant classes and castes monopolised the two productive resources of land and water. Through the control over labour and institutions such as the *panchayat* (village council) and the credit and dairy cooperatives, that dominance was reinforced. Groundwater-irrigated agriculture further widened this gap, as in the changing situation the access to water is determined through the level of investment and share in the tubewell. In addition to this, the

dominant class systematically shifted the irrigation costs towards the small and marginal farmers through their monopoly over tubewell irrigation. Almost all tubewells have until recently made profitable business through the sale of water to non-shareholders, and the shareholders subsidised their own cost of water in this manner. The dairy economy thrived, feeding into agricultural investment and vice versa. By the end of the 1990s, the dominant class had accumulated enough surpluses to partially move out of agriculture. This era shows long-distance migration by people belonging to dominant classes and an increase in the prevalence of sharecropping arrangements. The institutional arrangement of sharecropping created new ways of shifting the price of water to the sharecroppers. The context includes the decline in agricultural productivity, shrinking water markets due to reduction in electricity supply, and increasing crop failures. The burden of price was borne by the lower classes, who shared the risk in agriculture, paid the price of water and provided cheap female labour.

A Journey through the Landscape

Sangpura is just like any other village of Mehsana district but relatively small[5] (Map 1.2). In 2001, 628 families inhabited Sangpura (see Table 1.1). Looking at the three equally sized group of families, the village could approximately be divided between – Thakores, Patels and *Iter Kaum*[6] such as Prajapati, Darbar, Parmar, Vaghari and others. The three groups have an approximately equal number of families. Table 1.1 cites the major castes, the number of households and their primary caste-based occupation.[7] The village is around 700 years old and according to the village tales, a person named Sanga Rabbari, belonging to a pastoral caste settled it. Sangpura thus derived its name. If one happens to visit Sangpura in the morning, the common sight would be a number of women and men walking in one direction with a pot on their heads. They head towards the milk cooperative, an important institution of the village. Later, they head towards their respective fields on foot, tractors or bullock carts. The village has a primary school that educates children until seventh standard, after which they go to Akhaj or Kherva, three to four kilometres away, to complete high school, and then to Mehsana town if they want to continue further.

MAP 1.2: VILLAGE MAP OF SANGPURA, 2001



Source: Field data

The village is well connected by a concrete road to Mehsana town. The state transport buses come to the village in the mornings and evenings, with direct linkages to towns like Mehsana, Kadi, Kalol and Ahmedabad. For people working in and around

Mehsana, numerous private jeeps fill in the gap of frequency between the government run buses. The old dried up tank that has now become a place for garbage collection welcomes visitors to the village at its entrance. During summer, some families who stay nearby tether their cattle under the trees that stand in the periphery of the dried tank. A small road, bifurcating from the main road, leads to various small settlements of the village. On the left side one can see the new settlement of Prajapatis. Though Prajapatis have settled here, a few Patels also bought land and built their houses at the end of the cluster. On the right side, just across the dried tank, a new Patel settlement has come up to which families from the old Patel settlements have shifted. The new Patel colony stands proud with its majority of two-storied buildings, freshly painted houses and dish antennas. Further left towards the tank, a small path leads to the village cremation ground on the fringes of which some Dalit families have made their houses.

TABLE 1.1: CASTES AND THEIR PRIMARY OCCUPATION IN SANGPURA[8]

Caste	*No. of households*	*Primary caste-based occupation*
Thakore	225	Agriculturist
Patel	200	Agriculturist
Prajapati	70	Potter
Parmar	60	Cobbler and agricultural labourer
Vaghari[9]	25	Engaged in vegetable and fruit procurement and vending
Darbar	12	Agriculturists, former feudal lords
Rabbari	8	Cattle rearing
Rawal	6	Camel-Caterer
Bawa[10]	4	Village priests
Nai	4	Barber
Suthar	4	Carpenter
Senma	3	Agricultural Labourer
Darji	2	Tailor
Luhar	2	Blacksmith
Others	3	-
Total	628	

Source: Field data collected through focus group discussions in September 2001. The figure represents approximate number of households.

Further, the main road leads to three *paan* (betel nut wrapped in betel leaves with spices) shops where old and middle-aged Patels can be seen standing clad in spotless white *kurta* and pyjamas.

These Patels have given their land for sharecropping and have family members working in the USA. The spotless white clothes speak well for the status-conscious Patels. They discuss state and central politics sitting near one of the prominent pan shops. This shop also provides the morning newspaper that stimulates further discussions. Every inch of the newspaper is read and discussed. Along with the Patels, a few Prajapatis also have the privilege of sitting with them on the same platform. Another shop owned by a Thakore plays devotional songs in the morning, which slowly shifts to new Hindi movie songs as the day progresses, to attract the younger crowd, who are regular customers of pan and *guthkha* (a form of tobacco). Discussions among the younger clientele range from jobs in Mehsana town to various sex scandals which have broken out in the country.

On the right hand side of the main road, there is a washing *ghat* (platform) made alongside the cattle trough. The government tubewell that supplies piped water for domestic use is also located here. In the mornings, women wash clothes in the washing ghat and the water flows to the open low area beside the village school. This area is a breeding ground for mosquitoes. Further, the road takes a visitor to the prominent areas of Sangpura. On the left side, the milk cooperative building stands portentously. On the right stands a two-storied building with a ration shop on the ground floor and the credit cooperative society on the first floor. On the corner of the milk cooperative, the government-run *Balwadi* (kindergarten) is housed. The village teashop, a barbershop and a general store are seen alongside. In the mornings and evenings, the teashop provides a concoction of milk, sugar, water and tea in a 2:2:1 proportion popularly called *chaa* (tea) in the village. During winters, this tea is mixed with *masalas* (spices) to make it stronger and is liked by people of all ages.

The next destination is a conglomeration of three temples of the Lords Rama, Shankar and the Goddess Chamunda. The size and the maintenance of these temples speak of who the devotees are. Upon enquiry, one would always be told that the house of *Bhagwan* (God) is open to everyone. However, in fact these three big temples have only Patels and Prajapatis as usual visitors. Thakores come whenever there is *Bhajan* (devotional songs) in the village. Otherwise, for all practical purposes, other communities have their own temples in their domestic clusters. The three main temples are

beautifully decorated and painted every year. On the walls of the temple, one can see figures of saints including some political figures, like Gandhi and Sardar Patel.

The road then divides into three parts. The right turn goes to the old Prajapati and Patel housing areas and at the end joins the settlement of Parmars, Vagharis and Senmas. The left turn takes one to another important destination called the panchayat office, headed by the village *talhati* (secretary of the village council). The talhati is the lowest-level representative of the state administration in the village. On paper, the talhati is supposed to be the secretary of the village *sarpanch* (chairperson of village council) but in actual terms, every official work is done through the talhati. Without his (the post talhati in Sangpura was occupied by a man in 2001-03) consent, it is almost impossible to do any paper work in the village. The responsibility of the talhati includes maintaining land records, issuing caste certificates, ration cards, helping to conduct panchayat elections, issuing birth and death certificates, and dispute settlement. The range of responsibilities has imbued a sense of power in him. This power is manifested in many ways. Out of six working days, the talhati comes only for three to four days depending upon the number of meetings he has to attend in Mehsana town or elsewhere. Every morning, people stand outside the panchayat office waiting for him. The talhati stays at Mehsana, and if he does not come by the 10:30 am bus from Mehsana town, this means that he will not turn up for the day. The talhati of Sangpura is a man of few words. He speaks only when he does not agree to a proposal or when he expects favours for a certain task. In any case, he does not speak for himself; an orderly does this for him.

The straight road goes to Thakore settlements, where more than 200 families live. If one happens to follow the lane, children would follow too until one reaches ones destination. In the evening, people sit in one's group for chatting. Some of the youngsters play cards while betting on them. Women sit in groups around the Thakore temple. Thakore houses are mostly made of an un-plastered brick structure with corrugated iron used as roofing material. Very few houses have a concrete roof. One such house is the sarpanch's house. There are no double-storied houses like most of the Patels own.

The right hand turn of the straight road that crosses old Patel and Prajapati hutments leads to the corner of the village settlement boundary. On the corner of this live Parmars, Vagharis, Ravals and Senmas. The Parmar settlement greets one with a large painting of Dr. Bhimrao Ambedkar and his message for untouchable castes to be educated and organized. Here, there are four small and medium temples, divided between these four castes. Some of the Parmar houses are newly-built and signify the change in their economic status in recent years due to having government jobs. Vagharis and Senmas are not that lucky; they still live in mud or semi-concrete houses. Vagharis are mostly engaged in horticulture. Around 20 per cent of the village land is under horticultural crops, which are mostly leased by Vagharis on fixed rent basis. For chikoo (also called sapota, scientific name *Achras Sapota*) and lemon, the lease is mainly for a year. The season for guava lasts four months for which the Vaghari family shifts to the location in order to prevent theft both by human beings and birds that love to peck at them. Senmas are mostly agricultural labourers working within and outside the village.

Groundwater Irrigation and Agrarian Change

The intricate relationship between groundwater irrigation and development has been widely debated and polarised. Many believe that groundwater irrigation has a positive impact on productivity and generates year-round employment due to intensification of agriculture, and that therefore it can be used as a weapon against rural poverty (Chambers 1986, Chambers, 1988, Chambers, Saxena and Shah 1989, Shah 1993, Vaidyanathan 1996 and 1999, Narayanamoorthy 2001, Roy and Shah 2003). Irrigation is considered a powerful factor for food security, protection against adverse drought conditions, increased opportunities for more employment, stable income offering opportunities for multiple cropping and crop diversification. It is argued that access to irrigation leads to the adoption of new technology and increase in cropping intensity, which leads to higher productivity and greater returns from farming. Besides this, it also opens up new on and off farm employment opportunities improving the income level of farming households (Hussain and Biltonen 2001). However, unlike

canal irrigation, groundwater development mostly took place in the private arena, and in many locations access to groundwater is chiefly determined by water markets operating at a local level. Wide-scale tubewell irrigation and groundwater markets have been reported from various parts of India. They are mainly from states like Gujarat (Shah 1985, 1993, Kolavalli and Chicoine 1987, Shah and Raju 1987, Bhatia 1992, Dubash 2002), Tamilnadu (Janakrajan 1992, 1994, 1997b), Uttar Pradesh and Bihar (Pant and Rai 1985, Wood 1995, Shah and Ballabh 1997, Kishore 2004, Pant 1992, 2003, 2004), Karnataka (Chandrakanth et al. 1998), Andhra Pradesh (Shah 1986, Prahladachar 1994, Satyasai and Vishwanathan 1997) and Punjab (Jairath 1985). Most of the academic work revolves around the themes covering groundwater development (Dhawan 1982, 1988, 1993, Vohra 1982), groundwater markets (Shah 1993) and management of the groundwater resource due to large scale depletion (Moench 1991, 1994, 1999). Among them, the contribution and use of groundwater in irrigation development has been widely accepted. However, questions have been raised on the nature and functioning of groundwater markets and consequent market-based management prescriptions based on this analysis. The most prominent among these is Tushaar Shah's influential work on groundwater markets. Based on neo-classical economic analysis, Shah argues for dense and competitive markets on the ground of efficiency and equity of water use. Shah claims that groundwater markets are natural oligopolies and advocates policies that create a situation where oligopolists behave as if they operate under competitive conditions making the resource available to large population through market mechanisms (Shah 1993). His policy prescription is to have flat-rate electricity pricing based on contracted load of the tubewell motors, which will create incentives for farmers to access and sell surplus water. Shah's analysis has been criticised by scholars on the ground of his policy recommendation of charging flat-rate electricity. It is argued that flat-rate electricity charges have led to wide scale overexploitation of groundwater by resourceful farmers leading to deleterious implications on small and marginal farmers who are excluded due to their inability to chase the water table. Further, the issue of dominant caste/class's appropriation of an environmentally precious resource was not part of Shah's analysis (Palmer-Jones

1994, Moench 1994, Bhatia 1992).[11] Much of the critique of Shah's work is available elsewhere and hence I do not focus on it here.[12]

Instead, I focus on the issue of groundwater development from the perspective of agrarian change in groundwater dependent societies under the broad theme of irrigation ethnography. The reason to take this approach is the lack of detailed description of the internal characteristics of groundwater irrigation institutions in available literatures. Irrigation ethnography has been a long tradition in canal irrigation systems (Wade 1988, Sengupta 1980, Attwood 1984, 1985, 1987, Gorter 1989, Omedt 1993, Ramamurthy 1995, Mollinga 1998, Chakravarti 2001). It was influential in showing irrigation as a politically critical resource in societies characterised by inequitable distribution of power and resources. These studies showed how irrigation helped in transforming social and production relations and have different implications for different classes and actors, thus contributing in policy formulations for irrigation reform.[13] However, apart from few recent studies, the same has been largely missing in most of the analysis related to groundwater irrigation. This is more so for Gujarat as its model of groundwater markets have been widely discussed without much sociological enquiry on the process of groundwater development focussing on the question who gains and who loses in the course of these developments?[14] Allocation of a scarce resource such as groundwater is looked at from a narrow equity and efficiency perspective, while the questions of individualized appropriation of a common resource and its implications on an unequal society have hardly been answered. Further, the nature of relationships between agrarian structure and technological change in the context of agrarian transformation hardly gets precedence in these papers. Instead, there is an oversimplification of the problem, which tries to connect groundwater irrigation with poverty alleviation without unpacking the nuances of other possible linkages.[15] In the next few paragraphs, I review the available literature on groundwater from an agrarian change perspective understanding how local power structures impinge on the distribution of groundwater resources in order to locate the context of the present study.

Meinzen-Dick (1989) analysed irrigation development and agrarian structure in the southern Indian state of Tamilnadu. She studied how differential control over the resource affected access

to irrigation and how access to irrigation, in turn, affects agricultural production and employment. According to her, agriculture in Tamilnadu has gone through colossal changes with a shift from collectively managed surface water to individually managed groundwater.[16] This shift is associated with the technical innovation in pumping technology. While access to surface irrigation is related to ownership of land, access to groundwater is dependent on capital investments. Her study revealed that households with the greatest control over land and surface irrigation had an initial advantage in investing in the components of groundwater technology. Increasing dependence on groundwater irrigation reinforces inequalities based on land and surface irrigation resources. Irrigation development increases land productivity and employment opportunities due to external inputs and intensive cultivation. However, the increased employment is also supplemented by family labour for middle class peasants. Farmers with land but no access to water are increasingly dependent on wage labour. This indicates the proletarianisation of this group and thus amplifies the differences between households in their control of resources. According to her, 'the analysis of interplay between agricultural technology and social structure needs to go beyond land, labour and capital, to give explicit attention to the implications of differential control over water resources for agricultural production and agrarian structure' (Ibid: 208). Further, she emphasised that investment in irrigation contributes to food security and employment, but the extent and type of benefits of irrigation depend upon the household resource base. This means that 'irrigation development is not a substitute for redistributive policies to reduce inequalities in rural areas. The primary beneficiaries of irrigation development are the landed rather than the landless. Even within the landed classes, access to irrigation often reinforces rather than compensates for inequalities based on control over land. This is particularly true of access to groundwater, which requires a capital investment for digging a well and installing a pump-set' (Ibid.: 210-211).

Janakarajan (1992, 1994) studied the interlinked land-lease and credit markets in a village in Tamilnadu and highlighted the manner in which differential access to groundwater resources can be instrumental in precipitating an exploitative interlocking of water, labour and credit markets. According to him, 'the water-sellers

offer water to the purchasers in exchange for a rental share of the produce raised by the latter on his (her) own land, and labour services (paid or unpaid) which must be rendered by the purchaser for the seller. The trader offers a production loan to the water seller in exchange for a transfer of the latter's output at a price below market price; further, the trader exploits the relationship between the sellers and the purchasers of water by including the sellers to pressure the purchaser into selling his output cheap to the trader. He observes that the market for water favours the water sellers and the tying-up of the land-lease and labour markets that one frequently encounters in the literature of traditional landlordism is paralleled, to a great extent, by the interlinkage' (Janakarajan 1994: 151-201). He points out the unequal trading relationship that prevails between sellers and buyers, which results in the exploitation of buyers not only through price but also through non-price mechanisms. His analysis shows that the 'transactions' in groundwater markets leaves little room for the buyers to negotiate. This leads to involuntary involvement of resource-poor farmers who have no other choice but to cling to an exploitative structure, which perpetuates inequity in resource allocation and access.

Bhatia (1992) analysed the political economy of groundwater overexploitation by observing the pattern of groundwater utilisation in north Gujarat and raised the issue of inequity in access to resources. In a case study of Sabarkantha district, Bhatia studied eight villages in the course of distribution and ownership of irrigation assets between different caste/class groups. The first category of people belonged to economically well off upper caste such as Patels, Rajputs and Baniyas. The intermediate class consisted of people belonging to 'other backward castes' as well as scheduled tribes. The third category of people was of scheduled castes of Bhambis and Vankars who were landless. She found that ownership of irrigation assets was overwhelmingly concentrated among the privileged castes, especially Patels. It was more pronounced with modern irrigation devices such as tubewells than dug wells. Her analysis showed that the move from surface or low cost dugwell to deep groundwater irrigation has induced differential access to the resource that is largely concentrated with the upper castes/classes.

Dubash (2002) studied the agrarian question and institutionalization of groundwater exchange in north Gujarat. Using

data collected in two villages – Ratanpura and Paldi, the study looked at the dynamics of change in a groundwater dependent village and the emergence of institutions for the management of groundwater extraction and distribution. The study throws light on class-based categorization of study villages and observed that in both villages, caste corresponds closely to landowning and landless classes. Well ownership is closely tied to patterns of landownership. In Ratanpura, large landowners have their own wells, while farmers with smaller land size classes share well ownership. In Paldi, almost all wells are individually owned and there is no distinction across landownership classes. Dubash observed that the class boundaries were starker in Paldi than in Ratanpura, one of the reasons being the difference in patterns of groundwater utilisation. Further, groundwater irrigation brought structural forces that compelled technological and institutional adjustments and took the form of reorganisation of well ownership and deepening of commodity relations.

Of the four studies cited above, two were based in north Gujarat, the area of the present study. While Bhatia's (1992) work was in the neighbouring Sabarkantha district (see Map 1.1), one of Dubash's (2002) study villages is quite close to the village I studied in Mehsana district. Bhatia's study is a much-needed corrective of the way groundwater markets were portrayed in north Gujarat and was published when the literature was flooded with glorification of what was is called the 'groundwater market boom'. However, Dubash's work was published exactly ten years after Bhatia's monograph and was based on fieldwork conducted during 1995-96. My study departs from Dubash's work in several important ways. First, he used political economy as one of the approaches to understand the institutionalisation of groundwater exchange and discussed ways to curtail the 'tubewell capitalism'. However, his narratives do not necessarily disapprove of the groundwater resource appropriation by large farmers and instead this is looked at as a farmer's ability to be an 'entrepreneur' in exploiting groundwater resources. In fact, there is implicit praise for the commoditisation and commercialisation of agriculture, without looking into its interlinkages with increasing resource inequity and consequent social differentiation. Dubash did mention the unrestrained groundwater-based accumulation, which led to the 'centralisation of control over groundwater and towards centralisation of ownership of wells' (ibid.: 119-120). However, this

process was regarded as a 'success story in the development of agricultural productivity' (ibid.: 120) without explaining how this process influenced the labour process in villages with skewed access to productive resources. Second, Dubash used an 'intensive' approach as a research method but failed to capture the detailed everyday practice though which groundwater exchange institutions negotiate the distribution of water, and the politics that revolve around such intercessions. Third, though he studied social differentiation arising out of differential control over access to productive resources, his policy recommendations surrender to the local power structure that reproduces groundwater mining. Criticising the Model Bill to regulate groundwater use, Dubash suggested that 'allocation to individual well owners at sub-village level should be in the hands of the village community' and that 'the water allocation is not entirely determined by relations of power in the village' (Ibid.: 255). This notion undermines the fact that local water markets institutions are partly responsible for aquifer depletion. Powerful social groups have cornered and appropriated the resource while the people lowest in the social hierarchy have paid the price of water. Further, he advocated increasing electricity prices as 'electricity rationing has proved a powerful incentive to efficient water use' (ibid.: 256). Without safeguarding the interest of subaltern groups, the policy change will have an adverse impact on small and marginal farmers and water buyers, as the present study demonstrates.

Finally, much has changed in Mehsana district after Dubash's fieldwork in 1995-96. The electricity pricing policy of the government has reduced the hours of electricity supplied to the farmers, and slowly the water markets have shrunk. In addition, the increased depth at which groundwater is accessed, is leading to declining tubewell yield and escalating groundwater prices. The shrinking water markets have pushed water buyers out of the market. This is coupled with the retarded agricultural growth of Gujarat in recent years. Since agricultural growth largely depends upon available environmental resources and their prudent use, an environmental hazard such as depleting aquifers limits the growth of agricultural productivity. How is these situations tackled at the village level and what are the coping strategies of different social groups? What has been the response of the state and how do these responses change or contribute to the way groundwater is extracted, used and distributed? In the sections that follow, I try to locate these questions in the

theoretical arena through a triadic framework of theory of agrarian institutions, ecological variables in agrarian change and the domain of the state in influencing institutions, nature and society.

Political Economy and the Theory of Agrarian Institutions

History is concerned with the study of events and processes that lead to change in society. According to Marx, to understand change one needs to understand the processes by which human beings in society maintain themselves in existence, that is, the material processes of production and distribution of food, goods and services. In a capitalist society, according to Marx, the principal aim is to accumulate capital by producing goods and services and setting them at a price in excess of the amount of labour invested in them. Therefore, the exchange value does not correspond to the use value and/or labour value. Hence surplus value is created, which the capitalists appropriate. According to Marx, this mode of surplus accumulation is highly exploitative. Therefore, change can only come through changes in the way economic activities are organized and hence in changing the mode of production and economic base of the society.[17] The economic structure of society consists of property relations, and it corresponds to the level of development of the productive forces, which include all means of production technology (Marx 1970).[18] 'Changes in the forces of production, particularly technological changes, over time produce some tension between the existing structure of property rights and the productive potential of the economy. It is through class struggle that this tension is resolved in history, with the emergence of new institutions' (Bardhan 1989: 4).

Applying Marx's theory of political economy[19] to agrarian institutions includes 'viewing agrarian conditions as historically determined and changing whole. It takes into account production relations and their dynamic connection with the productive forces.[20] Ideally, this approach establishes the interconnectedness between agriculture and the rest of the society' (Pandian 1990: 10-11). Political economy also refers to investigations that take the social relations of power, their forms, reproduction, transformation and effects, as subject matter (Bolding, Mollinga and van Straaten 1995). The political economy framework gave rise to many theories

of agrarian institutions as applied to Indian conditions. Most prominent among them is the widely discussed and criticized model of Bhaduri (1973, 1983 and 1983a). Bhaduri's model argued that the presence of a 'semi-feudal' power structure has been responsible for the non-responsiveness of agriculture to innovation impulses. His model suggested that where a landlord also serves as creditor, he [she] may prefer to keep the tenants indebted rather than invest in productivity-enhancing measures, which could allow the tenant to break free of the debt trap. The inherent conjecture is that the returns from capitalist agriculture will be lower than from usury and tenancy combined. This model has been primarily criticised on the inconsistent use of the notion of power that the landlord exercises.[21] It is argued that if the landlord is powerful enough, he [she] would also be able to grab the surplus generated by capitalist intervention in land to increase its productivity.[22] Later, Bhaduri (1997) himself called the semi-feudalistic model rigid but made a further, interesting point. According to him, 'although the model of semi-feudalism provided a precise illustration of how production relations might exert a crippling influence on the productivity growth in land if landlords choose their *rentier* role, it misleadingly overplays an orthodox idea. Almost mechanically, it placed too rigid emphasis on the idea that debt-dependence as a part of the production relations belongs to the *super-structure* and that this super-structure would be changed if the *base* of productivity growth changed significantly.... New technology involving high-yielding varieties was introduced through larger advances of working capital loans from the landlord. The tenant now became indebted to his [her] landlord for both consumption and production loans. Old production relations involving debt-dependence at an even higher level and crop sharing continued, while land productivity increased due to the application of new technology. The moral of the story is important: in traditional agriculture, the relation between production relations on one hand and labour productivity, yield levels and their growth on the other is not hierarchical in any causal sense. This is because the distribution of gains from increases in productivity can be manipulated by manipulating institutional arrangements to suit class efficiency.[23] It is essential to understand more precisely in this context the pressures that operate on the class distribution of income, as considerations of capturing productivity gains through

class efficiency mediate between changes in productivity and production relations' (Ibid: 125). Overall, Bhaduri's explanation reemphasises the fact that there is a functional relationship between class relationships and institutional forms. Further, it means that a particular institutional form may help the ruling class to consolidate its class position in order to maintain the present level of surplus extraction and increase it in future.

Rudra (1984) examined the influence of local power in farm-level decision making in a model of a self-sustaining village society. This village society is composed of people who have little or no means of production and who live by exchanging their labour power against money in the capacity of agricultural labour. The labour class is in majority. The other part is the minority of property owners who derive income by appropriating a surplus out of the use value produced by the labourers. The relationship between the labourer and the property owner is of a patron-client type through an unequal dependence. This relationship is not confined to economic exchange as can be quantified, priced and contracted, but extends much beyond it, covering the entire social life of the village community. This relationship, according to Rudra, does not allow the class of labourers to develop into a class-in-itself and operates on the economic system by preventing labour markets from coming into existence.

Applying the classical theories of rent to the Indian condition, Patnaik (1983) looked at the Indian economy in the phase of transition from pre-capitalist, transitional to capitalist mode of production. Patnaik considers pre-capitalist rent 'that constitutes the entire surplus labour of the petty producer working with his own and family labour and owning means of production other than land; and it is extracted for the use of land by a dominant class monopolizing property in land' (ibid.: 76-77). Further, she emphasises pre-capitalist relations as 'direct relations of domination and subordination between the ruling classes and the direct producers, unmediated through the market characterised by extra-economic coercion' (Ibid.: 77). According to her, under petty commodity production, prices cover the outlay on materials, consumption of family and pre-capitalist rent whereas under capitalist production prices cover the outlay on materials, wages, average profit and capitalist rent. Thus, pre-capitalist rent represents the surplus of output value over production costs

including customary consumption of the petty producers, while capitalist rent represents the surplus of output value over the price of production including average profit.

How does this political economy framework help in understanding institutions evolving in groundwater-led economies such as north Gujarat for this study? First, it tries to locate the development of capitalist relations in agriculture accentuating class relations, modes of surplus extraction and consequent social differentiation. Second, it analyses the labour process in the petty commodity production and the emergence of new institutional forms that mediate the process. Third, it looks into class and social relations and places the manifestation and effects of different forms of 'power' at the centre stage of analysis. In sum, it tries to answer - how do local power structures impinge on the distribution of irrigation water and consequently on the different institutional forms of agricultural production systems?

The Ecological Variable in Agrarian Change

The neo-Marxist critique of environmentalism focused on the failure to recognise the social and historical nature of resource, development and ecological problems. This analysis has helped in giving rise to a stream of thought called political ecology. Among the early political economists, Karl Marx came close to defining the dialectics between individuals, their productive activities and nature as the main theme. However, political ecology theorists critique Marx's dialectic that takes a narrow view on nature and its role in the production process. They insist on expanding the role of nature to respond to the inclusion of cultural and political activity within the analysis of political economy (Greenberg and Park 1994). Political ecology thus, is concerned with the analysis of local environmental issues in their larger macro contexts and within the framework of political economy. It stresses the openness, complexity and contradictory nature of environmental issues that encompass the interactive effects between nature and society at the levels of individual, households, community, state and the world. It explores the nature of relations of power and production and how access and control over resources or property rights are defined and contested (Mehta 1998). Modern environmentalists, according

to neo-Marxists, ignore the importance of the mode of production in conditioning our perception of nature and society, and they therefore present environmental dilemmas in terms of fixed and unchanging natural limits upon human action (Pepper 1984). Escobar (1999) argues for three regimes of nature - organic, capitalist and techno. Organic nature is characterised by the inseparable aspect of nature and society with an organic view. Capitalist nature links nature with capitalism and commodity forms, which produces an alienated view of the environment. The vision is approached through the lens of capitalist rationality and control over the means of production. The techno nature regime is one where modern technology mediates the natural environment and the drive for profit for the capitalist.

Jansen (1998) provided a perspective on agrarian change and environmental deterioration that is located in land use and in historically evolving political economic relations. He talks about the concept of subsumption and social differentiation to understand environmental deterioration in the context of social relations of production. According to him, subsumption involves the processes of labour and production that end up under the control of capital, which is harmful to the environment. The producers thus involve themselves into exploitative relations with nature in order to make short-term profit to survive in the economy dictated by the market. Social differentiation, according to him 'refers to the emergence of several classes out of a peasantry as different producer types develop with different relations to labour and capital' (ibid.: 11-22). Jansen regards producers as not simply the objects of the laws of nature or social structures, but active subjects transforming social structures and nature.

Paranjape and Joy (1995) distinguish the primary and secondary productivity of an ecosystem from an ecological perspective. According to them, primary productivity is the productivity an ecosystem would have if all external inputs were withdrawn from it. The increase of productivity achieved with the external inputs into the ecosystem is the secondary productivity of the area in relation to that particular level of external input. It is quite possible that the sum of primary and secondary productivity is rising while primary productivity is falling. The application of increasing levels of external inputs to raise productivity soon leads to diminishing returns. Early warning signals of a fall in primary productivity of

the ecosystem are scarcity of drinking water, and increasing external inputs such as irrigation and fertilizers to maintain productivity. The green revolution in Gujarat has heavily relied on external inputs in agriculture, leading to high agricultural production. It has also posed environmental dilemmas such as depleting aquifers and declining primary productivity of the ecosystem.

To sum up, groundwater depletion problems are related to the question of resource management and the coalition of powerful property owners protecting their interests, under a capitalist society. The application of a theory of political ecology for groundwater irrigation, thus explores the causes of environmental degradation from the perspective of agrarian change. It seeks to establish a relation between groundwater depletion and social marginalisation of people, showing the mechanisms through which powerful property owners are able to appropriate environmental resources for private gains in an economy dictated by the market.

Irrigation Development and the State

Irrigation development in the post-colonial period of many third-world countries was triggered by the intervention of national and international financial institutions. The state was seen as an agent for irrigation development. This resulted in large-scale public irrigation systems to be managed by irrigation bureaucracies. However, from the 1970s and 1980s, the state came to be seen as a major obstacle to irrigation modernisation. This is chiefly because public irrigation under-performed and the state ran out of finances to maintain the irrigation structures and was unable, in the Indian case, to increase payment by users for water. The huge investment that went into building irrigation infrastructure came under scrutiny, as the irrigation department was unable to maintain the system. As a result, the 'state vs. market' debate appeared, with neo-classical scholars advocating a market-led approach to irrigation water management. A 'price response of users to reallocate water' was called for the reallocation of water. This reallocation would involve volumetric water pricing, introduction of water markets, establishment of financially autonomous irrigation agencies, irrigation management transfer and promotion

of self-governing systems (Rosegrant and Binswanger 1994: 1617). This aspect strengthens the neoclassical perspective and rent-seeking analysis of public irrigation systems developed by Repetto (1986). According to Repetto, an economic rent is the differences between the values of additional water to the farmer and the amount the system charges. The rent seekers appropriate this difference by virtue of their control over the system. The key actors in his analysis are: the staff of the state irrigation agency aiming to appropriate the flow of funds for their personal gains; foreign aid agencies that have to spend their budgets and please powerful engineering consultancies and construction agencies within donor countries; and politicians who wish to share the supplementary income of irrigation engineers and wealthy farmers. These processes are considered as limiting factor for irrigation reform.[24] Repetto's analysis has been heavily criticised for its market-friendly policy prescriptions of volumetric water pricing[25] and for the fact that his analysis does not take the complexities of irrigation systems into account, especially with regard to irrigation systems that are located in developing countries. His analysis creates a paradox wherein promotion of the market as an alternative relies heavily on the effective functioning of non-market socio-political institutions (Moore 1989). Despite criticism, Repetto's analysis brings out the rent-seeking behaviour of the institutions representing the state, and explains some of the interests of the state in the development of irrigation infrastructure.[26] This explanation is rather unique, as earlier only the development agenda of the state was put forward in the analysis of a state's interest in irrigation policy.

In contrast to the above, political sociologists have questioned the agenda-setting presumptions and the legitimising myths of state-directed development led by the 'rational and modern' elites representing the state (Bardhan 2003). They consider the state as a set of administrative and coercive institutions headed by an executive authority that structures relationships not only between civil society and public authority but also within civil society itself. This definition is consistent with the Weberian position and helps to focus on those elements of the state, which allows political actors to play a significant role in civil society. In contrast to Weber, in this view, control over coercion is not always expected to be complete, centralised or legitimate (Stepan 1978, Skocpol 1979, Kohli 1987 quoted in Ramamurthy 1995). In actual sense, it is a set

of relations between the 'state-as-actual-organisation' and the dominant-class 'ruling coalition', which is primarily constituted by the agrarian bourgeoisie or rich capitalist farmer class and the industrial bourgeoisie led by big capital. The state's capacity to realise democratic principles is impaired by the power of the dominant classes. This also means that the boundary between the state and society is permeable or indistinct, and the state is porous because the dominant classes and their interests can permeate it (Fuller and Harris 2001). Exploring the processes of exclusive and inclusive citizenship within the broader theme of the state, Kabeer (2002) highlighted the role of various institutions including the market and civil society in determining which needs and priorities are given high status of right. The state can mirror and reproduce the social inequalities prevailing in a given context, which can occur through active discrimination or unconscious bias. 'The result is that those who are marginalised within the wider society are also least likely to gain access on equal terms to the rights, resources and protection associated with the status of citizenship' (ibid.: 21).

The question of state-society relationships and the way these work in operational ways is documented by various case studies. Jeffrey and Lerche (2001) explored the relationship between state power and class reproduction in western Uttar Pradesh, India focusing on the different relationships between low-caste rural workers, Jat capitalist farmers and the local state. They showed that the access to certain forms of state power was closely circumscribed by the ability of capitalist farmers to mobilise material resources that reproduced class power. The case study provided evidence of how the interaction between local public, state agents and the political structures at the state level reproduces class divisions in agrarian societies. Looking at the agrarian class relations in canal-irrigated village in north Bihar, Chakravarti (2001) concluded that the dominant class derives power from preponderant control over means of production that is intertwined with social power derived from belonging to a dominant caste. The coercive power was inextricably connected with these two dimensions of power. The inequality of social power was reproduced within the dominant political institutions. The nexus between social power and the state power led to the former's inability to implement its own laws in favour of the working class. Ramamurthy (1995) analysed the loco-centric relationship between

the state and local agrarian communities in canal-irrigated villages in south India. Her analysis showed that though the local collectives were able to badger state bureaucracy in mobilizing water, they could not and did not change the local power structure. In fact, the 'differential privileges related to pre-existing inequalities in the distribution of resources were perpetuated through the local collective irrigation organisations' (ibid.: 283).

From the perspective described above, how do I locate the emergence of groundwater irrigation institutions? First, the law relating to the exploitation of groundwater favours the landed class. Many tubewell cooperatives in Gujarat have been registered under the State Cooperative Societies Act and have been functioning under the legal system approved by the state. Village-level irrigation cooperatives in Sangpura are informal collectives of people and have not been registered under any act. As a result, in law they are non-existent other than in the status of an agreement between the members under the Contract Act (Shah and Bhattacharya 1993). Even under the Act, the role of a cooperative is restricted to maintenance of organisation and does not encompass the regulation of groundwater extraction.[27] Apart from this, many tubewells are functioning in a privatised regime, which is very difficult for the state to regulate. This leads to the second concern where the overexploitation of groundwater resources is also linked to liberal state policies of flat-rate electricity charges and availability of institutional finance. I agree with critics' argument here that the state refrains from stringent rules against over-exploitation of groundwater due to the lobbing of large farmers, who have a direct stake in agriculture and who form an important base of the political parties. These farmers can defy regulations and indulge in competitive deepening of tubewells for actively participating in groundwater markets. This calls for reflection on the political nature of decision-making on groundwater management (Moench 2000). Third, the state influences local politics and politico-economic institutions and in-turn, gets influenced by it. A particular social characteristic of the state helps in consolidating the agenda of politically dominant social groups and hence the state has interest in maintaining a particular type of institutional arrangements. The control over various village-level institutions as different arms of the state by dominant social groups and groundwater exploitation could be viewed from this perspective.

Focus of Research

This thesis focuses on the agrarian transformations taking place in groundwater dependent economies such as north Gujarat. First, it seeks to understand how groundwater depletion and inequity have become intrinsically related elements of this process. In addition, it investigates the factors that have shaped unrestrained use of groundwater and the responses of various social groups characterized by class and caste, to this process of social change. These factors range from the issues of access and control over productive resources such as land and groundwater, a local ecology that enabled groundwater development and institutions such as groundwater markets and sharecropping, which have mediated the change process. Together they present a new social differentiation between those who are able to escape the agrarian trap and the ones who are forced to bear the consequences. The present work, thus, examines the ability of dominant classes to maintain control over groundwater in such a way that it allows transfer of surpluses even in case of water scarcity.

Second, the overexploitation of groundwater and its social consequences are the result of certain processes of development in irrigated agriculture that occurring at the cost of depletion of aquifers and sustainable farming systems. The state intervened initially through agrarian reforms, and later by providing credit facilities and indirectly supporting milk and tubewell cooperatives. It has also interceded in creating law for limiting groundwater overexploitation. However, the state also became ineffective in checking depletion of groundwater resources largely due to the interest of a large farmers' lobby. The various institutions of the state and their control provide impetus to an agrarian politics that tilts toward the interest of dominant social groups. These mechanisms work right from the lowest panchayat and dairy cooperative level to the level of the state, reflecting the overall political economy. On the ground, they help the dominant classes to consolidate their position and determine differential access to groundwater resources through various sources of legitimacy and power. Thus, the process of groundwater exploitation is viewed from the framework where agrarian institutions, ecological variables and domains of state functioning interact and define the course of social change.

Thus the central concerns of this research raises the question: What are the mechanisms that connect overexploitation of groundwater and social differentiation, and how have the different institutions of the state reacted and played a role in controlling agrarian institutions and ecological variables?

The Methodological Design

After doing a broad survey of 17 villages in five districts of north and south Gujarat, I decided to focus on Sangpura village for a detailed village-based study. Sangpura is situated in the heart of groundwater-mined Mehsana district in north Gujarat, a focus of India and Gujarat-centred debates over depleting groundwater. I stayed in the village from September 2001 to November 2002 and then visited on and off until March 2003 before I concentrated fully on writing.

The study design largely follows the socio-anthropological traditions of village-based case studies for deeper understanding of village society and changes around them (Dube 1958, Mayer 1958, Nair 1961, Beteille 1965, Djurfeldt and Lindberg 1975, Hardiman 1987, Chakravarti 2001). Patton (1980), while discussing qualitative methodology in evaluation research, describes it as a tool to understand phenomena and a situation in totality with emphasis on the 'whole being greater than the sum of its parts'. The tools and techniques used were in-depth interviews, case studies and participant observation. In-depth interviews are a form of non-directive, unstructured, non-standardised and open-ended interviewing. It means repeated face-to-face encounters with the interviewee, directed towards understanding their perspective on life, experiences or situations as expressed in their own words (Tylor and Bogdan 1984). A case study tries to illuminate a decision or a set of decisions, and is a preferred strategy when the investigator has little control over events in a real-life context. It involves deep and detailed study of individuals or families by exploring and analysing life as a social unit (Yin 1984). Participant observation typifies a society from 'inside' by participating in the way of life of the social actor concerned, professing that the description of a social phenomenon should be more securely

grounded in the point of view of the actor rather than the researcher (Benson and Hughes 1983).

The initial objective of the study was to understand the process of change in a groundwater-irrigated village situation. However, the interactions and observations at the village level started to point towards a larger process of transformation where agriculture was a prominent but not the only driver of change. The dairy cooperative started to take shape in the early 1960s, followed by the larger industrialisation of the state that contributed towards the process of change. The green revolution changed the cropping pattern, which was tuned towards catering to the market through establishment of an agricultural produce market yard in Mehsana town. The challenge of the fieldwork was to capture this process of transformation through the groundwater question.

During the first few weeks, I spent time meeting key people including the village sarpanch, prominent individuals, the village talhati, chairpersons and officials of the milk and credit cooperatives and leaders of all the castes in the village. Sangpura was visited first through a friend who worked for an NGO in Mehsana and hailed from the village. His family provided the much-needed social base and helped me in getting acquainted to village life. Having been born and brought up in urban locations, this was the first time that I had actually stayed in any village. Initially, I was the centre of attention of the villagers, which was a difficult thing to cope with. On the other side, the village had never experienced a resident researcher before, which made the task of introducing my intentions in being there more difficult. However, in the first month, the problem was sorted out slowly as my stay prolonged and villagers accepted me as time went by. I utilised this time to make friends among youngsters, roaming around the village with them to understand the geography and settlement patterns, plucking guavas, drinking tea and watching the latest Hindi movies on my laptop with groups of women, men and children.

After these activities, I obtained a village map from the land record office in Mehsana and doing a base-line survey of all the tubewells in the village. The location of tubewells was mapped with the help of the village map. The exhaustive base-line survey of the 36 tubewells of the village gave important insights into the social ownership of tubewells and the socio-economic inequality in access and control over the most productive resource of the village. The

outcome of the survey was not surprising, the dominant caste of Patel monopolised a large part of village resources, including land and water. Their decisive role in village-level institutions such as the panchayat, dairy and milk cooperative were evident. After the initial base-line survey of all tubewells, it became evident that social ownership of the tubewells was a prominent issue and hence needed to be enquired about in depth. I then decided to make tubewell operation a point of entry to know the larger process of transformation in the village and skewed resource endowments. I selected four tubewells that were primarily managed by people of four castes – Patels, Prajapatis, Thakores and Parmars. The purpose was to see the point of difference between the four tubewells with different social ownership. However, I was initially mistaken on many assumptions, as mixed caste groups shared many tubewells and my perception of caste identities did not match with local reality. What followed from this was my greater interest in an emergence of class-based ownership and control of tubewells, and that how this had close relationship with caste and historical control over the means of production. Some boundaries of caste are fading but that phenomenon is limited to the upper castes of Patels and Prajapatis. Intermingling was not observed between the upper and lower castes.

Collecting information was a Herculean task especially from Patels and some influential Prajapatis who were very secretive about their income from tubewells, dairy or otherwise. Interviewing families whose members had migrated to the USA was viewed with suspicion. The only answer to this was to stay in the village as long as possible, which helped in the end. Information used to come in bits and pieces, and the task of maintaining detailed field notes with markings to add new information started to be a tough exercise as the research progressed. The family history sheet would prolong for months, as fresh information would chip in every time some new developments took place. Interviewing Thakores, Parmars and Vagharis was always easy as, in my view, they had nothing to lose from sharing the information. Initial problems occurred because I stayed in a Prajapati house and was moving around, initially, with them. However, as time passed, they also understood my interest from the kind of questions I raised. Up to a point, it became rather political to discuss situations with lower caste communities especially on the domination in institutions such as the panchayat

and the dairy cooperative. Similarly, I had to be listening quietly (showing that I am non-opinionated) when Patels discussed these issues and I happened to be there. This was more so during the panchayat elections, when Patels wanted their candidate to win the sarpanch seat and the strategy for the same was being carved out. These were the points of discomfort that I had to overcome or minimise for the sake of research. What came out of the process is presented now for the readers.

Another, important turning point during the time of research was the communal strife that broke out in Gujarat at the end of February 2002. The violence and hatred experienced by the people was unprecedented in recent history. The society was sharply divided on the issue, leading to a feeling of despair and helplessness. Sangpura was not visibly affected by the riots, as there were no Muslim households in the village. However, the communal strife had spread to some of the urban and rural locations in pockets of Muslim-dominated areas of Mehsana district. I used to travel by motorbike from Ahmedabad to Sangpura, using rural roads to avoid the busy highway, and could hear news about massacres in villages close to the route. I had to postpone the trips to the village for around two months due to the increasing incidence of violence and mistrust. The responses of the people in Sangpura towards the riots were divided between the upper and lower segments of society. An analysis of the causes of these riots acknowledges to the history, sociology and realpolitik of modern Gujarat showing sharp contradictions in intermingling identities of caste, class and religion (Prakash 2002). Communal strife should also be seen in the context of capitalist development and globalisation taking place in recent years. This has introduced a yawning gap between aspirations and reality. Every riot brings extra hardship for the poor whose livelihoods are threatened and cannot ever be justified on any grounds.

Overview of Chapters

Chapter 2 sketches the distribution and causes of groundwater scarcity in different eco-regions of Gujarat, which is grounded in local ecology. The causes of water scarcity are seen in the historical context of agricultural development that relied heavily on

groundwater irrigation. The chapter looks into the various responses of the state for the management of groundwater. It also updates information on the famous Sardar Sarovar Project (SSP) and its distribution networks, and shows how it will not address the problem of groundwater scarcity in north Gujarat as it covers only part of the scarcity zones.

Chapter 3 analyses the organization of tubewell irrigation cooperatives as shareholders and water buyers. It shows how the pattern of groundwater irrigation is embedded in prevalent social relations of production and where the class structure closely coincides with the caste structure. The small dominant minority controls the groundwater irrigation institutions and defines the manner in which groundwater is accessed and distributed in the village. This control, which stems from the differential access and control over groundwater resource for different classes, leads to a much sharper social differentiation.

Chapter 4 maps the responses of increasing irrigation costs due to decreasing supply of electricity and groundwater depletion. Through the entry point of four tubewells, this chapter provides the worm's eye view of the organisation of tubewell cooperatives and their coping mechanisms in meddling with increasing groundwater prices. The cases provide information on the broader dynamics and strategies of different social groups in confronting the declining trend of groundwater and rising input costs in agriculture. It shows how unsustainable resource use does not generate contestation in relation to declining groundwater but shapes and structures responses towards the progression of water mining.

Chapter 5 documents the rise in sharecropping contracts in the village and illustrates how this is a part of its changing history, rooted in social and economic contingencies. It also looks at the aspects of production relations where sharecropping becomes the preferred form of contract. Powered by the new economic might generated through long distance migration, the dominant classes define the manner in which labour is appropriated. Through the description of the basic features of sharecropping in Sangpura such as historical evolution, coverage and types of contracts, the chapter outlines the social relations of production in sharecropping arrangements. It focuses on the rationale of landlords and tenants for taking up sharecropping and shows how dominant classes

transfer the burden of resource depletion to people other than themselves.

Chapter 6 closely examines the everyday village politics of Sangpura, which contributes to the social power generated at two levels, in the control over economic resources and by maintaining and reproducing the social and economic hierarchy. It also leads to increased tussle over groups of people claiming control by gaining more power and room to manoeuvre. The chapter shows how the structure of power and politics of the village is reflected in controlling institutions such as the panchayat, dairy and credit cooperatives by dominant groups, which in turn reproduces legitimacy and power for them. These institutions and their control provide impetus to an agrarian politics helping dominant classes to consolidate their power positions and define the course of resource exploitation and agrarian change.

Chapter 7 summarises the major arguments of the thesis and revisits the key concepts. It opens up debate on the dynamics of agrarian change and the process of social differentiation in the context of groundwater exploitation. Departing from the popular theories that looked at institutions and groundwater markets, the study shows a triadic relationship where access to resources, crop production systems and social relations interact and define the course of social change in groundwater dependent economies. It also looks into the feasibility of some of the solutions to the problem of groundwater depletion discussed by scholars and activists.

Notes

[1] The names of individuals have been changed to protect their privacy.

[2] A pseudonym for the village in Mehsana District, Gujarat that I studied as part of the research.

[3] Calculated at the rate of US$1 = Rs 47.5

[4] The sharecropping arrangement varies in the village but the most popular form involves division of the net production in three equal parts for land, labour and water for irrigation. A detailed description of these arrangements is given in Chapter 5.

[5] All the neighbouring villages of Sangpura are relatively larger with

populations of around eight to ten thousand people.

[6] *Iter Kaum* literally means "other castes" and connotes the feeling of others being less in number than the one in majority. It is generally used by Patels who sees themselves as high in the socio-economic hierarchy and in number, though it is rather a 'perceived' notion as it is the Thakore who are in majority.

[7] I have not used the original caste name of Parmars (cobblers) as *Chamar* (meaning the caste that works with animal skin). The word Chamar was used as a caste title in the 1960s. It was subsequently changed to Parmar in Sangpura's land record. Similarly, the present day Prajapatis, the potter caste, used to have *Kumbhar* (literal meaning is potter) as their title in 1960s, which was changed to Prajapatis only in early 1980s. Prajapati is a synonym of Lord Brahma, the creator of the world in Hindu mythology. The potters claim to be the descendants of Brahma as their traditional skill is also as creators (creating earthen pots) and hence they changed their name from Kumbhar to Prajapati. At present, in the village, calling some one a Kumbhar is used with humour to pull them down in casual conversations. While interviewing people from the Chamar community, the caste identity used was *Harijan* and Parmar interchangeably. In the recent literature dealing with subaltern groups, using the word Harijan has been largely refuted. Harijan (son of god) is a term given by Gandhi for untouchables that was rejected as an 'artificially imposed term given to untouchables by upper castes that could not genuinely integrate them within their social consciousness despite its divine association and hence lacks discursive capacity' (Guru 1998: 16). Instead, the word *Dalit* (oppressed) is used, which 'derives its epistemic and political strengths from the material social experience of the community and it is the social construction of dalithood that makes it authentic and dynamic' (Ibid: 16). Dalithood thus is the 'kind of life conditions that characterise the exploitation, suppression and marginalization of Dalits by the social, economic, cultural and political domination of the upper caste brahminical order' (Ambedkar 1990: 194-98; Quoted in Guru 1998: 16). However, in Sangpura, this consciousness of using the word Dalit instead of Chamar is not found, largely due to ignorance on the 'politics of naming'. This is unlike Kumbhars who have changed their name to Prajapatis and are conscious of someone using their caste name. In representing people, I have thus used the name Prajapati for Kumbhar and Parmar for Chamars. This is mainly because, at a personal level, I do not want to reproduce the hierarchy. At the same time, I also try to capture the level of consciousness of the caste groups in larger political processes.

[8] The present table does not in any sense describe the social hierarchy and only present castes in terms of their population.

[9] *Vaghari* is a word combined with two independent words of *Vagh* (tiger) and *Ari* (enemy). Vagharis were known as the enemy of tigers and were recognized as hunters. Traditionally Vagharis gather honey, herbal drugs and useful plants from forests and provide them to the society (Vyas 1998: 299). The Vagharis of Sangpura are engaged in vegetable and fruit procurement and sale.

[10] *Bawas* of Sangpura originally came from Marwar district in Rajasthan around seven generations back. In the village, they write *Goswami* as their family name along with their name. Traditionally Bawas are priests in the *Mahadev* Temple and they used to take up agriculture in the land attached with the temples in the past. There was no fixed caste system for Bawas in the past, as according to them, anyone 'who leads a pure way of life' could become Bawa. This system has changed in the last 50 years, and now Bawas follow the system where someone is born as Bawa. There are 10 sub-castes among them who now belong to the category of Other Backward Castes (OBC) in Gujarat. (Source: Interview with Goswami Bechargiri Shambhugiri, Sangpura Village, June 6, 2002)

[11] Hardiman (1998) puts forward the class/caste nexus in the distribution of tubewell water in Gujarat. According to him 'water controlling cartels do not require a formal union or constitution; they operate according to a precise local knowledge in which each family is too aware of its standing within the hierarchy, its corresponding entitlements, and the bounds beyond which they cannot step. In the past, dominant classes controlled subordinate groups within a village with an iron hand, often involving violence. Today their political control is challenged, with members of lower castes voting for politicians of their own community and attempting to assert themselves in whole number of different ways. Increasingly, therefore, dominant groups have to rely on their economic power both to control subaltern classes and prevent them from gaining any economic powers themselves. This is the real *rationality* of the system' (Ibid: 1541, emphasis added).

[12] For detailed criticism of Shah's work, see Palmer-Jones, 1994 and Dubash 2000, 2002.

[13] Mollinga (1998) discusses commoditisation and the agrarian structure in a south Indian canal system. He observes that the introduction of irrigation has led to the emergence of a group of head end farmers in the command area who could establish and expand water-intensive and highly commoditised farming systems through access and appropriation of water. This has resulted in class-related geographical patterns of water and land distribution. Further, he sketches the nexus between the economically and politically sound farmers, politicians and irrigation department officials where acquisition of extra resources such as water has reproduced social and political capital biased towards a class of

farmers. The unequal distribution of water does not lead to 'visible' conflicts because of interlocked systems of credit and employment relations and poorly defined water rights. Mollinga describes the phenomenon as "unequal but relatively conflict-poor water distribution". This can be seen as less 'visible' conflict as it does not surface due to unequal economic and social positions manifested in power and hierarchy (Ibid: 89-121, 248). He considers these socio-geographical dimensions of the differentiation of agrarian producers as a constraint for management reform. Similar findings are reported by Gorter (1989) who studied canal irrigation and agrarian transformation in south Gujarat, where a trend towards capitalist farming has been noticed. His analysis shows that due to the construction of a large-scale canal irrigation system, large farmers could transform into commercial farmers. This has led to a reappearance of tenancy relations, which are otherwise associated with feudal agrarian relations. As a result, the dividing lines between various agrarian classes have become more pronounced.

[14] Much of the detailed account of social processes in tubewell irrigation comes from Tamilnadu (Janakarajan 1992, 1994, 1997a, 1997b, 1999 Meinzen-Dick 1989). In Gujarat, apart from Bhatia's (1992) monograph on groundwater irrigation in north Gujarat, there was no detailed account of groundwater led agrarian change when this study was conceptualised. Dubash's (2002) detailed case study of two groundwater dependent village was published soon after this study was initiated.

[15] Groundwater irrigation intensifies agricultural operation, reduces risk of crop failure and creates year round wage employment. These factors do influence the economy and benefits may trickle down to people living below poverty line. However, there is an increasing trend to find simple correlations between groundwater irrigation and poverty decline. Moench (2002) looks at the state-level data from India to indicate that groundwater extraction rates and poverty decline between 1956 and 1991 are closely correlated. Similar findings are cited by Narayanamoorthy (2001) who looks into the inverse relationship between the availability of groundwater irrigation and the percentage of rural poverty. Both the studies focus on states like Bihar, Madhya Pradesh, Orissa and West Bengal, which is marked by severe poverty and where the development of groundwater irrigation is very low. The policy prescription is to focus more on developing groundwater irrigation to reduce rural poverty. First, these studies undermine the other poverty related variables that are at work apart from the development of groundwater. The availability of groundwater is locality specific and its use, in most cases, is subject to the non-availability of surface water resources. Accessing groundwater is also dependent on access to land and capacities of individuals to invest in tubewells. Apart from this, the poverty-stricken states also have high rainfall leading to more availability of surface water resources and

increased soil moisture that is used for taking winter crops without external irrigation. Second, due to lack of any formal property right system in groundwater, there is a danger of overdevelopment of the resource if this policy prescription is followed. The Gujarat, Tamilnadu, Andhra Pradesh and Karnataka conditions are a case in a point. Studies conducted in Tamilnadu (Janakarajan 1997a) show that the overdevelopment of groundwater resources has led to increased environmental risk for the poor and marginalised who have become dependent upon rich farmers who have the ability to chase the water table. Models of developing groundwater at the expense of the environment and poor people's resource base thus needs more analysis.

[16] Meinzen-Dick considers groundwater exploitation as a process of *privatization of irrigation* when she compares it with the more collectively owned and managed tank irrigation. For more elucidation, see Meinzen-Dick (1989).

[17] 'In the social production which [wo]men carry on they enter into definite relations that are indispensable to and independent of their will; these relations of production correspond to a definite stage of development of their material power of production. The sum total of these relations of production constitutes the economic structure of society – the real foundation on which rise the legal and political superstructures and to which correspond definite forms of social consciousness. At a certain stage of their development, the material forces of production in society come into conflict with the existing relations of production, or – what is but a legal expression for the same thing - with the property relations within the framework of which they have operated hitherto. From the development of the forces of production these relations turn into their fetters. Then comes the period of social revolution. With the change in the economic foundation, the entire immense superstructure is more or less completely transformed' (Marx 1970: 20-21)

[18] Means of production include tools, machines, access to external inputs such as fertilizers, HYV seeds and irrigation and skills of the labour force. Control of access to these elements can be as important a source of surplus labour as possession of the objects of labour themselves (Pearce 1983).

[19] 'The meaning of the expression 'political economy' is not altogether unambiguous. To some it simply means economics. It is indeed the old name of the discipline, common in the nineteenth century, and now rather archaic. To others, political economy is economics seen in the perspective that is a great deal broader than is common in the mainstream of the modern traditions. In this view, the influences of political and social institutions and ideas are taken to be particularly important for economic analysis and must not be pushed to the background with some stylized assumptions of heroic simplicity. Political economy thus interpreted can

appear to be rather 'interdisciplinary' as the disciplines are not standardly viewed' (Dreze, Sen and Hussain 1995: 14)

[20] Productive forces include people with their production experience and skill, and instruments of production (such as tractors and pumpsets). These elements evolve through, and are part of, the labour process, 'a process in which both [wo]man and Nature participate, and in which [wo]man on his [her] own accord starts, regulates, and controls the material reactions between himself [herself] and Nature' (Marx 1978: 173).

[21] For an elaborate debate, see Bardhan 1989, Chakravarty 1984 and Lindberg 1997.

[22] Bhaduri's model played an important role in theoretical framework of an empirical study (Athreya et al. 1990) carried out in two talukas of Chinglepet district of Tamilnadu in India. This study is about how production relations are influenced by agricultural change coming through the green revolution and other technological changes. It indicated that usury was frequent and both landlords and merchants extended credit to farmers. The study found 'other' contextual factors such as ecology, institutional credit, infrastructure development and price policies limiting the productivity of agriculture in addition to forced commerce and interlocked markets (Lindberg 1997: 130-135).

[23] According to Bhaduri (1997), an institutional arrangement is class efficient if the more powerful class can maintain a higher income in its favour, despite the lower productive efficiency of the system. Productive efficiency may be violated deliberately if it helps in manipulating sufficiently the distribution of income in favour of the more powerful class.

[24] Mollinga et al. (2000) discusses the source of irrigation reform on two counts. First, the reform comes from vertical and horizontal divisions of the complex government and administrative matrix in different combinations and alliances. The political leadership of the state and irrigation bureaucracy form this part of alliance. Second, external forces such as NGOs, donor and international organisations and people's associations, also guide these policies. Even though these policies are consolidated within the government, the state is not necessarily an initiator of policy transformation. This means that the state as a set of institutions has been and can be influenced by the larger policy environment, and the role of the state differs in, and depends upon, the wider socio-political situation.

[25] Repetto (1986) propounds that irrigation systems have to be redesigned and water markets should be installed wherein the water could be sold in bulk to groups of farmers. Irrigation should no longer be subsidised and farmers have to pay the full economic cost of water, reflecting the infrastructural and the managerial costs. In this way, rent seeking would cease to exist and so the problem of water distribution would be solved.

[26] Similar observations are made by Korten (1987) on the role of the state. First, the state may be a party to building irrigation infrastructure in the form of ownership or being co-manager in large irrigation works. In this capacity, the state is a direct stakeholder. Second, the state may influence the costs and benefits of resource exploitation and enhance the productivity value of the resource through developmental programs. Third, the state secures property rights, creates formal user organisations and preserves law and order.

[27] Personal communication, Vishwa Ballabh, IRMA, Anand, India in August 2003.

2

The Dark Zone

Groundwater Irrigation and Water Scarcity in Gujarat

40 years ago, I fetched water through the bucket using my own hands. Does any one see water now?

- A 64 years old farmer in Sangpura, November 2002

For more than a decade, Gujarat has been at the forefront of debates concerning water scarcity[1] and the level of decline of the groundwater table. This is rightly so, as water for drinking and irrigation is of critical concern in today's Gujarat, particularly in areas where groundwater recharge is low and rainfall is scanty and erratic. The consecutive droughts of 1999-2001 have aggravated the problem. This compels analysis of the systems of water management in the state.[2] This chapter looks into the causes and distribution of water access and how it is grounded in the ecology and political economy of resource management in Gujarat. The chapter is divided in three sections. The first section sketches the water reserves of different eco-regions of Gujarat and shows how groundwater overexploitation is historically grounded in different region's ecology. The following section focuses on agricultural development in the pre - and post - independence era. It shows how the British colonial government promoted capitalist farming through a land revenue and taxation programme, which was followed by introduction of 'the green revolution' in the post-independence era. These developments in agriculture relied heavily on groundwater irrigation. The last section deals with two specific

responses of the state and central government. The first relates to the policies and regulations for checking groundwater exploitation while the second focuses on building a high dam on the river Narmada to deal with the problem of water scarcity. This section critically evaluates whether these responses could bring positive changes in the groundwater ecology of Gujarat.

Gujarat is the tenth most populated state of India with an estimated population of 50.6 million in 2001.[3] It has an area of 195984 km^2 and lies in the western semi-arid region of India out of which about 53860 km^2 (27% of the total area) is drought prone. Gujarat is the fourth most urbanised state with 37.35 percent of its total population living in urban areas; ten percent higher than the national urbanisation rate of 27.79 percent (Hirway 2000). According to the 2001 census, 69.97 per cent of Gujarat's population is literate, as against 65.38 percent at the national level. 97 percent of its villages are linked by concrete roads and have been electrified. Gujarat is one of the most industrialised states of India with concentration in chemicals, fertilisers, textiles and dairy products (Wood 1997).

TABLE 2.1: SECTORAL GROWTH RATES IN GUJARAT

Sector	*1960-61 1970-71*	*1970-71 1980-81*	*1980-81 1990-91*	*1990-91 1995-96*	*1980-81 1995-96*
Primary Sector (Agriculture)	2.91 (2.27)	4.15 (4.22)	1.24 (1.10)	0.18 (0.26)	0.89 (0.82)
Secondary Sector (Manufacturing)	3.62 (3.04)	5.64 (5.55)	7.85 (8.73)	9.45 (11.92)	8.38 (9.78)
Tertiary Sector	3.51	5.86	6.83	10.61	8.08
Overall State Domestic Product (SDP)	3.32	4.95	5.30	5.41	5.67
India Gross Domestic Product	3.17	3.66	5.42	5.07	5.44

Source: Hirway (2000)

The Gujarat economy has grown faster than the Indian economy. This development was balanced between the primary,

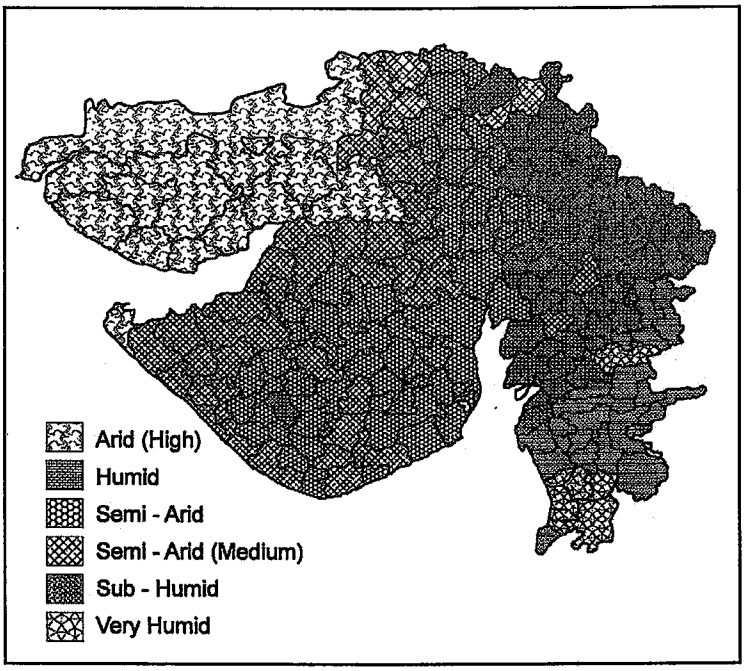
secondary and tertiary sectors during the 1960s and 1970s but since 1980, it is oriented towards the secondary and tertiary sector (see Table 2.1). Agricultural growth has shown a sharp decline from 2.27 per cent in 1960-70 to 0.26 per cent in 1990-96.[4] The annual growth rate in agriculture fell to one per cent while the secondary and tertiary sector showed a big jump to around seven per cent during the 1980s. During the 1990s, the annual compound growth rate in agriculture remained at less than one per cent while secondary and tertiary sectors rose to 9.45 and 10.61 per cent respectively (Hirway 2000). Further, the share of agriculture in the Gross State Domestic Product (GSDP) dwindled from 19.9 per cent in 1993-94 to 13.6 per cent in 2002-03 while the secondary sector showed an increase from 35.8 to 37.2 per cent during these years. The tertiary sector showed the highest jump from 38.8 per cent in 1993-94 to 45.6 per cent in 2002-03 (GOG 2004). Does this worry planners in Gujarat? Many say that in an industrialising economy a move away from primary to secondary and tertiary sector is predicted. However, the declining trend is problematic as agriculture employs more than half of Gujarat's population. In 2001, 52 per cent of the total workforce of Gujarat came from this sector and hence any decline in its growth directly affects half of the state's workforce.[5] The causes of decline in agricultural growth are many and complex. One of the important factors is the ever-stressful water situation of the state that is rooted in its agro-ecology and political economy of agricultural development, together with socio-economic factors. As a prologue to an exploration of the intricacies of the problem, I examine them one by one.

The Agro-Ecology of Gujarat

Within its 190000 km^2 of geographic area Gujarat has a uniquely diverse bio-climate ranging from dry desert areas to high altitude rain forests. According to the National Bureau of Soil Survey and Planning, Gujarat can be broadly divided into eight major ecoregions based on variability in rainfall, potential and actual evapotranspiration and other ecological factors (Map 2.1). The

regions are marked by both erratic and uneven rainfall and periods of heavy rain. Gujarat receives only one rainfall period from the south-west monsoon between June-July and September-October that ranges from 1000-2000 millimetres in the southern rocky highland to 250-400 millimetres in Kutch. The distribution of rainfall determines the water regime of the state. Around 70 per cent of Gujarat's total geographic area falls in the arid or semi-arid region and is drought-prone (Table 2.2). Surface water is generally concentrated in the southern and central parts of the state. The northern alluvial plain lacks a perennial source of surface water but is rich in groundwater sources. However, the recharge zones of this groundwater reserve fall in neighbouring Rajasthan state and the Arawali forest ranges on the border of Gujarat and Rajasthan.

MAP 2.1: ARID-ZONES OF GUJARAT



Source: GEC (2000)

TABLE 2.2: ECO-REGIONS OF GUJARAT

Eco-region name	*Area in percentage*	*Aridity index in percentage*	*Rainfall in millimetre*	*Water Regime*	*Ecosystems*	
					Natural Ecosystem	*Agro-ecosystem*
Northern rocky highland	12	30-40 Semiarid	700-1000	Unconfined	Dry deciduous forest	Rainfed
Southern rocky highland	7	10-15 Sub-humid	1000-2000	Unconfined	Moist deciduous forest	Rainfed
Northern Alluvial Plane	14	20-40 Semiarid	450-700	Unconfined & Confined	Scrub forest water-land	Rainfed, irrigated
Central Alluvial Plane	8	20-30 Sub-humid	500-800	Unconfined & Confined	Nil	Rainfed, irrigated
Rann and Banni of Kutch	13	40 Arid	250-450	Saline waste	Rann, wet\dry grassland	-
Peninsula of Kutch	8	40 Arid	250-450	Unconfined and Semi-confined	Scrub forest wasteland	Rainfed
Peninsula of Saurashtra	24	20-40 Semiarid	400-600	Unconfined and Semi-confined	Scrub forest wasteland	Rainfed
Coastal Zones of Gujarat	14	10-40 Arid to Humid	250-200	Unconfined	Littoral and swamp forests, wetlands, estuaries	Rainfed, irrigated, horticulture

Source: Compiled from Patel (1997)

Most of Gujarat's groundwater resources are concentrated in unconsolidated formations covering 40 per cent of the area of the state. Around 70 per cent of this potential is in the alluvial plains. More than 70 per cent of the State's water need is met through groundwater (Patel 1997).

For the purpose of the present analysis, the agro-ecological zones of Gujarat can be broadly divided into four regions: water-abundant south Gujarat; the central alluvial plain or middle Gujarat; the semi-arid northern alluvial plain or north Gujarat; and peninsular Gujarat including Saurashtra and Kutch (see Map 2.1). These regions are also characterised by diverse agro-ecologies ranging from the forested southern hills to the fertile soil of northern plains in Mehsana district, the area of the present research. The climate becomes semi-arid proceeding towards the northwest. Peninsular Gujarat consists of two sub-regions– Saurashtra and Kutch. Most of Saurashtra is characterised by a semi-arid region with hard rock geology. Kutch is the most arid part of Gujarat (Wood 1997).

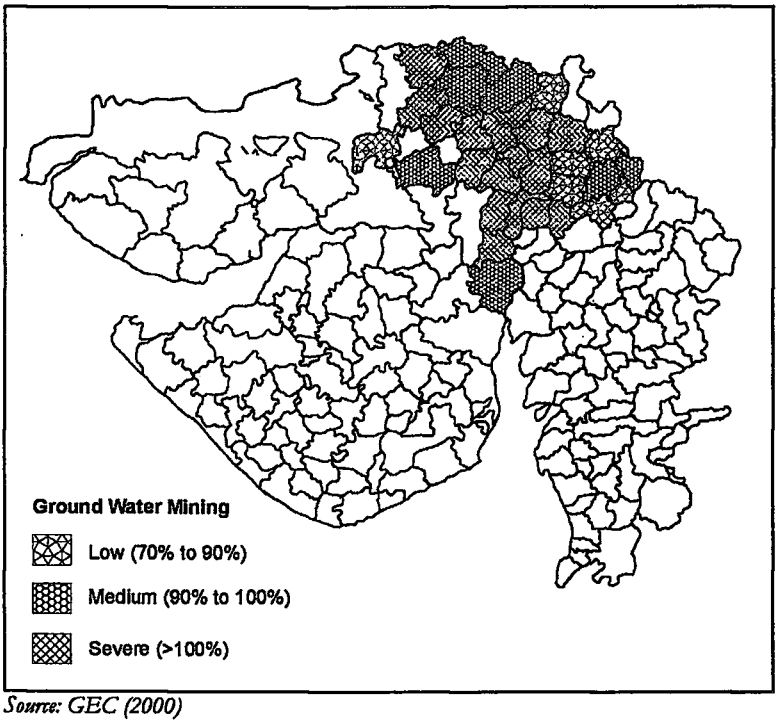
The combination of climate, physiography and geology in different regions of the state provide different conditions for water resources. The north Gujarat alluvial area has low rainfall but good topographic conditions for recharge and high-yielding aquifers, making it a groundwater rich region.[6] The southern hilly and forested areas provide perfect locations for creating surface storage dam reservoirs. The arid areas of Kutch have confined aquifers and the coastal areas of Saurashtra are capable of storing the rainfall shed from the upland rocky terrain (Hirway 2000).

To summarise, each eco-region has specific water resources available in different forms. However, in recent years, Gujarat is facing severe water crisis in almost all regions, but especially in north Gujarat, Saurashtra and Kutch. Central and southern regions are less affected due to the extensive canal network that feeds the central region, while the southern region is naturally rich in water resources. In the next section I illustrate the water situation in Gujarat showing the nature and extent of problem areas.

Water Scarcity in Gujarat

Because of grossly mismanaged water resources, Gujarat has been facing a water crisis for more than a decade. Due to surface water being concentrated in the southern areas, Gujarat's water needs are largely met through groundwater resources. Around 80 per cent of Gujarat's irrigated agriculture is dependent on groundwater, apart from several other needs such as industrial and domestic water requirements. As a result, groundwater resources have shown increasing signs of over-development. Groundwater mining has resulted in areas increasingly falling into the 'overexploited' categories (see Map 2.2). Recent figures released by the government, show that while in 1984 about 162 talukas[7] (88 per cent) were under the 'white' category, in 1997 this fell to 95 (about 51 per cent). The number of overexploited sub-districts has increased from just one in 1984 to 31 in 1997.[8]

MAP 2.2: GROUNDWATER MINING IN GUJARAT



Source: GEC (2000)

TABLE 2.3: TALUKAWISE LEVEL OF GROUNDWATER DEVELOPMENT

District	*Number of talukas in each category*														
	1984					*1991*					*1997*				
	W	*G*	*D*	*OE*	*S*	*W*	*G*	*D*	*OE*	*S*	*W*	*G*	*D*	*OE*	*S*
Ahmedabad	6	-	-	-	-	*2*	-	-	*4*	-	2	-	2	3	-
Amreli	7	2	1	-	-	*9*	-	-	*1*	-	9	-	-	1	-
Banaskantha	11	-	-	-	-	*5*	*2*	*1*	*3*	-	1	1	2	4	3
Baroda	12	-	-	-	-	*11*	-	*1*	-	-	10	1	-	1	-
Bhavnagar	12	-	-	-	-	*12*	-	-	-	-	10	2	-	-	-
Bharuch	11	-	-	-	-	*9*	-	*1*	*1*	-	6	2		3	-
Valsad	8	-	-	-	-	*8*	-	-	-	-	7	1		-	-
Dangs	1	-	-	-	-	*1*	-	-	-	-	1	-		-	-
Gandhinagar	1	-	-	-	-	-	*1*	-	-	-	-	-		1	-
Jamnagar	9	1	-	-	-	*8*	*2*	-	-	-	7	3		-	-
Junagadh	9	4	2	-	-	*8*	*4*	*2*	*1*	-	3	8	2	2	-
Kheda	10	-	-	-	-	*6*	*1*	*2*	*1*	-	4	4		2	-
Kutch	9	-	-	-	-	*2*	*4*	*1*	*2*	-	2	3		4	-
Panchmahals	11	-	-	-	-	*8*	*3*	-	-	-	10	1		-	
Rajkot	8	4	-	1	-	*10*	*2*	-	-	*1*	5	7		-	1
Sabarkantha	10	-	-	-	-	*5*	*3*	*1*	*1*	-	1	6	2	1	-
Surat	13	-	-	-	-	*13*	-	-	-	-	13	-		-	-
Surendranagar	8	-	-	-	1	*4*	*4*	-	-	*1*	4	4		-	1
Mehsana	6	2	3	-	-	-	-	*1*	*10*	-	-	-		9	2
Gujarat	162	13	6	1	1	*121*	*26*	*10*	*24*	*2*	95	43	8	31	7

Source: Hirway (2000: 3113) [W = White; G = Grey; D = Dark; OE = Overexploited; S = Saline]

TABLE 2.4: IRRIGATION POTENTIAL CREATED AND UTILISED, JUNE 2003

Item	*Ultimate Irrigation Potential*	*Irrigation potential created up to June 2003*	*Maximum utilisation up to June 2003*
	In million hectares		
Surface water	3.94	1.71	1.48
Major and medium scheme	*1.80*	*1.41*	*1.29*
Sardar Sarovar Project (including conjunctive use)	*1.79*	*0.03*	*0.03*
Minor irrigation	*0.35*	*0.27*	*0.16*
Groundwater	2.55	2.04	2.03
Total	6.49	3.74	3.51

Source: GOG 2004

Salinity ingress into the groundwater is another problem caused by excessive withdrawal of groundwater, especially in areas close to the seashore or in marshy land such as Kutch. The number of talukas affected by salinity ingress has increased from one in 1984 to seven in 1997 (Table 2.3). In 1997, only 52 per cent of the talukas in Gujarat had groundwater that is considered potable.

An important question is which forces have led to the present situation. The answer is complex and lies in the larger political economy of the state. The earlier land use and livelihood patterns were determined by the availability of fresh water, i.e. a supply - determined pattern of land use and agriculture-based livelihoods. This pattern changed due to technological innovations such as pumpsets and external input agriculture that increased pressure on natural resources like water. The increase in water demand has led to changes in the configuration of water utilisation in three spheres - technological, institutional and distributional; each of which has had significant effects on the nature and dynamics of the resource and thus for its users (Prabhakar et al. 1997).

The figures presented in Table 2.3 show that groundwater use reached a threshold. An estimate of the potential of irrigation and utilisation shows that in June 2003 the ultimate irrigation potential through surface water was 3.94 million hectares (MHa). This

included 1.79 MHa to be irrigated through the Sardar Sarovar Project. However, the surface water potential created up to June 2003 was only 1.71 MHa of which 1.48 MHa are already utilised. The irrigation potential through groundwater was assessed at 2.55 MHa, out of which a potential of 2.04 MHa was created up to June 2003 and almost all of this was utilized (see Table 2.4). Altogether, the total irrigation potential created up to June 2003 is estimated to be 57.6 per cent of the ultimate irrigation potential and maximum utilisation comes to 94.1 per cent of the irrigation potential created and 54.2 per cent of ultimate irrigation potential (GOG 2004).

Much of the problem of groundwater exploitation lies with the way water resources have been managed in the state in the past four decades, and the development of agriculture. The lion's share of total groundwater use in the state is siphoned off by agriculture. The development of agriculture in Gujarat has been shaped by its response to the green revolution technologies in the early 1970s. In the initial stages diesel pump sets met irrigation water demand but had limited capacity to cope with declining groundwater levels. Rural electrification boosted investment in electric tubewells that gave greater capacity to use high-powered motors to draw water from deep aquifers. Groundwater is considered by farmers as an extremely cheap and efficient alternative to surface irrigation networks that were non-dependable. The current overexploitation of groundwater in Gujarat is closely related to this reliance (Bhatia 1992). The increasing dependence on groundwater shows in considerable rise in well numbers since the 1960s, with overdraft and saline intrusion problems becoming major issues in some locations. Consequently, water tables started dropping alarmingly. Depletion of static groundwater reserves became a well-known problem in many areas of Gujarat, including Mehsana district (Moench 1991). Due to the stressed groundwater situation agriculture suffered because the cost of irrigation increased manifold. Simultaneously the quality of land and water also decreased with increased salinity, which has adversely affected the productivity of agriculture. In the next section I examine these trends for Gujarat.

Agricultural Development and Groundwater Irrigation in Gujarat

Agricultural development in Gujarat can be broadly divided in three distinct phases – pre-independence (prior to 1947), pre-green revolution (1947-65) and green (1965-1980) and post-green revolution (1980-till date). In order to understand the changes of agriculture in Gujarat, I outline its phase-wise characteristics to see how agriculture has historically been dependent on the use of groundwater.

The pre-independence phase

Pre-independence agricultural development and revenue administration in Gujarat is excellently documented by Patel (1969) and Hardiman (1998). This section therefore draws heavily on the analysis of these scholars. In the British regime, the Gujarat region formed part of the Bombay Presidency and covered the five districts of Ahmedabad, Khaira, Panchamahals, Broach and Surat. These districts were interspersed with 148 Princely States and estates like Baroda, Bansda, Dharampur, Lunawada, Deogadh Baria, Jambuaghoda, Limbdi, Idar, Palanpur and others that were under the jurisdiction of the Western India States Agency. The whole of Gujarat did not come under British rule at one stroke. The territorial connections commenced in commerce and date back to the 17th century with Surat, then with Broach, Ahmedabad and Khaira and lastly with Panchamahals. The first territorial footing of the British was in 1759 when they captured Surat followed by Broach, Ahmedabad and Khaira in 1772, 1817 and 1838 respectively. Panchamahals was the last district of Gujarat to come under British rule in 1877 (Patel 1969: 15-18). 'For revenue administration, the Bombay Presidency followed the *Ryotwari* system unlike the *Zamindari* system introduced in the Permanent Settlement in Bengal in 1793. The land revenue in the Zamindari system was fixed in perpetuity at 10/11th of the agricultural income and 1/11th of the rent was given to the Zamindars. The British thought that this system would create a loyal force that would help them in consolidating the empire. However, they found that the revenue flow was not up to their expectations. Zamindars under-reported the actual cultivated land and hence siphoned off a share

of agricultural revenue. This led to the introduction of the Ryotwari system in Madras Presidency that was based on the full survey and assessment of the cultivable land. This system gave better revenue and hence was replicated in Bombay Presidency in 1851' (ibid.: 20).

However, when the British took over Gujarat, irrigation was on the decline. This decline appeared to have been due to continuing warfare in the region with the British, the Peshwas, the Gaikwads and other Maratha aristocrats vying for ascendancy that caused the traditional forms of irrigation such as wells and tanks to decay. The British did not value the excellent irrigation system built by previous rulers (Hardiman 1998). 'For example, the large reservoir near Ahmedabad, the Karna Sagar – which had existed since the time of Solankis – was fed from a dam on the river Rupen. This was washed away in the monsoon of 1814. The British, who took control of Ahmedabad in 1817, never made any efforts to reconstruct this dam and the reservoir ceased to exist' (Hardiman 1998: 1538). The Irrigation Commission of 1901-03, appointed to look into the problems of irrigation recommended irrigated projects connected with the Sabarmati, the Mahi, the Narmada and the Tapi. The Visvesvaraya Committee appointed in December, 1937 observed that 'there is a keen demand in Gujarat for large storage works that would ensure perennial irrigation, but considering the meteorological conditions and the existing high intensity of cropping without irrigation in this region, it is a matter of doubt whether the increase in the value of crops raised and the revenue expected would justify the outlay' (Report of Irrigation Inquiry Committee, quoted in Patel 1969: 12-13). The suggestions of the irrigation inquiry committee were dropped or postponed on the ground of financial exigencies. In the absence of a network of irrigation works, the cultivators mainly relied on the monsoon and wells for irrigating the crops. Wells accounted for over 78 per cent of the total irrigated area in 1930 as against only ten per cent irrigated through canals. This was because of British policies that promoted well irrigation through tax exemption. 'In many parts of Ahmedabad district, for example, when a new well was built to a depth of 200 *haath* (about eight meters) or more, the land thus irrigated was exempted from tax on *rabi* (spring) and *unado* (summer) crops for either a specified period of between two and eight years or for as long as it took to repay the cost of construction. The general rule was that the deeper the well, the

longer the exemption' (Hardiman 1998: 1539). The tax-relief policies thus gave an impetus to well irrigation. They largely benefited the wealthier communities.

The Indian Easement Acts of 1882 passed by the British provided the right to appropriate water beneath the land of the landowner. This change in the property rights system created incentives for exploiting a common resource (Bhatia 1992: 64). As a result, individual well construction gained momentum followed by development of water markets in areas dominated by agriculture in the early 19th century. The political position of the elites in the village was strengthened through the exchange of water in a sharecropping system that appropriated one third of the produce for supplying water. Further, it gave rise to economic individualism and capitalist development in agriculture. The British also encouraged the production of non-food crops such as cotton to provide raw material to the textile mills in Manchester. The landowners, who were also the village elite, used a variety of oral tenancy contracts and shifted the risks of cultivation to the lower classes. Kanbis, who were elevated to the status of Patidars, were the main beneficiary of the changed land tenure system and encroached the land of Kolis and Adivasis in the northern part of the region (Shah and Rutten 2002: 27).

The pre-green revolution phase

After independence in 1947, Gujarat came under the jurisdiction of the Western India States Agency, and the princely States and estates were merged with the existing five districts of Gujarat in 1948-49. In 1956, the reorganisation of States merged the State of Saurashtra and Kutch in the bigger bilingual State of Bombay. In 1960, Bombay State was bifurcated into Gujarat and Maharashtra.

Tenancy legislation was implemented in 1951 with the objective to increase the income of cultivators by increasing their landholdings. Compared to other states in India, the Tenancy Act was effectively implemented in Gujarat, especially in abolishing the Zamindari system in Saurashtra and other regions. However, the affluent class mainly took advantage of the act and hence it did not change the basic social structure of the village society. The land reform accelerated the process of commercialisation and economic

development especially in central and south Gujarat (Shah and Rutten 2002). Another development was reform in the land revenue system. The Taxation Enquiry Commission (1953-54) set up by the government to look into the land revenue system, recommended that the land taxation should be reduced. The report mentioned that Gujarat had been heavily assessed in the past as a part of the former Bombay State on account of the fertility of soil and the revenue legacy of the Maratha period. Accepting the recommendations of the commission, the Bombay Government amended the Land Revenue Code by the Amendment Act XXVII of 1956 and made 1/16th of the average yield of the crops, the basis of normal and standard assessment of the land. By this time, agricultural production was rising due to early adoption of new technologies in agriculture. The burden of land revenue on the cultivators decreased as the income for cultivators increased due to higher yields in agriculture. The benefit of this situation largely went to large landholders who raised commercial crops with a large marketable surplus (Patel 1969: 468-492). The process created a class of farmers within village society who had already tested new technologies and were ready to adopt the green revolution technology that was becoming available.

During this phase irrigation was limited to the *Rabi* season. The *Kharif* (monsoon) season crop was mainly rainfed. Irrigation was used for Rabi crops such as cotton, tobacco and groundnut, which are non-food crops. The area under non-food crops such as cotton, tobacco, groundnut and sugarcane increased considerably from 1949-50 to 1963-64. This coincided with steady decrease in cereals and other food grains (see Table 2.5). The figures thus show that Gujarat slowly moved towards a cash crop economy that was largely irrigated through wells.

TABLE 2.5: AREA UNDER PRINCIPLE CROPS (IN MILLION HA)[9]

Crop	*1949-50*	*1963-64*
Cotton	0.82	1.69
Tobacco*	0.05	0.08
Groundnut	0.47	1.85
Sugarcane	0.01	0.02
Total cereals	4.82	3.90
Total food grains	5.33	4.44
Total oilseeds	0.75	2.04

Source: Patel (1969: 12)

In 1961 around 68 per cent of Gujarat's population was directly dependent on agriculture for its livelihood. According to the census, the total population of Gujarat was over 20 million and of the total workers, cultivators constituted 53.3 per cent while agricultural labourers constituted 14.8 per cent. This dependence on agriculture led the government to invest in irrigated agriculture to increase its productivity and create employment opportunities. Under the first five-year plan, several medium and minor irrigation projects were initiated in Gujarat but surface irrigation was insignificant in the early 1960s.[10] In 1961 about 52 per cent of Gujarat's total geographic area was under cultivation but the net irrigated area as a percentage of net sown area was only 7.8 per cent. Of this a large part was contributed by well irrigation rather than surface irrigation through canals or tanks. In 1961-62, around 83 per cent of irrigation was carried out through wells and only 9.5 per cent through canal networks. By investment in the public irrigation system, canal irrigation increased up to 13.4 per cent in 1965-66 but the dependence on wells and tubewells remained almost the same, although the area irrigated through them increased (see Table 2.6).

TABLE 2.6: AREA IRRIGATED BY SOURCE (IN KM^2)

Source	*1960-61*		*1965-66*	
	Area	*%*	*Area*	*%*
Government canals (including Panchayat canals)	652	9.5	1393	13.4
Private Canals	6	0.1	11	0.1
Wells (including tubewells)	5677	83.1	8625	82.8
Tanks	128	1.9	296	2.8
Other Sources	366	5.4	87	0.8

Source: Statistical Abstract of Gujarat State 1985-86 quoted in Bhatia (1992: 23a)

However, the nature of well irrigation started to change during this phase. While earlier water was extracted manually with draught power, the technology of energised pumps started to enter into the village economy. The electrification of villages played a role in boosting investment in pump sets. The number of electrified pump sets was 5400 in 1960-61. It rose to 15240 at the end of 1966, which is a 182 per cent increase over the preceding five years (Bhatia 1992: 21-23). Tubewell technology coincided with the

development of external input agriculture and created an environment for a groundwater-based green revolution to stand on a firm footing.

Green and post-green revolution

The green and post-green revolution phases can be located in the years 1965-1980 and 1980 onwards respectively. During the green revolution phase, agriculture contributed to the state economy in more than one way. In 1970-71, the primary sector (including agriculture) contributed around 49 per cent to the net state domestic product (NSDP). The output in the state doubled during this period compared to that recorded in the 1960s. In 1981-83, crop output recorded an unprecedented growth rate of 3.6 per cent, compared to the 2.2 per cent of the previous decades. The trends in agriculture over three decades starting from 1960 show that the green revolution influenced the cropping pattern to move towards cash crop production. Data released by the Directorate of Agriculture of Gujarat shows that, from 1963 to 1993, the area under cereals declined from 42.5 per cent to 29.8 per cent. The area under coarse cereals declined by nearly 1.11 million hectares. The area under food grains remained stagnant at 50 per cent of the gross cropped area during 1963-83 but declined dramatically to 30-eight per cent during 1983-93. Other crops such as mustard, sugarcane and cotton replaced food grains (Mathur and Kashyap 2000).

The change in cropping pattern affected the irrigation scenario in the state. Since almost all the non-food cash crops need irrigation, the area under irrigation increased over the years. Recent figures show that the percentage of net irrigated area to the net sown area increased from 20.91 in 1981 to 30.5 in 1996-97. In the 1980 to 1992 period, the percentage grew from 20.9 to 27.4 (around seven per cent) but this growth slowed down in later years. By 1996-97, the irrigated area had increased only three per cent as compared to 1991-92 (see Table 2.7). The overall area under irrigation grew during the green and post green revolution period but it was extremely dependent on the use of groundwater resources. Irrigation through wells and tubewells accounts for 79.3 per cent of all the sources combined in 1980-81. This had slightly

TABLE 2.7: AREA IRRIGATED BY SOURCE (IN '00 HECTARES)

Source	*Year*							
	1980-81	*1985-86*	*1990-91*	*1991-92*	*1993-94*	*1994-95*	*1995-96*	*1996-97*
Government Canals	3668	3586	4731	5570	5301	5930	5735	6125
Wells\Tubewells	15884	16532	19301	20565	19709	23656	22665	23863
Tanks	409	253	314	256	307	353	417	292
Other sources	65	24	30	34	88	82	105	138
Total Net Irrigated Area	20026	20395	24376	26425	25405	30021	28922	30418
Gross Irrigated Area	23344	23812	29105	32269	30869	36548	34994	36424
Percentage of Gross Irrigated area to Gross Cropped Area	21.7	22.8	27.8	29.2	28.8	32.5	31.8	32.9
Percentage of Net Irrigated Area to Net Area Sown	20.9	21.7	26.2	27.4	26.9	31.2	29.2	31.5

Source: Directorate of Agriculture, Gujarat State

reduced to 78.4 per cent in 1996-97. The dependence on government canals increased from 18.3 percent in 1980-81 to 20.1 per cent in 1996-97. In 1998-99, this percentage further increased to 31.9, which is around eight per cent below than the national average (GOG 2003).

In order to meet the growing need for irrigation numerous private tubewells were installed. The government also responded to this increasing demand. During the severe drought of 1965-67, a centrally sponsored scheme was introduced for groundwater development in nine states.[11] The Gujarat Water Resource Development Corporation (GWRDC) was established in 1975 as a state-owned company responsible for establishing and managing irrigation tubewells with resource support from the State government. Between 1975 and 1994, the GWRDC set up 2,800 public tubewells (Shah et al. 1995: 159-60). The primary objective of the public tubewell programme was to increase the area under irrigation by utilizing the groundwater. To an extent it created irrigation access for the farming communities. However, it was a bureaucratically managed, subsidy-based programme. It did not sustain itself over a long period. GWRDC generated enormous losses and its tubewells became defunct due to lack of repair and maintenance on the part of the bureaucracy. The government decided to transfer the management responsibilities of the public tubewells to the farmers' organisations.[12] It had two stated objectives for turning over public tubewells – to reduce the financial burden on the state and to improve utilisation of the wells. Many of these tubewells were transferred to farmers' cooperatives. Simultaneous with the government's response of increasing irrigation access through groundwater, many water companies[13] and farmers groups emerged to install deep tubewells for sharing and selling surplus water to other farmers. Shah et al. (1995) compared the economic performance of the public tubewells turned over to farmers' cooperatives and water companies, and showed that an average company earned twice the gross income of an average cooperative run by the government. These assessments created a policy environment where private water vending was advocated in groundwater potential areas. Institutional finance was made available for people or groups who wanted to sink tubewells to access groundwater for irrigation. In

many areas of north Gujarat, private water markets emerged to access and sell surplus groundwater.

With the economic resources to invest in tubewells and/or social networks to access institutional finance, the village elite mostly dominated the water markets. The flat-rate electricity and its uninterrupted supply also gave impetus to this growth. As a result, small and marginal farmers became dependent on water vendors for irrigation. Within a policy environment with subsidised electricity, the number of tubewells increased considerably. As a result, the water table started dropping alarmingly. Today, around 50 per cent of Gujarat's aquifer falls in the overexploited category.

In sum, agricultural development in Gujarat has historically relied on the use of groundwater. Irrigation was on the decline when the British took over Gujarat due to continuous warfare among earlier rulers in the area. The excellent surface irrigation systems built by early rulers were ignored and instead well irrigation was promoted through tax relief policies, which largely benefited wealthy farmers. The British also introduced commercial agriculture to provide raw materials for the industrial revolution in England. In addition, the change in property right over land created incentives for private appropriation of groundwater resources. In the post-independence era the agrarian economy slowly moved from non-food crops towards cash crops that needed irrigation. The surface irrigation systems were unable to cover a large area and hence the changed cropping pattern relied heavily on well irrigation. The green and post-green revolution era experienced technological advancement with the introduction of mechanised tubewells. By this time food grain production replaced cash crops that were irrigated through wells and deep tubewells. However, use of wells and tubewells also created water markets where resourceful farmers engaged in selling water to those who did not have resources to own a tubewell. This process also led to increased groundwater use and consequent depletion of aquifers in many locations. In the next section I discuss the various responses of the government towards solving the problem of water scarcity in Gujarat, and their effectiveness.

The State's Response

The response of the state towards growing water scarcity can be categorised in two ways: 1) to increase the supply of water by new external sources and 2) to curtail demand through various policy measures. The policy response includes the enforcement of groundwater law, establishment of central and state authorities, and controlling institutional finance, and change in electricity tariffs for checking overexploitation of groundwater resources. In this section, I discuss these policy responses and evaluate their effectiveness in solving the issue of water scarcity in Gujarat.

Loopholes in the groundwater law

The constitution of India treats "water" as a state subject and the Union comes in only in the cases of inter-state river waters. List II of the Seventh Schedule dealing with subjects on which states have jurisdiction says "water, that is to say, water supplies, irrigation and canals, drainage and embankments, water storage and water power subjects to the provisions of Entry 56 of List I". The Entry 56 of List I (union list) reads "Regulation and development of inter-state rivers and river valleys to the extent to which such regulations and development under the control of Union, is declared by the Parliament by law to be expedient in the public interest" (GOI 1999: 200).

Within the constitution of the State, various laws and policies govern the right to water. In the case of groundwater, the most important law is the Easements Act of 1882 implemented by the British government. The act refers to the right to every owner of land abutting a natural stream, lake or pond to use and consume its water for domestic and irrigation purposes. It gives the right to every owner of the land to dispose of all water under the land within his (her) own limits. However, this right is always subjected to the overriding power of the State to regulate the resource (ibid.: 211). The consequence of this legal framework is that only landowners can own groundwater. Landless individuals and tribals (who may have group or community rights over land but not private ownership) are excluded. The legal framework also implies that rich landlords can be water-lords and indulge in selling as

much water as they wish (Singh 1995). This law also led to a *de facto* right at the field level where affluent farmers with high pumping capacity and deeper tubewells have disproportionate claims over the resource. This iniquitous right over groundwater coupled with the lack of capacity of the state to regulate groundwater use resulted in excessive withdrawals in many areas.

In 1970, the Government of India introduced the Groundwater Model Bill. This was a legislation-based approach to control the use of groundwater. Since water is a state subject, the bill brought by the central government was to be endorsed by the States and until now, very few State governments have enacted it. In 1992, a revised version of the bill was introduced but enacted in very few States. Gujarat, where the groundwater depletion problem was clearly visible, succeeded in implementing it but only applied it to a limited number of districts, which are considered overexploited.[14] Even in these districts, the act was never implemented in full spirit due to a powerful farmers' lobby opposing any such regulatory measures.[15]

Establishment of the ground water authority

In 1996, the Supreme Court (SC) of India, responding to public interest litigation (PIL) against the overexploitation of groundwater resources, directed the Ministry of Environment and Forests to constitute the Central Ground Water Board (CGWB) as an Authority and exercise power under section 5 of the Environment (Protection) Act, 1986 for regulating the overexploitation of groundwater resources. Further, the SC also directed the establishment of State Ground Water Authorities to act at the state level and provided it with authoritative powers to check overexploitation of groundwater resources. However, the jurisdiction of the Central Ground Water Authority (CGWA) and state authorities over protecting groundwater resource is intensely disputed. The case of the Gandhinagar district notification illustrates this. While making standard observations in Gandhinagar district, the scientists of CGWB came across a deeply located good aquifer. They sent a report to the CGWA recommending for its protection. Based on the report the CGWA notified Gandhinagar taluka as a protected reserve for groundwater and a directive was

issued with instructions for not drilling any tubewells below 200 meters.[16] The issue raised controversy over the powers of the state and the central authority. Since water is a state subject and environment is a central subject under the Indian Constitution, the central authorities notified the district under the environmental protection law. They argued that the exploitation of the groundwater aquifer was environmentally unsustainable and hence should be curbed. However, the notification spoke only about not constructing new wells, and was silent on present wells being drilled deeper to exploit the aquifer. The notification did not work, as numerous wells were developed which CGWA could not check this due to lack of resources and infrastructure to monitor them.[17] The issue remains unresolved at the time of writing this book.

Further, the CGWB drafted 'Environment Protection Rules for Development and Protection of Ground Water' that included legal and institutional aspects. It was circulated to all the states for their comments before notification. 'However, the circulation and enactment of such bills and rules raises the spectre of a vast bureaucratic machinery administering use of groundwater through licensing and supervision. Presently, the owner of the land has absolute freedom in accessing groundwater. However, many abstain from trading this freedom with bureaucratically administered licensing regimes and therefore no state has shown any inclination to adopt the proposal' (GOI 1999: 213). All these attempts led to the need of coordination between the state and central authorities. The SC guidelines also directed states to establish state level organisation along the lines of the State Pollution Control Board. In 2003 the Gujarat government constituted the Gujarat Water Resources Council (GWRC), an apex decision-making body on water related issues. The expected function of the council is to finalise a uniform tariff for water supplies from irrigation dams including the Narmada project to agriculture, industries and for drinking to big towns and cities. The council will also look into the haphazard exploitation of groundwater and is expected to make important suggestions to amend the existing groundwater act. It is also anticipated that the council will form legislation to curb the increased pumping of fast depleting groundwater, mainly in north Gujarat region.[18] However, the effectiveness of the recently formed council is yet to be known.

Institutional finance and electricity pricing

Some of the indirect approaches to manage groundwater resources came in through limiting institutional credit for well development, controlling new electricity connections and electricity pricing mechanisms. The institutional finance for well construction was cut off in areas which had been notified as dark zones by the central groundwater board. The state electricity board denied new electricity connections to these areas. 'Neither credit limitations nor restrictions on electricity connection have proven particularly effective in limiting the growth of groundwater extraction. Farmers, particularly wealthy ones, can often tap private sources of capital for well construction. These approaches had little impact and have proven impossible to implement because well-off farmers are generally able to bypass regulations and obtain credit or access to electricity connections' (Moench undated: 10). A well-developed market for electricity connections is reported which uses one clause of the electricity act where electricity connection can be transferred from one village to another within the same district (also see chapter 4). Further, the government also tried to curtail the hours of electricity supply for agriculture to the farmers and increased the electricity tariff. Many attempts were made to convert the present flat-rate of electricity into a pro-rata tariffs but it has been effective. The electricity charges have also been raised but every time the political leadership was compelled to backtrack on the decision taken by government departments such as the Gujarat Electricity Board (GEB). At present, there is a tussle between the government and farmers' bodies over the electricity price. In the year 2003 the price was hiked by the electricity board, which resulted in farmers refusing to pay. Strong agitations by various farmers' groups have been reported, followed by some form of negotiation. However, at the time of completing this study an amicable solution of the issue acceptable to both farmers and government had not come about.[19] As far as the cut back in the institutional finance, the rich farmers have never been dependent on the state for the investment. Other sources of finance based on social networks and private credit cooperatives can fill this gap.

It is evident that the state responded to the scarcity situation through formal legal attempts and regulatory mechanisms. According to the law, the government classifies 'dark–

overexploited' zones by notification; there are specific limits to tubewell construction. These notifications do not work, as numerous new tubewells are dug every day. The reasons for the non-implementation of the regulations are many. Foremost among them is the Patel farmers' lobby. Patels are one of the largest resource-rich caste groups in north Gujarat. They constitute the strongest political influence in state politics. The use of their political influence has ensured that the regulatory aspects of legislation are not implemented on the ground. Till now, the people have witnessed only indirect forms of regulation through decrease in electricity supply and cuts in institutional finance for drilling tubewells. The electricity pricing mechanisms also did not work out for similar political reasons. In order to address the problem of water scarcity, the government initiated many programmes in the early 1990s. Among these are transfer of government-owned tubewells to farmers' cooperatives, initiating participatory irrigation management for efficient utilisation of canal water, and undertaking watershed management at a large scale. Among other programmes, watershed management has shown initial success in Gujarat with significant increase in agricultural yield, which can be attributed to a substantial increase in the water table (Shah 2000). In the year 2004, the Gujarat government announced the ambitious 'Sujalam Sufalam Yojna', which aims at finding a permanent solution to water problems particularly in drought-prone areas, while also doubling farmers' income and improving the rural economy. The scheme would usher what is called the *second green revolution* in the state. The project plans to build 'khet talawadis' (farm ponds), check dams and 'boribunds' (small dams made up of sand-filled gunny bags) to store rain water.[20]

However, most important and controversial among them is the building of a high dam on river Narmada. In the next section, I discuss this issue, which has the potential to alter the groundwater situation in some locations of Gujarat. I also analyse the impact of the new water[21] coming from the dam on the groundwater ecology of Gujarat.

The Sardar Sarovar Dam on River Narmada

The Narmada River originates from the Maikal ranges at Amarkantak, 1057 meters above sea level, now in Shahdol district of Madhya Pradesh (MP) in central India. In its 1312 km long journey before joining the Arabian Sea, the Narmada flows through the states of Madhya Pradesh, Maharashtra and Gujarat. Nearly ninety per cent of the river flows in MP, and the rest in Gujarat. The Sardar Sarovar Project (SSP) is part of the bigger Narmada Valley Development Plan (NVDP) that envisaged building of 30 big dams, 135 medium dams and 3000 small dams along the river Narmada and its tributaries. Ever since its conception, SSP has been under controversy over its costs and potential benefits. Numerous organizations and individuals including the Narmada Bachao Andolan (NBA) led movements against the construction of the dam.[22] The history of the SSP and associated controversies are well-documented (Morse and Berger 1992, Fisher 1995, Mehta 2001).[23] Hence, I focus only on updating the information from the perspective of changing groundwater ecology due to SSP in Gujarat.

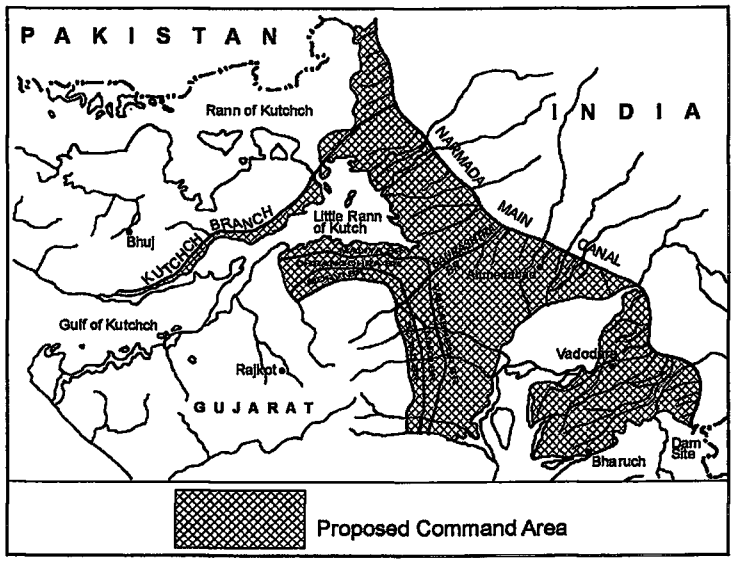
SSP's impact on water availability in Gujarat

The Narmada canal make its journey up to the Rajasthan border traverses regions with diverse agro-climatic and soil characteristics and crosses numerous streams and major rivers. The major areas benefited should be central and north Gujarat, Saurashtra and Kutch (see Map 2.3). Apart from bringing irrigation, the canal network is expected to alter the groundwater ecology in the canal command areas. The farmers of theses areas are hoping for year-round irrigation based on surface flow from the canal. They expect the groundwater level to go up, which would also combat salinity ingress (Wood 1997).

However, the data provided by the government are treated with a lot of suspicion by activists and scholars (Ram 1993, Roy 1999, Kothari 1999 and Black 2001). Questions are raised on the extent of irrigation possible under the Narmada command and the cost involved in bringing water from a far-off region to water-starved areas of Gujarat. It is claimed that when the original water flow in

the river was calculated in 1979, there was not enough historical rainfall and river flow data to produce accurate figures. Official estimates have historically underestimated the affected area and people and grossly overestimated the benefits of dams (Roy 1999). The amount of water actually available for use at the dam site at 75 per cent dependability is only 22.69 MAF (Million Acre Feet) and not 27.22 MAF as stated by the government. Even with the official estimate, the SSP is likely to irrigate only 44-52 per cent of the 1.8 MHa proposed as the amount of water available for irrigation is substantially less than what was planned. Furthermore, the efficiency of the canal system assumed by the government seems unrealistic. The efficiency is likely to be closer to 45 per cent rather than the 60 per cent claimed. Therefore, it will further reduce water available for irrigation (Ram 1993).

MAP 2.3: THE CANAL NETWORK AND COMMAND AREAS OF SSP



Source: www.mapunlimited.com

In the SSP command areas, the cost at which water will be provided to water-starved areas is also questioned. SSP has taken away a whopping 80 per cent of the total irrigation budget of the Gujarat government in the past ten years. In the 2000-2001 annual

plan, the SSP was allocated $811 million – half the state's entire budget. The expenditure is morally legitimised on the ground of the persistent water scarcity in districts of Saurashtra, Kutch and north Gujarat. Experts say that water cannot enter the canal by gravity until the dam height reaches 110 meters. Therefore, a decision was taken to pump water into the canal from the Sardar Sarovar reservoir (Black 2001). Many believe that the cost of pumping water into the canal is too high and unaffordable. For example, in October 2002, the water from Narmada was pumped into the dry bed of the Sabarmati River. The people of Ahmedabad experienced the river flowing bank-to-bank after many years. The water was not directly used for drinking but to recharge the French wells that are used to supplement the drinking water supply from Raska weir. However, later the Gujarat government slapped Rs. 1020 million onto Ahmedabad Municipal Corporation (AMC) as a charge towards the water flowing in the River Sabarmati at the rate of Rs. 6.40 for every 10000 litres. As a result, the AMC was forced to increase taxes by nearly Rs. 3.3 million in its interim budget for the year 2003-2004. However, the interim budget was rejected by the standing committee of the AMC under pressure from people and civil society institutions.[24] The example shows that the cost of bringing water into canals will be high. Only time will tell how people are going to react to the increased cost of irrigation.

Even at the cost decided by the government, the fact is that Narmada water will reach only two per cent of the drought prone areas in Kutch, 22 per cent in Saurashtra and 17 per cent in north Gujarat. There are other areas such as Sabarkantha, Banaskantha, part of Mehsana and many villages of Saurashtra that need irrigation but are not under the command area of SSP (see Map 2.3).[25] In Rabi 2002, water was released in the Narmada canals for irrigating 80000 hectare in Narmada, Bharuch and Vadodara districts where canal infrastructure up to minor level was fully or partially ready. While the full reservoir capacity is likely to be created once the dam height is raised to 135 meters by 2003, it will take 10-15 years before the canal network gets constructed to cover the entire command area of the project (Shah 2003). Even in the command area of SSP, water availability is expected to go down with time due to various environmental changes. Narmada, therefore, should not be mistaken for a panacea for solving the groundwater depletion of Gujarat.

Concluding Remarks

This chapter shows how scarcity is historically grounded in the unique ecological situation of Gujarat. The ecology ranges from rocky highlands to marshy wet lands and alluvial plains to coastal zones. The physical situation has resulted in uneven distribution of land, vegetation, surface and groundwater resources. The historical analysis showed that the British promoted commercial agriculture in the pre-independence era responding to the industrial revolution in England. This also resulted in early introduction of HVY seeds, and Gujarat moved from non-food to cash crop irrigated agriculture in the post-independence era. However, the shift in land use pattern, which was earlier determined by the availability of surface water, slowly changed due to the introduction of green revolution technology based on external inputs. In order to meet the demand, numerous wells and tubewells came up, mining the deep aquifers in many locations. The government policy of subsidizing electricity for the farming community promoted extensive groundwater markets. The market flourished in some of the alluvial zones suitable for tapping deep aquifers.

The response of the government to check groundwater exploitation was in terms of certain policies for increasing supply and curtailing demand of water. These policies include direct and indirect forms of regulation. The direct form of regulation was the adoption of the groundwater model bill and creation of authorities to check exploitation. Evidence shows that the regulation-based response had little effect and is difficult to implement in spirit due to political compulsions. The indirect forms of regulation include controlling institutional finance and electricity prices, which has worked to some extent. It has been inequitable in its effect on access to groundwater for the poor and marginalised. Altogether, governmental policies have been detrimental to the limited water resources of the state, allowing exploitation of surface and groundwater resources for private gains, making the pattern largely unequal and unsustainable. As a part of solutions to the problem, the government proposed to build a high dam in the River Narmada. An examination of the water available through the SSP shows limited effect on the groundwater ecology of north Gujarat in specific and Mehsana district in particular. The distribution networks of SSP covers only part of the scarcity zones and,

therefore, should not be seen as a panacea for solving the crisis of scarcity for large parts of Gujarat. Lastly, planners and experts also question the cost at which this water will become available from SSP.

Notes

[1] In defining what water scarcity is, I agree to the term used by Mehta (2003). She defines scarcity against the popular absolute and monolithic terms obscuring the complex nature of scarcity and links it with ecological, socio-political, temporal and anthropogenic dimensions. According to her, water scarcity is created and reproduced both at discursive and biophysical levels. The 'manufacture' of scarcity at the discursive level obscures some important aspects of 'real' scarcity. One, inequalities often shape access to and control over water. Two, water scarcity occurs largely due to anthropogenic interventions resulting from deficiencies in managing water and land use practices. The naturalisation of scarcity at the discursive level does not help mitigate the symptoms and causes of real scarcity. In addition, scarcity is also a revenue based criteria in most states, related to level of failure of crop yields.

[2] During 1999-2000, the government declared 8666 villages (from a total of 18637 villages) *scarcity–hit* in the wake of monsoon failure. Total scarcity was declared in 6675 villages while 1991 villages had semi-scarcity conditions and 7467 villages faced severe shortage of drinking water. According to the government, the deficient monsoon during the year led to a decline of 29-31 per cent of crop production in Saurashtra, Kutch and North Gujarat districts. The estimated figures of production showed a decline of 45 percent in pearl millet, 83 percent in sorghum, 72 percent in groundnut and 41 percent in *moong*. The total crop loss was estimated at Rs. 45.89 million (GOG 2000). The problem continued in 2002 when 13 out of 25 districts received less than normal rainfall. In total, 5144 villages in these districts were declared *scarcity/semi-scarcity hit*. The production loss for the Kharif season was estimated to be 23 percent amounting to Rs. 18.74 million while in the Rabi season, the loss was of the order of Rs. 9.69 million (GOG 2003).

[3] According to the provisional results of the Population Census 2001 at 0.00 hours on March 1, 2001. This figure includes the estimated (and not actual) figures of earthquake-affected areas of Gujarat where the census could not be held along with other areas (Census of India 2003).

[4] The sector 'Agriculture, Forestry and Fishing' registered a negative growth rate of 2.35 percent during 1998-99 compared to 1997-98. The sectors that registered significant growth during the same period were -

Mining and Quarrying (13.08 %), Communications (18.64%), Banking and Insurance (13.88%) and Public Administration (24.89%) (GOG 2000).

[5] During 1961, agriculture in Gujarat engaged 64 per cent of the total workforce, which reduced to 50-six per cent in 1991. This indicates that the state is reducing its dependence on agriculture for income and employment generation and hence is going through structural transformation. This transformation is a result of a 'textile first strategy' vis-à-vis 'machine first strategy' apart from inducing agriculture and industry linkages. This strategy resulted in a decline of the share of cereals and food grains and a rise in non-food grain crops in total production (Mathur and Kashyap 2000)

[6] A local saying claims that 'north Gujarat has three Narmadas beneath its land'. This means to suggest that north Gujarat can store (or has stored) three times the water available in the River Narmada.

[7] According to the 1991 census, there were 19 districts and 184 sub-districts in Gujarat. However, in the year 1998 the districts of Gujarat were reorganized and new districts were carved out of older districts for administrative purposes. Navasari, Bharuch, Anand, Patan, Porbandar and Narmada are the six new districts, increasing the total number of districts to 25 in 2001. The number of sub-districts increased from 184 to 226 (Census of India 2003).

[8] According to the Central Groundwater Board, Government of India, overexploited sub-districts are areas in which the level of groundwater abstraction is more than 100 per cent of average annual recharge. Dark blocks are areas in which the level of groundwater extraction is between 85 and 100 per cent of annual groundwater recharge. Similarly, grey blocks are areas that have between 65 and 85 per cent of groundwater extraction. White blocks are areas having less than 65 per cent of groundwater extraction.

[9] This figure excluding Kutch and Saurashtra regions as data was not available.

[10] The classification of irrigation projects in India is on the basis of extent (size) of cultivable command area (CCA) serviced by an irrigation work. A project with a CCA of more than 10, 000 hectare is called a Major Irrigation Scheme. One with a CCA of more than 2000 hectare but less than 10000 hectare is called Medium Irrigation project/scheme. One with a CCA up to 2000 hectare and less is called a Minor Irrigation Scheme (Navalawala 1997).

[11] In order to support the scheme, geo-hydrological units were set up in eight states. The programme was further facilitated by the rapid electrification of the rural areas and the increased availability of institutional finance. The estimated Fourth Plan outlay of Rs. 13.53 million on groundwater schemes (Rs. 2.53 million from the public sector

plus Rs. 6.50 million from financial institutions, plus Rs. 4.50 million from the cultivators themselves) was expected to lead to a net increase in the irrigation potential of 4 million hectares (Planning Commission 1974: 1)

[12] 'In recent years when the government has begun to restrict subsidies, the GWRDC has accumulated a loss of over Rs. 700 million. Most of the corporation's problems are those of any public-sector bureaucracy. It has acquired a permanent staff of 6400 imposing a staggering wage bill of Rs. 220 million per year; as a result, its overheads were 31% of its total operating cost in 1993. Compared to this, the annual gross income of all its tubewells is a mere Rs. 60 million which can barely meet a fourth of the salary bill, leave alone the costs inclusive of capital' (Shah et al. 1995: 160).

[13] These are private companies engaged in water vending. In most cases, the investment comes from individuals who are not engaged in agriculture and sell water for profit. Irrigation cooperatives are mainly farmers' organisations, which invest in tubewells to access water for their land and sell surplus water to non-share owners of the cooperative.

[14] 'After some prodding from the central government, the Bombay Irrigation Act (governing Gujarat) was amended in 1976 to regulate new deep tubewells and the use of water in the existing tubewells. As a result of a series of legislative delays, the amendment only entered into force in 1988 and currently applies to nine districts' (Dubash 2002: 70).

[15] Moench (undated) discusses the implementation of the groundwater model bill. According to him 'implementation of regulations under the Gujarat legislation has proved difficult. Political opposition have blocked all attempts in areas where the act has formally been brought into force. How regulations limiting groundwater extraction could actually be enforced even if the political will were present is open to question. With wells in private hands and a firmly entrenched tradition equating groundwater use rights with ownership of the overlying lands, centralised enforcement would require development of a major and highly intrusive organisation'(ibid.: 11).

[16] Interview with Mr. A.K. Sinha, Director, CGWB, Mr. Raghav Rao and Mr. P.K. Parchure, Scientists CGWB on February 25, 2003. Additional information was downloaded from the official website of the Central Groundwater Board, West Central Region, Ahmedabad at www.wcrcgwb.com/achievements.htm.

[17] Compiled from various newspaper articles, *Times of India*, Ahmedabad edition.

[18] Based on newspaper article State Government sets up Water Resources Council', *Times of India*, Ahmedabad Edition, February 21, 2003.

[19] Based on the Gujarat Electricity Regulatory Commission's (GERC) award dated October 10, 2000, the Gujarat Government hiked the tariff

of electricity used in agriculture from June 2003. There are an estimated 600,000 farm connections in the state wherein farmers pay for electricity according to the contracted load of their motors. The increased rates for electricity motors of less than 7.5 hp capacity was from Rs 350 per year to over Rs. 1050. For motors with more than 7.5 hp capacity, the increase was Rs. 1260 from Rs. 500 per year. NGOs and activist groups believe that the government acted under pressure from the Asian Development Bank to do away with the subsidies in the farm sector, following which it was decided to cut the subsidy to the Gujarat Electricity Board worth Rs. 11.56 billion. Around 50-seven per cent of these subsidies are shouldered by the agriculture sector. The Gujarat government spends Rs. 17 billion every year as subsidies to farmers. However, soon after the declaration of this tariff hike strong agitations sparked off from farmers' organisations. They stopped paying electricity bills and in some cases did not allow the electricity department officials to enter the village to demand payment or sever connections due to non-payment. A number of farmers' organisations are involved in the agitation. Most prominent among them is the Gujarat Farmers' Agitation Forum led by Bipin Desai, *Bhartiya Kisan Sangh* (BKS), the farmers' wing of the ruling Bhartiya Janata Party (BJP) and Gujarat Khedut Sangharsh Samiti (GKSS) backed by the Congress Party. The agitations led to two state-wide *Bandhs* (lockouts) in 2003 wherein government used force to suppress the violent agitations. A 31 year old farmer in Surat district died in September 2003 after police officers beat him up while taking part in a demonstration against the power tariff hike. Because the general election was round the corner in 2004, the government offered a 25 to 33 per cent reduction in the power tariff. This would mean that the farmers using up to 7.5 hp pumps would have to pay Rs. 750 per hp per year instead of earlier proposed Rs. 1050. Similarly, those using motors with a capacity higher than 7.5 hp have to pay Rs 900 instead of Rs. 1260 per hp per year. The new tariff was not accepted by the farmers' organisations and they continued their resistance. In February 2004 one of the farmers' organisations, BKS, compromised with the government and called off their strike after a decision on lowering the tariff further by Rs. 50 per hp. However, other organisations are continuing with their agitations, calling it a great betrayal by BKS due to their proximity with the ruling BJP. In the general election of 2004 the ruling BJP suffered a major set back losing 12 of the 26 parliament seats including Mehsana. (Compiled from various newspaper reports, discussions with farmers and their organisation leaders)

[20] 'Sujalam-Safalam : A unique scheme by honourable chief minister: Gujarat towards a second green revolution'. News article published at the official website of the Government of Gujarat. Sourced at http://www.gujaratindia.com/News_asp/en3.htm.

[21] I have borrowed this term from Wood (1997) who describes the 'new'

availability of water in the context of variety of water management initiatives possible in different zones of Gujarat including water available through the Sardar Sarovar Dam. The new water has to attend to technical, social, economic, institutional and political challenges.

[22] NBA also filed a writ petition to review the project in the Supreme Court (SC) to which the SC stayed the construction of SSP in 1995 at the height of 80.3 meters. In February 1999 the Supreme Court gave the go ahead for the dam's height to be raised to a height of 88 meters followed by the judgment in October 2000 to allow immediate construction of the dam up to a height of 90 meters. Further, the judgment also authorised construction up to the originally planned height of 138 meters in 5-meter increments subject to receiving approval from the Relief and Rehabilitation Subgroup of the Narmada Control Authority.

[23] The history of SSP is available at a number of internet sites. They are - www.sardarsarovardam.org (official website of the Sardar Sarovar Narmada Nigam Ltd, Government of Gujarat), www.nvda.nic.in (official website of Narmada Valley Development Authority, Government of Gujarat) and www.narmada.org (website of sympathizers of the Narmada. Bachao Andolan, one of the activist organisations that is highly critical of the SSP).

[24] The information is based on the newspaper reports – 'Water wars waged over Rs 100-cr bill', *Times of India*, September 19, 2003; 'What Rs 102 crore means to cash-strapped AMC?' *Times of India*, September 21, 2003 and 'AMC standing committee rejects interim budget', *Times of India*, September 21, 2003, Ahmedabad edition.

[25] 'In Junagadh district in Gujarat, the coastal areas of Mangrol block have become the scene of a major health scare. Take Loej village five kilometres from the coastline for instance. 200 odd families have one thing in common: each has at least one member suffering from kidney stones. According to WHO norms, the total dissolved solids in drinking water should not exceed 500 ppm. In Leoj, the TDS content is 4000-8000 ppm. Over the past three decades, salinity ingress has made groundwater unfit for drinking in village after village. Out of the 60 villages, 23 are gripped under total salinity ingress. In 29 other villages, it has contaminated more than half of the groundwater resources. As the state's drinking water schemes always remained a pipedream, villagers had to rely on well water, even while the groundwater table was depleting fast. The rhetoric of the Narmada water supply can not provide a balm as the scheme is meant for only parts of Jamnagar and Rajkot' (*The Indian Express*, April, 28, 2003 quoted in Dams, Rivers & People, 1 (6-7), July-Aug 2003, Delhi: 26)

3

Groundwater Irrigation and Social Differentiation

Wells and Tubewells in Sangpura 1960-2003

We were sukhi (well-to-do) before but we lost the ability to go deeper with the aquifer like Patels. Patels can go to patal (bottom of the earth) to fetch water...we cannot.

- A Thakore farmer in Sangpura

If landownership reflects the socio-economic condition of people, access to irrigation is another crucial factor that determines one's position in society. The agrarian economy of Sangpura, where people's survival depends strongly on access to groundwater resources is a clear example of this. Reliance on groundwater is a characteristic of the ecology of north Gujarat, which lacks perennial sources of surface water but used to have extensive aquifers with large groundwater storage capacity. With the introduction of irrigated agriculture the use of shallow wells started in the early 1960s in Sangpura. The shallow water table dried up around the mid 1980s, which led people to invest in deep tubewells. The immediate fallout of tubewell irrigation was a sharp decline in groundwater levels. In less than four decades, Sangpura was classified as a dark zone for groundwater utilisation. The tubewell technology came with a price tag that was beyond the reach of many. Shared tubewells thus became the order of the day in Sangpura and other villages of north Gujarat. With depleting aquifers, the ownership of tubewells was further skewed to those

who had resources to buy shares in tubewell cooperatives, leading to an increased social differentiation. This differentiation was based on the unequal distribution of land and the control over productive resources such as groundwater by the privileged few.

How did this process come about? What are the interrelations between social differentiation and the pattern of organisation around groundwater resources? Who are included and who left behind? I discuss these questions in this chapter. However, before investigating these issues in detail, I sketch the history of irrigation in Sangpura and the surrounding region. This is followed by an analysis of the ownership of and control over land and water and the organization of tubewell irrigation cooperatives as shareholders and water buyers. The investigation shows that the ownership of water closely follows landholding patterns. The control over groundwater reproduces the inequality in control over land. The class structure closely follows the caste hierarchy and determines the differential access and control of groundwater for different social groups. This disparity establishes the level of accumulation that different classes generate from agriculture.

Irrigation History

Groundwater development in the Mehsana region can be divided into three phases: pre-1935, 1935- 1955 and post-1955. During the pre-1935 phase, groundwater was available at a depth of 5-10 meters and obtained from dug wells using manual lifting and draught power. During the 1935-55 phase, the groundwater level declined to ten to 30 meters primarily due to the use of dug-cum-bore wells powered by diesel pump sets. The post-1955 phase experienced a rapid decline in water table. From the 1960s, it amounted to one to three meters per year. The groundwater table deteriorated further in the post-1955 phase with the advent of electricity-based pumping (Gupta and Deshpande 1998). Deep tubewells fitted with electric motors are now used for lifting groundwater from 100-250 meters depth. In Sangpura too, the decline of the groundwater level has followed this pattern. Below, I reconstruct the history of groundwater and agricultural development from 1960 to 2003 for Sangpura.

Prior to 1960, the water level in Sangpura village was at around two to four meters depth. The main crops were sugarcane, paddy and chillies; irrigation was mainly through open dug wells. The winter crops were *methi* (fenugreek), *bajri* (pearl millet), *chana* (chickpea), indigenous cotton, *jeeru* (cumin) and *variyali* (fennel). There were no summer crops during the 1960s, and even the winter crops were grown by utilising the soil moisture and with little irrigation. Irrigation was done through open dug wells using animal draught power. Irrigation constituted only 30 per cent of the total cultivated area of Sangpura.

TABLE 3.1: DEPTH OF TUBEWELLS IN SANGPURA 1960-2002

Year	*Depth to water table (in meters)*	*Mode of extraction*	*Electricity supply (hours per day)*
Before 1960	3-4	Animal draught power	-
1960	6-9	Crude-oil engine	-
1970	16-24	Diesel engine	-
1980	29-35	Diesel engine/ electric engine	24
1985	35-47	Electric engine	18
1990	103-112	Electric engine	16
2003	118-132	Electric engine	8

Source: Field data

In the early 1960s mechanised pumps were introduced in the village. By this time, the groundwater level was at six to nine meters depth. The machines were powered by crude oil engines due to which irrigation in Sangpura contributed to about 60 per cent of the total cultivated area. The remaining 40 per cent was irrigated through capturing runoff collected through small bunds and field ponds. This irrigation, together with new HYV seeds, started to give a slightly higher yield. The new technology, thus, gave impetus to the further growth of irrigation.

Table 3.1 sums up the development of groundwater irrigation in Sangpura from 1960 to 2003. It shows how the water table declined from six to nine meters in the 1960s to 132 meters in 2003. The mode of extraction changed from animal draught power to oil engines and from diesel to electric engines to cope with the declining water table. However, the electricity supply for agriculture, which was 24 hours per day in the 1980s, has decreased

to a mere eight hours per day in the 2001-2003 period.[1] Table 3.2 shows the social ownership of land and dugwells in the early 1960s in Sangpura. It shows that ownership was skewed towards Patels, the landowning caste that owned 53 per cent of land and 67 per cent of the dugwells in the village. Thakores followed them with 22 per cent of land and 19 per cent ownership of five dugwells.

TABLE 3.2: SOCIAL OWNERSHIP OF LAND AND DUGWELLS IN SANGPURA, 1960

Caste	*Land*		*Dugwells*	
	Total land in hectare	*% of total village land*	*Number*	*Percentage*
Thakore	119.38	22	12	19
Patel	289.18	53	42	67
Prajapati	71.53	13	5	8
Parmar	17.50	3	2	3
Vaghari	3.44	1	1	2
Darbar	12.22	2	1	2
Others	28.24	5	-	0
Total	541.49	100	63	100

Source: Village land record of 1960 (land); field interviews (dugwells).
Note: Others include Rabbari, Bawa, Suthar and Vaniya Castes.

However, in the late 1950s and the early 1960s, access to the market was still difficult, as there were no good roads in the village and residents had to walk a kilometre to catch the passenger bus to sell agricultural produce in the market at Mehsana town. Many people used to walk up to Mehsana (around 15 kilometres) to visit the agricultural produce market. Camel carts were commonly used to carry agricultural produce to the market. Villagers were largely illiterate, and *Vaniyas* (moneylender caste) ruled the village through extending loans for agriculture and household consumption. Almost all villagers were indebted to the Vaniyas. The Land to the Tiller Bill, introduced in the district in 1955 paved the way for villagers' freedom from the Vaniya's clutches.[2] Agriculture was described as *Sukhi Evam Sasti Kheti* (dry and inexpensive). Milk production was limited as compared to today and was mostly utilised for household consumption.

Many developments took place after Gujarat was separated from Maharashtra state in 1960.[3] The most important among these was

the introduction of a milk cooperative that was initiated in the village by the Mehsana-based *Doodh Sagar* Dairy in 1965. Earlier the *Rabbaris* (pastoral caste specializing in cattle rearing and milk production) collected milk and sold it in Mehsana town and nearby villages. With the milk cooperative a ready market was created in the village itself, which initiated economic transformation for most people. Farmers could then invest this money in productivity-enhancing measures for agriculture. During this time, only a few Patel households were living in brick houses, while the rest of the people lived in mud houses. 'Water scarcity' was not in the village dictionary, as many parts of the village used to be flooded for months after the monsoon. Water was abundant enough to grow sugarcane. People had enough water to irrigate. This was also the time when the Primary Agricultural Cooperative Society was introduced. It provided oil, kerosene and agricultural credit to the farmers.

In 1970 the village was electrified and the panchayat office got electricity free of cost. Initially people were afraid to use electricity and there used to be huge crowds at the panchayat office in the evenings to see the light powered by electricity. Patels and Prajapatis were the first to buy ten electricity connections for household consumption. Improved varieties of cotton and pearl millet were introduced around the same time. The landowners who possessed open dug wells and had water to irrigate first adopted them. The water level in the open wells was at 18-24 meters depth as a result of full-fledged irrigation through mechanized engines. Slowly all indigenous varieties of crops were replaced by high-yielding varieties. Only indigenous wheat (*Tukri Ghaun*) survived and is still popular among the farmers, due to lower water use, more resistance to pest attack, and almost the same level of production compared with the hybrid variety. On the upper reaches of Sabarmati River, Dharoi multipurpose irrigation dam was built in 1960. As a result of this, the water flow in the river was severely affected. The farmers realised that water in the Sabarmati River, the only source of surface water in the region, had decreased. This affected the water recharge scenario of the village. Sangpura's wells started to go deeper. By 1975 commercial agriculture had taken root in the village. The major crops were

TABLE 3.3: CROP CYCLE IN SANGPURA, 2001-02

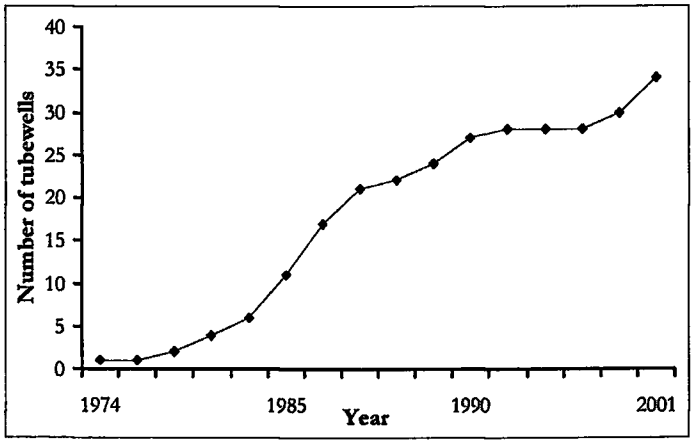
Crops	*May 15*	*June 15*	*July 15*	*Aug 15*	*Sept 15*	*Oct 15*	*Nov 15*	*Dec 15*	*Jan 15*	*Feb 15*	*March 15*	*April 15*
Sesamum*	Ploughing	→	Sowing	Gestation		Harvesting						
Guwar*	Ploughing	Sowing	→	Gestation		Harvesting						
Cotton	Ploughing	Sowing	→	Gestation		Harvesting						
Mung*	Ploughing	Sowing	Gestation	→	Harvesting							
Chaura*	Ploughing	Sowing	Gestation	→	Harvesting							
Sweet Potato	Ploughing	→	→	Sowing	Gestation	→	→	→	Harvesting			
Castor	Ploughing	→	Sowing	Gestation		Harvesting every 15 days	→	→	→	→	→	→
Sorghum #	Ploughing	→	Sowing	Gestation		Harvesting						
Mustard					Ploughing	→	Sowing	Gestation	→	Harvesting		
Wheat					Ploughing	Sowing	Gestation	→	→	→	Harvesting	
Alfalfa					Ploughing	Sowing	Gestation	→	Harvesting every day as per requirement			
Isabgol					Ploughing	→	Sowing	Gestation	→	→	Harvesting	
Pearl Millet	Harvesting								Ploughing		Sowing , Gestation	
Tobacco	Harvesting				Ploughing	→	Sowing	→	Gestation	→	Harvesting	

Source: Field Data, *Non-irrigated; #fodder crop (Compiled with inspiration from Chakravarti, 2001: 60)

cotton, sugarcane, paddy, chillies, wheat, alfalfa (fodder crop), mustard, pearl millet (winter and summer), sorghum and castor. All these crops were of a high-yielding variety (see Table 3.3).

By this time, diesel engines were slowly replaced by electric motors as the water level started to fall further and it was difficult to access it through diesel engines. The electricity supply was 24 hours per day. By 1985 the water level had gone down to around 47 meters. This was the time when tubewells, powered with electric motors, started to be installed in the village. The first deep tubewell was installed in 1974; Patel shareholders had a majority ownership. By the end of 1985 the number had risen to 12 along with six tubewells installed in 1984-85 (See Figure 3.1). By the end of 2001 the figure rose further to 34 tubewells, excluding one owned by the Gujarat Water Resources Development Corporation (GWRDC).[4] Map 3.1 shows the location of these tubewells in the village.

FIGURE 3.1: CUMULATIVE GROWTH OF TUBEWELLS IN SANGPURA - 1974-2001

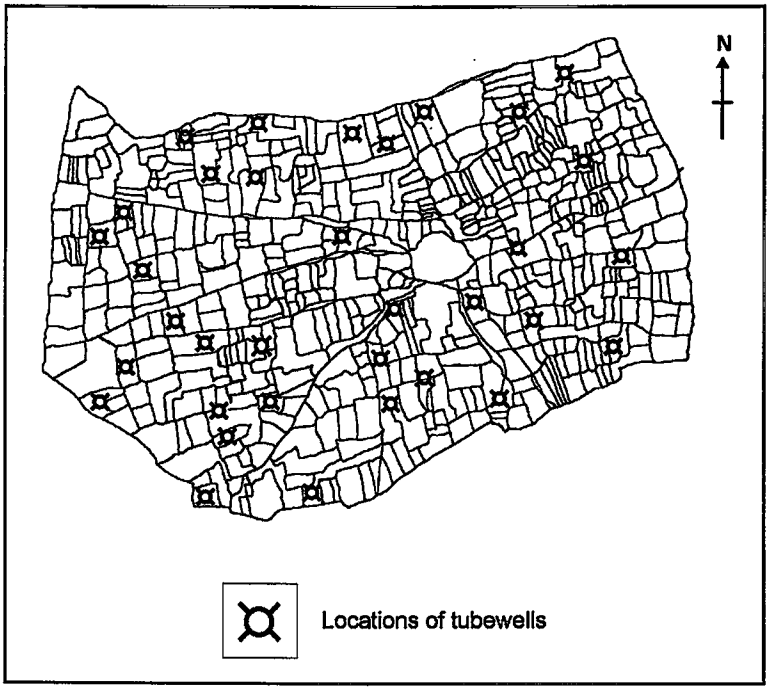


Source: Field interviews

With the declining water table, and farmers turning to electric motors, the demand for electricity increased. Since the electricity was subsidised, with the increase in demand, the government reduced the supply of electricity from 24 to 16 hours per day to

adjust the level of subsidy. The credit cooperative provided advance crop loans to farmers, and the milk cooperative paid ready cash twice a month. The decade of 1975-85 is known as the *golden age* of agriculture. Farmers had bumper crops and could get substantial income from agriculture and dairy farming. However, this growth was limited to the main land-owning castes of Patels and Prajapatis and a few Thakore and Parmar families. They built concrete houses and their lifestyle improved. Thakores, who had land but were not as resourceful as Patels and Prajapatis could not derive much benefit in the process. With the decline in water table, access to irrigation started to reduce. The ownership of tubewells was concentrated with a few resourceful farmers. This gave rise to water markets, as there was plenty of surplus water that could be sold to make a profit. This was under the flat-rate tariff system with electricity supply available 18 hours a day. It rationalised the sale

MAP 3.1: LOCATION OF TUBEWELLS IN SANGPURA, 2002



Source: Field data

for the shareholders of tubewells, as they had nothing to lose but only to gain monetarily through the sale of surplus water. Groundwater markets flourished during this time. By 1990, 28 tubewells of Sangpura were irrigating an average of 20 hectares of land per tubewell. However, after 1990 the situation started to change. By this time, the water level had fallen to around 100 meters and electricity supply was reduced to 12 hours a day with flat rate charges based on the contracted load of their motors measured in horsepower. The land had been over-cultivated. Some crops had developed pest resistance. In order to sustain the level of production, farmers increased the use of external inputs such as chemical fertilisers and pesticides. However, even the excessive use of fertilisers and pesticides did not sustain the level of production. Hence, crop failure became increasingly common. Due to the costs of irrigation and other inputs, agriculture was not as profitable as earlier. Under increasing demand of electricity, the government decided to provide electricity in day and night shifts and in rotation. This caused inconvenience for the farmers who now had to be awake at night to irrigate their fields. Water buyers were then given night slots while the shareholders enjoyed the day-time irrigation. By this time the tubewells had passed the age of 15 years. To make the situation worse, tubewells started to fail one by one. In order to continue irrigation they needed to be renovated. This involved a minimum cost of Rs. 200000 per tubewell. The indebtedness level rose, as the farmers had to take loans for investing in, or buying shares for new tubewells. The hourly charges for water were increased to cover the expenses. Until the late 1990s most of the shared tubewells were making profits up to Rs. 100000 per year by selling water to buyers. However, many tubewells went through major renovation with an increased maintenance cost. Some shareholders who could not contribute to this cost sold part of their share. Thus, their share of profit was also reduced. In 2000 the electricity supply was further reduced by the government to eight hours per day, leading to a significant decrease in water sales. Shared wells were not able to supply sufficient water to the shareholders, so the water sale was curtailed further. Hence, the profit went down for shareholders. The lands of water buyers were fallow and to cover this, five new tubewells were installed during 2000-2001 under joint ownership. By the end of 2002, the water level had gone down to more than 130 meters.

To access water at this level the contracted load of the motors had to be up-graded from lower to higher horsepower. If the 1975-1985 period was the golden years of agriculture, post-1990 is referred to as the dark years with productivity decline, increased input costs and crop failures.

The history of irrigation shows a grim picture of groundwater utilisation in which agricultural development was achieved at the cost of depletion of the aquifer. The water level fell from 2 to 130 meters below ground level within four decades. The changes in groundwater level coupled with land fertility decline. The water retention capacity of the soil reduced further due to intensive cultivation, which is one of the reasons for declining agricultural productivity. In the next section, I discuss the effect of this process on the village economy. I illustrate the level of differentiation in ownership and control over the two most productive resources, water and land in Sangpura.

Ownership and Control of Economic Resources

The economy of Sangpura is largely driven by agriculture and animal husbandry. In a way, they are intimately related with each other. The access and control over land and water determined the pattern of agriculture and generation of surplus. This surplus was fed back into animal husbandry through the milk cooperative system. In Sangpura the introduction of new agricultural technology, development of groundwater irrigation and the establishment of a milk cooperative happened almost simultaneously. The development of groundwater irrigation happened in the private sector, but it was informally linked with the partially state-funded cooperative sector such as the primary agricultural cooperative and the milk cooperative. The primary agricultural cooperative society provided institutional credit to farmers whereas the milk cooperative gave a village-based market to sell milk. The easy availability of institutional credit boosted investment in agriculture. Farmers invested in high yielding variety seeds, irrigation and other inputs. Agricultural produce and residues were well utilised for animal husbandry. The question is whom did this process help among the agrarian community? In this section, I

examine the pattern of distribution of land and access to groundwater in Sangpura to find out whether these development processes have favoured or disfavoured particular social groups.

Land ownership in Sangpura

Land is an important indicator of household wealth. Sangpura's 2002 land revenue register speaks of inequality in land distribution (see Table 3.4). Patels, who constitute around 32 per cent of the total households, possess 54 per cent of the village's agricultural land. Thakores constitute approximately 36 per cent of the total households but have only 21 per cent of land. Prajapatis who constitute 12 per cent of the village household have 14 per cent of village land. Around 35 per cent of the households are landless (see Table 3.5) and 14 per cent of the total households fall below the poverty line (see Table 3.6).

TABLE 3.4: CASTE AND LAND HOLDING IN SANGPURA, 2002

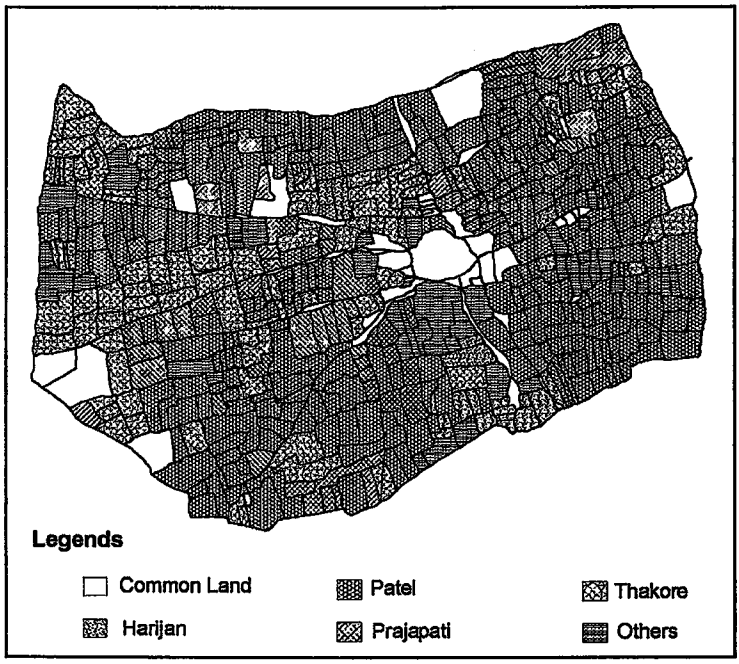
Caste	*No. of households*	*% of total households*	*Land holding in hectares*	*% of total land holding*
Thakore	225	35.83	111.99	21.02
Patel	200	31.85	284.00	53.32
Prajapati	70	11.15	76.28	14.32
Parmar	60	9.55	17.50	3.29
Vaghari	25	3.98	5.19	0.97
Darbar	12	1.91	12.25	2.30
Rabbari	8	1.27	0.80	0.15
Rawal	6	0.96	0.00	0.00
Bawa	4	0.64	10.95	2.06
Nai	4	0.64	0.64	0.12
Suthar	4	0.64	9.86	1.85
Others	10	1.60	3.21	0.60
Total	628	100	532.67	100

Source: Number of households from field data.

Note: Landholding data was compiled from the land revenue register of Sangpura village in January 2002. This data does not include two joint holdings between Patel & Prajapati and Thakore and Prajapati castes of 1.47 and 1.20 hectare respectively. Shahs do not stay in the village as they shifted to Mumbai way back in the 1960s. However, they still hold land in the village, which is given for sharecropping. These families come once in a year to settle the accounts with their shareholders. The total number of household data was collected through field interviews and hence only showed the approximate number of households.

The landownership class characterized by marginal, small, medium and large farmers and their caste associations show another distinct picture. Patels lead in each land class (see Table 3.5), except in the class of landless, which is dominated by Thakores.[5] The majority of Patels fall in the category of marginal, small and medium farmer and only nine households have landholdings greater than five hectares. In fact, only 14 per cent of total land belongs to large farmers who hold more than five hectares and the larger part (around 75 per cent) consist of small and medium farmers. This is largely due to land fragmentation and division between families over the years. Of the total landless caste, Thakores form the largest caste group in the village (225 households) but hold only 21 per cent of the village agricultural land. Most Thakore household have landholdings smaller than three hectares under the category of marginal and small farmers.

MAP 3.2: LAND OWNERSHIP CHARACTERISED BY CASTE IN SANGPURA, 2002



Source: Land record data superimposed on village revenue map

TABLE 3.5 LAND OWNERSHIP SIZE CHARACTERISED BY CASTE IN SANGPURA, 2002

Caste	*Landless Households*	*Up to 1 Ha Marginal Farmer*		*1.01-3 Ha Small Farmer*		*3.01-5 Ha Medium farmer*		*More than 5.01 Ha Large Farmer*		*Total*	
		Households	*Area*	*Households*	*Area*	*Households*	*Area*	*Households*	*Area*	*Households*	*Area*
Thakore	77	24	11.95	44	82.32	3	11.07	1	6.65	149	111.99
Patel	30	55	25.72	66	123.13	21	79.24	9	55.90	181	283.99
Prajapati	14	19	8.57	19	32.34	7	28.92	1	6.44	60	76.28
Parmar	24	10	4.88	8	12.62	0	0	0	0	42	17.50
Vaghari	7	1	0.62	3	4.57	0	0	0	0	11	5.19
Darbar	5	2	1.93	2	4.38	0	0	1	5.94	10	12.25
Rabbari	-	2	0.80	0	0	0	0	0	0	2	0.80
Bawa	2	3	1.90	1	2.44	2	6.61	0	0	8	10.95
Nai	2	1	0.64	0	0	0	0	0	0	3	0.64
Suthar	3	4	2.17	5	7.70	0	0	0	0	12	9.86
Shah	1	0	0	0	0	1	3.21	0	0	2	3.21
Total	165	121	59.18	148	269.5	34	129.05	12	74.93	480	532.66

Source: Land record of Sangpura, year 2002

For landless households information was obtained from village Primary Agricultural Cooperative Society 2001-2

Note: The land record data does not speak of the division of landholdings within a family. The records show the land under the name of the eldest male member (in case of death of the male member, the land is in the name of the eldest member's widow). However, the names of family members are also written in the record including the names of women members. The total number of households presented in the table does not coincide with the total number of households identified through group discussions in September - October 2001. The households have divided in reality but the land is still undivided on paper.

Parmars and Vagharis who form approximately 14 per cent of village population hold only four per cent of the total village land. Around 19 per cent of the Thakores, 26 per cent of Parmars and 36 per cent of Vagharis fall in BPL category (see Table 3.6). The large populations of landless and below-poverty-line families of Thakores and Parmars are the major agricultural labour force in the village. While Thakores specialize in agricultural labour, Vagharis lease horticultural plots on a yearly basis from mainly Patel and Prajapati farmers who possess orchards of lemon and guava. Map 3.2 shows the caste-wise land ownership in Sangpura.

TABLE 3.6: INDIVIDUALS AND HOUSEHOLDS LIVING BELOW POVERTY LINE (BPL) IN SANGPURA CHARACTERISED BY CASTE

Caste	*Number of BPL individuals*		*Number of BPL households*		*% of total BPL households within caste category*	*% of BPL families to total village households*
	No	*%*	*No*	*%*		
Thakore	170	46.20	42	48.28	19	6.69
Patel	13	3.53	4	4.60	2	0.64
Prajapati	18	4.89	6	6.90	9	0.96
Parmar	66	17.93	14	16.09	23	2.23
Vaghari	43	11.68	9	10.34	36	1.43
Darbar	7	1.90	2	2.30	17	0.32
Bawa	13	3.53	2	2.30	50	0.32
Nai	10	2.72	2	2.30	50	0.32
Suthar	5	1.36	1	1.15	25	0.16
Luhar	10	2.72	2	2.30	100	0.32
Rawad	13	3.53	3	3.45	50	0.48
Total	368	100	87	100	-	13.85

Source: BPL list obtained from the Village Credit Cooperative Society, 2001-2

The analysis of families falling under the official categories of BPL (see Table 3.6) shows that around 50 per cent of all BPL families belong to the Thakore caste followed by Parmar (16 per cent) and Vaghari (ten per cent). Altogether, a total 14 per cent of village population is below the poverty line.[6]

Access to irrigation in Sangpura

In the groundwater-dependent economy of Sangpura, access to irrigation is a very crucial factor, which determines an individual's wealth. In Sangpura, 34 private tubewells were functioning at the end of 2002. Most of these tubewells were jointly owned between households. Only four out of 34 were individually owned. Before drawing upon the issue of access to irrigation, let me detail the way irrigation cooperatives are organised.

The organisation of tubewell cooperatives

The tubewell cooperatives are organized on the basis of shares in the tubewell. The shares are generally bought at the time of tubewell construction. The share of a tubewell is fixed in proportion to the total expected cost of construction. For example, if construction of a tubewell is expected to cost Rs. 700000, a ten per cent of share could be bought for Rs. 70000. This cost excludes the cost of the underground pipeline from the source of water to the field, which is borne by the shareholder. The cost of the pipeline depends upon the distance of the field to the tubewell. Investment in a share has two advantages. First, shares ensure the right to certain hours of irrigation based on their percentage. The right to irrigation is crucial in the groundwater-dependent agriculture of Sangpura; by buying a share the shareholder ensures the right over irrigation. Second, the tubewell makes a profit by the sale of water to non-shareholders. The shareholder gets a dividend at the end of every financial year. However, the risk of tubewell failure and maintenance is also attached to the shareholder's right. A shareholder has to invest in maintenance cost whenever needed, in proportion to the share. Most of the tubewells keep a reserve fund for incidental expenses. These expenses are accounted for in the yearly profit and loss account. The shares in the tubewell follow the patriarchal inheritance right. They are passed on to the male heirs after the death of the shareholder. Irrigation access is thus defined in two ways, for those having shares in the tubewell and those who buy water.

The shareholders

In Sangpura, the tubewells can be classified according to the contracted load of the motors represented by horsepower (hp). In most cases the higher the pumping capacity, the higher the yield. Thus, the cost of a share in a tubewell is positively related to its capacity. This means, the higher the capacity of the tubewell, the higher will be the value of its share. The tubewells are categorised in three broad classes of 30-45, 45-60 and 60-75 hp. Out of a total 34 tubewells, 12 fall in the 30-45 hp range while 11 each are in the 45-60 and 60-75 hp categories.

An examination of the percentage of shares owned by families characterized by caste shows that Patels have 65 per cent of total tubewell shares though they constitute around 32 per cent of the village population. Thakores, who are around 36 per cent of total village households, have only 15 per cent of total tubewell shares (see Table 3.7). Prajapatis, who are 11 per cent of the village population, hold 13 per cent of shares. Parmars, who are approximately ten per cent of the village population, hold two per cent of the total tubewell shares. The table also shows that the majority of shares are in the 45-60 hp class (41 per cent) while the rest is almost equally distributed over the 30-45 hp and 60-75 hp classes. This means that the majority of the households own a medium capacity tubewell. Castes such as Darbars, Parmars and Vagharis possess shares in lower capacity tubewells only. Patels, as a social group have the biggest share in any tubewell class than

TABLE 3.7: PERCENTAGE OF SHARE IN TUBEWELL CLASS CHARACTERISED BY CASTE[7]

Caste	*30-45 hp*	*45-60 hp*	*60-75 hp*	*Total*
Thakore	4	6	5	15
Patel	17	27	21	65
Prajapati	3	8	2	13
Parmar	2	0	0	2
Vaghari	1	0	0	1
Darbar	3	0	0	3
Total	30	41	28	99

Source: Baseline survey of tubewells 2001-2

others. The majority of them fall under the medium capacity 45-60 hp tubewell class. The pattern of tubewell shares closely follows the landholding and irrigation patterns. Patels own 66 per cent of total irrigation share of the village followed by 15 and ten per cent for Prajapatis and Thakores respectively. The majority of the Patel households irrigate through higher capacity tubewells falling in the category of 45-70 hp (Table 3.8).

TABLE 3.8: LAND UNDER IRRIGATION CHARACTERISED BY TUBEWELL CLASS AND CASTE, SANGPURA 2002

Caste	*Tubewell class in Horse Power*							
	30-45		*45-60*		*60-75*		*Total*	
	Land in Ha	*%*	*Land in Ha*	*%*	*Land in Ha*	*%*	*Land in Ha*	*%*
Thakore	6.21	1.75	18.98	5.34	9.32	2.62	34.50	9.71
Patel	36.46	10.26	106.49	29.97	92.52	26.04	235.46	66.27
Prajapati	12.65	3.56	23.35	6.57	18.17	5.11	54.17	15.25
Parmar	6.90	1.94	1.61	0.45	0.00	0.00	8.51	2.40
Vaghari	2.30	0.65	0.58	0.16	0.00	0.00	2.88	0.81
Darbar	2.76	0.78	2.30	0.65	3.91	1.10	8.97	2.52
Rabbari	2.30	0.65	2.30	0.65	0.00	0.00	4.60	1.29
Bawa	0.69	0.19	2.07	0.58	0.58	0.16	3.34	0.94
Nai	0.00	0.00	0.46	0.13	0.69	0.19	1.15	0.32
Suthar	0.00	0.00	0.00	0.00	1.73	0.49	1.73	0.49
Total	70.27	19.78	158.14	44.5	126.92	35.71	355.31	100

Source: Baseline survey of tubewells 2001-2

Note: The figures presented in the above table show the total approximate land irrigated by the shareholders and do not show the total irrigated land of the village.

The water buyers

Water buyers form an important group in the village and until 2001 they were a large group of people. From 2001 there has been a drastic reduction in the supply of electricity and therefore the number of water buyers has also decreased. This is mainly because the reduced water pumped from a particular tubewell has to fulfil the need of the shareholders first. Only then the surplus can be sold. Selling water is a profitable business as it subsidises the cost of water for the shareholder, but it is not done at the cost of availability of water for the owners. Table 3.9 shows the number of water buyers characterised by caste. It reveals that the total number

of households buying water from tubewells has decreased from 173 before 2001 to 104 in 2001-2. The total area of land irrigated by 'buying water' also reduced, from 124.5 hectares before 2001 to a mere 48.76 hectares in 2001-2. Thakores are the largest water buyer group in the village, and they are the hardest hit by reduction in sale of water. Their total area of land under irrigation decreased from 45.41 hectares in 1995-2000 to 20.13 hectares in 2001-2.

TABLE 3.9 NUMBER OF WATER BUYERS CHARACTERISED BY CASTE

Caste	*1995-2000*			*2001-2*		
	No of HH	*No of TW*	*Total irrigation in Ha*	*Number of HH*	*Number of TW*	*Total irrigation in Ha*
Thakore	79	17	45.41	43	11	20.13
Patel	57	19	47.21	31	14	16.96
Prajapati	22	10	19.19	13	7	5.16
Parmar	1	1	0.46	8	2	2.42
Vaghari	5	2	1.79	5	2	1.79
Darbar	5	4	7.02	2	2	1.38
Rabbari	2	2	3.68	2	2	0.92
Bawa	2	2	2.53	0	0	0.00
Total	173	-	127.29	104	-	48.76

Source: Baseline survey 2001-2002. HH: Households; TW: Tubewells
Note: The figures in column 2 and 5 represent the total number of tubewells from which the households were buying water for irrigation.

Groundwater Irrigation and Social Differentiation

What does this information indicate for understanding the patterns of social differentiation in Sangpura? The early definition to understand this process came from Lenin (1967) whose study of peasant differentiation in the nineteenth century Russia categorised peasantry into the capitalist and labouring classes.[8] Leninist differentiation analysis is criticised for its emphasis on definitions that separates people into classes in purely economic terms. Write (1979) describes the differentiation pattern in a politico-economic rather than a pure economic sense. Social differentiation in his approach, includes a set of relationships to the means of

production, control over the labour process and material resources. Further, the social differentiation concept was redefined from the perspective of exploitation replacing domination. The exploitation model differentiates three main forms based on ownership of capital assets, control over organisational assets and possession of credential assets (Write 1985). Other scholars such as Wesolowski (1979) describe the differentiation in a peasant economy as arising out of economic, political and ideological domination. Economic domination comes from control over the means of production and the labour process while political domination is a result of a nexus between classes and the power of the state. Ideological domination is a structure of ideas professed by culture and institutions that legitimises the position of governing classes.

I define social differentiation as a concept that includes a categorisation of the peasant community and the process of emergence and development of social difference due to irrigation-induced agricultural intensification and commoditisation (Mollinga 1998).[9] As the Sangpura case suggests, the relationship between groundwater irrigation and social differentiation starts with the basic inequality in the ownership of land. The inequality in distribution of groundwater resources builds on this, and therefore early advantages lie with landed farmers. The analysis shows that the distribution of the two most productive resources - land and groundwater is skewed towards the higher classes. The class structure closely parallels the caste structure in the village. The dominant Patels are the principle land and groundwater share-owning group in the village. The organisation of groundwater irrigation is based on the access through shareholding in the shared tubewells and by selling water to non-shareholders. Table 3.10 summarises the data on access to irrigation based on caste and shows that around one third of the village households do not have any access to irrigation. These people belong to lower classes as well as to castes lower in the social hierarchy. Irrigation access is dominated by Patels who belong to the higher caste as well as class. They have shares in 29 out of 34 tubewells in the village; amounting to 65 per cent of the total shareholdings (see Table 3.7). Thakores forms the largest water buyer group and have only 15 per cent of the total tubewell shares. However, this was not the situation for Thakores in 1960 when irrigation used to be carried out through dugwells. In the 1960s, Thakores owned 19 per cent of

the total village water shares (see Table 3.2). This shows that since the introduction of tubewells, while the total area under irrigation has increased, the accessibility for some groups of people has relatively reduced. Table 3.10 also shows that the lower caste groups neither own shares in the tubewells nor buy water. Many of them are near-landless cultivators who cultivate only rainfed crops in the monsoon season. These groups, along with the landless families from the Thakore caste, form the wage labour force in the village.

TABLE 3.10 CASTE-WISE ACCESS TO IRRIGATION IN SANGPURA 2002

Caste	*No. of households*	*Households having share in a tubewell*		*Households buying water from tubewells*	
		HH	*No of TW*	*HH*	*No of TW*
Thakore	225	30	11	43	11
Patel	200	165	29	31	14
Prajapati	70	35	15	13	7
Parmar	60	13	2	8	2
Vaghari	25	3	2	5	2
Darbar	12	6	3	2	2
Rabbari	8	2	2	2	2
Rawal	6	-	-	-	-
Bawa	4	4	3	-	-
Nai	4	3	2	-	-
Suthar	4	2	1	-	-
Others	10	-	-	-	-
Total	628	263	-	104	-

Source: Field data
Note: HH = Households; TW = Tubewells. For column 4 and 6, figure represents the total number of tubewells from which the households derive their water share or buy water.

An examination of the share of land classes in each of the tubewell classes characterised by caste reveals another piece of information relevant to the analysis of the social differentiation pattern in Sangpura. As discussed earlier, the higher the capacity of the tubewell, the higher is the yield. This also means that higher capacity tubewells are able to irrigate larger areas and thus having a share in a higher capacity tubewell means deriving more surpluses from the sale of water. Table 3.11 shows the share of land class irrigated by three tubewell classes divided on the basis of horse-

TABLE 3.11 ACCESS TO TUBEWELLS CHARACTERISED BY SHAREHOLDER CLASS AND CASTE

Caste	*Number of households in tubewell class I (30-45 hp)*				*Number of households in tubewell class II (45-60 hp)*				*Number of households in tubewell class III (60-75 hp)*			
	Up to 1 ha	*1-3 ha*	*3-5 ha*	*>5 ha*	*Up to 1 ha*	*1-3 ha*	*3-5 ha*	*>5 ha*	*Up to 1 ha*	*1-3 ha*	*3-5 ha*	*>5 ha*
Thakore	1(0.69)	1 (2.3)	1(3.22)	-	8(4.67)	7(10.8)	1(3.45)	-	9(4.94)	2(4.37)	-	-
Patel	3(2.76)	6(8.45)	4(17.35)	1(7.36)	22(13.76)	37(70.82)	1(3.45)	2(11.5)	39(434.26)	36(54.27)	2(6.9)	1(6.5)
Prajapati	-	2(2.3)	-	1 (6.9)	8(4.69)	10(15.18)	1(3.45)	-	3(1.83)	9(14.25)	-	-
Parmar	4(1.61)	2(4.54)	-	-	2(1.61)	-	-	-	-	-	-	-
Vaghari	1(0.69)	1(1.61)	-	-	1(0.57)	-	-	-	-	-	-	-
Darbar	-	1(2.76)	-	-	-	1(2.3)	-	-	1(0.46)	3(3.45)	-	-
Rabbari	-	1(2.3)	-	-	-	1(2.3)	-	-	-	-	-	-
Bawa	1(0.69)	-	-	-	-	1(2.7)	-	-	1(0.57)	-	-	-
Nai	-	-	-	-	1(0.46)	-	-	-	2(0.68)	-	-	-
Suthar	-	-	-	-	-	-	-	-	2(1.72)	-	-	-
Total	10 (6.44)	14(24.26)	5 (20.57)	2(14.26)	42 (25.76)	57 (104.1)	3 (10.35)	2 (11.5)	57 (444.46)	50 (76.34)	2 (6.9)	1 (6.5)

Source: Land records of Sangpura 2001 and field data.

Note: Figures in parentheses represent the total land in hectares irrigated by the households

TABLE 3.12 ACCESS TO TUBEWELLS CHARACTERISED BY WATER BUYER CLASS AND CASTE

Caste	*Number of households in tubewell class I (30-45 hp)*				*Number of households in tubewell class II (45-60 hp)*				*Number of households in tubewell class III (60-75 hp)*			
	Up to 1 ha	*1-3 ha*	*3- 5 ha*	*>5 ha*	*Up to 1 ha*	*1-3 ha*	*3- 5 ha*	*>5 ha*	*Up to 1 ha*	*1-3 ha*	*3- 5 ha*	*>5 ha*
Thakore	12(7.01)	-	-	-	9(3.66)	1(1.15)	-	-	18(5.02)	1(1.15)	-	-
Patel	7(2.86)	-	-	-	9(3.91)	2(2.76)	-	-	12(5.8)	1(1.61)	-	-
Prajapati	2(1.14)	1(1.15)	-	-	6(1.72)	-	-	-	4(1.19)	-	-	-
Parmar	1(0.46)	-	-	-	-	-	-	-	7(1.95)	-	-	-
Vaghari	-	-	-	-	-	-	-	-	5(1.77)	-	-	-
Darbar	-	1(1.15)	-	-	-	-	-	-	1(0.23)	-	-	-
Rabbari	-	-	-	-	-	-	-	-	2(0.92)	-	-	-
Bawa	-	-	-	-	-	-	-	-	-	-	-	-
Nai	-	-	-	-	-	-	-	-	-	-	-	-
Suthar	-	-	-	-	-	-	-	-	4(1.84)	-	-	-
Total	22(11.47)	2(2.3)	-	-	24(9.29)	3(3.91)	-	-	53(18.72)	2(2.76)	-	-

Source: Land record of Sangpura 2001 and field data.

Note: Figure in parenthesis represent the total land in hectares irrigated by the households

power. It is evident that Patels dominate in all tubewell classes but have a much larger share in the higher capacity tubewells. Table 3.12 shows that the water buyers are mostly small landholders having less than one hectare of land. Table 3.13 summarises the number of shareholders deriving water from tubewell categories as per land class in shareholders and water buyers' category. Around 87 per cent of shareholders are from the higher capacity tubewell class of 45-60 and 60-75 hp while 13 per cent fall in the 30-45 hp class. The water buyers are largely small holders; 99 of 107 families belong to the land class of less than one hectare. Due to decreasing hours of electricity supply, the number of water buyers also reduced considerably in the year 2001-02 (Table 3.10).

TABLE 3.13 NUMBER OF SHAREHOLDER AND WATER BUYERS FAMILIES PER TUBEWELL AND LAND CLASS

Land class	*Tubewell class based on horsepower*						*Total*	
	30-45		*45-60*		*60-75*			
	SH	*WB*	*SH*	*WB*	*SH*	*WB*	*SH*	*WB*
>1 Ha	10	22	42	24	57	53	109	99
1- 3 Ha	14	3	57	3	50	2	121	8
3- 5 Ha	5	0	3	0	2	0	10	0
>5 Ha	2	0	2	0	1	0	5	0
Total	31	25	104	27	110	55	245	107

Source: Field data. SH = Shareholder; WB = Water buyer

To summarise, the organisation of tubewell irrigation was a response to certain developments in agriculture that induced the use of external inputs such as irrigation. In Sangpura, the farmers responded to these changes through increased and unrestrained use of groundwater. Consequently, the aquifer declined and in the process farmers started losing access to groundwater. In order to retain access, the irrigation institutions were reorganised as collectives to share cost and spread risk. The readily available tubewell technology yielded more water than the shareholders could use for irrigating their own fields and hence water markets developed covering a large area. However, these collectives closely followed class and caste affiliations and determined differential access and control over groundwater for different social groups. The powerful classes could generate surplus through water vending

which subsidised their own irrigation costs. The state subsidy for electricity and ready availability of institutional finance supported this process of accumulation. The surplus was diverted towards land and water owning classes. However, with the aquifer decline and decrease in supply of electricity the water markets started to shrink. The group of water buyers were severely affected by this change. They were pushed out of the market and lost access to a precious resource. This process led to the process of social differentiation where a small minority controlled and defined the pattern of access and distribution of groundwater resource in Sangpura.

How do this differentiation and relations of exploitation leads to larger control over the labour process, socio-political institutions and material resources? In the chapters that follow I provide evidence on these aspects. In the next chapter I illustrate how different social groups are affected by declining productivity and increasing irrigation prices, induced largely through unrestrained use of groundwater resources and unsustainable farming practices. I also show the strategies of these groups in coping with the increasingly difficult situations.

Notes

[1] The electricity supply was reduced to eight hours per day in early 2001. However, during the panchayat elections, the electricity supply was increased to ten hours per day which was curtailed again to eight hours per day soon after the election was over. During the general election early 2004 the electricity supply was again increased to ten hours per day.

[2] In 1948, the Bombay Tenancy and Agricultural Lands Act replaced the Bombay Tenancy Act. The Act advocated fixity of tenure, right to house-sites and trees, protection from eviction, commutation of crop share rents into cash and fixed the maximum rent at 1\6th of the crop irrespective of land being irrigated or non-irrigated. The Land to the Tiller Bill of 1955 was passed by the State Legislature in 1965-66 and fixed the maximum and minimum rent at five times the assessment or Rs. 20 per acre and twice the assessment, respectively, in the areas surveyed and settled under the Land Revenue Code (Patel 1969: 425). These laws worked for people who were indebted to Vaniyas and had lost their land to them. There were many cases where the land was in possession of the Vaniyas in lieu of non-payment of the loan advanced to them. This was mainly due to the high rate of interest that led to people falling into the indebtedness cycle.

However, in some cases, these lands were not transferred to Vaniyas in the land revenue register. Such lands were given back to the tillers as a policy initiative. Looking at the changes in administrative policies and other advances in the village society, the Vaniyas slowly started to migrate to urban areas of Ahmedabad, Surat and Mumbai, as increasingly they found it difficult to extract rent and draw surpluses. None of the Vaniya families now live in Sangpura today although they still have houses, land and property in the village. They have given their land on sharecropping and come once in a year to settle the dues.

[3] During the British regime Gujarat was part of the Bombay State, which covered five districts. These districts were interspersed with 148 Princely States under the jurisdiction of the Western India States Agency. After Independence, Sardar Patel, the then Home Minister, initiated a movement for integration of States. The present State of Gujarat was constituted in three administrative stages – the integration of States and estates in the British districts during 1948-49, the reorganization of States in 1956 and the bifurcation of the Bombay state in 1960 (Patel 1969). The bilingual state of Bombay was split into two - namely, the Gujarati speaking Gujarat state and the Marathi speaking Maharashtra state (Hirway 2000).

[4] In 1975 GWRDC transferred the management responsibilities of many of the public tubewells to the farmer's organisation. However, the GWRDC tubewell at Sangpura is still managed by the corporation.

[5] I have used four land size classes instead of the five used in government data. The categorization of marginal, small, medium and large farmers I have used in the study is based on intensive discussion with different social groups and their idea of land classes. Therefore, they only show local people's construction of land class and may not coincide with the government's classification.

[6] The Planning Commission in India estimates the proportion and number of poor people separately for rural and urban India at the national and state level based on the recommendations of the Task Force on 'Projections of Minimum Needs and Effective Consumption Demands'. The Task Force defined the poverty line as the cost of an all India average consumption basket at which calorie norms are met. The norms are 2400 calories per capita per day for rural areas and 2100 calories for urban areas. These calorie norms have been expressed in monetary terms as Rs. 49.09 and Rs. 56.64 per capita per month for rural and urban areas respectively at 1973-74 prices. Based on the recommendations of a Study Group on 'The Concept and Estimation of Poverty Line', the private consumption deflator from national accounts statistics was selected to update the poverty lines in 1977-78, 1983 and 1987-88. Subsequently, an expert group examined the issue and accepted the definition of poverty

line and base year figures but suggested an alternative methodology to calculate the poverty line. It recommended the use of a consumer price index for agricultural labour to update the rural poverty line and a simple average of weighted commodity indices of the consumer price index for industrial workers and for urban non-manual employees to update the urban poverty line. The Planning Commission accepted the recommendations of the expert group but modified the method for updating the poverty lines. For example, in 1999-2000, the poverty line for rural Delhi was fixed at an individual's capacity to earn Rs. 362.68 per month (Planning Commission 2001-2).

[7] The percentage shown is rounded up to whole numbers and therefore it does not include the share held by Bawas and Suthars, each of which have 0.20 per cent of total village tubewell shares in the 60-75 hp tubewell category. It also excludes Nais who have 0.10 per cent of the total village share in the 45-60 and 60-75 hp tubewell categories. To obtain the percentage of shares in a tubewell, I collected information on the number of shareholders, percentage of shares owned by each shareholder, their caste affiliation, records of water sale and the capacity of tubewells.

[8] Lenin's definition included six peasant classes – agricultural proletariat, semi-proletarians, small peasantry, middle peasantry, big peasants and big landlords – a scale ranging from agricultural wage labourers to capitalist entrepreneurs. He used a number of criteria to classify the peasantry. Some are area of landholding, tenure status, peasant's relation to the labour market, family and farm reproduction, peasant's participation in production and their relations of production (Lenin 1966).

[9] Athreya, Djurfeldt and Lindberg (1990) describe the level of commoditisation in an agrarian economy. Using the definition of Bernstein (1982), the authors explain economy being at a low level of commoditisation when the reproduction of the farm and the family involves the consumption of few commodities. 'In such cases, reproduction occurs through non-commodity circuits: it can be family labour working on raw materials and with means of production that are home-produced or it can be labour and means of production obtained through non-market networks of exchange like the Indian *jajmani* system' (ibid.: 183). The authors explain how an agrarian economy would have both commodity and non-commodity features. The green revolution increased the level of commoditisation by breaking down non-commodity forms of reproduction. At the same time the economy retains important non-commodity features. Therefore, 'peasants stand with one leg in the market economy and the other outside, in a non-commoditised economy. They cannot retreat completely from the market because the commoditised elements of reproduction have become necessities to life and to production' (ibid: 184).

4

Declining Productivity and Increasing Irrigation Prices

Who will not like to sell water for profit? But we can not do it at the cost of irrigating our own field.

- A shareholder of a tubewell in Sangpura

We have over used (cultivated) our dharti maa (motherland), now its time for her to take revenge.

- A woman tenant in Sangpura

With the decline in groundwater level the demand for energy applied in accessing water increases. The present electricity pricing structure in Gujarat is based on the contracted load of the electric motors rather than a metered tariff based on pro-rata use of electricity. The increase in demand for electricity under this tariff system is controlled by the government through reducing the hours of electricity supplied to the farmers.[1] The reduced electricity supply has resulted in decreasing well yields and shrinking command areas of the tubewells. The process makes groundwater more expensive than in the past. It also parallels the decreasing economic returns from agriculture because of land productivity decline with increasing requirements for external inputs. With water shortage, the irrigated lands are slowly converted back to rainfed cultivation. The groundwater was an insurance against risk for the farmers. Due to increasing groundwater mining this risk has been aggravated. On the other hand, the hydro-geological conditions of north Gujarat, being in the alluvial zone, make further deepening of wells possible. This helps in postponing rather than tackling the problem. The responses of

different social groups are to take escape routes to avoid the effects of depletion of groundwater. Their efforts are focused on pushing the time horizon rather than actually confronting the unsustainability problem. Here, the logical boundaries to the productivity decline do not apply. Farmers adjust the declining productivity through increasing external inputs for maintaining the same level of output. However, this process makes agriculture less profitable compared to the past, and therefore only a few social groups are able to cope with this change. These processes, coping mechanisms and abilities to push the time horizon for resource depletion contribute to resource mining, the impacts of which are socially distributed through different mechanisms.

This chapter maps these responses to increasing costs of water and mobilisation of investment resources. Through the entry point of four tubewells this chapter provides a worm's eye view of the organisation of tubewell cooperatives and their coping mechanisms in dealing with increasing groundwater extraction costs. It is divided in three sections. The first section focuses on the decline of agricultural productivity in Mehsana district and in the case study village. The next section presents the cases of four tubewells that are starting points to understand the broader dynamics and strategies of different social groups in confronting the declining trend of groundwater and increasing irrigation costs. The last section analyses - who are at the forefront of the crisis of groundwater depletion and why? I argue that unsustainable resource use does not generate contestation in relation to the declining groundwater but shapes and structures responses towards the progression of water mining.

Declining Agricultural Productivity

After the initial spurt in agricultural production during the green and post green revolution (1965-95) in Gujarat, a sharp decline has been reported in recent years. Declining productivity[2] of major crops, degradation of land and depletion of groundwater resources has come to a threshold, making agricultural growth stagnant and its pattern unsustainable. This trend has been a matter of concern in recent years. The issue is well documented and accepted, and hence does not require much confirmation (Desai 1997, Desai,

TABLE 4.1 PATTERN OF AGRICULTURE IN MEHSANA DISTRICT

Year	*Area under 35 crops ('000 ha)*	*Value of output of 35 crops ('000 Rs)*	*Gross cropped area ('000 ha)*	*Net area sown ('000 ha)*	*Gross irrigated area ('000 ha)*	*Fertiliser (NPK) consumed (tonnes)*	*Tractor (no)*	*Pump sets (no)*
1962-65	647438	1847092	752798	705513	145181	945	255	13325
1980-83	661246	3948638	900670	684000	363670	22915.33	3484	24203
1990-93	612715	4664191	900620	696450	450000	556828.53	4843	13497

Source: Compiled from Bhalla and Singh (2001)

TABLE 4.2 AREA ('00HA), PRODUCTION ('00TONNES) AND YIELD (KG/HA) OF MAJOR CROPS IN MEHSANA DISTRICT

Crop	*1996-97*			*1997-98*			*1998-99*			*1999-2000*		
	Area	*Prod.*	*Yield*	*Area*	*Prod.*	*Yield*	*Area*	*Prod.*	*Yield*	*Area*	*Prod.*	*Yield*
Total Pulses	325	184	566	306	203	663	326	133	408	294	48	163
Total Cereals	942	948	1045	942	947	687	918	667	727	852	571	670
Total Wheat	788	2279	2892	859	2302	2680	793	2103	2652	654	1828	2795
Total Pearl Millet	1047	1444	1379	1200	1787	1489	1307	1868	1429	1084	1293	1193
Castor	913	1959	2144	952	1886	1982	928	1773	1911	783	1418	1811
Total Cotton	1109	1743	267	999	1984	338	1076	1912	302	840	1051	213
Mustard	1241	1815	1462	1245	1221	981	1148	1605	1398	1085	1059	977

Source: GOG Undated (a) and GOG Undated (b) for years 1996-97 to 1999-2000.

Shah and Singi 1999, Hirway 2000, Mathur and Kashyap 2000, Bhalla and Singh 2001). However, most of the data presented in the recent literature relates to the early and late 1990s. Hence, in this section, I update and confirm the deceleration process using the secondary information available.

TABLE 4.3 AVERAGE RAINFALL OF MEHSANA DISTRICT

Year	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*
Rainfall in mm	508	476	1225	1096	380	300	627

Source: GOG (2002)

In order to understand the lagging agricultural growth in Mehsana, it is worthwhile to recapitulate the patterns of its development. Table 4.1 shows the growth in agriculture in three distinct periods, 1962-65, 1980-83 and 1990-93. The data illustrate growth in area under crops and increasing value of output through adjusted value of Rupees. However, during the 1980-90 period, though there was growth in gross cropped area and net sown area, that growth was not very significant as compared to earlier decades. Fertiliser consumption has doubled in the later years while the number of pump sets has reduced for the district. These figures are an indication of the changes taking place in agriculture in the district.

Recent data on area, production and yield in Mehsana district show stagnation and decline in the yield of major crops (Table 4.2). Based on final forecast reports of the Directorate of Agriculture, Gujarat, the data suggest that the area under crops such as pulses, cereals, wheat, castor and cotton declined from the year 1996 onwards. For pearl millet, there is a slight increase, but it is not significant looking at the decline in the yield. Table 4.3 presents the rainfall pattern of Mehsana district and shows the low rainfall in year 1999-2000, which was declared a drought year. The fluctuations in rainfall also affect the productivity of the crop. However, most of the cash crops are irrigated though groundwater and hence a drought year may not affect the number of irrigations as water is accessed from deep aquifers. In order to relate the productivity decline data of Mehsana district with those in

Sangpura, I gathered information on the number of irrigations required and average yields for all the major crops (Table 4.4).

The information on number of irrigations required for major crops shows that there has been an increase of about two to four irrigations in the year 2001 as compared to the period 1985-1990. The yield per hectare has declined considerably except that of alfalfa, which is due to the introduction of a new seed variety resulting in sustained yields over time.[3] Indigenous wheat has more or less sustained yield compared to other crops, perhaps due to its capacity to resist and adapt to a changing environment. Other crops show a sharp decline in yield despite irrigation input rising. Farmers attribute these changes to the increasing crop intensity and the consequent loosening of soil that does not retain as much water as compared to the past.[4] This is coupled with the present seed varieties that are losing their genetic potential in repeated use, while information on new seeds is not reaching the farmers[5]. In addition, with increasing external inputs in agriculture, farmers are afraid of experimenting with new varieties of seeds and therefore have increased external inputs to sustain the level of yield.

TABLE 4.4: IRRIGATION REQUIREMENT AND YIELD[6] OF MAJOR CROPS IN SANGPURA IN 1985-90 AND 2001

Crops	*Approximate number of irrigations required*		*Average approximate yield per hectare in kilograms*	
	1985-1990	*2001*	*1985-1990*	*2001*
Cotton	8-10	10-12	350	200
Castor	8-10	10-12	3038	2170
Wheat	5-7	6-8	4340	3038
Mustard	3-4	4-6	1736	1302
Sweet Potato	8-10	10-12	17360	13020
Tobacco	-	8-10	-	2604
Sorghum	1-2	3-4	6510	5425
Pearl Millet	2-4	5-8	3472	2604
Alfalfa (Rajko)	25-30	25-30	3200	3906
Isabgol	2-3	4-5	868	520.8
Indigenous (*Desi*) Wheat	4-5	6-8	2604	2170

Source: Group discussions in September and December 2002

The availability of groundwater has also changed the crop cycle. For example, sugarcane and chilli were extensively grown in Sangpura until the late 1960s, but have now completely vanished.

Sugarcane used to be sown in waterlogged fields soon after the monsoon broke. With decreasing water availability farmers shifted to other crops. Chilli was reported to have suffered major pest attacks in the area, which led to farmers opting out of it. Crops such as cotton and castor, which were grown with limited irrigation in the past, have become totally dependent on irrigation in present times. Tobacco has been introduced recently in the village, which is a high-input water-intensive crop. With the rise in tubewell irrigation, more water intensive cash crops were grown in Sangpura. With decreasing water table and changes in soil fertility, the yield has been declining, which is supplemented with increased inputs. The present crop cycle of Sangpura, therefore, reflects the changes in agricultural technology and availability of water resources. These changes are also observed at the district and state levels. Mathur and Kashyap (2000) analysed the district-level problems and prospects of agriculture in Gujarat state in the trienniums 1961-63, 1971-73, 1981-83 and 1991-93. They observe that 'amongst all the inputs, increased availability of irrigation is an essential condition in rising productivity levels along with a shift in the cropping pattern, from less to more remunerative crops, which are often water intensive' (ibid: 3317-3318). They show a major change in Gujarat with a clear shift from food grains to non-food cash crops since the 1960s. This shift was particularly pronounced in canal-irrigated districts such as Surat and Kheda, and tubewell-irrigated north Gujarat districts such as Mehsana and Banaskantha. Districts such as Mehsana that had greater input use experienced faster growth of output. However, soon the level of output and land productivity declined, making agriculture stagnant. The authors call for a 'rethinking on the resource use pattern' to check the declining productivity and growth in agriculture (ibid.: 3146).

The declining agricultural growth is reflected in agriculture's declining contribution to the gross state domestic product (GDP) of Gujarat. In 1993-94 agriculture and animal husbandry contributed 19.9 per cent of the GDP. Quick estimates for the year 2002-3 show that this contribution has come down to 13 per cent (GOG, 2004). One of the reasons of this could be that other sectors are growing at a faster rate than agriculture. However, government data shows that the growth of agriculture in Gujarat has also declined over the year which is reflected in its contribution to the GDP (also see Table 2.1). Until now, more than half of

Guajrat's population still directly depends upon agriculture and allied services. The question is whether the productivity decline is affecting the agrarian community and if so, in what way. In the next section, I show how different social groups, through tubewell organisation, strategise to address these problems. Prior to this, I describe the tubewell infrastructure of Sangpura.

Box 4.1: The operator's day and night

In Sangpura, the schedule of electricity supply followed the shift of day and night every 15 days in 2002-03. The operator of the tubewell changes his own schedule according to the electricity supply available. The arrangement is in such a way that those people who need to irrigate, contact the operator and get the schedule of their turn. Usually it is done a day before the farmer's irrigation requirement to avoid any criss-crossing with another's schedule. Once the farmer is aware of the schedule, the operator is approached, who should be present at the pump site. The operator starts the water and opens the pipe through which water flows to his field. Once the irrigation is over, the farmer informs the operator. If there is night irrigation, the operator sleeps after diverting water to the one who is under schedule for that night because it takes at least four to five hours to irrigate a quarter of a hectare of land. Based on the area of the land the operator calculates the timing and then goes back to sleep. The second farmer who is supposed to irrigate under the schedule would come and wake the operator. Usually there is half an hour overlap in night irrigation, while in day irrigation the gap is only in terms of diverting the water flow. This also means that the second person who needs water has to come half an hour before the specified time and then wait until the first person has finished irrigating. In some tubewells, the operator gives a receipt to the person stating the timing and date of irrigation. The copy of the receipt along with his signature is kept with the operator, who then enters it in the irrigation schedule register. The register carries the name of the person who has irrigated the field, the date and time of irrigation and the crop that was irrigated. Sometimes work such as irrigation after initial ploughing is also recorded to give a rationale for longer hours of irrigation.

Source: Field note

The Tubewell Infrastructure

The tubewells in Sangpura and surrounding areas of Mehsana district are constructed by drilling into the soil with a large auger using the hydraulic-rotary method. In this method, 'a bit is rotated at the end of a string of pipe with mud slurry being circulated through the drill shaft into the hole and back to the surface outside the drill pipe. The slurry serves to support the walls of the hole during the drilling and to bring the material loosened by the bit to the surface' (Linsley and Franzini 1991: 104). After drilling, the hole is cased with perforated pipe to prevent it from collapsing and to allow water to seep in from fissures and caverns. The electric motor is placed around three meters below the water table and then the tools are withdrawn (Picture 4.1). Once the tubewell is installed, it is connected with an overhead tank into which water is pumped and stored (Picture 4.2). From there, it is distributed into left and right hand pipe networks depending on the capacity of the pump (Picture 4.3).The lower capacity pumps have one distribution

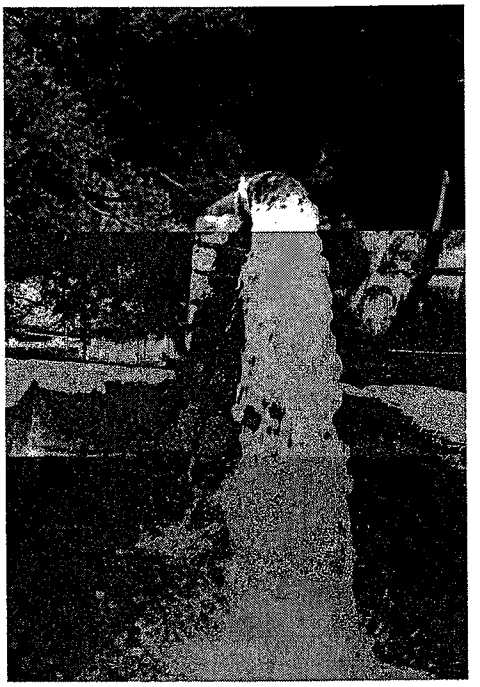
Box 4.2: The decision on the irrigation schedule

The decision regarding the irrigation schedule is taken on a first-come first-serve basis. Those members who have prepared their land come to the tubewell operator and request him to provide water. If there are two or more people in the same day, they decide among themselves whose land will be irrigated first. There is no point of conflict here because different people till their land at different times and so there is always a difference of 15 to 20 days between the first and the last farmer in the command area of a tubewell. The tubewells run every day during winter and summer season. Once a schedule is set, it is followed strictly. The first irrigation is given soon after land is prepared and just before the seeds are sown. A second irrigation is given after approximately 20 days followed by subsequent irrigations as per the schedule. However, this schedule depends upon the command area of the tubewell, its discharge and crops grown. The farmers have to adhere to the schedule as there are many in the queue to get water. This is especially so in winter season when the number of irrigators are more than in summer or in the monsoon season.

Source: Field notes

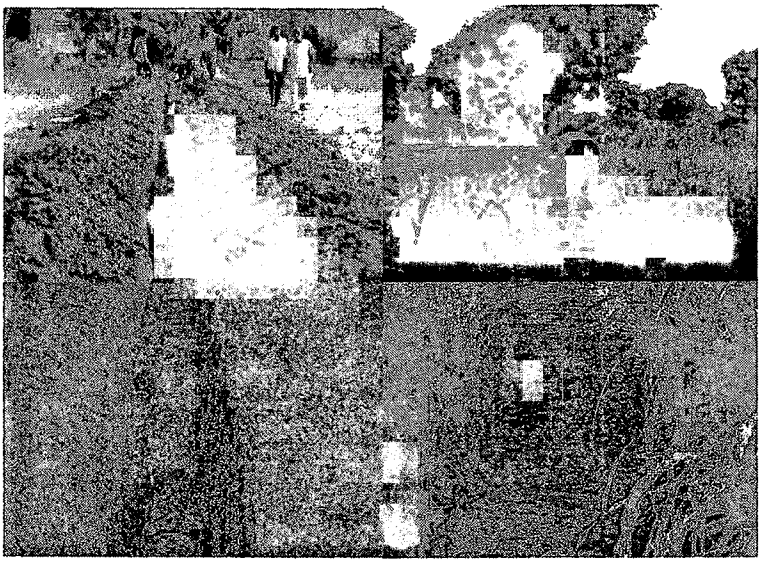
PICTURE 4.1: INSTALLATION OF A TUBEWELL

PICTURE 4.2: GROUNDWATER PUMPED INTO OVERHEAD TANK



PICTURE 4.3: WATER DISTRIBUTED THROUGH RIGHT AND LEFT HAND CHANNELS

PICTURE 4.4: WATER REACHES THE FIELD THROUGH UNDERGROUND CHANNELS



channel while the higher capacity pumps have two because of the higher yield of the tubewells. Underground pipes carry water to the field from where it flows through open channels (Picture 4.4). The entire network from the overhead tank to the underground pipeline is based on gravity flow and electricity is used only to pump water into the overhead tank. In order to distribute the water pumped, a written irrigation schedule is made at the beginning of the season. Each tubewell appoints an operator whose task is to operate the tubewell and keep these records (see Box 4.1). The operator is a paid employee of the tubewell cooperative. Sometimes they are also members of the cooperative themselves. The operator strictly follows the irrigation schedule (Box 4.2). Management is done in such a way as to minimise conflict.

Shrinking Command Area and Decreasing Profitability

The first section showed that agriculture is stagnating and the yield for all major crops except alfalfa is declining. One of the major responses to the declining yield and dwindling agricultural productivity is the heavy reliance on external inputs.[7] In order to maintain the level of productivity, farmers are increasing inputs such as inorganic fertilisers, irrigation and organic manure.[8] In this section, I map the historical organisation of tubewell cooperatives in Sangpura that came into existence in the early 1980s and 1990s when the shallow water table dried up. Through the cases of four tubewells I narrate the experiences of individuals associated with tubewells as organisers, shareholders and buyers while documenting their strategies in coping with the changes in the profitability of agricultural production.[9]

Characteristics of sample tubewells

The tubewells were selected to represent four different parts of the village territory, the east, west, north and the south, in order to have good geographical representation. Land distribution in the village is also historically determined, and based on castes and class.[10] Thus, organization and membership of tubewells reflects the possession of land for people falling in a particular area. As

evident from Table 4.5, Patels are the dominant group in tubewell 1 having around 72 per cent of the total shares. Tubewell 2 has a majority of members from the Prajapati caste, holding 60 per cent of the total share. Similarly, major shares belong to Thakores in tubewell 3 (100 per cent) and Parmars in tubewell 4 (65 per cent).

Table 4.5: SOCIAL COMPOSITION AND SHARE PATTERNS OF SAMPLE TUBEWELLS

Tubewell	*Number of families (% of share in Tubewell)*				
	Patel	*Prajapati*	*Thakore*	*Parmar*	*Others*
1	9 (72%)	-	1 (5%)	-	5 (23%)
2	3 (30%)	5 (60%)	2 (10%)	-	-
3	-	-	6 (100%)	-	-
4	-	-	-	6 (65%)	3 (35%)

Source: Field data

Table 4.6 shows the physical characteristics of the sample tubewells. The tubewells were constructed as early as 1985 - the starting point of the tubewells era and as late as 1990, which could be called the middle of the tubewell era. The command area of tubewells in Sangpura is dependent on the discharge of the tubewell, which in turn depends on the capacity of the pump and the depth from which water is pumped. The command area ranges between 12 and 17 hectares while the capacity of the pump ranges between 40 and 62 horsepower (hp). The discharge of tubewells

TABLE 4.6 PHYSICAL CHARACTERISTICS OF SAMPLE TUBEWELLS, 2001

Features	*Tubewell 1*	*Tubewell 2*	*Tubewell 3*	*Tubewell 4*
Year of construction	1985	1986	1990	1990
Command Area (in ha)	17.14	14.95	12.65	11.73
Depth of water table (in meters)	111.7	100.0	111.7	100.0
Depth of tubewell	215.2	202.9	132.3	132.3
Discharge (litre per second)	21.7	22.9	18.5	17.9
Horse power (hp) of Pump	62	65	50	41
Water charge (Rs./hr)	74	52	35	40
Water charge (Rs./m^3)	0.95	0.62	0.52	0.62

Source: Field data

similarly ranges from approximately 18 to 22 litres per second. The water charge for each tubewell is different and based on an internal decision of the cooperative members.[11] It ranges from a minimum Rs. 35 per hour for tubewell 3 to a maximum Rs. 74 per hour for tubewell 1. The water charge per cubic meter ranges from Rs. 0.52 to 0.95. These variations in price show that there is no 'marginal' value of water that informs price. The price of water is determined on a variety of other factors including the decision of shareholders on the level of profit. In 2001, Tubewell 3 and 4 did not sell water to non-shareholders due to considerable reduction in their yield. Tubewell 1 still engaged in selling water as it had gone through major renovation. The price of water is higher in tubewell 1 to make profit while for the other tubewells the water is shared within the shareholders and a few buyers.

Next, I present the narration of the organisers of the four tubewells and the opinion of some of the associated members, to understand the strategy and basis of their organisations and the problem they face in the process of increasing prices and declining productivity.[12]

Tubewell 1: Patel Jiwabhai Pasabhai

Jiwabhai Patel initiated this tubewell in 1986. He was one of the early starters of what is called the 'tubewell era'. During 1986 the water was drawn from 47 meters using a thirty hp pump. The tubewell has 15 members. Jiwabhai describes the tubewell as *panchrangi* (five-coloured) as almost all the castes of Sangpura are represented as members. However, nine out of 15 members are Patels and they hold 70 per cent of the total shares. The tubewell has seven water buyers out of which four are Thakores, two are Suthars and one belongs to the Patel caste. Altogether, the present water sale is for 2.5 hectares of land. Jivabhai has two sons, one of whom is settled in the USA since 2001 working at a confectionery shop in Chicago. He went to the USA by paying Rs. 700000 to an agent. Jiwabhai has four daughters, all of whom are married. The second son helps him in agriculture. Because his son stays in the USA, Jiwabhai has a sustained income and as he says, 'no day-to-day headache of carrying out agriculture'. According to him, he is engaged in agriculture only to 'keep himself occupied'. Jiwabhai and his brother own 3.5 hectares of land. In 1985, when he initiated the tubewell, the total cost came to Rs. 350000. His wife

suffers from heart trouble. Until now, his earnings from the tubewell have gone into the medical treatment of his wife and marrying four daughters. However, with his son now in the USA, he could save some money. According to him, from 1986 onwards until 1998, the tubewell generated a lot of profit for the shareholders, as the command area was more than 25 hectares. Half of that was irrigated through water sale. After the considerable reduction in electricity supply, the command area started shrinking. In the year 2000-01, the tubewell was defunct due to a technical problem. It became old, so many parts had to be renewed. The shareholders then spent more than Rs. 400000 to get it repaired. The cost of repair was collected from the *Bhagidars* (shareholders) based on their share in the tubewell. Some of them could contribute money, others did not. Those who did not had money, sold part of their shares to contribute for the repair. For example, Narayanbhai Patel held 20 per cent of the share but since he did not have enough money to contribute. He sold five per cent of his share to another Patel. The capacity of the motor was increased to 65 hp and the renovated tubewell was dug to a depth of 220 meters. The water table in 2001 stood at 117 meters. In the tubewell cooperative, the water charge is based on an electric meter rather than the hourly basis that is popular in the village. According to Jiwabhai, the meter-based charge ensures that every drop of water is counted and then the farmer who is using it has to pay for the same. Due to the renovation cost, the water charge was also increased. This charge was towards collecting a maintenance fund over time, so that if tubewell has major problems again in the future, the members do not have to shell out a lot of money at one time. The increased water charge would thus contribute towards a reserve fund. The charge now is 65 paisa per unit, which comes up to Rs. 37 per hour.[13] The earlier charge was less than Rs. 30 per hour.

Amthibhai Patel, Bhagidar in Tubewell 1

'For both my brothers, I have a 15 per cent of share in the tubewell. I have two hectares of land. I have been associated with this tubewell right from the beginning. Earlier, we used to irrigate from our own dugwell. The total irrigation was around two hectares from my well, which was 18 meters deep. Slowly the water table started receding and then the need for having a tubewell was

felt. In 1986, we invested in a shared tubewell, as having a tubewell costs so much money that one person individually could not afford it. Therefore, it was good to have the *bhagidhari* (shareholding) system. We also decided about the *kalakwari* (hours of irrigation) through the unit system. In the village almost all tubewells distribute water on an hourly basis, but we charge on a unit basis. On an hourly basis, sometimes, say ten to 15 minutes always goes unaccounted for between two irrigations but this is not so in the unit based system. It is a more accurate way of water charging. Even one unit is accounted here'. I asked him - how did the process of accounting come about, as there was no other example of this in the village? Amthibahi says, 'In our earlier motor we used to have metered water supply. We were more used to the metered supply and since we were the first few people who installed the tubewell, we continued with the metered supply even though the electricity charges were turned into a flat-rate system based on horsepower. We find this system more accurate. In 1986, we used to pay the electricity bill on a meter basis and then in 1987 we had the flat rate tariff. In the flat rate tariff, farmers can irrigate more and so the production is more. On a metered basis, farmers used to irrigate less as the charges were more. The cost of water is lower in a flat rate than in a unit-based system. During the time of pro-rata electricity bill, we used to sell water on a crop-sharing basis. This means that those who bought water had to pay 1/3rd share of their production as water charge. It so happened that for one or two years, the production was not much, due to drought and heat waves that stressed cultivation. During that time, the water buyers had low production while the seller had to pay money according to the tariff though the profit was less. During that time, the tubewells did not make profit and therefore, this system was changed to supply water on a cash rather than crop-sharing basis. Now irrespective of anyone having crop failure or bumper crops, the charges of water have to be given'.

'In 1996, we bought a 20 per cent share for Rs. 16000. But this is not the only investment. Every year, we have been investing money in the tubewell. The general maintenance of a tubewell is Rs. 20000 for one year. This includes the operator's salary and electricity bill. For the last three years, we have been in trouble due to the increased cost of the tubewell. In the last two years, we spent more than Rs. 500000 for renewing some or other part of the

tubewell. We bought a new motor and made a new storage tank. So, all the profit for the past three years has been invested back into the tubewell. In 2001, the net profit was around Rs. 50000, which was distributed among 15 members based on their respective shares. For my 15 per cent share, I got Rs. 7500. This was almost equal to my total irrigation cost and so I did not pay for the irrigation charges. This is the only benefit for shareholders, but we also have to invest all the time. I have two sons. One is a teacher in Kheda and the other one is studying in BA. I studied up to 11th standard. For ten years, we had a problem in maintaining the motor and whatever we earned went in that. Initially, when the tubewell started, there were 11 bhagidars. In 1989, when there was increased maintenance cost, one member sold two per cent of his share. In 2001, when the tubewell was under major repair many people sold part of their share and three more people joined. Now we have 15 members. In 2001, I also sold five per cent of my share. Initially I had a 20 per cent share and now I have only 15 per cent. If you have a three per cent of water share, you can irrigate a quarter of a hectare of land. Now there are eight water buyers and the irrigation turn is once every 15 days. We get eight hours per day so we get 120 hours of water in one round. This means one who has one per cent share would get one hour 12 minutes of irrigation. We sell water at the rate of ten per cent of total water available. This means only 12 hours of water that we have surplus is being sold. I have 15 per cent of share and so I am entitled to 18 hours of irrigation. I have only two hectares of land. In the winter season, it takes four hours to irrigate a quarter of a hectare of land. This means that I need 40 hours of irrigation for irrigating 2.3 hectares of land. Therefore, I am buying water from this tubewell, as my shares are not enough for me to irrigate all the land. We have also kept the water charges high, so at the end we do not have to pay for irrigation as it is compensated against the profit'.

Tubewell 2: Atmaram Chagandas Prajapati

Atmaram Chagandas Prajapati initiated the tubewell in 1986. Atmaram was the second son of his father. His elder brother was mentally ill and died at the age of 18. Since there was no other heir, Atmaram inherited all the two hectares of land from his father. His father expired when Atmaram was 15 and since then he is engaged in farming. Due to early responsibility, he studied only up to the

fifth standard. Initially, Atmaram together with his first cousin owned the open dugwell that irrigated around six hectares of land in the early 1970s. The dugwell was inherited from his grandfather, so it was to be shared between him and his first cousin. The well was powered by an electric motor. Out of the total six hectares of land, Atmaram and his cousin used to irrigate their own land and sell the rest of the available water. At that time, water sale was on a crop-sharing basis and for the water sale, Atmaram and his cousin used to keep 1/3rd of the total production, which was shared equally between them. Atmaram has two sons, one of whom is working as an accountant in the Gujarat Government. The second one worked for a few years in the diamond polishing industry in Mehsana. Since two years he is back in the village and is trying to go to the USA. He now helps his father in agriculture. He has gone to Mumbai twice to get the visa as per the instruction from the agent. However, he failed to obtain the visa as the agent was found to be a fraud on both occasions.

In 1986, when the dug well ran dry, Atmaram got together with other interested people and installed the tubewell. He bought a 15 per cent share while nine other members contributed the rest. The partners in the tubewell were carefully chosen based on those who own land in the vicinity and those who are good to deal with. Atmaram says - 'caste is not a factor here but you should chose someone who is *sukhi* (well-to-do) and *vyavasthit* (balanced). We even have Thakores as members in our tubewell. If their land is near our tubewell and if they are resourceful enough to contribute to the cost, why should we deny them membership?' Since Atmaram initiated the tubewell he takes minor decisions. For some major decisions such as repairs or maintenance, he talks to other shareholders. At the time of construction, the tubewell had a total investment of Rs. 225000. In 1986 the water table was at around 35 meters, which had increased to around 100 meters in 2001. Due to the declining water table, the capacity of the pump had to be increased from 41 hp in the beginning to 65 hp in 2001. At present, it irrigates around 15 hectares of land. All the shareholders of the tubewell have their land near it. According to Atmaram, the tubewell has seen golden years during the decade 1980-1990 when the total irrigation from it used to be more than 25 hectares with an electricity supply of 16 hours per day. In 1995 the irrigated area reduced to 23 hectares as the electricity supply was reduced to

twelve hours per day. In 1998 it reduced to 16 hectares with the electricity supply being curtailed to ten hours per day. In the year 2001 the electricity supply was further cut. With eight hours supply per day, the command area of the tubewell was reduced to around 15 hectares. The decreasing supply of electricity has an impact on water sales. These were reduced from more than 13 hectares of land in the beginning to less than a hectare in the year 2001-02. There were around twelve people buying water from this tubewell, while in 2001-02 it was reduced to two. Those who do not get water had either to invest in a new tubewell or keep their land fallow for two seasons and take only rainfed crops.

According to Atmaram – 'the main cause of the reduction in the command area of the tubewell is the reduced electricity supply and the declining water table in the area. The tubewell is also getting old and hence the maintenance has increased. We have been tilling this land for more than 15 years and never gave rest to the land. Everyone has some capacity and if you overuse it, you are going to face the consequences. Nevertheless, what could we have done? We did not look at the future for utilising groundwater and hence now we face a problem. Earlier, with the same supply of electricity, more land was irrigated because the water table was high. However, with the decreased electricity supply and groundwater depletion, more electricity is required to irrigate the land. We have to increase the power of the motor so that it fetches the same if not more amount of water. The command area is reducing and the water sale has virtually stopped. To cope with the situation, we have to change the irrigation schedule. Earlier, the water supply was once in 15 days. This has gone up and now it is once in 20 days. In some cases only shareholders are getting water and we have said no to those who used to buy water. Who would not like to sell water? It subsidises the cost of water for us. Nevertheless, we cannot do anything. We cannot give water at our cost to others. However, the reduction in command areas has been more visible in the summer than in the winter season because winter crops require less water than summer crops. We are now giving water to only two people and for less than one hectare. When we ourselves do not have water, how could we give to others? This year, we had a great loss. Every year the profit of our tubewell exceeded Rs. 100000. For the last three years, it has been a no profit-no loss business. This year, the total profit from the water sale only just passed the total

expenditure and we could make profit of only around Rs. 8000. Our tubewell is now 15 years old and so the maintenance cost has increased. This year, we spent around Rs. 40000 for repairing the motor and inserting two pipes (around six meters) as the water level went down further. Others made a profit, but we could not because we had to incur these costs. It is the same for all the tubewells now. If they made profit this year, they would lose the next year. So we can not foresee any profit in the future'.

Joitaram Prajapati, Bhagidar in Tubewell 2

'We have a ten per cent share in this tubewell. My father bought the share and we are two brothers, so the share divides between the two of us. We have two hectares of land that is irrigated through the ten per cent share in the tubewell. Earlier it was good as half of the water from the tubewell used to be sold increasing the profit. For the last two years we have been facing many problems. I keep all the accounts and make the yearly profit-loss account of the tubewell. Our water sale is reduced to only half a hectare as the tubewell discharge is affected considerably. It is not only the electricity charges, but also the depth at which we take water. Most of the people are concerned with electricity, as it is more visible. Of course, with more electricity available we can take more water. The other fact is that every year we are going six meters deeper and so it takes more electricity to fetch water from that depth. For us it is not much of a problem. I have four sons and all of them are working and earning a good sum of money. My elder son works as an accountant, the second to him is in a fertiliser company. The third son is studying under an apprenticeship and working with the electricity department as a trainee. The fourth one has gone to Surat to work as a computer operator in the diamond polishing industry. At home, only my wife and I are dependent on agriculture. The land in the command area of the tubewell has been given on sharecropping to a Thakore. We ourselves cultivate 0.69 hectare of land that is close to our house. That much is enough for us along with the income from the dairying. We have two buffalos, so we get a good income from dairy. All together, we are not at loss even when the profit from the tubewell is decreasing. However, I also see a bad time ahead because we do not know what is going to happen in the future. It is good that my sons are well placed, so I do not have any problem.'

'In our tubewell, the water charge is lower than every other one in the area. We used to have a high water charge when we used to sell a lot of water. Now there are only two water buyers, so we have reduced the water charge because it is our own money that is rolling and with two buyers it is not much of profit. Therefore, we decided that we would not charge more. When there was more water for sale, the charges were high. We never had two charges for owners and buyers. It does not look good. In any case, the money is divided between us as profit so it should not look bad for the buyers that they are paying more and we are paying less. They also know that ultimately the money will come to us but on the face of it, it does not look good. This year, we had a lot of maintenance problems, as the tubewell is getting old. Like the problem of old age, our tubewell gets sick now and then. We have to invest a lot of money to get it repaired. This government is not good. They are decreasing electricity supply and so our profit is being cut. We pay the same charge as before but we get much less water. They also called for an increase in electricity rates. We will oppose any more increase until our last breath.'

Tubewell 3: Chelaji Badarji Thakore

Chelaji Thakore, 54, worked in a textile mill at Ahmedabad for 20 years. When the mill was shut down, he tried working at some other places in Ahmedabad. However, he never got a satisfying job and hence decided to come back to the village in the late 1980s. In 1990 he initiated the tubewell partly with the money that he received from the textile mill to compensate for the loss of his job. In the area where Chelaji's tubewell is now situated, there were not many tubewells except that of Jiwabhai Patel. Jiwabhai's tubewell used to be in demand and so Chelaji did not get water from his tubewell. This led to Chelaji's decision to invest in a tubewell. The tubewell was initiated with a bhagidari system but the major share of the tubewell - 85 per cent - remained within his extended family of four brothers and only 15 per cent of the share in the tubewell went outside the family. According to him 'during that time only Jiwabhai's tubewell was there... we never got water from him as his tubewell was occupied with other people's demands. I got money from the textile mill as compensation and invested that in the tubewell. In 1990, I spent Rs. 350000 from the money I had and the rest I borrowed from others. Out of this, around Rs. 45000

were contributed by bhagidars. In 1990 water was only 70 meters deep and I used to have two *relas*[14] of water from the tubewell. Therefore, there was so much water for all of us. The total irrigated area was more than 23 hectares but now we cannot even irrigate ten hectares of land. At that time, the water charge was 15 rupees per hour and now it has increased to 35 rupees per hour. My father was working in the textile mill and so we also worked in the mill. I was educated in Sangpura but my brothers studied in Ahmedabad. Those were the good times and we never wanted to return to the village. In Ahmedabad there were 75 mills and now only four to five have survived. The rest are closed now. All my three brothers have been working in the mills but when they started to close one by one we all returned to Sangpura. Those who had some land in their village returned, but those who did not have any thing back home stayed in Ahmedabad. They started working as wage labourers in other industries. Since we had land, we could fall back on the assurance that we can have food to survive. Just now I have spent around Rs. 20000 because the motor had to be renewed. Earlier, the profit from the tubewell was around Rs. 60000 -70000 but this year we are under a big loss. For the last three years the tubewell is giving some or the other trouble... sometimes the motor has to be repaired sometimes the pump (see Box 4.3)... so one has to spend a lot of money in all that... for us, Rs. 26000 is the total electricity bill in the year whether the tubewell is running or not'.

'Due to some problem or the other, my tubewell has not been running but I have to pay for the electricity charges. Even small maintenance such as starter repair takes away a lot of money. This year we have incurred a loss and I am totally broke. I could not collect the water charges as the crops have failed. No one is giving money for the water consumed; they themselves have not earned money. Even the labour charge could not be paid, so how can I ask money from them when I know that they do not have money? I want to return the electricity connection this time. I have half a hectare of land. For this much of land, why should I take this big a headache? I have to give money to the person who repaired the tubewell. Last time I bought a starter for Rs. 15000 and I gave him only Rs. 5000 as I did not had money. I have to give Rs. 10000 back but how can I repay the loan to him if I do not have any income? This time the crops have failed – from a quarter of a hectare one did not get even 100 kg of pearl millet so what should

we do? From less than 100 kg of pearl millet, we have to deduct the *kalakwari* and *majuri* (labour charges). All of us have the same problem and so how can I pressurise them to give me money? This year, we did not get enough to survive, leave apart the profit. See, Gemarji Thakore has now constructed a new tubewell. For electricity connection, the government has given him an estimate of Rs. 100200. He spent Rs. 60000 on buying an electricity connection

Box: 4.3: The maintenance diary of Chelaji Thakore

Jan 1, 2001	New starter was bought and the motor was repaired
Nov 29, 2001	Purchased new capacitor for the pump
Dec 3, 2001	Two new columns were inserted
Jan 1, 2002	New starter was bought and the motor was repaired
Jan 8, 2002	Two new columns were inserted
Oct 23, 2002	New motor installed
Nov 24, 2002	New column inserted
Dec 6, 2002	The bore had accumulated sand and so the sand was removed for 29 meters and then one column was inserted
Dec 8, 2002	Pump bearing was changed
Jan 18, 2003	Motor was repaired

Source: Field notes

from a village in Vijapur under a transfer scheme. Last week the electricity board has given the connection. The electricity bill is four times the bill that we pay as all the new electricity connections are metered and charged on a pro-rata basis. The charge for new connection is 50 paisa per unit. For me the bill comes to Rs. 4200 every two months. I have a 50 hp motor and so the flat-rate charges are Rs. 500 per hp per year. Therefore, the total money is Rs. 25000, which I have to pay in six instalments. For this month, I have got the bill but do not have money. From where would I pay the bill? I do not have any other source of income like Patels. We have to depend upon the income from agriculture to pay for the tubewell. We do not have income from the USA either. From

where should we be paying? I went to Rambhai Patel to ask for money. But he said that he himself does not have money and his bhagidars have also not contributed. He is calling a meeting of all the bhagidars. Now tell me, if Rambhai Patel would face problem then we are small people in front of him.[15] What can we do?'

Chelaji has two sons who work in the industries in and around Mehsana both earning around Rs. 3000 per month. Chelaji does not want his sons to be engaged in agriculture as in his opinion it is becoming an uncertain business. Working in the industries is preferred much more due to the sustained income that one gets.

Takhuji Thakore, Bhagidar in Tubewell 3

'I am a ten per cent bhagidar in the tubewell and I am there since the beginning. In 1990 I paid Rs. 30000 for getting the ten per cent share. Earlier we used to have very good profit but now we are running into trouble. The discharge of the tubewell has reduced and together with less electricity supply the total area under irrigation has reduced. I have half a hectare of land but I also take up Patel's land for sharecropping. Today with half a hectare of land, you cannot survive. I used to work in diamond polishing in Mehsana. For 25 years, I did diamond polishing but it requires very minute observation. So when I become old, I had to leave it. Many people like us came back to the village and are engaged in doing agriculture now. From the last year onwards, we are not having any profit from the tubewell. All the bhagidars are in debt now and we cannot give back the money that we took on loan to repair the motor. I have two sons and two daughters. The daughters are married. My elder son is engaged in diamond polishing while the younger one is studying. After he finishes his education, he will get some job in Mehsana. Even if he works for Rs. 1000 a month, it is good for him. I will not allow him to take up agriculture any more'.

Takhatji Thakore, Water buyer, Tubewell 3

'In our tubewell the water charge is 35 rupees for one hour. We have a problem, as we do not get water. Our turn of water comes after 15 to 20 days and sometimes even after a month. The land on our side of the village is not good. The soil is sandy, so we need irrigation every 15 days in the winter season. But what to do if we do not get it? As a buyer, I am dependent upon them. There are no other tubewells here and so I have to be with them even if I do not

get water when I require. This government is curtailing power and we cannot do anything. We cannot even get back our investment from agriculture now. I have four cattle but I buy fodder for them, as the agricultural residue is so little. I have four sons and two daughters. All the daughters are married. We do sharecropping and if we do not get it, we go for wage labour. I have a pair of oxen that I give on hire and this is one source of income for me. I get Rs. 200 per hectare for land preparation. I will tell you, there is nothing left in carrying out agriculture for us. If you are a Patel and if you have orchards, then you can survive. I do not have a share in the tubewell and have to give money for water. If there are more hours of electricity, the water charges are less. Now they have increased the price of water because the electricity comes for only eight hours or less. When water decreases in the tubewell, we are the first ones whose water is curtailed. Last winter, it was worse as they (the electricity department) first gave four hours of electricity and then six hours and then at the fag end of the winter season they gave nine hours of electricity. Therefore, the average supply comes up to around six hours per day. The charges for electricity are based on the flat rate so there is no reduction in the bill but when hours of electricity is reduced, we are the first ones who are denied water. Even I cannot complain because, if I were the owner of the tubewell, I would not give water to others if my fields were drying. It is all this government which does not want people like us to survive.'

Tubewell 4: Ramchandrabhai Parmar

Ramchandrabhai Parmar (70) initiated the tubewell in 1990. According to him 'in 1962, the first tubewell was installed by the Gujarat Water Resource Development Corporation [GWRDC] but most of the people used their own wells for irrigation and very few bought water from the GWRDC tubewell. It was only when the groundwater level started to decline in the 1980s that people started to irrigate through tubewells. Parmars in the village have approximately 23 hectares of land. Most of the land (10-12 ha) is concentrated on the south of Sangpura bordering Aakhaj village. On the western side, Parmars own three hectares of land while on the eastern side they have three hectares of land. On the northern side of the village, we have little less than a hectare of land. When the water level declined, we started buying water from the

GWRDC tubewell. Since most of our land used to come in their command area, we never thought of investing into a tubewell of our own. However, in 1989 the GWRDC tubewell went out of order. The tubewell was never repaired and hence we started buying water from a Patel from the neighbouring village. Since many people were getting water from that tubewell we started having difficulties in getting water. The Patel used to give us water only during the night while he used to irrigate his fields in the day. Since the Parmars did not have any share in his bore, they could not force the Patel tubewell owner for any equitable time distribution between share and non-shareholders. This problem drove Parmars to have their own tubewells, and in 1990 we invested in the tubewell. The tubewell was constructed to a depth of 132 meters and the water table was at 59 meters. The tubewell has ten bhagidars out of which two belong to Vaghri caste and one is a Bawa. Since we have more land in this area, the members are dominated by people from the Parmar community. In addition, whoever came to invest in the tubewell was inducted into the cooperative and so there is no distinction made based on caste. When we started this tubewell, we used to have a good profit and all the water charges for our own fields were paid from this profit. In 1990 a ten per cent share's value was Rs. 26000 and then we hardly paid any money for our own irrigation. However, from 1998-99 onwards things started to change. First the hours of electricity available were curtailed and then our tubewell started to give problems. Earlier, we used to have two relas but now we have only one rela. Therefore, the water sale was curtailed and now we have very little profit. Because not much water is sold, the profit comes from us only as we have kept the water charge higher than what is actually incurred. This is the way to collect money and keep it as a reserve, as one will never know when the motor or any other part of the machine needs replacement. During the last three years the water sale has been reduced and so the profit became very low. Apart form this, we also incur costs for maintenance of the tubewell'.

So what are the costs of adjustment to the declining water table and increasing cost of irrigation? Ask the question and Ramchandrabhai replies 'the cost of maintaining the tubewell is very high. Many tubewells are creating one or other problem and so if the shareholders are not financially strong they cannot survive

with the increasing problems. For the last three years, four new tubewells were installed in the village; all the money has come from the USA. Anyone who is working here will not have money to initiate a tubewell. Not even ten per cent of the share. Earlier, we used to have shares that were almost equal within a tubewell cooperative. Now one Patel will have 60 to 80 per cent and the rest of the shares will be with his friends and relatives. It is difficult for an outsider to buy a new share in a tubewell. Every year we are going six meters deeper and so we do not know where we are heading. Every time you sink a pipe you spend around Rs. 4000-5000. The water sale has almost ended and so we have to pay from our own money now'.

Bechargiri Bawa, Bhagidar, Tubewell 4

Bechargiri is one of the partners in the tubewell. He used to work with an industrial house in Ahmedabad and returned to the village after retirement. He has 0.7 hectare of land which is irrigated though the tubewell. Two years ago, a Thakore took a Rs. 20000 loan from him. As an interest towards the loan, Bechargiri kept his half hectare of land and would return this only after the principal amount is given back to him. He has given that land to another person for sharecropping. According to him 'the tubewell is like a security deposit for us. In 1990, I paid Rs. 13000 to get a five per cent share... tomorrow if you need Rs. 10000, you can sell part of your share. There are many people to buy these shares here. However, in our tubewell we have made a *karar* (agreement) that if any one wants to sell the share, they will have to inform the shareholders and the first preference would be given to the present shareholders. Even for selling water to non-shareholders, there has to be a consensus among the Bhagidars. Some people want to sell some parts of their share. The value of our tubewell shares have gone up. Now a normal tubewell costs around Rs. 700000 and so a five per cent share will cost around Rs. 35000. In 1990, I paid Rs. 13000 and the same share could cost Rs. 35000 now. However, the price of the share always depends upon the capacity of the motor and so in actual sense we cannot compete with the new tubewells as they have higher capacity pumps and so the actual price of our share will be lower but the price has definitely doubled in ten years. Earlier, when there was sufficient electricity in the village, we used to give water to *bin-bhagidars* (non-shareholders). However, we have

stopped that for the last two to three years. The amount of fallow land was never like this before. There obviously is an interest in selling water. If we give water the income is for our tubewell only, isn't it? We have to pay the same amount to the electricity department. Earlier, there were many buyers but now the tubewell has only one rela and that is why the water flow is less...when the *ghar ka dhani* (tubewell owners) will not get water, how will they sell it to bin-bhagidars? We do not even give water to the tubewell operator if he is not having share in the tubewell'.

Somabhai Vaghari, Bhagidar and Operator, Tubewell 4

Somabhai Vaghari, 50, is the tubewell operator and now stays at the tubewell for eight hours when the electricity is provided. He says that it is not difficult as one anyway comes to the field to work and this becomes his side profession. According to him, 'now having a share in a tubewell means shelling out a lot of money. In April we got the servicing done for the tubewell and hence the yield increased but we had to pay Rs. 18000 for the work. Generally, when there is an emergency like this, we collect money from the people based on their share. For example, if the total expenditure is Rs. 10000 then the person who has five per cent of share will have to contribute Rs. 500. If not then we take money based on total command area of the tubewell. For example, if the tubewell has 11 hectares of total command area during a particular season, we charge Rs. 850 per hectare and so collect the money. Those who are buying water also give money and we deduct the money paid in advance from their water charge for that particular season. Two people have invested in our tubewell but they do not have land in the command area. For them, it is just an investment and so they do not give money for any emergency repair. All the people get their fair share at the end of each year and so no one has a problem. I have half a hectare of land and I have taken another half hectare on sharecropping. I also cultivate my brothers' land but it is on a fixed rent basis as he has a government job and stays in Junagarh. I am the operator for the last eight years. Earlier we used to have 24 hours of electricity so there was no problem in getting water but when electricity was reduced to twelve hours a day, the electricity supply was converted in day and night shifts. Every 15 days, the shift is changed. My son has studied up to 12th standard and is working in Kalol in the Arvind mills factory. We

spent Rs. 5,000 for his training and now he has a job. He took training in Gandhinagar and now he is working over there. I would never like my sons to take up agriculture. It is better for them to work outside the village. I have a five per cent share in the tubewell for which I paid Rs. 13,000 in 1990. I took a loan from our relatives. Because of the tubewell my son has studied and is working. When you take a loan for investing in the tubewell, it is easy to get money from relatives, as this investment is considered safe. If you want to borrow money for marrying your daughters, you may have a problem in getting it but not so when you want to buy a tubewell share. This is because in the past, a tubewell generated money and so it was not difficult to get the money back if given on loan.

The increasing cost of water and declining profit

The four case studies of the tubewells and narratives of farmers clearly show that the decreased supply of electricity has had an impact on the groundwater available for the farmers. Table 4.7 provides the data on shrinking command area and reduction in water sale of the four tubewells. It shows that the command area of all tubewells has reduced. Due to the shrinking command area the sale of water has also been decreasing. In some cases, such as tubewell 2, the water sale has reduced from irrigating around 13 hectares in 1990-91 to less than one hectare in 2001-02. The case is similar for other tubewells in Sangpura (also see Table 3.9).

Another effect of the lowering of the water table is the progressive deepening of the tubewells. The present rate of deepening in Sangpura is around six meters per year. The deepening of tubewells has been combined with increasing the capacity of the motor. All the four sample tubewells have increased their pumpset capacity from 10 to 20 hp in less than a decade. The price of electricity is based on the capacity of the pump and hence the increase in capacity affects the price paid for pumping water (Table 4.8).

TABLE 4.7 SHRINKING COMMAND AREAS AND FEWER WATER BUYERS

Sample Tubewells	*Command Area (in ha)*			*Water sale (in ha)*		
	1990-91	*1998-99*	*2001-02*	*1990-91*	*1998-99*	*2001-02*
1	26.45	19.55	17.14	14.95	4.14	2.53
2	25.3	16.1	14.95	13.45	2.76	0.69
3	24.15	14.95	12.65	19.55	14.95	3.91
4	22.54	16.56	11.73	12.65	6.44	1.38

Source: Field data

Note: Until 1986 the charges of electricity in Sangpura were based on kilowatt of electricity consumed. In 1986, it was turned into a flat rate based on the contracted load of the motors (in Horse Power). In 1998-99, the supply of electricity was reduced to twelve hours from the earlier 16 to 18 hours per day.

The increasing cost of water has affected the profit for members of the tubewell cooperative. The profit calculation is a very important exercise and is done with taking all the expenditures and costs into account (see Box 4.4). The profit also depends upon the total water yield of a particular tubewell and hence its water sale. The sale of water is highest in winter followed by summer and the monsoon (see Box 4.5). Table 4.9 shows the gross profit of the four tubewell cooperatives in three distinct years. In 1991-92 all the tubewells generated a profit from the sale of water. With the electricity cut in the year 1998-99, the profit reduced considerably. Further, in the year 2001-02, the account shows that only tubewell 1 and 4 have made a profit whereas tubewell 2 and 3 have just managed to cover their costs.

In 2003 tubewell 3 has stopped functioning due to increasing maintenance requirements and lack of money to get it repaired. Tubewell 1 has made considerable profit even in the time when everyone else is losing out. This is because the owners have renovated the entire system using some parts of the old tubewell, costing around Rs. 500000. The capacity of the pump was increased and hence it could cope with the problems. The case of tubewell 4 is similar: its major shareholders have government jobs and hence they do not solely rely on agriculture. They also renovated the tubewell to maintain the flow of water. Tubewell 3 has barely survived, making a profit of around Rs. 8000. In the year 2001-02, tubewell 3 faced problems and hence it was stopped twice for major repairs, which lasted for almost 15 days during the peak winter season. Due to this, the farmers getting water from this

TABLE 4.8: PROGRESSIVE DEEPENING

Tubewells	*Depth of water table (in meters)*			*Capacity of pumpset (in hp)*			*Size of casing (pump lift pipe) in inches*		
	1990-1991	*1995-1996*	*2001-2002*	*1990-1991*	*1995-1996*	*2001-2002*	*1990-1991*	*1995-1996*	*2001-2002*
1	94.1	105.8	117.6	41	50	62	8 (5)	8 (5)	10 (5)
2	82.3	94.1	100.0	41	50	65	8 (4)	8 (4)	8 (4)
3	67.6	88.2	111.7	41	41	50	8 (5)	8 (5)	8 (5)
4	58.8	82.3	100.0	30	30	41	8 (4)	8 (4)	8 (4)

Source: Field data

TABLE 4.9 GROSS PROFIT OF TUBEWELL COOPERATIVES (IN RS.)

Financial year	*Tubewell 1*	*Tubewell 2*	*Tubewell 3*	*Tubewell 4*
1991-92	120000	80000	80000	80000
1998-99	95000	75000	50000	55000
2001-02	68517	8566	2106	40165

Source: Field data

Note: For the year, 2001-02, the records were taken from the annual profit-loss accounts of the tubewell cooperatives. Figures for the other years are based on the recall method and hence do not represent a totally accurate figure.

Box 4.4: Record keeping and profit calculations

The profit of a tubewell is calculated by deducting the maintenance cost, electricity expenses and the salary of the operator from the total water sales. The price of water is fixed per hour. The price is the same for share and non-share holders in Sangpura. The irrigation schedule is strictly maintained and minutely recorded in the record book, including the hours of irrigation for each individual. At the end of the season, just before harvesting, these records are pulled out and each person's kalakwari is calculated. First, the money is collected from the non-shareholders after confirming that they have sold their harvest and have ready cash that could be collected. The yearly account is made in October soon after the nine-day long festival of Navratri. The new account book is opened in November on the day of *Labh Pancham*, the first day of the New Year according to the Gujarati-Hindu calendar. The charges for kalakwari of shareholders are also taken at the end of each season. This money is utilised for paying electricity bills and for any eventualities such as major maintenance of the tubewell. Some tubewells have reserve funds kept for emergencies. At the end of the financial year, the profit is distributed according to an individual's share in the tubewell. If the shareholder's kalakwari is more than the total profit, he is supposed to pay back the money. For example, if a shareholder has a five per cent of share and if the total profit of the tubewell is Rs. 40000, then the share of profit is Rs. 2000. If that shareholder's kalakwari is less than Rs. 2000, the money is returned. If the kalakwari is more than the share of profit, the money in excess of this amount is paid back.

Source: Field notes

tubewell could not access water and hence their crop failed[16]. Therefore, even though the account shows a small profit of Rs. 2106, the owners could not collect the money from farmers as some incurred loss due to crop failure. In this case, the profit-loss account recorded the individual's liability that will have to be paid back in the next year.[17]

Box 4.5: Shrinking command area in summer
It was observed in one of the tubewells that the command area in the winter of 2001-2002 was around eighteen hectares reduced to eight hectares in the summer of 2002. The question is why was there such a reduction if water was available? The answer lies in the fact that there are very few crops – only as pearl millet, sorghum and alfalfa – that are sown during summer (the hot season). The farmers' choice of whether to grow a summer crop or not depends upon the profit projection for the season by studying the market and trends. Every farmer keeps some land for the fodder crop alfalfa, which is used as green fodder for buffaloes. Depending upon the resource base of the farmers, they decide how much to sow during the summer season. This is largely because the number of irrigations increases in summer and thus the cost. If farmers do not see the returns coming from a particular crop, they do not wish to irrigate. During summer the physical labour requirement is also higher and the decision to sow a crop considers this. The chances of crop failure are much higher due to heat waves. Further, the choice also depends up on their neighbour's decision to take up crops or not, because if all the surrounding land is fallow, the crop in the middle would require more water for irrigation due to the oasis effect. In that case farmers decide against taking a particular crop. However, this decision does not affect alfalfa cultivation as it is necessary for milk production. In almost all cases the command area of the tubewell is reduced to half during summer.

Source: Field notes

Whose Crisis is it Anyway?

Declining productivity in Sangpura is caused by the depletion of groundwater resource coupled with other crucial factors such as the impact of intensive agriculture over time and lack of technical innovation to keep up the level of productivity. The immediate fallout of this is the declining yield of crops. The area under cultivation also declined from 1996 to 2000, as recent government figures show (Table 4.2). The visible effects of the declining productivity trend are increases in cost of inputs such as irrigation, and decreasing yield. Both have an impact on the household and

village economy. Until very recently, the government data did not show a declining productivity trend, which is calculated as yield per hectare. At the village level, the cultivators increase the level of input to maintain output. Yield data fails to capture the declining trends of productivity. For each hectare of land the cost of production goes up while per unit of land productivity is maintained. In this chapter, we have seen how farmers have been engaged in progressive deepening of tubewells that increases the irrigation prices. Apart from this, the number of irrigations given to a particular crop has increased, as well as the application of other inputs such as fertilisers and organic manure. These efforts are directed towards maintaining the level of productivity. Each of the above has an effect on the profitability of agriculture. In Sangpura a large majority is still engaged in subsistence agriculture. The declining profitability of agriculture has direct linkages with household economics especially for small and marginal farmers.

None of the above responses address the issue of groundwater depletion and in fact reinforces the situation of mining. Why is this so? The answer lies in the way the crisis hits the village. Not everyone is affected by the crisis in the same way. For example, tubewell 1 has made profit, as the owners were able to invest and renovate their tubewell. With increased capacity of the tubewell they could maintain the level of profit, if not increase it significantly. Tubewell 3 that is primarily owned by Thakores, could not cope with the problem of increased prices and maintenance cost, and hence was shut down in the year 2003. The shareholders confessed that they have incurred debts in the process and the only way to recover this is to sell off the tubewell along with the electricity connection to someone who has more capacity to maintain it. In Mehsana district there has been a government restriction on providing electricity connections to tubewells; as the district is categorised as a dark zone. However, the farmers exploit a section of electricity rule for transferring electricity connections within the district. A market for electricity connections has developed. Hence people sell their electricity connection at very high prices in the name of connection transfers. The leaders of tubewell 3 were considering that option to recover their losses and in this way could get immediate relief.

The case of Sangpura and Mehsana is not isolated and can be largely compared to the situation in Gujarat and some other parts

of India. Bhalla and Singh (2001) carried out a nation-wide study of district level agricultural growth and development. The study suggests that the high rates of growth recorded during the 1980s are not being sustained and that the growth rates of agricultural output have decelerated during the 1990s. The study shows that the central region (comprising of Gujarat, Madhya Pradesh, Maharashtra and Rajasthan) is characterised by year-to-year fluctuations in agricultural output, mainly due to vagaries of the monsoon, absence of assured irrigation and non-development of appropriate technology suitable for dry-land and drought-prone areas. Mathur and Kashyap (2000), in their district-level analysis of the problems and prospects of agriculture in Gujarat, report a major shift from food to non-food cash crops in the 1980s. However, the land productivity for selected crops has experienced a significant decline after the 1980s. According to them 'declining productivity levels of selected crops perhaps indicate that increasingly productive and problem-free lands are being allocated to other crops. These crops perhaps also account for a major portion of purchased inputs (fertilisers, water, tractors etc)' (ibid.: 3146). This decline of agricultural growth is attributed to several technical constraints such as present HYV seeds losing their genetic potential. Government expenditure on agriculture, irrigation and electricity is decreasing, which destabilises the capacity of farmers to sustain risk (Desai 1997). Over the years, the pressure on land has increased in absence of a major diversification from agriculture. This led to an increased pressure on natural resources such as land and water. Experts in Gujarat are calling for 'seed-centred new technology with resource-centred new technology' to combat the situation (Hirway 2000). However, until this happens the crisis continues in villages such as Sangpura. The crisis definitely is not for the resource rich farmers who have greater capacity to sustain risk and maintain the level of productivity through increasing inputs and renovating and deepening wells. The crisis is for households who have no means to respond adequately to the situation. Their own labour utilisation is subject to the agricultural productivity as they do not have any means of existence other than agriculture and therefore are at the receiving end of the declining productivity.

In the next chapter I show how groups who are solely dependent on agriculture for survival are coping with changes in

the agricultural production system. The small and marginal farmers who are pushed out of the water market form a large labour force in Sangpura. The easy availability of labour has revived the sharecropping system. The dominant classes are able to extract surplus and transfer the burden of resource depletion to groups lowest in the socio-economic hierarchy through the sharecropping arrangement.

Notes

[1] The government avoids using direct methods of revenue generation to curtail subsidies in the power sector. This is largely because of political reasons. The government chooses to decrease supply in electricity. The conflicts between farmers and government over a recent price hike in electricity used in the farm sector are discussed in chapter 6.

[2] There is an increasing body of literature dealing with water productivity instead of land productivity due to increasing water scarcity situations. The water productivity concept is based on more crop per drop or producing more food with the same water resources or producing the same amount of food with less water resources. In a broad sense, productivity of water is related to the value of benefit derived from the use of water (Molden 1997). Water productivity also describes various aspects of water management such as production, utilisation, environment and economy (Molden and Sakthivadivel 1999). The term, water productivity is used due to the growing recognition of agriculture being the main consumer of freshwater resources and increasing productivity of water use seems to be the most practical way to save water (Droogers and Kite 2001, Bastiaansen and Droogers 2003). However, in this chapter I use land productivity instead of water productivity when referring to the word 'productivity'. This is because of the lack of historical data available on water productivity when referring to productivity growth in agriculture over time. The village level data on water use is based on the recall method, which could not be used to calculate water productivity over time as that should be based on more accurate and precise information on water use. However, I define productivity using the concept of ecosystem productivity developed by Datye (1997) and Paranjape and Joy (1995). I will return to the discussion in chapter 7.

[3] Unfortunately I could not confirm the introduction of new variety seeds of alfalfa from government sources.

[4] Farmers refer to these changes as land becoming *Reteelee* (sandy) due to which the irrigation requirement has increased. The director of an

agricultural college, on request for anonymity, informally confirmed this problem of land degradation and desertification in Mehsana and other intensively cultivated districts of Gujarat due to over-cultivation.

[5] Only recently, Bt Cotton seeds have been in news as an alternative to existing cotton seed varieties. However, there was a lot of confusion regarding the use of Bt Cotton in Sangpura as it was not authorised for commercial use in the year 2001-02, and early 2003, during the time of the my field work. Farmers heard the rumour that the leafs of Bt Cotton are poisonous and if buffaloes eat them, by mistake, they would die instantly. Some confusion was regarding the actual productivity of this new seed variety and the authorisation for actual use. During my stay, I never heard any official confirmation of the introduction of this HYV seed in Sangpura through agricultural extension services.

[6] The production of sorghum is measured in *Puda* (a bundle of grass) that is roughly equivalent to 2.5 kg. Tobacco is a new crop for farmers of Sangpura and hence its production in 1990 is not known to them. Alfalfa lasts for approximately one to two years but is mostly taken for eight to twelve months in order to get good quality. The crop is irrigated every seven to ten days depending upon the season. The yield for alfalfa is calculated based on an approximate production of eleven kg per day for one year in one hectare of land.

[7] This could be a two way process. External inputs may cause decline in productivity while because of productivity decline, the use of external inputs may go up. However, the declining productivity may also be due to other factors such as declining soil fertility that includes changing chemical composition of the soil, organic matter content and soil structure. These concerns are subject to detailed analysis of soil texture and ecological factors other than groundwater depletion.

[8] Gupta and Deshpande (1998) studied the cost to economy and health of depleting groundwater levels and increasing fluoride in Mehsana district. Their study shows that in the decade 1980-1990 large scale exploitation of groundwater has occurred due to intensive cultivation based on groundwater irrigation. This has led to a fall in groundwater table at the rate of three meters per year. The study cites four major impacts of groundwater level decline. First, the fluorides and other dissolved salts in drinking water have shown a progressively increasing trend and have exceeded the safe limit in the past two decades. Second, chemical quality of groundwater is also showing an adverse impact on soil fertility and crop growth. Third, with progressive decline in groundwater table more electric power is required to lift the same quantity of water. Fourth, the process of deterioration of groundwater quality continues unabated. This leads to a proportion of the population being affected by fluorosis. The study recommends conserving rainwater in both surface and sub-surface

reservoirs and treatment and reuse of waste water as a step towards solving the problem.

[9] As mentioned in chapter 1, the initial idea was to study how people identify and associate themselves with the tubewell. In Sangpura, this identification is based on the one who is the principle motivator to start the tubewell and hence their caste identities are attached simultaneously. In the initial days of my stay at the village I also started my investigation with criteria based on caste. I assumed that the tubewell cooperatives were caste-based organisations. However, I was proved wrong as I started an in-depth enquiry into the membership pattern of the tubewells. I found that most of the tubewells consisted of mixed caste groups but were called by the caste name related to the person who manages it. As I enquired further, a class and geography-based classification of tubewells pattern emerged against the caste-based identities. Caste plays an important role in determining access and control over land, but in tubewell organisation, geography and class were more prominent identifications than caste.

[10] Caste-wise land ownership is largely clustered in particular geographical regions because of historical ownership of large tracts of land by particular families who belonged to a particular caste. The class-wise land ownership is clustered more in some areas that are considered good due to better soil quality. They are also in possession of richer class families. As shown in Chapter 3, class and caste coincides inmost of the cases.

[11] For tubewell 1 and 2, the discharge is high and hence water is divided into two parts and sold simultaneously through right and left hand pipe outlets. Upon enquiry, the price of water per hour will be referred by the villagers as the price of water from one outlet only. Therefore, in calculating the price, the referred price has to be doubled as water is sold simultaneously. For tubewell 3 and 4, there is only one outlet and hence calculation is done based on the referred price.

[12] While interviewing the individuals, I used audio tape and then transcribed them. Some of the conversations that are presented in the case studies and where actual quotes are used, I have not edited the text apart from changing the use of land measurements from bigha to hectare and water level from feet to meters. This was mainly for the reason that I want to use the literal account of the people that provided information on connectedness between issues while the topic is centered around tubewells. This, in my understanding, shows the other linkages and hence provides a broader understanding of the context.

[13] While saying this, he refers to only one side of the pipe flow. Refer to footnote 13 for details.

[14] Normally the water from the tubewell is divided in two sections and water flows through the pipe in two different directions. They are called left and right hand pipes. *Rela* actually means 'flow' but here the two *rela*

means that the tubewell had water flowing in left and right hand pipes. When the discharge of tubewell is low, it leads to having only one *rela* or water flowing only in one direction at a moment in time.

[15] Rambhai Patel is one of the big landlords in the village. He also lends money to people.

[16] In such situations farmers try to get water from neighbouring tubewells on request. Most of the time, the schedule for irrigation is very strict and so it is unlikely that neighbouring tubewells will share their water as they are bound by commitments to their shareholders and buyers. Sometimes it also depends upon the number of tubewells in the area and the surplus water available. In that case farmers buy water through other tubewells. In the area where tubewell 3 is located, the density of tubewells is very low as the area is dominated by Thakores, who are mostly non-tubewell owners. In absence of tubewells, farmers of tubewell 3 lost their crop.

[17] There is a superstition attached to showing a negative balance in the annual account book. Due to this, the tubewell owners do not want to show that they have incurred a loss due to the belief that it would happen again. In the case of tubewell 3, the account calculated the total irrigation charges and showed a small profit but in reality, it was at a loss. The loss or inability to collect money from the shareholders was shown as a liability, which had to be paid back by next year.

5

Sharecropping, Migration and the New Face of Water Markets

Je hitkarm kare cche te bhai cche
Je poshak cche te pita cche
Jema vishwas cche aee mitra cche
Jya jivika cche aee desh cche
(Who is concerned for the well-being is a brother, who is a protector is a father, who is trustworthy is a friend and wherever there is livelihood, is the native-land[1])
- A Gujarati Saying

'Reaching the USA will also not last forever like groundwater so utilise it to the maximum now'
- A Patel Farmer

This chapter deals with some of the problems faced by marginal and near landless households who take up sharecropping for their livelihood in Sangpura. Sharecropping links the land rental and water markets with the labour market to share the increasing irrigation costs. The large farmers adjust to the situation of declining profit from agriculture through long-distance migration and appropriation of surplus through sharecropping contracts. The marginal and near-landless farmers are forced to take up land on a sharecropping basis to cope with their increasingly difficult situation. The new situation creates a divide between those who can afford to move out of agriculture partially and those who are forced to bear the consequences of declining productivity in agriculture due to their inability to seek employment outside the

village. Within the class of tenants, the burden of agriculture is transferred to the next 'weaker' segment – the women. The chapter illustrates how sharecropping is part of the changing social fabric of village society due to changes in systems of production. It also looks at the aspects of production relationships where sharecropping becomes the preferred form of contract, and how dominant classes define the manner in which labour is appropriated through these arrangements. This aspect explains why sharecropping in Sangpura is not 'a mere *technical* arrangement for allocating productive resources but a product of varying social relationships' (Pearce 1983: 43, emphasis added). These arrangements provide instruments for the dominant classes to transfer the burden of resource depletion to other people.

The chapter is divided into three sections. The first section describes the basic features of sharecropping in Sangpura by focusing on its historical evolution, its coverage and the types of contracts prevailing. The following section outlines the social relations of production in sharecropping arrangements. It also looks at the rationale of landlord and tenants for taking up sharecropping. The last section places the analysis within the realm of theory and concludes the chapter.

Historical Evolution of Sharecropping in Sangpura

The system of sharecropping[2] in Sangpura dates back more than a century. However, it was not a very significant production relation until the rise of irrigated agriculture in the early 1960s. During that time irrigation was carried out in the winter season, and only if there was inadequate rainfall. Water was lifted through *kos*[3] and the production under sharecropping used to be divided in three parts – the *bhagiyo's* (tenant's)[4] share for labour, the *dhani's* (landlord's)[5] share for the land, and the owner of the draught animal's share for lifting water. During that time tenants and landlords usually owned draught animals as keeping them was not very expensive. However, the first right to use the draught animal rested with the tenant and hence, even though the well used to be owned by the landlord, two parts of production used to go to the tenants in most cases. The rationale for the third share was that for accessing water through the well, the tenant had to use draught animal and labour to lift water and hence the right to that produce rested with them. Lifting

water was very laborious work as the tenant had to be present the whole day looking after irrigation. The crop share was compensation towards the work. As an old tenant explains, 'it was not like pushing a button to get water in a minute'. However, this system was not very popular in the beginning and was enforced slowly in the late 1960s and early 1970s when the cropping system included irrigated winter crops. Earlier the winter crops were grown with the water available from residual soil moisture and irrigation was not necessary for the crops. In this system, the shares were divided equally between the tenant and the landlord as there was no irrigation cost. With the changes in water table, the winter crop started to be irrigated using the open well. Hence the one-third system of sharecropping was introduced.

The system of lifting water using kos was followed by well mechanisation. The water level started to go down and it was beyond the capacity of draught animals to lift water. With well mechanisation the area under crops increased significantly, as the well yield almost doubled, making water available in surplus. This water was sold to people who did not have a well and a water market started to develop. The water charge was based on crop sharing. One-third of the production went for the share of water. With the availability of water, the gross area under irrigation increased significantly as summer crops were introduced together with the existing monsoon and winter crops. The changes in agricultural technology under the green revolution required more control over external inputs. This was different from non-irrigated agriculture where the external inputs used were minimal and would require minimum care from the farmer. Slowly a large part of the land came under irrigation. The sharecropping system evolved as a response because the owners could not cultivate all the land in their possession. This situation existed until the full-fledged introduction of tubewells in the early 1980s.

During the pre-tubewell phase, the sharecropping system divided production again into components – land, labour and water. However, the expenses to access water increased under the mechanised well system, which used electricity or a diesel engine to lift water. Costs were higher as compared to the use of draught animals. In mechanised wells, the machines for lifting water always belonged to the well owners who were also landowners. Compared to draught animals, the machines to lift water were immovable

items. In a symbolic sense, using draught animals never threatened the landowner's individual right over the well whereas it was otherwise in case of water lifting machines. Draught animals were used for carrying out multiple tasks and could be hired if not owned. In contrast, the electric or diesel motors had to be fixed to the well and therefore it was the well owner who invested in these machines. In this context, the landlord got two-thirds of the produce while the tenant received one-third. The well and the motor to access water always belonged to the landlord. This was the case in the early stage of the green revolution. The use of external inputs such as fertilisers, pesticides and seeds was still minimal as the land was fertile enough to provide good harvests. Therefore, the net benefit was more due to minimal expenses incurred for external inputs.

During the 1980-90 decade there was a slump in the incidence of sharecropping contracts. This period was marked by innovations in tubewell irrigation. Because of round-the-clock electricity supply much more water was available than a decade before. The water markets became much more extensive, covering a much larger area than before. It was also an opportunity for small and marginal farmers to access water. Hence owner cultivation became a much more lucrative option than sharecropping. Apart from a few drought years, the period is referred to as the 'golden years of agriculture' in which land productivity was at its maximum. As compared to the present day, the farmers recollect that the land was very fertile and it had capacity to retain soil and moisture levels that resulted in good production with less irrigation. For the tubewell owning farmers it was a vending boom and water markets expanded. The returns from the sale of water were higher than that of sharecropping. The good harvests created a lower willingness than before to share the produce with sharecroppers. Agricultural operations were carried out with household and hired labourers. For the marginal farmers without a tubewell water was available. Together with fertile land conditions and family labour, the returns were higher than what they could get through sharecropping.

However, this situation lasted only for a decade and in the late 1990s things started to change again. By this time the tubewell owning farmers had generated enough surpluses from booming agriculture and invested in other sectors. The water level started to decline together with the hours of electricity available, making

groundwater much more expensive. By this time, some of the tubewells had become old and hence their maintenance costs increased (see chapter 4). All this reduced the well yield, which resulted in shrinking of command area. Once again sharecropping contracts became preferable for both tenants and landlords for two reasons. First, the shrinking of water markets pushed out the water buyers who were dependent on the market for their access to groundwater. With a shrinking command area, water was made available first to the shareholders and buyers or non-shareholders were denied irrigation. Second, the number of irrigations also increased together with input costs such as fertilisers and pesticides to keep up the level of productivity. It made agriculture more expensive than in the past. The increased cost of agriculture reduced the margin between investment and profit. The landlords wanted to share this burden. Alongside, there was a large majority of people available who had been pushed out of the water market and were ready to take up sharecropping for survival regardless of the terms of contract. This led to an elaborate and more institutionalised form of sharecropping, in which the contractual arrangements carefully followed the input share in agriculture to allocate the increased costs. Another cause for the rise of sharecropping was the land division and fragmentation in the village, which reduced per capita land available for farmers. This was especially the case for marginal farmers. Their descendents have doubled in number but not the size of the land, making more people to survive on the same piece of land. For the large farmers dairying supplemented income together with employment opportunities outside agriculture. So the marginal farmers where hard hit, rather than medium and large farmers, who had partially moved out of agriculture. Some families with small tracts of land on two different sides of the village preferred to have one sharecropped as they could not manage them both. Table 5.1 summarises these developments in Sangpura.

Occurrence of sharecropping

As stated earlier, the occurrence of sharecropping in Sangpura is very extensive. In 2002-03, around 80.4 per cent of the total land sown in Sangpura was under sharecropping contracts.[6]

TABLE 5.1: THE HISTORICAL EVOLUTION OF SHARECROPPING IN SANGPURA

Period	*Incidence of sharecropping (coverage)*	*Incidence of water markets*	*Approximate irrigated area in Sangpura (in hectares)*	*Preferred mode of contracts*	*Reasons for the preferred system*
Prior to 1960	Low (less than 20% of the total cultivated area)	Low	150-200	Divided in three parts- one each for tenant, landlord and the owner of the draught animal	Limited land was under cultivation and winter crops were taken with minimum irrigation; external inputs such as fertilisers were used but not so significant to be calculated as costs; the groundwater level was high; water was lifted through kos using draught animals in winter and hence a third part of the produce went to the owner of the draught animals
1960-80	Medium High (around 60% of the total cultivated area)	Low	300–350	One third for tenant and two-thirds for the landlord	Groundwater level declined; need of irrigation was felt; water charges were included in sharecropping; one part of production was charged towards the cost of running the pump, cost of external inputs were very low and were rarely calculated
1980-90	Low (less than 20 % of the total cultivated area)	High	500-540	One third for tenant and two-thirds for landlord	Groundwater level further declined and tubewells were installed; water became 'costly'; external inputs were introduced; shares included one part each for land, water and labour with an institutionalised system of who will share how much; water markets expanded and income from sale of water exceeded that of sharecropping; sharecropping declined
1990-2003	High (80% of the total cultivated area)	Low	300-350	One third for tenant and two-thirds for landlord	Groundwater level further declined and together with the decrease in electricity supply accessing water became expensive; command areas of tubewells decreased drastically and the water market was curtailed; sharecropping contracts increased to share the burden of increased costs for lifting water

Source: Field data

A sample survey of the proportion of households engaged in sharecropping contracts showed that around eight per cent of people leased in as well as leased out land while 12 per cent were owner cultivators. Patels were the biggest caste group that leased out land.

In 2002-03, 83 per cent of the Patel respondents leased out part of their land under a sharecropping contract. Thakores were the principal caste group that leased in land, as 84 per cent of them were involved in some or other tenancy contracts. Leasing out was also widely prevalent among Prajapatis. About 80 per cent of them leased out part of their land. All together around 49 per cent of the households leased in land while 46 per cent of households leased out part of their land. When households were divided on the basis of land class, it showed that households having one to three hectares of land were the largest group leasing in land (87 per cent). Households having land between three to five hectares were the major group that leased out land (see Table 5.2).

TABLE 5.2: OCCURRENCE OF SHARECROPPING BY CASTE AND LAND CLASS IN SANGPURA 2002-03[7]

	Proportion of household in the specific group (%)	*Proportion of households leasing in (%)*	*Proportion of households leasing out (%)*
Caste			
Patel	32	13	83
Thakore	36	84	16
Prajapati	11	20	80
Parmar	10	50	0
Others	11	100	0
All Households	100	49	46
Land ownership class (ha)			
0	34	2	0
0.1- 1.0	25	87	3
1.1 -3.0	31	11	89
3.1-5.0	7	0	100
5.1 and Above	3	NA	NA

Source: Village sample survey, 2002-03. NA: Not available

Types and Terms of Contract

As seen above, sharecropping is a widely accepted and practiced as a form of leasing land in Sangpura. The sharecropping contracts last for a minimum of a season to two years depending upon the type of contract. In the majority of cases, the tenants have been cultivating the land for at least two years and in some cases even for 20 years. The contract involves an unwritten oral agreement between the tenant and the landlord, the specifics of which are different for different crops and types of contracts. Below I list all the prevailing contracts including their terms and conditions.

1. One–third system: This system is the most common and covers around 85 per cent of all the sharecropping contracts in the village. It functions through distributing the agricultural production in three parts each representing the inputs in the production process - land, water and labour. Over the years, the one-third system has developed an elaborate arrangement through which different inputs are shared between the tenant and the landlord (Table 5.3). These inputs are paid in cash or kind by the tenant and the landlord. The net production is shared in three parts. Under the system, the right to irrigate rests with the landowner, as s/he usually has a share in the tubewell. However, if the landowner does not have a water share in any tubewell close to the land, she is supposed to buy water from any tubewell. In this case the share of water from the overall production will go to the landlord. Thus, under the one-third system, the shareholder is entitled to only the labour input share.
2. Fixed rent: The fixed rent system is called *ucchak* in the village. In this system the land is leased to the tenant for one year on a fixed rent. In ucchak, the responsibility of irrigation also lies with the tenants who either buy water or use their own share (if in possession) in the tubewell to irrigate. Ucchak is popular mainly in two cases. First case is of families who stay outside the village but own land. In this case ucchak is given within the extended family, which reduces the risk of the land being acquired by others if cultivated for a long time. Second, it is also popular for leasing in horticulture plots on an annual basis. The tenants in the case of horticultural plots are mainly of

TABLE 5.3: TENANTS' AND LANDLORDS' SHARE OF INPUTS IN THE ONE-THIRD SHARECROPPING SYSTEM

Activities/ Items	*Tenant's share of inputs (%)*	*Landlord's share of inputs (%)*
Land		
Land Preparation	100	0
Making Field Borders	100	0
External input costs		
Seeds	50	50
Pesticides	50	50
Inorganic fertilisers	0	100
Organic fertilisers	100	0
Labour costs		
Sowing	100	0
Weeding	50	50
Labour cost for fertiliser applications	100	0
Labour cost for pesticides application	100	0
Harvesting the crop	100	0
Labour cost for thresher	100	
Making bundles of agricultural residues (if any)	100	0
Carting the produce from the field to the home of the landlord	100	0
Carting to market yard	33	66
Irrigation		
Cost of buying water	0	100
Labour cost for irrigating the field	100	0

Source: Field data

Vaghari caste. They stay on the plots during the harvesting season for guarding, plucking and selling the products. In the first case, the rate of leasing was around Rs. 5000 per year per hectare in 2001-02 while in the latter, the rates differed for different orchards such as lemon and guava. These contracts are renewed on a yearly basis. The fixed rent system had an approximate coverage of five per cent of total tenancy contracts in Sangpura in 2002.

3. Fifty-fifty system: In this system, all the costs of inputs and labour are shared equally between the tenant and the landlord, which includes irrigation, field preparation, harvesting and weeding. The fifty-fifty system mostly works on a season-to-

season basis. Sometimes the landlord may not contribute the actual labour for say weeding or irrigating the field. In this case, an equivalent amount of money is paid to the tenants as the landlord's share. This form of contract had less than five per cent coverage in 2002-03.

4. One-sixth system: In this system, the cost of all the inputs are borne by the landlord and only labour is provided by the tenants. This also means that the tenant takes all the responsibility for providing labour whenever necessary but the management and supervision of the farm will be done by the landlord. The landlord has to inform the tenant about the need for labour a day in advance (any time during the period of contract) and the tenant is obliged to come. This formed only two to five per cent of the sharecropping contracts in 2002-03. This contract is used on a season-to-season basis.

All the above sharecropping contracts are for irrigated crops. For non-irrigated rainfed crops, the gross production is shared equally between the owner and the tenant. This is because the use of external inputs is minimal in the non-irrigated crops and in some cases zero. The seeds of non-irrigated crops are indigenous and farmers do not buy them in the market. Instead they use the seed preserved from last season.

In all the contracts, the share of the landlord is larger than that of the tenant. In the most prevailing one-third system, two-thirds of the produce goes to the landlord while only one-third remains with the tenant. This system is based on the principle that it is the landlord who has to provide the water for irrigation. In almost all cases the landlords have a water share in a tubewell. It is very unlikely that the tenant will have a water share in that particular land, for three reasons. First, it is not practical to hold a water share in a tubewell when the tenant does not hold land in its command area. Second, the sharecropping contract is not fixed and is renewed on a yearly basis, so there is no assurance that the person would win the contract again. The third reason is clearly explained by Jhalabhai Thakore, a tenant, 'if we could afford a water share, we would have been working on our own land'.[8] He owns half a hectare of land but it is non-irrigated as he was unable to buy a share in a tubewell. His land also falls in the area where mostly Thakores own land, and there is no tubewell in the vicinity for him

TABLE 5.4: TYPES AND TERMS OF SHARECROPPING CONTRACTS PREVALENT IN SANGPURA 2002

Type of contract	*Share of input*		*Share of output*		*Approximate coverage against the total sharecropping contracts*
	Landlord	*Tenant*	*Landlord*	*Tenant*	
One-third	Land, some cost of inputs shared with tenants, water charge	Labour and input costs, share cost of weeding and carting with landlord	Two-third of net production	One-third of net production	85 %
Fixed Rent	Land	All costs involved in agricultural operations	Fixed rent per year	Profit from agriculture or horticulture	> 5 %
Fifty-Fifty	Land and half of all input and labour cost	Half of all input and labour costs	Half of gross production	Half of gross production	5 %
One-sixth	Land and all the inputs including supervision and management cost	Labour	5/6th share of gross production	1/6th share of gross production	2-5 %

Source: Field Data

to buy water. His land is thus cultivated only during the monsoon, which he thinks is 'quite erratic nowadays and one can not totally rely on it'. Without irrigation, he can cultivate only pulses such as *Tal*, and *Mag*, which are not the staple food. To feed his family he has to grow pearl millet and wheat, therefore he takes land for sharecropping.

The landlord is powerful and has the right not to renew the contract if there is the slightest threat on the part of the tenant in not adhering to the specified 'norms'. What are the rights of the tenant in this case? One rule relates to tenants' investment in buying and applying organic fertiliser in the landlord's field. It is believed that a one-time adequate application of organic fertiliser stabilises the soil moisture level and helps in keeping the fertility for two years. The landlord applies organic fertilisers once in two years when it is owner-cultivated. In the case of giving land under sharecropping, the tenant is expected to put in the same. This also provides a right for the tenant to cultivate the land for two consecutive years. If the landowner wants to break the contract before that, the landlord is expected to pay compensation to the tenant. Most of the time, the compensation is calculated through the money spent by the tenant to buy fertiliser. The case of Takhatji Thakore elaborates this further.

Takhatji took land under the one-third contract system from Bhatarbhai Patel. He sowed cotton as advised by Bharatbhai. One day while visiting the field Bharatbhai saw that cotton buds had matured and had to be harvested. He insisted that Takhatji should pluck the cotton on the very same day. First, Takhatji did not like the manner in which Bharatbhai had communicated with him. He also takes up other land for sharecropping. That day was assigned for irrigating one particular field, so he agreed to pluck the cotton the next day. Bharatbhai was annoyed and asked Takhatji to pluck cotton the same day or his contract would be discontinued. Takhatji replied that he had applied organic fertiliser in the field and so he had the right to cultivate it for two years. If the contract had to be discontinued, he should be given compensation of Rs. 5000 for 1.15 ha of land. The compensation included the charge of field preparations and application of organic fertiliser in the field. Takhatji also threatened that if he did not pay him the compensation, he would see that no one worked in his field or took it up for sharecropping. In the village, the majority of the

tenants and labourers are from the Thakore community to which Takhatji also belonged. He used this threat to seek justice and ultimately, Bharatbhai had to pay Rs. 5000 as compensation to Takhatji.

However, the tenant is not always given compensation in case of breach of contract. In a similar case, Dashrathbhai Patel discontinued the contract that was given to Kalaji Thakore just after one season, as he did not find much inclination in him to work hard for a good harvest. However, as Kalaji had put in organic fertiliser, he insisted that he would not leave unless he was compensated. Dashrathbhai's son had migrated to the USA around six years earlier and hence the family has a steady income. He said that he would prefer the land to remain uncultivated if no one comes to sharecrop it from the Thakores but he would not give the compensation to Kalaji. He claimed that due to his lethargy, he has suffered a production loss and hence did not see a point in compensating him. The matter was under dispute and for the next season, no one from the Thakore community came forward to negotiate for the contract. In the year following this Dashrathbhai could strike a contract with a Parmar family who took the land on a fixed contract at the rate of Rs. 5000 per hectare per year.

This section shows how sharecropping contracts largely favour and respond to the need of farmers owning land and water rights in Sangpura. However, there are cleavage points that do provide some rights to the tenants as the cases above suggest. Nevertheless, these rights work on a case-to-case basis and largely depend upon the bargaining power of the two individuals in the contract. For the tenant, this power could derive from social ties and bonding among the communities as the first case suggests. However, in the second case, the 'Thakore threat' did not work, due to the economic power that the Patel farmer had. This power provided him the capacity to wait for the full year due to the sustained income from his son who worked in the USA. The problem is that these situations are increasingly common as more and more people from the upper income strata diversify from agriculture. In the next section, I examine how sharecropping interlinks with land, labour and water markets, favouring the class of landlords.

Land, Labour, Water Interlinkage in Sharecropping

Above I showed the increased incidence of sharecropping in Sangpura and how this is closely related with the rise and fall of water markets (Table 5.1). In periods with a sharp decline in water markets, the incidence of sharecropping increased strongly. This section looks into the rationale of taking up sharecropping from the point of view of both the tenant and the landlord and answers the question: what is the interlinkage between land, labour and water markets under sharecropping arrangements?

The economics of sharecropping[9]

In order to understand the rationale of increased occurrence of sharecropping in Sangpura, it was worthwhile to understand the economics behind it. The information collected from the farmers for five major crops that are cultivated through sharecropping is presented in Table 5.5. It shows that the net gain for the labour share is highest in castor, a cash crop, while it is lowest in pearl millet, which is a food crop and mostly used for household consumption. For a large part of the village population, especially the poor, pearl millet is the staple diet. Wheat supplements pearl millet for the medium and upper strata of people. The net gain for labour is second highest for wheat. From the landlord's perspective, the net gain for the land component is highest in castor followed by cotton and pearl millet. For the water component, the gains are highest in castor while it is lowest in mustard. This is mainly because castor is an eight months crop spreading between monsoon and winter season and needs around eight irrigations. The winter crops of cotton and wheat need a similar number of irrigations, and because of this reason the water charges are almost the same for castor and other crops while the cash value of the yield is much higher.

How are these figures useful to understand the rationale behind sharecropping? The contract includes a two-thirds share for the landlord as the land and water right rests with them. Therefore, the profit for the landlord includes the net gain from land and water components together. The tenant gets the return from the labour days invested into agriculture through sharecropping. In Table 5.5,

TABLE 5.5: PER HECTARE NET GAIN FOR LABOUR, LAND AND WATER COMPONENTS IN SHARECROPPING, 2002-3

Crops	*Gross production per ha equivalent in Rs.*	*1/3rd share of gross production in Rs.*	*Labour component investment*		*Labour component net gain (in Rs.)*	*Landlord's investment (in Rs.)*	*Land component net gain (in Rs.)*	*Irrigation costs (in Rs.)*	*Water component net gain (in Rs.)*
			Cash in Rs.	*Labour days*					
	a	*b =a*0.33*	*c*	*d*	*e = b-c*	*f*	*g = b-f*	*H*	*i = b-h*
Castor	50666	16720	3026	82	13694	1926	14794	4709	12011
Cotton	29989	9896	3081	98	6815	3494	6402	4514	5382
Mustard	17956	5925	1850	38	4075	1255	4670	4496	1429
Wheat	25272	8340	2311	63	6029	3547	4793	4613	3727
Pearl millet	23590	7785	2345	72	5440	1529	5820	5880	1905

Source: Field data

Note: For the land component, the net gain was calculated by deducting total cash expenditure from the share of produce. For the labour component, the total cash expenditure was deducted from the share of produce. This figure does not include the price equivalent of the number of labour days invested as it is seen as overall return from the produce of labour, which is different from the concept of working as wage labourer. For the water component, the irrigation schedule was looked at for each of the farmers and the amount paid by them for the water. This cost was deducted from the water component share so as to calculate the net gain. At the time of fieldwork, the crops of mustard, wheat and pearl millet had very different yields, and for some farmers especially the small holders, these crops failed. Thus, this analysis does not reflect the normal situation for these crops as yields are normally higher.

During the financial year 2001-2003, the value of one US $ ranged between 47.5 – 49 INR (Mehra, 2004).

the labour component net gain excludes the market equivalent of the labour price. This is because a tenant is viewed from the perspective of an entrepreneur rather than a wage labourer. Taking a step further in analysis, the actual profit for the three components is calculated. The profit of the labour component is calculated by deducting the prevailing market price of the labour days invested from the total rupees equivalent of the share in produce. This excludes the supervision and management cost that the tenant puts in apart from manual labour. Similarly, for the landlord, the time invested in supervision is minimal, so the calculation excludes the wage equivalent of the supervision cost. The actual price of water paid by the landlord is deducted from the total share to arrive at the profit.

TABLE 5.6: INVESTMENT AND PROFIT FOR LABOUR, LAND AND WATER COMPONENT

Crop	*Labour component*		*Land component*		*Water component*	
	% investment	*% profit*	*% investment*	*% profit*	*% investment*	*% profit*
Castor	52	26	14	41	34	33
Cotton	50	14	22	47	28	39
Mustard	39	26	13	56	47	17
Wheat	40	25	26	42	34	33
Pearl Millet	45	18	11	62	43	20
Average (all crops)	45	22	17	50	37	28

Source: Field data

Note: The investment for labour component here includes cash investment plus the cash equivalent of labour days incurred. The market rate for a labour day during 2001-03 equals to Rs 50. The land and water component cash investment is in Table 5.5 which is calculated here as percentage. Figures rounded up to their nearest whole number.

Table 5.6 shows that for the tenant, the profit ranges from a maximum 26 to minimum 14 per cent while for the landlord it fluctuates between a maximum of 82 per cent to a minimum of 74 per cent. This means that in actual sense, the one-third sharecropping system is never exercised as the average profit ratio for the landlord and the tenant is 78:22. However, this figure excludes the profit that the landlord makes from the sale of water. The market rate of the irrigation price includes the cost of

electricity, maintenance of the tubewell and a profit margin for the shareholders. In the present analysis, the irrigation cost is calculated taking the prevailing market rate and includes the profit of the shareholders which is calculated separately. If that cost were to be calculated, the net profit would further move towards the landlord.

The tenant's rationale

The analysis above indicates the flow of surplus from the tenants to the landlords through labour appropriation. However, a very important question that follows is the rationale for the tenant to take up sharecropping even if the situation is exploitative. There are three main motives for the tenants to take up sharecropping despite being aware of the terms, conditions and the situation that favours the landlord. First, the present tenants are smallholders (and former water buyers) who have been pushed out of water markets due to the significant reduction in hours of electricity supply, aging of tubewells and the consequent decline in tubewell yield (also see Table 3.9). Due to large-scale reduction in the functioning of water markets, the total irrigated area in the village reduced and the people associated with it needed work to survive. These former water buyers were a ready work force for sharecropping.

Second, taking up sharecropping also assures employment over the contract period, a situation that is in favour of tenants. Within the prevalent situation, it was the most convenient arrangement for the tenants to tie up with the landlord. Hence sharecropping is preferred. As Table 5.7 shows, the wages received by tenants under sharecropping range between Rs. 70 to Rs. 167 per day averaging to approximately Rs. 100 per day. This is double the wage for a casual agricultural worker in Sangpura in 2002. This provides a rationale for a tenant to tie up with the landlord. As evident from the Table 5.7, the lowest wage is for cotton, which is labour intensive because of the number of days required in plucking cotton. The highest wages are for castor, which is an eight-month cash crop. Pearl millet comes close to cotton as regards the return in wages. This is mainly because it has a high productivity suited to climatic areas such as Sangpura. Poor farmers also prefer it because it provides food security.

Third is the issue of the feminisation of the agricultural work force in the village. Sangpura is located in the central part of the industrialised Mumbai-Mehsana highway that is also called the 'golden corridor' of Gujarat. It has a number of small and medium industries concentrated along a 500-kilometre stretch. The

TABLE 5.7: WAGES FOR TENANTS UNDER SHARECROPPING (PER HA)

Crop	*Average labour days incurred by tenant*	*Average financial benefits of tenant (in Rs.)*	*Wages for tenant (in Rs.)*
	a	*b*	*b/a*
Castor	82	13694	167
Cotton	98	6815	70
Mustard	38	4075	107
Wheat	63	6029	96
Pearl millet	72	5440	76

Source: Field data

industries in the vicinity create a requirement for unskilled labour on a daily wage basis. The wage outside the village was around Rs.100 per day during 2001-03 while the agricultural wage labourer in Sangpura got only Rs. 50 per day. Due to lucrative options available outside agriculture for wage workers, it is convenient for male labourers of Sangpura to search for non-agricultural employment. Women do not work outside the village due to their day-to-day household responsibilities such as childcare, cooking and looking after the needs of the family members. This situation has led to increased women's participation in agricultural operations inside the village. For example, earlier, taking the grain to the thresher was the responsibility of men. This is now undertaken mostly by women. Other 'men's' jobs include field preparation and making borders. This is now largely done by means of tractors and is done by sub-contracting to the owners of tractors. Out of all the manual work in agriculture, now only irrigation is men's responsibility and the rest is slowly shifting towards women.

Table 5.8 provides the gender-segregated labour requirement for five major crops. Cotton is a highly women-intensive crop due to

the need for labour to pluck cotton buds. It is followed by mustard, castor, pearl millet and wheat. Wheat and castor require threshing,

TABLE 5.8: GENDERED DIVISION OF LABOUR (PER SEASON)

Crop	*% of man days involved*	*% of woman days involved*
Castor	42	58
Cotton	31	69
Mustard	35	65
Wheat	55	45
Pearl Millet	42	58

Source: Field data

Note: The irrigation component includes the per day wage (done by men), which is largely based on number of irrigations rather than on daily wages. For convenience, it is estimated on hourly basis and hence it may overestimate the number of actual working days for men. In Sangpura, there is no different wage rate for men and women.

which is largely men's responsibility. However, threshing is fully mechanised for these two crops and the only task for men now is to collect the grains and fill them in the bag. Harvesting of pearl millet and mustard is done manually and the responsibility largely rests with women. Therefore, even though the labour days for cultivating wheat are more for men, in physical terms, the work is heavier for women. An overall segregation of labour days shows that the responsibility of men and women are in the proportion of 40 to 60 respectively.

Box 5.1: Gitaben's working day

Gitaben Jhalaji Thakore, 28, stays in the *Thakore Vas* in Sangpura along with her husband, two children and in-laws. Gitaben's husband works as a wage labourer in a brick kiln factory. Her father-in-law, Manguji Thakore holds less than half a hectare of land in the western part of the village. Manguji worked in the diamond polishing industry until very recently, where he was engaged in cutting and polishing diamonds. The family never had enough resources to acquire a share in a tubewell but were benefited by the water sale.

(Box 5.1 continued)

They bought water for their land and grew food crops that ensured some food security for the family. Together, with the earnings of Gitaben's husband and her father-in-law's work at the diamond polishing industry, the family lived a comfortable life. However, the water market started shrinking in the area due to the reduction in electricity supply. The tubewell was also aging and hence the capacity slowly reduced. Around 5 years ago, Manguji left the job at the diamond industry as it was affected by the global slump in the market. The industry became more mechanised over the years, and Manguji could not cope with the new techniques. He was also getting old and had to leave the job. Back in Sangpura, he took 1.15 hectare of land under a sharecropping contract. Together with their own land, they have around 1.6 hectare of land under cultivation. Gitaben's mother-in-law is aged and she cannot work in the field. Though she looks after the children, managing daily household chores is Gitaben's responsibility. She gets up early in the morning at five and after finishing the usual work at home such as cooking, cleaning the house, milking the buffalo and going to the dairy to sell milk in the cooperative, she heads for the field at eight in the morning. She works in the field up to 12:30 engaged in various tasks such as sowing, weeding, harvesting, and gleaning depending upon need. After this, she returns home and cooks for the family. After the lunch, she again works from 2:30 to 5:30 pm. Gitaben also has a buffalo and after returning from the field, she milks the buffalo and goes to the dairy to sell the milk. After this she comes back home to cook for the family. How does she manage 1.6 hectare of land looking after almost the entire cultivation? Gitaben says that her father-in-law helps her sometimes; also her husband who, if he does not get work comes back to the village to help her. They take up tasks such as initial preparation in the field and irrigation as it is not supposed to be a female job. Complaining on the unequal division of labour within households, Gitaben laments 'if my husband and I have come together from the field, he will sit on the cot while I am supposed to work in the kitchen'.

However, the family find themselves fortunate to get land for sharecropping. According to Gitaben, 'if the same situation existed around 10-15 years ago, we could not have got land on sharecropping. Most of the land that is on sharecropping is with Patels. Since they have started going to the USA, they have been providing land to us. So the *dollariyo* Patels (the Patels who have relatives in the USA

(Box 5.1 continued)

earning in dollars) do not work now, and hence land is all given to us – the Thakores'. Having one's own land and water is always preferable for people but in their absence, sharecropping does provide income assurance. The number of women labourers aspiring for work is always higher than the amount of work available. Sharecropping ensures some returns for labour. What if Gitaben had more land along with a water share in a tubewells? Would it make the family happy? Ask this question and Gitaben's answer is simple: 'if we could afford a water share, we should be working on our own land and selling water to earn profit. We have to work on others' land only because we do not have any other way to live and survive'. The sharecropping is undertaken because if there is good harvest, it ensures that the family has enough pearl millet to eat for some months, if not the whole year.

Source: Field notes

The central government has fixed the minimum wage for agricultural labour per day at Rupees 86.63 under the Minimum Wages Act 1948 (GOI Undated). In Sangpura, the wages are much lower than the minimum wage as fixed by the government. As compared to real wages in states like Punjab and Haryana, where the wage for agriculture labour has crossed Rs 150 per day, wages in Sangpura and surrounding areas can be considered very low.[10] One of the possible reasons for the wages not increasing in the village and surrounding areas as compared to other parts of the country is the easy availability of women wage labourers in the case of male labour migration. The male labour generally goes out of the village to work as manual labour in Mehsana and connected industrial areas. However, the demand for unskilled labour is not very high and usually a person gets work only for 15 days in a month. The wage rates for casual labour are more than double that for agricultural labour and hence 15 days of work in non-agricultural sector equals a month's work in the village. Apart from this, there is a social taboo attached to agricultural wage labour for men and therefore they prefer to do any menial job outside rather than work as labourer in one's own village. These taboos have also generated the practice of labour sharing that is called *aras-paras*, which is a mutual sharing of labour within households. Under the system, the number of days worked in another person's farm is to

be returned by the other person working in one's own farm for a similar number of days. Working as a casual labourer is associated with loss of dignity. However, in peak agricultural seasons, there is always a shortage of labour and families help each other in harvesting the crops. This is more so among marginal farmers who cannot afford to hire labour, so aras-paras come to their rescue.[11] As of now, it is practiced within caste and extended family units. This system is not very significant now and amounts to around 20 per cent of the labour requirements in the peak agricultural season.

TABLE 5.9 SEASONALITY OF WAGE LABOUR DEMAND IN SANGPURA, 2002-03

Month	*Demand for labour*[12]	*Remarks*
Oct – Dec	70%	This is one of the peak agricultural seasons and labour demand is high. The type of work includes sowing and weeding (for mustard, wheat, *isabgol*, tobacco and *methi* [fenugreek]), picking in cotton and irrigating crops
Jan- Feb	40%	During this period, the labour demand declines as the crops are in their gestation period and as a result there is not much work apart from irrigating and weeding
Mar- Mid Apr	70%	It is the period of harvesting so the demand for labour picks up again. Apart from this, pearl millet and sorghum are also sown during this season
Mid Apr – Mid May	5%	Very low demand for labour due to the hot summer season; agricultural activity at a low
June 1-30	100%	It is harvesting season for pearl millet and sorghum. On the onset of the monsoon, people engage labour for saving their crops from rains and keeping it safely at home. The stems of pearl millet are used as dry fodder whereas sorghum is specially grown as cattle feed. Non-irrigated crops such as tal, guwar, mag and irrigated cotton are also grown. Labour demand thus reaches its peak.
Aug - Sept	30%	During this period castor is sown and non-irrigated crops are harvested which is mostly done by households themselves. Labour demand is low.

Source: Field data

Table 5.9 shows the seasonality of labour demand in Sangpura. As against agricultural labour, non-agricultural work is available in all seasons and preferred by men. Lower caste women, both in casual labour as well as under sharecropping, supplement the shortage of male labour. Around one quarter of the families in Sangpura work as casual labourers. 70 per cent of these workers come from the Thakore community followed by 20 per cent from Parmars and ten per cent from Vagharis. The participation of lower caste women in agricultural operations have increased, adding to their burden (See case box 5.1). Kodoth (2004) documents similar experiences in the southern Indian state of Kerala, where greater male occupational mobility has increasingly shifted the balance of responsibility for farming to women. Citing a number of case studies, she shows that, due to gains from education, employment and migration of male members to the Gulf countries, some households moved up in the income ladder. For others who still derive their primary livelihood from agriculture, considerable change in women's work pattern was observed. This is in a context where 'agriculture is no longer perceived as a gainful or viable occupation in Kerala and the value of agricultural land is low compared to its real estate value. The decline of agriculture has gone alongside pronounced male occupational mobility away from agriculture and outmigration processes that have pushed women to shoulder increasing responsibility over farming and family property' (ibid.: 1918). She considers the outcome of such processes as increasing insecurity and vulnerability of women. Comparing this with Sangpura, the sharecropping system is an escape route as wages are much higher under sharecropping equivalent to the share of food product. Working as a labourer under sharecropping avoids the stigma of hiring oneself out as wage labourer.

The landlord's rationale

The rationale for the landlord to offer land for sharecropping is two fold. First, as the data presented in Table 5.5 shows, one-third sharecropping is the best option for the landlord as it combines land and water share components. Hence they appropriate two-thirds of production. Further, the average percentage of the cost share for labour, land and irrigation comes to 45, 17 and 38

respectively. Among all costs, the percentage of labour costs are the highest followed by cost of water. The tenant, who shares 45 per cent of total costs, gets around 22 per cent of the profit while the landlord who shares 55 per cent of the total costs receives 78 per cent of the net profit (see Table 5.6). This profit sharing makes the one-third sharecropping system a preferable mode of renting out land. Further, the landlord also saves the costs otherwise incurred in supervision and management. The crops are virtually looked after by the tenants, including the day-to-day management.[13]

BOX 5.2: Going abroad

Around 100 people from this village alone have migrated to the USA. Going abroad is an aspiration that cuts across all groups in the village. There are many agents operating in the village who send young people to the USA and other places legally or illegally. In the first one week's stay, I could see two such people visiting village elders and convincing them about sending their sons abroad. On a couple of occasions, I was mistaken as an agent who sends people to the USA and was asked about the present rate. It costs a lot to go abroad. The rate has increased after the terrorist attack in the USA on September 11, 2001. Now it touches up to Rupees 2 million. People borrow from friends, family and outsiders to go abroad. There are agents working right from the top to the village level. Most of the people who go to the USA are graduates, but they work as labourers in various places. The borrowed money is returned within two years of the person reaching the USA after which a regular income is assured for the households. Some of the people who have paid up the borrowed money have rebuilt their houses and invested in new tubewells. Two new tubewells that have come up in Sangpura in the last three months belong to Patels whose sons are in the USA.

Source: Field notes, November 2001

Second, from 1990 onwards Sangpura and surrounding areas in Mehsana district experienced large-scale long-distance migration of the upper class farmers, mostly Patels (see Box 5.2).[14] In Sangpura also, out of around 200 families of Patels, 100 families have close relatives such as a brother, father or first cousins in the USA. Most of them migrated illegally, paying a huge amount of money to agents. The process started in the early 1990s and is still operational

BOX 5.3: The USA rationale: A friendly chat with Kalpeshbhai Patel
Kalpeshbhai is in his early 20s. He studies B Com in Mehsana. He belongs to one of those families in Sangpura that could be categorised as big farmers. Kalpeshbhai also looks after agricultural operations on his family's land, most of which is on sharecropping. His father migrated to the USA in 1997, working in a motel in Georgia State. He earned around six US $ an hour in 2002 and worked for 12-14 hours per day. His boarding and lodging was arranged by the owners of the motel who are distant relatives. Kalpeshbhai owns a share in one of the tubewells and has initiated a new tubewell where the family has more than a 50 per cent share. His brother owns a confectionary store in a nearby town. Like his father, he too wants to go to the USA but since his father had gone there illegally, he cannot invite him unless he surrenders himself as an illegal migrant. His father paid Rs. 700000 to the agent, which has already been repaid by him. Kalepeshbhai says 'going to the USA has many advantages. As you invest in a tubewell, we invest in people who work in the USA for their family. With one person's work, the whole family is at an advantage back home. People going from the village to the USA earn around 1000–1500$ per month and after deducting the cost of living, they save around 500-1000$ a month. This money travels back to Gujarat and supports the family. It also increases the status and respect of the family in the village. For the first year, the family repays the loan that it had taken from the 'market' to pay the agent. The second investment is to improve household infrastructure such as renovation of the house, buying modern gadgets and items of entertainment followed by investment in tubewells and land. The fourth priority is to diversify from agriculture and invest in business like the one my brother has done. He owns a confectionary shop in another town. Some of our relatives have invested in viable businesses like medicine or small industries in Mehsana town. However, going there is not easy at all. Most of the time people go to the USA when they already have a network of people over there. In my father's case, his cousin brother's son was there in Chicago and helped him find a job. In some states of the USA, the concentration of Indians is high and hence they are not easily recognised as illegal migrants. The government there has a tough time searching for people who do not have proper visas.'

Source: Field notes, December 2002

despite the stringent policies of the government, especially after the 9/11 attack on the twin towers in the USA in 2001.[15] The migrant uses social networks to stay in the USA and works in industries owned by Gujaratis forming cheap and reliable labour for them. Some individuals work for more than 16 hours a day to repay the loan that they have taken to reach the USA. After the initial months, they start sending money back home to first repay the loan and the interest amount, and then provide income for the family (see Box 5.3). Of late, people from the Prajapati caste have joined their Patel counterparts. In the year 2003, two out of the 70 Prajapati families had migrants in the USA. This process made many families independent of agricultural operations in the village, as migration secures a considerable money income from their kin in the USA. Their houses are easily recognised. They have dish antennas and freshly plastered tiled rooms furnished with modern gadgets such as colour TV, cordless telephones and newly bought fridges. During 2001-03, three new tubewells were installed and financed solely by these families. The long-distance migration of some families has strengthened their economic base, making more room for them to bargain for a maximum share from the profit. However, the tenants have no other options but to agree to the contract, in absence of other employment opportunities. The case shows how water scarcity and increased pricing of groundwater has contributed to a 'shared' contractual arrangement. It illustrates how pricing of groundwater is either shifted or shared by the landlords in a way that favours their interest.

Unequal Crop Sharing and the New Face of Water Markets

This chapter showed that there is a transfer of surplus through sharecropping contracts from the tenants to the landlords in Sangpura. The issue becomes important given the large prevalence of these contracts and their contribution to overall village economics. In Sangpura, the incidence of sharecropping closely followed the changes in the mode of agricultural production. With the introduction of irrigated agriculture and well mechanisation, large areas came under agriculture. The technological innovation for water extraction in the form of tubewell irrigation resulted in amplifying the area under irrigation from a single extraction point and gave rise to water markets. During the 'golden years of

agriculture' in Sangpura, sharecropping incidence touched an all-time low and water sales were reported to be the highest. The water right owning community found it easy and more lucrative to sell water than to put their land under sharecropping and share the booming produce with tenants.[16]

However, this situation did not last more than a decade because of the deepening of the water table, over-cultivated lands and sharp reduction in the supply of electricity. Agriculture started to become a costly exercise with profits becoming less and less. A large share of the input costs were water costs and agriculture was no longer seen as a lucrative business for the upper classes. The reduction in electricity supply also curtailed the tubewell yield, and water markets started to shrink. Small and marginal farmers who were earlier dependent on water sales for irrigation had to abandon agriculture or take up only rainfed monsoon crops. Once again, Sangpura experienced a rise in sharecropping contracts that claimed to share the produce for land, labour and water components under the most popular one-third sharing system. In 2001-03, around 80 per cent of the irrigated area in the village was under sharecropping. Sharecropping was the new face of the water market. Water was sold to tenants in return for a one-third crop share. Technically speaking, in the one-third system, combining the share for land and water should leave at least 33 per cent of the benefits for the tenant. The analysis showed that the average net profit share between the landlord and the tenant is in the proportion of 78:22. This is against the share of average investment, which is in the proportion of 55:45 for the landlord and the tenant respectively. This ratio does not include the cost of supervision and monitoring on the part of the landlord. This is reduced to a minimal level when land is given on sharecropping. On the contrary, the supervision and monitoring cost lies with the tenant which is not calculated here as its investment cost. Thus the labour days invested by the tenant are much higher than that of landlord. Under sharecropping, the risk of agriculture is shared with the tenant in an unequal way. The profit share is unequal against an almost equal input sharing. This is an economic relation of inequality where surplus is generated by the landlord through controlling the labour process under sharecropping by virtue of the property right in land and water. This surplus flows towards the landlord through unequal profit share in a situation of extreme

scarcity of water, where agriculture is characterised by lower productivity and negative growth.

What is the theoretical significance of the case of Sangpura? The theoretical literature found on sharecropping can be broadly divided in the neo-classical and Marxist streams of thinking. However, both relate to the 'economic' logic of sharecropping dealing with risk sharing (Cheung 1969), incentive effects (Stiglitz 1974) and moral hazards (Dubois 2002) in principal-agent models. Sharma and Dréze (1996) considering sharecropping as a 'puzzle' in economics, demystified it on the ground of common sense and basic economic analysis in a village of north India. The authors looked at sharecropping from the partnership perspective that involved both conflict and cooperation between landlord and tenant especially in the case of modern agriculture. An excellent review of literature is available elsewhere and hence I am not focussing on it here.[17]

Instead, I focus on the social relations of production and try to understand 'sharecropping as a part of the changing fabric of history and as a relationship that is a product of certain social and economic contingencies' using the analytical framework developed by Pearce (1983:42). He suggested that share contracts are a particular method of surplus labour appropriation in contexts where 'class relations are such that the decision concerning the nature of the contract lies with the landowning class, but where the costs of supervising production are potentially large' and where the tenant is 'insufficiently endowed with resources to allow him to discount income variance as a decision variable' (ibid.: 65). The case of Sangpura too suggests that the social relations of production and control of the labour process become the crucial characteristics of sharecropping logic. The 'partnership' concept of sharecropping as a product of bargaining between the landlord and the tenant, as described by Sharma and Dréze (1996) does not hold much meaning in Sangpura. 'Bargaining is meaningful only if both parties enjoy more or less symmetrical economic power' (Bhaduri 1983: 88). This is hardly the case in Sangpura where land - and water - owning Patels and Prajapatis strike a deal with marginal and near landless Thakore and Parmar households. In the village, the sharing of the net profit under sharecropping is on the basis of the proportion of the cost contributed including the labour cost. In a partnership arrangement, reward should ideally be proportion to

the input, which in turn is, proportional to the contribution to the production process. I showed in Sangpura that two parties – the landlord and the tenant - contribute to cover the costs of a production process in certain proportion but benefits differently and disproportionately. This is because the landlord exploits the tenant's labour by virtue of holding property right for land and groundwater. The 'partnership perspective' does not problematise the social relations underlying the sharecropping arrangements and do not question the issue of disproportionate right in land and water. This exploitation of landlords is strengthened by the new economic power gathered through long distance migration, which virtually makes them independent of agricultural operations. Marginal and near landless farmers are at the forefront of this changing situation. For them, it is an agrarian trap characterised by land degradation and water scarcity embodying increasing prices and lower profit for sustenance.

von Benda-Beckmann and Benda-Beckmann (1994) look at social organisations, institutions and norms from the perspective of social security which refers to ways in which individuals, households and communities protect their livelihood and are protected socially against the shocks and stresses that threaten their stability. People's choices are responses to the uncertainties and eventualities of daily life and therefore their strategies to combat them are mostly non-state and localised. The migration and patterns of sharecropping in Sangpura could also be viewed from this perspective. Migration can be both a source of and response to insecurity that couples local networks with wider networks in an area where state provisions are better accessible with more economic opportunities. Nooteboom (2003) documents various approaches to social security to understand the persistence of poverty and vulnerability. His analysis shows that some people are better equipped to cope with risks and uncertainties and wealth is an obvious discriminating variable. Poor people face more risks and uncertainties in their lives than those who are better off as they are more vulnerable and often have less ways and means to cope with adversities. Chakravarti (2001) narrates the changes in production relations brought about by green revolution technology and canal irrigation in north Bihar, which led to a decline in the sharecropping system because it became less profitable for landowners. The tractorisation, intensive cultivation and

interlocking of credit and product markets compounded the plight of sharecroppers, resulting in their indebtedness and eviction from agricultural operations. Sharecropping as an institution started to decline and gave rise to the emergence of new production relations based on wage labour. Thus, 'technology plays a catalytic role in the transformation to a new regime of production relations' leading to the landowners becoming directly concerned with the labour process making the issue of tenancy reform obsolete (ibid.: 100). A similar process could be observed in Sangpura, where the new tubewell technology paved the way for sharecropping leading to a demise of the institution when the water market was booming. However, when the groundwater and agricultural operations started to become more expensive, the institution was revived. It used the cheap labour force of lower caste women, who were evicted from direct cultivation due to shrinking of command areas and declining water markets.

An important question that follows from this is whether this nature of production relations and labour process produces conflicts leading to class struggle. As analysed, there are areas of disagreement but there are no open and organised conflicts against the landlords. As seen in chapter 3, the relations of exploitation in Sangpura are embedded in the class structure based on production relations and the labour process. Together, they provide the impetus for landlords as a class to decide the nature of labour exploitation and surplus generation. The necessary condition for class struggle is class formation, that is: the transformation of classes-in-themselves into classes-for-themselves (Das 2001). This is hardly the case in Sangpura. A possible explanation for the lack of 'open' conflict is the consolidation of inequality through the caste system and economic dependence on the upper classes for day-to-day survival. The exploited classes are overtly divided in hierarchical caste systems placing one against another, although together they form a decisive majority.[18] The lack of agency of exploited classes inhibits them from associating with their other exploited counterparts for exerting collective pressure on their employers. This comes from their dependency relationship with the landlords, which deters them from forming economic agency in the labour market and political agency in class politics (Chakravarti 2001: 286). In addition, landlords as a class have also been changing over time, trying to see that the situation is not too

exploitative to generate conflict. As a Patel farmer puts it, 'if you keep your pet dog hungry, it may turn against you even though it is loyal to you...so you have to give them food from time to time for them to be faithful'.[19] The sharecropping arrangement in Sangpura does give advantages to tenants in satisfying their need for daily survival. These arrangements are also nurtured through social and credit ties where the tenant feels obliged towards the landlord. This makes them too passive to raise issues of inequity. Therefore, it is very unlikely that subtle conflicts will result in class struggle. The costs of that seem too high and the potential benefits too low to take the risk of open confrontation. Another aspect of this is the active support from the political class working at the level of the state, which upholds and protects the interest of the propertied class. I analyse the nuances of this in the next chapter.

Notes

[1] I am thankful to Esha Shah and Deepa Sonpal for the English translation of the original Gujarati saying.

[2] Here I follow the definition of sharecropping as described by Cheung (1968). According to him 'share tenancy is a land lease under which rent is a contracted percentage of the output yield from the tenant per period of time. As a rule, the landowner provides land, and the tenant provides labour; other inputs may be provided by either party. Share tenancy (or sharecropping) is thus share contracting, defined here as two or more individual parties combining privately owned resources for the production of certain mutually agreed outputs, the actual outputs to be shared according to certain mutually accepted percentages as returns to the contracting parties for the productive resources forsaken' (ibid.: 1107).

[3] *Kos* is an irrigation device operated manually using *barad* (draught animal). It has a bag made up of camel leather attached to the well with rope. The barads are tied up with the rope that is attached to a wheel. When barads move in a circle, the water comes out of the well. The device resembles a Persian wheel but is different in design.

[4] Bhagiyo is a Gujarati word that means sharecropper. It originates from the word *Bhag* that means share or division.

[5] Dhani originates from the word *Dhan* meaning wealth. Dhani is someone who possesses wealth. The landlords in Sangpura and elsewhere in north Gujarat are addressed by this term.

[6] In order to understand the coverage of sharecropping, I undertook a

stratified random sample survey of households engaged in agriculture in the winter season of 2002-03. The figures in the Table 5.2 refer to the proportion of leased-in land to the total land holding of the members participating in the survey.

[7] The information represents sharecropping contracts during the winter season 2002-03 collected through a stratified random survey of 65 households (approx. 10% of the total households engaged in agriculture). Unfortunately, the survey missed a representative sample from the total 12 households in Sangpura that have more than five hectares of land. The table, therefore, does not provide information about households falling in that land class. Eight per cent of the total households in the survey were both leasing in and leasing out.

[8] There are a few cases where people have invested in tubewells but do not own land in the command area of that particular tubewell. However, these cases are exceptional.

[9] In order to understand the economics of sharecropping contracts, I interviewed 85 farmers engaged in a sharecropping contract selected through stratified random sampling. The input-output data of five major crops were taken in the year 2002-03. The time of interview ranged between July 2002 and April- May 2003 to cover the three seasons – monsoon, winter and summer.

[10] Sidhu and Singh (2004) correlated the status of agricultural wages and employment in Punjab with the introduction of technology. Due to stagnation in the growth of agriculture, a decline in demand for labour was observed. However, since 1980s, the wage rate had tended to rise faster than commodity prices, machine use prices and prices of herbicides. The index for wage rate with respect to output price (base 1981-82) rose to 176.63 in 1998-99 for wheat and to 156.82 for paddy. Correspondingly, the wage rate index with respect to price indices of machine use and chemicals use rose to 191.57 and 203.88 respectively for wheat and 174.56 and 174.77 respectively for paddy.

[11] A popular Gujarati saying *'Sapey maryo ane lathi na tute' was* used while narrating the incident. Translated literally, it means 'killing a snake while saving the stick'. In the present context, it means gaining both ways. Here, by exchanging labour among caste/kinship/neighbours, one does not acquire the indignity associated with hired labour while it fulfils labour requirements.

[12] This is a qualitative scale as expressed by wage labourers and shows the percentage of actual labour absorption to the total labour available for agricultural work during the time period. It is based on the interviews conducted during October 2001 to March 2002 in the village.

[13] As compared to the tenant, the landlord's time investment in the sharecropping arrangement is minimal. The only time investment is

during harvesting of the crop and selling it in the market. However, it was observed that the landlord keeps a vigilant eye on the whole affair through an elaborate social network. For example, if any other person who has passed by the land of a particular person who has given it on sharecropping, and if something unusual is seen such as pest attack or any other eventuality, it would be instantly communicated to the one who owns the land. These information bases work mutually and save the time of the landlord from day to day supervision. The evening gossip groups, which are based on class and caste affiliations also discusses the behaviour patterns of tenants or other crucial issues. These platforms also help in the management of farms by landlords. Similarly, the same also works for other groups.

[14] Patel and Rutten (1999) discuss the emigration patterns of Gujarati Patels. They report that about two million persons from south Asian origin reside in Europe, the US and Canada. More than half of them, that is, about 1.26 million live in the UK. About 35 per cent of Gujaratis living in the UK are Patels.

[15] During my fieldwork in 2001-2003, two people from the Patel and one from the Prajapati caste migrated to the USA.

[16] Shah (1993: 51-52) illustrated three types of contract in the water markets. The first included labour contracts, in which the buyer provided labour and draft power to the seller in return for water. The second was in terms of a crop-sharing contract where the seller provided water while the buyer provided land, labour, manure and other inputs and they shared the crop. The third included crop and input sharing contracts where the buyer provided land and labour while the seller provided water and both shared other input costs and output. The seller's share in output ranged between 33 and 50 per cent in the second contract while it was between 50 and 66 per cent in the third contract. Shah considered it an indication of the development of water markets and the level of maturity where the multiplicity of 'kind' contracts gives way to cash payments. In Sangpura too, at the peak of water markets during 1980s and 1990s, the kind-based transactions gave way to hourly supply of water based on cash payments. Sharecropping was at its lowest during this period.

[17] For review of the literature on sharecropping, see Pearce, 1983.

[18] This is contradictory to Patnaik's explanation that exploited classes are not yet a decisive majority in most regions of India, which weakens their organisation against exploiting classes (Patnaik 1999: 205). In Sangpura, they do form a decisive majority but are divided and unable to form a force against landlords.

[19] Personal interview, Bhikhabhai Patel, Sangpura, September 23, 2002.

6

Strategic Alliances and Everyday Village Politics in Sangpura

We don't give privilege for every one to ally with us. Have you ever seen a velvet cloth being stitched with jute thread?
- A Patel Farmer

This chapter looks at the everyday village politics of Sangpura while focusing on the distribution of power in the community. It is about the reproduction of economic and political dominance by powerful social groups in the village. The previous chapter have shown a largely unformed collective contestation of the domination by those who are not at the centre of power. This chapter closely examines the everyday contestation of power and politics in Sangpura showing how it generates social power for dominant classes, first from the control over economic resources and second, by maintaining the social and political hierarchy. It also leads to increased struggle between various social groups for control over critical and symbolic resources. The chapter shows how caste is still the main vehicle of social, political and economic organisation, which is closely linked with state politics and the way different local actors engage in broader society.

The chapter is organised in two parts. The first part discusses the constitution, basis and legitimacy of social power and defines everyday village politics. It shows how individuals and caste groups organise and contest for increased control over resources. The second part discusses how the structure of power and politics at the village level is reflected in the control over three formal

institutions in the village – panchayat, dairy and credit cooperatives that reemphasise the sources of legitimacy and power for the influential groups.

Social Power and Everyday Village Politics in Sangpura

Power is a concept variously used in the sociological literature and broadly falls in the purview of political sociology.[1] Max Weber's interest in understanding power is most prominent in the sociological literature. According to him, 'power is the chance of a man [or woman] or a number of men [or women] to realize their own will in a social action even against the resistance of others who are participating in the action (Weber 1978: 926 quoted in Béteille 2002: 158). The broad framework provided by Weber influenced sociologists and social anthropologists as they encountered social situations, processes and relations that had a manifestly political component. Sociological enquiry, thus, focused on the 'distribution of power in political communities'. Further, the study of 'the political aspect of social associations and social aspects of political associations' provided new grounds to understand para-political processes at the local level (ibid.: 159-61). Accepting the Weberian concept of power as an individual's ability to force others to do things, Adams (1975) identifies two types of power – independent and dependent. Independent power is the abilities and capabilities related to knowledge, skills and systematic attributes of social units to control relations of dominance. Dependent power is when someone gives another a right to make decisions on their behalf. However, in politics, according to Adams, power is constituted by resources and hence is directly dependent on an agent's access to various resources. Kurtz (2001) discusses how 'political agents create, compete for, and use power to attain public goals that, at least on the surface, are presumed to be for the common good of a political community. Yet just as often and more covertly, political power is used to attain private goals for the good of the agents involved. Without power, political agents are ineffective and probably ephemeral' (ibid: 21).

Operational definitions of power in India came from a number of empirical studies that defined how it is constituted in society. Chakravarti (2001), in a study of class relations in north Bihar, define three kinds of power - economic (class), coercive and social.

According to him, 'class power is derived from preponderant control over means of production that is intertwined with the social power derived from belongingness to a dominant caste. The coercive power exercised by the community is inextricably connected with these two dimensions of power and together they form the capacity to exercise decisive control over the village community' (Ibid.: 286-93). Ruud (2003) studied village politics in West Bengal and documented the changes brought about in rural society through leftist political development. The study investigated the interaction of cultural changes and the mechanisms and tools of village politics, showing how these politics affect and was affected by political and ideological changes in larger society. Critically looking at the 'traditional' studies of village politics that focused on concepts such as caste, faction and patron-client relationships, Ruud worked through the 'everyday village politics' where society consisted of many layers and groups of individuals engaged in political relationships. Politics for him is 'all activities related to struggles over material, social or symbolic resources and is merely a set of social mechanisms for the daily regulation of community affairs and distribution of scarce resources' (Ibid.: 4-5). In her study of tank irrigation technology and agrarian transformation, Shah (2003) defined power that 'reproduces itself by reproducing the societal ability to produce, but not without reconstitution and displacements' (ibid.: 18). According to her, power not only shapes the social phenomenon of reproduction and transformation in the relations of power but also, on the contrary constitutes it. In Sangpura too, politics is a sphere of activity connected with relations between castes and social groups that constitute the basis for deriving social power. In order to understand this, I first illustrate castes and their strategy of organisation in Sangpura, describing how different social groups organise themselves to derive and exert social power through everyday politics. Control of three important institutions in the village the panchayat, dairy and credit cooperative is part of everyday politics to maintain and sustain the level of control over various village resources and in turn derive more power to manoeuvre them.

Castes and the Strategy of Organisation

Prior to Independence in 1947, Sangpura, along with other villages in the region, was ruled by the Baroda State (see chapter 2). Darbars in those days were feudal lords under the *Ryotwari* system while the Thakores were *Padi* (footman soldiers) employed by the Baroda State Army. Being in the army, they also looked after the revenue collection and served as *chaukidars* (watchmen) of land and property. The Thakore's role as chaukidars enabled them to appropriate part of the property that was considered fallow. The population pressure on land was not very high during the pre-independence era. Hence, Thakores could appropriate land without much opposition from other communities. Patels were the landowning caste ancestrally, but in Sangpura and other surrounding villages, Thakores and Patels were at par in terms of landholdings. Thakore claimed to be the descendants of Rajput rulers and hence adopted their rituals. The Patels argued that Thakores made merry by engaging in drinking, gambling and eating meat like Rajputs! In a largely vegetarian society they were thus considered polluted and disgraced in public.[2]

Soon after independence and with the end of the British Raj, the services of Thakores were terminated and the power associated with them slowly got lost. Agriculturist Patels took advantage of their skills in the booming agricultural sector, a situation for which Thakores were not prepared. This was the time when irrigated agriculture was introduced and the Patels along with Prajapatis went ahead with it in a determined way. This was the time when dug wells were drying up and farmers were losing access to water due to increasingly mechanised irrigation. During the early 1980s when dug wells were replaced by deep tubewells, the Patels and Prajapatis had the initial advantage over the Thakores because they owned significant numbers of wells.

Agriculturist Patels[3] came to Sangpura from Dholka and Viratnagar in Ahmedabad District around eight generations back. Having an agriculturist background, Patels had the skills and knack for generating profit from agriculture. They were also very cognisant about their economic and social standing. As described by one of the Patels of Sangpura, they worked on the principles of being organised, saving money and working hard to earn more money. Patels organised themselves through caste and kinship

institutions. They started some of the early informal credit cooperatives within their caste, which used to give loans to other Patels through self-help groups. The organization around savings and credit institutions, coupled with investment in agriculture, led them to prosper in the village. Patels also took advantage of the loans given by the Gaekwad State for shallow wells. They had started growing cash crops such as sugarcane and cotton at the time of independence. The mechanization of dug wells also earned them money through limited sales of water.[4] By 1960-70, Patels generated enough surpluses from agriculture to advance consumption loans to people of other castes such as Thakores. The condition of such loans was to extend the right to cultivate their land till the loan amount was repaid. In most cases the repayment did not happen and the land stayed with the Patels. Slowly, part of others' land was transferred to Patels. When the dug wells dried up in the early 1980s, Patels were the first ones to invest in deep tubewells, followed by Prajapatis who went along with the Patels on a similar path. Thakores on the other hand did not organise themselves in similar ways and were not able to acquire credit in the market due to their convivial image. This became advantageous for the Patels, who dominated in the socio-political arena.

As against the Thakores, Prajapatis were more organized, confident and on an equal footing with Patels. Though their traditional occupation was pottery, there were two basic divisions among them. While one group took up pottery as a profession, the other group was engaged in agriculture. Though initially they had little land in the village, Prajapatis became landowners through diversifying their occupations. They took up the profession of brick making, which was close to their traditional occupation. Brick production exposed them to urban areas in Mehsana and Ahmedabad where demand for bricks was increasing due to city expansion. This exposure also showed them opportunities to work in the textile mills of Ahmedabad. Back home, they became close to Patels who taught them the skills of commercial agriculture. They bought shares in tubewells and benefited from the agricultural boom and water markets. Apart from benefiting from increased income in agriculture and surplus created through work in the textile mills of Ahmedabad, they also gained employment in diamond polishing industries in Mehsana and Surat. Tribhuvandas Madhavlal Prajapati was one of the many people who went to

Ahmedabad to work in the cotton mills during the peak of industrialization in the 1960s and 1970s. The timing coincided with technological changes in agriculture. According to him, Prajapatis and Patels went to Ahmedabad to work as industrial labourers and stayed in slums and *chawls* (one-room houses). This had an effect on the household economy as the pressure on land reduced. These industrial workers pooled money for the external inputs that were required for the new technology. The non-residents supported many mechanized pumps that were purchased at that time. This made life easier for the ones who stayed in the village, as there was increased production from agriculture on one hand, and fewer people to support on the other. But this was not the case for all the people in the village. Only 25 per cent of families had a member working in the mills at Ahmedabad and in nearby brick kilns.

The Parmars of Sangpura came from neighbouring Aakhaj village around a century and half ago. In Sangpura and elsewhere, they are organised through a lineage-based system. Though they occupy the lowest position in the social hierarchy in the village, some of them do hold economic power. This power also flows from the larger political organisations that helped them in accessing reservations in government jobs for scheduled castes provided under government. Within the community, there has been other social action, which provided impetus to their upward move. The majority of Parmars in Sangpura have become *Kabirpanthi*, the followers of the famous sufi Saint Kabir, who is part of the popular *Bhakti* movement, which challenged orthodox Hindu religion for the right to worship. Kabirpanth became popular among lower caste families in the movement of social upliftment, who derived cultural legitimacy by being vegetarian and practicing non-violence as advocated by the sect. The Kabirpanthi group in Sangpura has its followers largely among Parmars. A few Thakores also observe the regulated life of offering prayers, and denouncing non-vegetarianism. A second element of social mobility is related to the caste-based organization and search for political identity of Parmars. In Sangpura, they are a part of 282 *nath* (conglomeration of families) who are traditionally organised and further divided between the collective of 60, 42, 27 and 27 families spread over the district. These families have their traditional leaders who meet whenever any critical decision has to be made. The nath has developed its own code of conduct for marriage and death

ceremonies and other social activities that are binding for all. If they do not abide by them, a fine is levied, which may be followed by casting out from the community and social ostracism. Up to 2002, there had been no case of deviation from these rules. The nath is a traditional social organisation, but it is conscious of the new challenges that the community is facing. Their rules therefore are changed according to the circumstances that are in the interest of the larger community. For example, earlier a death ceremony used to involve lots of money. Many families in the community were indebted by repaying loan incurred when trying to fulfil their social obligations. The nath took note of this and a new rule has been enforced that does not allow any individual or family to have rituals during a death ceremony. Similar rules restricting dowry and gifts have been evolved for marriage and other social gatherings. Similar caste-based organisations have been found among Patels and Prajapatis, but are not very strong among Thakores. Although many Parmar families in the village are landless and live below the poverty line, some families have taken advantage of reservations and have accessed government jobs. Since they did not hold much land, there was not much emotional binding to place. Hence they could easily leave the village. The government jobs provided the much needed economic independence that in turn helped them to have a sustained income. Not all Parmars could procure government jobs but a significant number did manage this. By 2002, these Parmars families can align with other social groups to add to their power.

One question therefore is how these caste groups organize themselves to increase their control over resources. I describe some of these strategies through the accounts of prominent individuals and power-wielders of four prominent castes – Thakore, Patel, Prajapati and Parmar.

Case 1: Somarji Lilaji Thakore

Somarji (48) is one of the prominent opinion makers for Thakores in the village. This is primarily because of his position as a manager in a government insurance company in Mehsana. Having a government job, he earns a steady income. He has invested in buying land and shares in a tubewell from the income. Over the years, he has become one of the few people from the Thakore caste who is well off. In the year 2001, Somarji invested in a deep

tubewell where he is a 50 per cent partner and which irrigates around 10.5 hectares of land including his 3.5 hectares. This tubewell is 220 meters deep and is powered by a 52 hp engine. The total cost of the tubewell came to Rs. 650000 out of which Somarji spent Rs. 325000 as 50 per cent partner. Though the tubewell has the capacity to irrigate more than 10.5 hectares of land, there are no water buyers in this part of the village due to the high density of tubewells. He recounts, 'My father held only 1.15 hectares of land out of which I sold 0.5 due to economic need in the beginning. We are two brothers out of which I am serving outside and my brother is engaged in agriculture in the village. I was good in studies and I studied up to 11th standard at the school in Jagudhan. We were poor, so it was with a lot of difficulty that I could get admission in the college due to lack of money. It was the time when Chimanbhai Patel was the Chief Minister of Gujarat and the state was witnessing Nav Nirman Abhiyan (approximately during 1974-75 – see foot note 10 for details). For three months, the schools were closed and examinations withheld. When the schools resumed, I stood first in the class. I went to college and after finishing college, I saw an advertisement in the paper for the post that I am holding now. I filled in the form and got through. I am a self-made person. I have made a new tubewell this year with five other bhagidars. There was a person who sold the electricity connection that we bought for our tubewell as the government is not providing new electricity connections now. This connection was closed for some years and the government policy stated that it will be re-registered only on a pro-rata basis and not on a flat rate basis. The rate is 50 paisa per unit, which is expensive compared to the flat rate charges based on horsepower. The electricity charge for a general tubewell is around Rs. 25000 per year. For us it is Rs. 50000 per year, due to which the cost of water is higher from our tubewell. We will have to pay the Gujarat Electricity Board every month but the sale of water is charged on a season-to-season basis. Therefore we have to pay that much money every month from our own pocket and then get it from people at the end of the season. In the peak season, the tubewell runs for around 20000 kilowatt units costing up to Rs. 10000. Altogether, now it is a no profit no loss business but if the electricity charges go up, it may be difficult for us to survive. As of now, we are surviving due to the dairy farming as the agricultural residue goes back to cattle as fodder and provides us cash every 15

days. Having a new tubewell is almost impossible for people and only the rich can afford it now'.

'There are around 225 Thakore families in this village that make two-thirds of the village population. According to our ancestors, Sangpura is around 1200 years old and was fully destroyed three times in history. The recent history of destruction dates back to the Mughal period when they invaded the village and three people from the Thakore caste died in the clashes. The village was first inhabited by the families of Saukabhai Desai, and Sangpura derives its name from him. The next set of settlers were Patidars (today's Patels) and Thakores. Two families of Thakores came from villages called Meu and Padhana. The Thakores of Sangpura thus have two differentiations within them - Mehua and Padharia, deriving from the parental village that they came from. Padharia Thakores were *pagi* (footman soldier) of the Gaekwads while Mehua's were agriculturists. Gaekwads also appointed *Mukhi* (headman) for the village, who were Thakore by caste. The mukhis were appointed by the Gaekwads, and helped the villagers and administration at the time of conflict. The mukhi also had executive power, could prosecute the people for theft and petty crime, and were responsible for tax collection. Due to a Thakore being a mukhi, the community was well regarded in the village. When the Gaekwads left after independence, they gave large tracts of land to the families of pagi and mukhi as compensation. Before independence, Sangpura belonged to Thakores and Patels had very little land. Agriculture was rainfed and the rule of *Mehsul* (tax collection) was very stringent. At that time, if any one was not able to pay tax for a year then the Gaekwads would do *araji* (selling the land through bidding) to others who were interested and thus derived the tax from the sale. Thakores lost around 50 per cent of their land to Patels during 1940-50. During those times, Vaniyas who held economic power joined with Patels and together they bought the land. Just before independence, Dayalal Shah, father of Manilala Shah was the main wielder of power in the village but the government's legislation to redistribute land made them lose some of the land after distributing it within their families. Since independence, there have been many changes in the policy of the government due to which the Vaniyas left the village and settled in Surat and Mumbai. They sold their land to Patels. After 1970, when the water in the open wells was receding, the crude oil engine was

introduced. This was followed by the mono-block pump and deep tubewells. In the time when tubewells were introduced in the village, Patels were more organised and knowledgeable to understand the benefits of investing into them. At that time, the electricity rate was very low as compared to now and the total investment required to have a tubewell was around Rs. 80000 to 100000. When Thakores wanted to invest, the cost went up to around Rs. 700000 and hence we could not afford. Patels invested at the time when the 'price was right' and made money. During those days, the government also provided easy loans for constructing tubewells including subsidy, but due to social networks of Patels the loan amount only went to their near and dear ones. They took advantage and we were left behind. During the early 1980s, electricity was provided for 18 to 20 hours per day and hence every tubewell had a surplus. This surplus water was available to us but only during night time as the shareholders prefer to irrigate in the day time. Their tubewells made huge profit due to sale of water but the money largely came from the pocket of Thakores. Now the electricity is available for only eight hours. Even if we install a tubewell, we can not sell water to the extent that was possible before and hence we cannot make profit'.

'Out of 225 families of Thakore, only five are rich in terms of landholdings and have around 5.75 hectares of land. Most of the Thakore land is un-irrigated and have no value as you can have only a monsoon crop. Around 46 hectares of Thakore land is un-irrigated while most of Patels have irrigated land. Those who have irrigated land have also been having less production now. Crops are failing every year and the land needs some rest. We have been over-cultivating the land. Nevertheless, we cannot help, as there is increased pressure on the land due to the increase in population and changing lifestyle of the people. As of now, the dairy cooperative is preventing us from becoming wage labourers. Without the dairy cooperative, this village would have been drained by now. It is not that alternatives to agriculture are not sought. Young people from the village worked in the diamond polishing industry but that has also been going through a slump and there are no jobs available. Even those that are available are given to Patels as they have strong social networks. Thakore is a *mehnatkash kaum* (a caste that believes in hard work) and if given proper guidance we can do wonders. We do not go for *swarth* (greed) but for *parmarth*

(working for others more than one's own self). Unlike other castes, Thakores are more loyal. Though we are less educated and so we do not have our own doctors and lawyers like Patels and Prajapatis, we are not opposed to the growth of other castes. In our village around 25 years ago, we had a postmaster who was Patel. Being a Patel, he would tear up the appointment letters of other castes that came to the village. We were young at that time and he used to tell us "if you would be educated then who would work as labourer in our fields". When I was a kid studying in the village school, the Patels used to grow onions and chillies. Almost all the teachers in the village were Patels and they used to send us to their fields to work there plucking onions and chillies. At that time, we did not have a flourmill in our village and so the teacher used to send us to the mills in the neighbouring village for getting the wheat flour ground. We plucked vegetables from the field for our teachers during the time when we had to study. Until we reached seventh standard we did not open a book in the class room'.

Case 2: Vervabhai Govinddas Patel

Vervabhai (49) comes into the category of big landlords and opinion makers of the village. He stays in the new Patel colony along with his wife and two sons. Vervabhai is one of two brothers and his father Govinddas Patel was also an agriculturist. Earlier, they owned three dugwells in different locations through which the land was irrigated. After 1970 these dugwells were slowly converted into tubewells and so Vervabhai became a shareholder in one of the tubewells. Vervabhai has more than 3.5 hectares of land, half of which is under horticulture such as orchards of lemon and guava. These orchards have been leased out on yearly terms while the agricultural land is under sharecropping. During the year 2001-02 his land was under sharecropping to three different Thakore sharecroppers. To be on the safe side, he changes his sharecropper every alternate year. If the sharecropper is 'good' then according to him 'I can consider giving him land on lease for one more year but never more than three years'. Asking the reason, he laughs loudly as if I can not understand. 'I am here to save the land that my father and forefathers have accumulated over the years. Do you think I should distribute it among Thakores?' In his opinion, the recent spurt in sharecropping is a boon for Thakores, most of whom are landless or marginal farmers without any irrigation

facility. Taking land on a share basis ensures that they get wages as shared agricultural produce at the end of the season. He puts it, 'Thakores do not have to invest anything apart from their labour. All the cash money that is needed for cultivation is taken from us as a loan that we deduct at the end of the cropping season. This is a win-win situation for Thakore and Patel'. Surprisingly, Vervabhai does not 'own' a tubewell but has major shares in the tubewells that come near his agricultural land. The reason is again simple – 'Who is interested in day-to-day keeping of all the records. When you have a share in a tubewell, it ensures profit and so let it be done by others who do not have any other job'. However, Vervabhai is not as careless as he make others believe. For the last 20 years, he has meticulously carried out agriculture and slowly half of his land has been diverted to horticulture. For a family of five, half of the total land was sufficient for food security and hence investment in horticulture was done to earn more income through cash crops such as lemon and guava. Through the investment in tubewell shares he ensured the availability of water. The income from horticulture is around Rs. 100000 per year. In 1993, another strategic decision taken by Varvabhai and his family was to catch up with the 'going to the USA' brigade. His brother migrated to the USA in the same year through the extensive Patel network working in Ahmedabad and Mehsana, paying Rs. 700000. He was newly married at that time and after three years, his wife was also sent to the USA through a similar network. The 3.5 hectares of land that Vervabhai shared with his brother is under his supervision now. His brother being in the USA has helped Vervabhai in more than one way. After reaching the USA his brother took up a job and repaid the loan taken to pay the agent for sending him there. His wife then also migrated and now there is a steady income for Vervabhai. In 2000 when all the tubewells were failing one by one, Vervabhai bought a share in one of the new tubewells that was initiated by one of the Patel families from USA money. With income from agriculture and horticulture, Vervabhai does not have to worry about the future of his family. Both his sons are married and he is now thinking of opening a shop in Mehsana for them. Since Vervabhai has assured income from abroad as well as from the land and the share in water, he likes to experiment with new varieties of crops. For many years, the farmers of Sangpura did not take tobacco as it is a high-input crop and people were not ready to

take risk. During 2002-03, Vervabhai heard that the price of tobacco was going to be high, as the farmers from neighbouring Vijapur taluka (sub-district) were not sowing tobacco. Earlier, the Vijapur farmers used to sow tobacco as the area is under the command area of Dharoi multipurpose irrigation project, and irrigation there was cheaper compared to the groundwater-irrigated areas. However, during the year the water level was down at Dharoi reservoir and farmers anticipated that there would be insufficient water supply in the canal. Many farmers thus opted out of sowing tobacco. Vervabhai anticipated that the prices might go up due to shortage of produce. Keeping an eye on the market, Vervabhai decided to take a risk and planted tobacco on his one hectare of land through sharecropping. An agreement was made with the Thakore sharecropper that if the crop failed, the tenant would be compensated. The four months crop (sown early November and harvested in March) needed ten irrigations and also consumed huge amounts of pesticide. The investment in tobacco was much higher than for other winter crops such as wheat. However, Vervabahi could afford and absorb risk as he had income from the USA. In the one hectare of land, the total production of tobacco was worth Rs. 130000 and after deducting the total investment of Rs. 30000 the net profit from the land was around Rs. 100000.

As one of the rich persons of the village, many respect Vervabhai. Who knows when they require money and so they can borrow if they have good relations with him? Apart from this, many people from the Patel and Prajapati castes will sit around him in the evening to listen to his views on what is happening in India, the USA or in Gujarat. After all, Vervabhai has studied until class 12th, reads the newspapers with interest, and watches the news very carefully. His analysis of the political situation is something that creates opinion in the village. He is also a contact person for the political parties who come to the village for meetings. His house is double-storied with tiled flooring and facilities such as a colour television, cordless phone and satellite dish antenna. These facilities are available to people who are close to him. His two sons are also popular amongst their peers as they enable access to watching satellite TV and cricket matches and that too in coloured television. Vervabhai has never contested an election, whether it is of panchayat, credit or dairy cooperative. Nevertheless, he ensures

that 'his people' are elected in these positions so that he can have easy access to all these institutions if he needs them.

Case 3: Chaganbhai Nathabhai Prajapati

Chaganbhai is a middle-aged farmer clad in white Dhoti and Kurta with a white Gandhi *topi* (cap) on his head. He stays at the new Prajapati colony in the village, and can be spotted in the evening when he sits in his verandah on the swing with the help of cushions, entertaining visitors and friends. Confidence comes naturally in his face when he talks to people and his sense of pride can always be felt. This sense of pride is rooted in a number of things such as belonging to one of the five families of Sangpura who own a tractor, having more than seven hectares of land and a family tubewell. In the era of shared tubewells, Chaganbhai stands out with a tubewell that his family owns exclusively and sells water to others. However, according to Changanbhai, his wealth has come by building up their ancestral property. According to him, he had made wealth in the last thirty years but it was all the product of hard work of his family. In 1967, he owned only 1.15 hectares of land that had increased to seven hectares in 2002. How did this transformation come about? Before installing a tubewell in 1983, he had been doing the business of brick selling while his wife looked after the field operations. Slowly, his business picked up and Chaganbhai used to go around villages where he took orders for bricks and supplied them from the brick kilns. His business was expanding and he used to travel in the day and then replace his wife in the evening in the field, to look after the standing crops. According to him, with his hard work, he could accumulate money for investing in the tubewell on his own. In the early 1980s, after installing the tubewell, he stopped the brick business as the business of agriculture and water selling was profitable. In the year 1983 when he installed the tubewell, it cost around Rs. 75000. The investment in the tubewell was recovered in the first few years after installation. At present, the tubewell irrigates seven hectares of his land and three and half hectares of his neighbours to whom he sells water. Apart from a tubewell, he also invested money in cattle rearing as the milk cooperative had been opened in the village. At present, he has five buffaloes and the net earning from them is around Rs. 10000 per month. Chaganbhai has two sons, who are also engaged in agricultural operations. He also owns a tractor,

which is rented out during the peak agricultural season. In order to buy the tractor, Chaganbhai took a loan from the cooperative bank where he has an account. He is still repaying the loan but does not find it difficult as there are only five tractors in the village. During the peak agricultural season, the tractor works day and night earning handsome money.

Having a strong economic background, Chaganbhai is also an opinion maker of the Prajapati community. According to him, 'the Prajapatis were not a landed class. Most of the families had marginal landholdings but there was an emphasis amongst them to be organised and invest in agriculture and education. Chaganbhai is proud that today in the school the Prajapati children are sitting next to Patels and also compete with them. Last year, a Prajapati boy stood first in the higher secondary exams, rather than a Patel. The Prajapati *samaj* (caste-based organisation) gave him a scholarship to attend college in Mehsana. According to him, 'our strategy was to go slow but be on firm footing. We knew that since we are in minority, we can not take on Patels or any other caste people in numbers. Our approach was to first consolidate our position in economic terms. Today, we are well off in the village and therefore we can now have say in all spheres of life. Now we have our own doctors and lawyers who help us when we need them. If we have any land dispute with a Patel, we do not need to go to a Patel lawyer who helps the other Patels despite taking money from us. We have Prajapati lawyers and also people working in key positions. We can take on Patels now on all terms. However, since we have the power, we do not want to confront them because if you are together with Patels you can actually rule the village. So we have aligned with Patels in the village and have a say in almost all matters. This achievement was impossible in the early 1980s because we were not equal to Patels at that time. Today, they also know that we have our strong network and if they can institute a prize for a Patel student, we can also boost Prajapati students to rub shoulders with them. Since we were a little late in coming at par with Patels, we also lost out to them on sending our people to the USA. Now, when more than 100 Patels are in the USA, only two Prajapatis are in the USA. This was mainly because of the networks they had which gave them an initial advantage. Two people from Prajapati caste who went to the USA from our village have used the support from Patels only. But since the regulation

for going to the USA is so stringent that even if we have money, now we cannot go to the USA. It is extremely difficult for us now and hence I feel that we have lost out to Patels in these terms. Now the agricultural production is going down and the cost of water is increasing due to the supply of electricity curtailed to eight hours per day. Patels could foresee the problem and hence they now do not worry much about the declining productivity and increasing cost. We have to worry as our children have studied but they are not getting jobs here. All the jobs are for English speaking people and our children have studied in Gujarati medium. There are no government jobs available and so we are forced to be trapped into agriculture'.

Case 4: Govindbhai Joitaram Parmar

Govindbhai Parmar (64) is the leader of Parmars in Sangpura. In Sangpura, Parmars own only one tubewell and the major share in that is of Govindbhai. He worked as a 'fitter' in the Indian Railways in Mehsana. He has three sons, of whom two are employed in a government job in Mehsana and one looks after agricultural operations in Sangpura. The eldest son Prahladbhai works for the General Insurance Company in Mehsana town and is one of the opinion makers for second generation Parmars in the village. Prahladbhai's name is spoken with a lot of respect among the Parmars as well as others in the village due to his position in the company where he works. His monthly earning is around Rs. 17000. In Sangpura, out of 60 Parmar families, only 35 per cent have access to irrigation while 25 per cent live below the poverty line and work as agricultural labourers. In this situation, the family of Govindbhai is among the very few who have some landholdings and are engaged in agriculture. This situation has come mainly through the government policy of reserving some seats in government jobs for people coming under the scheduled caste category. Several people have taken advantage of the policy and hence got government jobs. While in a government job, a fixed income was assured which was then diverted towards buying land in the village from poorer households. The first generation worker in the government departments then invested in the education of his sons and hence could again take advantage for procuring jobs. Prahaladbhai is a successful example of this strategy. The surplus generated from government jobs was put into agriculture and

tubewells so that household food security was ensured and there is an income through the sale of water.

However, the journey was also full of problems as Govindbhai puts it 'from the day we are born we face discrimination. Even today the situation has not changed much. You can imagine what would have been the situation been 50 years ago. I myself and one other boy were the only two students from Parmar families who went to school at that time. We were asked to sit on the last row of the school and were not allowed to drink water from the earthen pot of the school. I have studied until seventh standard and when I grew a bit to understand the discrimination, I left the school. I used to feel bad about the way we were treated in the school. Luckily, one of our relatives was working in the Railways, and he informed me that there was a post exclusively reserved for people belonging to scheduled castes. I went and applied there and due to my education, I got the job. After I got the job there, I used to travel from Sangpura to Mehsana. I used to walk until Jagudhan village (around five kilometres away from Sangpura) where the train used to come from Ahmedabad. I used to board the train there and then come back the same way in the evening. My sons were studying at the school and when they grew up, we shifted to Mehsana for providing better educational opportunities for them. It is through education that my sons have been able to take advantage of the government policy and now work as officers in Mehsana. My youngest son could not study and so he now works in the village looking after the agricultural operations. We also have buffaloes and therefore through the milk cooperative, we are able to have good income'.

Giving his opinion on the village politics, Govindbhai says 'we know that we can not beat Patels in wealth and power but we can organize ourselves and at least be economically independent from upper caste people. This is our goal but it is a difficult one. Half of our population (Parmars) do not possess land or have as little as a quarter of a hectare of land. Now that there is opportunity for them to work as labourers in the industrial zones, it is not difficult for us to be independent. Even then, our women work in the farms of the upper castes and so we have to obey some of the rules even though we know that it is not in our favour. Till very recently, we have been voting for the Patels but for the last 20 years or so, Thakores have become the sarpanch. Even then, the main

institutions of the dairy and credit cooperative are still in their hands. We know this but we cannot challenge them because they are economically and numerically powerful. We decide from election to election if voting for someone is in our interest or not. In our caste, we have people in high positions in the Police and in other government departments. Even when there is some problem, Patels and Prajapatis come to us for help. We help each other knowing but helping people from our own caste comes first as we know that others also do the same.'

Strategic Alliances and Politics of Formal Institutions

Like many other villages, Sangpura is divided between groups. However, the political alliances have been changing over a period of time reflecting the needs and strategies of various social groups within the village. At the time of the field work (2002-03), the first group consisted of the majority of Patels, Prajapatis, several Thakores and Parmars. The second group had the majority of Thakores, Parmars, other castes small in numbers and several Patels. In both cases, the group was led by a Patel. The supremacy of each group depends upon its representatives getting higher offices in the panchayat and dairy and credit cooperatives. In this section, I study these three formal institutions of the village to analyse the politics of their control by the dominant group.

The village panchayat

From 1960 onwards, after the formation of a separate Gujarat state, formal village panchayats were instituted. Representation in the panchayat clearly reflected the major political alliances in the village. From the beginning of the formal panchayat system after 1960, the village was headed by Venabhai Patel. After he had been in power for almost two decades, many believed that Venabhai started to think that he was indispensable and so would continue as the sarpanch in all the coming elections. Patels had always dominated village life both economically and politically and Venabhai had a large base among them. Other castes did not have sufficient strength to challenge the authority of Venabhai. Once

Venabhai remarked in public that the village would be ruled by Patels forever. This remark boosted the anti-Patel campaign in the village. Venabhai did not only have enemies outside but also within his caste group. A small fraction of Patels felt that Venabhai was appropriating too much wealth from the panchayat account without providing much benefit for others. This group was led by Kantibhai Patel who was the teacher in the village school. Kantibhai aligned with the Prajapatis and Thakores and proposed Mangaji Bhagaji Mukhi, a Thakore, as the candidate for election in 1984-85. Venabhai supported Mangalbhai Atmaram Patel but ultimately, Mangaji won. Mangaji was a *mukhi* (the village headman during Gaekwad era) and so was a 'natural' leader of Thakores. All Thakore families supported him because they could see that it would be the first time that a Thakore would become sarpanch of the formal village panchayat. Mangaji was sarpanch for 2 terms (from 1985 to 1995) followed by Athaji Thakore (from 1995-2000). In the year 2001, the election was won by Kantibhai Patel.

During the panchayat election of 2001, the village was politically divided between two groups supported by different castes. On one side were the newly-rich Patels (whose relatives are in the USA), Prajapatis and almost half of Thakores and Parmars. The second, less influential side were the group of Rambhai Patel whose father was the first sarpanch of the village. Rambhai is one of the big landlords and is proud of his past, saying 'our family has ruled the village'. However, some of the Patels confess in private that 'this pride only brought him down as a section of us felt that his family was becoming too arrogant and accountable to none'. They blame that due to his hegemony, an alternative force was created and the panchayat headman post went to the Thakores. The election in the year 2001 was important for Patels, as they wanted the position back in their court. This move was supported by almost half of the Thakore families who were not happy with the way Athaji had functioned as sarpanch.

The 2001 elections of panchayats were also very important from the point of view of state politics. From 1960 to 1995 the Indian National Congress (INC) dominated the political arena in Gujarat. However, the upsurge of Hindu nationalism in 1989 and its culmination in the demolition of the Babri mosque in Ayodhya in 1992 gave rise to the right wing Bhartiya Janata Party (BJP). The BJP came to power in Gujarat for the first time in 1995. The BJP,

except for a one-and-a-half month break, has managed to stay in power ever since despite the storms of world-wide criticism over irregularities in the January 2001 earthquake relief work. With the state election around the corner in 2002, the central leadership replaced the then chief minister Keshubhai Patel with Narendra Modi on the allegation of 'sheer irregularities' in the relief works after the January 26, 2001 earthquake that killed thousands of people in the state. Also the ruling BJP was losing all municipal and panchayat elections to the INC.[5] Narendra Modi was brought in to re-organise the party and to help them win the next election in the state. Modi started with the panchayat elections as a 'semi-final' for the general election of the state to be held in 2002. In order to win the panchayat elections, he took advantage of a clause in the State Panchayat Act wherein the government can give awards to the gram panchayats who elect their representatives in consensus. The primary reason for awarding such panchayats as stated by the government is that consensus candidates save costs of an election and hence should be promoted. Many commented on this clause in the Panchayat Act on the ground that it helps in reconfirmation of the power structure of the village and the fact that most of the times lower caste candidates can not get elected if it is based on consensus. However, this clause was well suited for the BJP, whose electoral base was more in the upper and middle castes rather than among dalits, Muslims and other backward classes. As a strategy to win the panchayat elections, the compensation amount was increased from Rs. 5000 to 60000 in case village panchayat members were declared elected through consensus.

In Sangpura also the fact that the village would receive Rs. 60000 helped in bringing a broad consensus among dominant individuals that they should help make the panchayat be elected on a consensus basis. For days the mighty of Sangpura discussed this among themselves and convinced others. Consensus also meant those in favour of the 'consensus' option would have to ensure that no one from the village filed nomination papers. If there was even one nomination for the post of sarpanch, it would mean that there would be an election. For the politically powerful people, it was something that was in their favour, as their candidate would be elected without any opposition. This meant that the aspiring candidate would not even have to campaign for the election or make any promises. The group decided that Kantibhai Patel, the

former teacher would be their candidate for the sarpanch. They also decided on the names of the members of the panchayat which had representatives from all major castes of the village and as per the reservation guidelines of the Act. The other group in the village, which wanted to oppose this, was not gaining any support as getting Rs. 60000 for the village gave an advantage to the dominant group on issues of village development. It was discussed how the village could have a new road with the money received and those who planned to oppose this were called immoral as they did not think about the development of the village. However, the opposing group managed to float the name of Jayantibhai Prajapati, a Prajapati leader who stayed in Surat but whose name was in the electoral list of the village. This also showed that for the first time the Prajapatis, who always aligned with Patels, were informally divided within their group. The leadership of Prajapati tried to talk to Jayantibhai, who was called from Surat (around 500 kilometres away from Sangpura), but in vain. The opposition group asked Jayantibhai to go to Mehsana panchayat office directly for filing his nomination instead of visiting the village. The opposing group kept the news of Jayantibhai filing his nomination a secret. However, some people from the dominant group had already sensed the opposition. As a counter strategy, the leaders of the dominant group camped outside the panchayat office to check whether anyone from their village or from the opposite camp was visiting the panchayat office to file a nomination. They could spot Jayantibhai coming with other people from the opposite camp and stopped them. There was a heated argument among the groups and Jayantibhai was given a threat to his life in case he filed his nomination. With this pressure from the dominant group, Jayantibhai returned back to Surat without even visiting the village and filing a nomination. At the end, the village was declared a consensus panchayat with Kantibhai Patel as the sarpanch of the village.

The above process clearly shows how power works in some of the so-called democratic institutions where domination of certain social groups is maintained through formal and informal ways. In the 40 years of formal panchayat politics in Sangpura, Patels and Thakores have become sarpanch. The power has shifted from one group to another in recent years, but Patels have always spearheaded it. For 15 years (1985-2000), Thakores headed the

village but due to lack of social support and standing, Patels only used them in the process of gaining more power and control. However, in recent years, some of the Thakores have raised issues of actualising real power. They believed that if any one from their caste group becomes a sarpanch in the present time, they could use the opportunity to access resources in their favour. Some of the newly-rich Thakores who could align with Parmars and other smaller groups spearheaded these aspirations to challenge the authority of the Patel-Prajapati combine. These groups had raised issues of domination in the milk and credit cooperatives, which deal with large economic resources. There was nothing much to manipulate in the panchayat as it did not have a very large budget and hence the power associated with it was largely symbolic. For Patels, it was a time when the power should come back to them in actual terms as they were not clear if any protégé leader would comply with them this time. The choice for consensus was a step towards this objective.

The milk cooperative

The milk cooperative is one of the prominent institutions of Sangpura. The cooperative was initiated in 1965 under the apex institution Mehsana Doodh Sagar Dairy.[6] Prior to the initiation of the cooperative, milk production was predominantly for household consumption. Rabbaris, a caste traditionally engaged in the business of cattle rearing and milk vending, used to collect surplus milk from the households and sell it in Mehsana town. The milk cooperative provided a ready market in the village and therefore the number of people engaged in cattle rearing slowly increased. The milk cooperative became successful for two reasons. First, the milk cooperative built on the already available skill of the people. Dairying was an intrinsic part of agriculture and so it was not difficult for people to expand this activity for the market. The investment was low due to the use of agricultural residues as fodder. Second, the cooperative provided much needed cash flow for the farmers twice in a month. This was needed under the new technology in agriculture, which was based on external inputs to be bought from the market. Availability of cash provided access to these inputs that helped raising productivity of agriculture in the

initial years. However, the new arrangement was largely suited for the landed class as keeping cattle was directly related to agricultural production and the resource base of the farmer. The white revolution was thus based on the success of the green revolution and vice versa. Slowly, as the green revolution picked up, the marginal farmers also became part of the milk cooperative as production increased.

The milk cooperative is an economic institution and its membership and management reflects that interest. The membership of the cooperative was extended to all with paying a nominal fee. Membership was given on individual rather than household basis. All adults of Sangpura can be a member of the cooperative. Voting rights are given to those individual members who contribute a minimum of 700 litres of milk per annum. In the year 2000-2001, the Sangpura milk cooperative contributed more than 600000 litres of milk worth more than Rs. 7600000 (see Table 6.1). Apart from the direct economic benefit, the milk cooperative also provided life insurance. The premium of the insurance is equally paid by cooperative, member and the federation. In Sangpura, the member's premium is paid by the cooperative. The insurance is provided on a yearly basis but to qualify, a member has to contribute at least 200 litres per annum. The coverage of the insurance is Rs. 20000. Apart from the insurance, the cooperative also provides loans to buy buffaloes or cows. The members in the annual meeting generally decide this.

The large annual turnover of the cooperative raises interest in its control. From the beginning, the governance of the dairy cooperative was with the Patels, who constituted the board according to the specified norms. Their leadership went unchallenged for almost three decades. With the economic rise of Prajapatis over the years, a demand emerged from them to share power in the cooperative. It was decided between the Patels and Prajapatis that they would head the dairy and credit cooperative alternatively. This meant that if a Patel is chairperson of the dairy cooperative, the secretary should be a Prajapati so as to balance the power. Simultaneously, the credit cooperative would have a Prajapati as chairperson and a Patel as secretary. Darbars, an upper caste, agreed to this combination and did not ask any post, as they were few in number. The collaboration excluded Thakore and other castes from power sharing. As seen from the data collected

for 2000-01, the Patel-Prajapati-Darbar combine had 58 per cent of the members voting for them while the Thakore and others could manage only 42 per cent. Since Thakore and others were economically not well off, even though they might have more members, they might not qualify for voting rights because they could not always contribute a minimum of 700 litres per annum. The question is how do Patels and Prajapatis manage to get more voting rights? The Patel or Prajapati households produce more milk per family than others do. Since the membership is on individual basis, one household generally has an average of three to four members. In order to gain more voting rights, the first 700 litres of milk is contributed in the name of first family member, followed by the others. With the average milk production being much more than 700 litres per year per household in these families, more voting rights are obtained. An analysis of Table 6.1 shows that among castes such as Patel, Prajapati and Darbar, the percentage of voting members to that of total members is more than 60 per cent while it is less than 50 per cent for Thakores and Parmars. Other castes are too small in number to make a significant change in the combine. This means that even though Thakores and other castes can increase their number of members in the milk cooperative, it is difficult for them to challenge the Patel-Prajapati-Darbar combine due to their economic power to produce more milk. The struggle for control of the milk cooperative also stems from the way agriculture has changed its course in north Gujarat. In the 1980s agriculture used to support animal husbandry, but in recent years animal husbandry supports agriculture. With the declining agricultural productivity in general and water productivity in particular, the gains from agriculture are shrinking. The dairying cooperative has come to the rescue, as the return from dairy has superseded agriculture in recent years.[7] However, diversification from agriculture to dairy farming primarily took place among resourceful farmers. For marginal and small farmers household food security comes first, as small landholdings barely sustain the grain requirement of the family. A Patel farmer puts it concisely, 'earlier, agriculture used to complement animal husbandry but now it is up side down. However, not everyone can afford to have a buffalo. The land

TABLE 6.1: THE MILK COOPERATIVE MEMBERS AND THEIR CONTRIBUTION, CHARACTERISED BY CASTE

Caste	*Total members*	*Year 1998-99*			*Year 2000-2001*		
		Eligible members for voting	*Total milk production in litres*	*Rupees equivalent*	*Eligible members for voting*	*Total milk production in litres*	*Rupees equivalent*
Patel	170	126	227651.80	2847936.00	111	209618.00	2605871.00
Thakore	193	84	163605.30	1777714.00	89	146076.70	1719360.00
Prajapati	90	64	115380.20	1419034.00	60	125888.60	1532308.00
Darbar	32	16	39739.60	503663.80	24	45200.40	569232.10
Parmar	40	18	34927.40	453106.00	19	41207.40	496774.20
Vaghari	30	11	22668.00	272983.20	10	17720.80	207726.60
Rabbari	18	13	37052.10	337857.60	13	43434.70	366543.70
Bawa	5	4	6196.4	78448.1	3	5308.9	66759.02
Rawal	3	2	2466.80	24660.02	2	1477.70	15622.66
Suthar	4	2	1234.20	17015.19	2	2556.30	33573.83
Nai	2	2	1954.70	24452.68	2	3704.60	44011.98
Total	587	342	652876.50	7756870.59	335	642194.10	7657783.09

Source: Records of Sangpura milk cooperative, 1998-99 & 2000-2001

holding and ability to divert a piece of land for grass production determines the capacity to have cattle. Rearing one buffalo means one should have at least one hectare of land. One can also keep a buffalo by buying green fodder from the market, but in that case, it becomes uneconomic. Buffalos eat dry fodder (Bajri) and green fodder everyday and for this, one has to cultivate alfalfa (a grass crop) in the farmland. It is believed that alfalfa increases the fat content in the milk and thus helps in earning more money per litre of milk sold in the cooperative. If one has only a quarter of a hectare of land, it will not be sufficient even for growing food crops. In this case, one cannot divert land for growing fodder crops except when the income from the buffalo allows purchase of food grains from the market instead of growing these in one's own farm. In Sangpura, this is not the case. For most people if they do not have anything to eat, what will they give to the buffalo? It is like rearing a child; the more you give them to eat, the stronger they are. Similarly, the more green fodder you give to buffalo, the more milk they produce'.

TABLE 6.2: MEMBERSHIP COVERAGE OF THE MILK COOPERATIVE

Caste	*Number of adults*	*Total members in the milk cooperative*	*Percentage of milk cooperative members to the total number of adults*
Patel	552	170	31
Thakore	584	193	33
Prajapati	217	90	41
Darbar	65	32	49
Parmar	107	40	37
Bawa	22	5	23
Vaghari	118	30	25
Nai	10	2	20
Rabari	31	18	58
Suthar	34	4	12
Rawal	25	3	12
Luhar	4	0	0
Senma	11	0	0
Darji	14	0	0
Salat	10	0	0
Total	1804	587	33

Source: Records of Sangpura milk cooperative
Note: For column one, data was collected from the village voter list

Table 6.2 shows caste-wise membership of the milk cooperative. On average, the milk cooperative covers only two-thirds of the village. Among different castes, the figure fluctuates between a minimum of 12 to a maximum 58 per cent of adult members. The highest 58 per cent is among Rabbaris who traditionally are engaged in cattle rearing. The reason for the differentiation in the coverage is the interrelations of dairy with agricultural production. With the rise of sharecropping it was expected by sharecroppers that the fodder crops would also be covered, which would bring economic benefit to them as they could also rear cattle for milk production. However, the sharecropping arrangement excludes fodder crops on the ground that it does not require extensive labour. In addition, since the fodder crops cover a small portion of the total cropped area, it is generally grown using household labour. With the rise in sharecropping, the sharecroppers had some hope to keep cattle for milk production but that is excluded from the contracts. The milk production system thus builds on the prevalent social relations of production.

The agricultural credit society

The agricultural cooperative society was established in the year 1965 under the primary agricultural cooperative structure. The 'credit cooperative' as it is popularly called in the village, works to extend credit to farmers and non-farmers and runs the fair price shop. The crop loans are given to landowners at the beginning of the agricultural season. Landless workers and farmers falling under scheduled caste are provided a fixed amount. The amount of loan given to the landowners depends on the area that the farmer will cultivate and crop to be cultivated. For example if someone proposes to cultivate cotton, the amount of loan extended would be the highest as cotton is considered a high value crop wherein high investment is needed. The district cooperative bank issues a list of all the crops and the maximum amount that can be sanctioned under those crops. Accordingly, farmers fill the form and apply for the loan before a particular season. Sangpura is among the villages where there has been no defaulter to date. Due to this, the primary agriculture cooperative society of the village has been given 'A' certificate every year by the audit department. Apart

from sanctioning loans to farmers, the cooperative runs the fair price shop in the village and distributes wheat, rice, oil (rapeseed and groundnut), sugar, tea and fertilizers such as urea and DAP. Out of these, only wheat, rice and sugar are subsidised and the rest is obtained from the open market.

To become a member of the cooperative, every adult member of the village has to buy at least a share of Rs. 10. The cooperative has 361 members and is managed by an executive committee headed by a chairperson. The secretary of the cooperative looks after day- to-day functioning of the cooperative and is accountable to the committee and the chairperson. Until April 2002, the cooperative followed a system where the executive committee of the cooperative had nine members and every year three new members were be nominated to replace three old members. These nominations were 'one-off', which meant that none of the nominated members could be resubmitted until all the members of the cooperative had a chance of becoming a member of the executive committee. The rule was to ensure that no dominant group took over the functions of the cooperative. However, this has been changed and according to the new rule, the executive committee is elected for a period of three years. The executive committee will have 11 members who are elected or nominated. The committee works for 3 years after which a new election takes place. The new rule does not prevent people from standing if they have been elected before. Therefore, a person can now become a member of the executive committee as many times as the members vote for him or her. Though women are also members of the cooperative and there is a reservation for them in the executive committee, there is no history of a woman chairperson in the cooperative. The committee provides loans to people categorised as farmers and non-farmers. There is a special provision to give loans to lower caste farmers. During the financial year 1999-2000, the cooperative sanctioned more than Rs. 1000000 to the people of Sangpura. The loan amount is based on the land holding and hence the landed farmers get amounts up to Rs. 25000 while the minimum sanctioned amount is Rs. 4500 for a landless farmer. Loans are given twice a year, and have to be repaid before the next agricultural season. Due to the amount of money the cooperative deals with, different groups in the village want to control it through

various means. However, this is a game that the dominant castes have always won.

In January 2002 a Prajapati chaired Sangpura's agricultural cooperative and the post of the secretary had gone to a Patel. The committee was all male. It included five Patels and one representative each from Prajapati, Thakore and Parmar caste. How did this dominance of Patel-Prajapati actually come about and what are its

TABLE 6.3: SHARES HELD BY INDIVIDUALS IN THE CREDIT COOPERATIVE

Caste	*Total number of members*	*Total share in rupees*	*% of total share*
Patel	130	106081	48
Prajapati	49	33000	15
Thakore	112	48600	22
Parmar	36	15010	7
Darbar	11	7220	3
Others	23	9010	4
Total	350	218921	99

Source: Records of the Sangpura Sewa Sahkari Mandali, 1999- March 2000
Note: Percentages rounded to zero decimals

implications? As Joitaram Prajapati puts it, 'there is an unwritten agreement between Patels and Prajapatis to have their representatives on the board of the milk and credit cooperative alternatively. Since the milk cooperative is chaired by a Patel and assisted by a Prajapati (secretary), the credit cooperative should have a Prajapati chairperson and a Patel secretary to 'balance' the act.'

A subsequent question is how could a group of people dominate in a membership-based institution? This is more so as the membership can be granted for paying Rs. 10 only. The basis of dominance of the cooperative is the dependence of the voting right of the member on the share they own. The record of shares owned by individuals during April 1999 to March 2000 showed that 48 per cent of the total share was with Patels while 22 per cent of it was in the possession of Thakores. Prajapati owned only 15 per cent of the total share (Table 6.3). Here, the numerical combination of Patels and Prajapati outnumbered others and hence they win in the number game. However, in the history of the cooperative there

have never been elections and till now the executive committee members are nominated by powerful individuals. The selection of members means that the dominant group will have a say in who should be on the board. Patels have always had a larger share in this decision making body without even contesting elections. As one of the member of the executive committee puts it, 'if you can control the cooperative without elections, why do you have to ask for it? In fact election brings many uncertainties and one never knows who is going to align with whom. So selections are always better as no one generally comes out in the open to oppose others as they also have to live in the village'. The control over the cooperative is thus maintained in two ways. First, to follow a selection procedure to avoid any direct confrontation with other groups. Second, through the shares it is ensured that the dominance is always in the hands of Patel and Prajapati together in case an election takes place. If someone approaches the cooperative for new membership and if they are not part of the combine, they are ridiculed and the move is looked on as opposition to the dominant group. Since people from other castes also have economic and non-economic relations with the dominant group members, there are very few who can openly oppose this situation of control. It shows how dominant groups work through the social structure to be in authority and maintain control over institutions that may have a bearing on their life.

Caste, Alliances and the Everyday Politics of Sangpura

For almost 30 years one powerful alliance dominated by Patels governed Sangpura's politics. Others did not have sufficient economic and social influence to challenge them. However, as the local economy started to experience new opportunities, it also provided economic uplift to other social groups. The green revolution has contributed significantly to this. Due to increased irrigation facilities, agricultural operations amplified. Employment was available for at least two seasons in the beginning, which increased up to three seasons. Patels did not have the labour power to cultivate such large areas and therefore provided wage employment to others who were landless or marginal farmers in the initial years. Thakores, Parmars and others started to work as

labourers in the Patel land while Prajapatis mostly employed family labour. Though the gains from agriculture directly benefited the landed class, the poor also benefited through increased availability of employment. Further, in the late 1980s most of the families from a lower economic background started to consolidate their political power and hence their alignment challenged the supremacy of Patels. This alliance was not without the support of newly-rich Patels who had their families in the USA. The money that came from the USA made them rather independent of the rest of the society, as otherwise they would have been dependent on others for carrying out agriculture. This independence had paid for the new alliances along with the support from Thakores who were in majority. The population of the Thakore caste had overtaken the Patels in 30 years. This was attributed to the illiteracy and economic backwardness of Thakores who needed more 'working hands' for the family. Even though the Panchayat leadership was in the hands of Thakores, it largely became symbolic, as Panchayats did not have many economic funds and great power.

Prajapatis remain at an intermediate level seeking support from the new power group of Patels. However, as a social group, they were largely organised into one single unit so that their numbers would be intact. They often discussed that there were only 70 families. Hence, if they stayed together, they could bargain with the rest of the community on any matter. If one goes by the government categorisation of castes in different classes, Patels are the only upper classes in the village. Prajapatis and Thakores come under the official category of Other Backward Classes (OBCs) and the rest are categorised as Scheduled Castes (SCs). However, while Prajapatis are officially categorised as OBCs, they consider themselves as part of the upper class. They like to mingle more with Patels than with Thakores. According to them, as a potter caste, historically they were lower in the caste hierarchy than the Patels but when they slowly became agriculturists and economically well off, the occupational difference disappeared and so they became closer to Patels. Now, Patels accept food in Prajapati houses and are invited to social occasions such as marriages and funerals.[8] The history of the political alliances suggests that the powerful coalitions in Sangpura closely follow caste identifications, and these are historically changing. There is no doubt that caste has been one of the prominent bases that provides 'natural' superiority

of one group over another. Caste is crucially concerned with determining access to the means of production, control over resources and institutions and forms of surplus extraction (Chakravarti 2001). However, the everyday persistence of caste hierarchy is not as continuous and discrete as professed by Dumont.[9] Instead, 'the rule of caste obeys the rule of power' (Gupta 1991: 118) and together it forms a system of hierarchy. Social power is derived by maintaining the hierarchy and in some cases even nurtured by it. However, the question is, how social power generated through village politics feeds into the larger political process of the state, and vice versa.

The village level political alliances also influence the voting pattern of the people in state-level elections. This voting pattern also sides with popular alliances and caste identities. In Sangpura, in 2002, the upper castes vote for the right wing Bhartiya Janata Party (BJP), the ruling political party of Gujarat. The BJP has a strong base among the upper castes. Thakores, Parmars and Vagharis vote for Indian National Congress (INC). However, the voting pattern has not remained the same in the history of politics in Gujarat where power struggles has paved the way for different alliances. Since the formation of a separate Gujarat state in 1960, the INC worked with the popular Bhrahmin-Baniya-Patel alliance until the *Navnirman* movement of early 1970s that challenged the political combination of the castes. The movement was a sign of the up welling aspirations of the middle and intermediate classes.[10] A number of communities from the intermediate castes and socially and educationally backward castes, as well as scheduled castes and scheduled tribes, have moved upwards and become part of the middle class, sharing its aspirations and worldview.

In order to encapsulate the newer aspirations, the KHAM (Khsatriya, Harijan, Adivasi and Muslim combine) politics came into place (Yagnik 2002). This arrangement partly transferred power from the erstwhile Brahmin-Baniya-Patel combine to the more prosperous strata of lower castes and *adivasis* (indigenous people). This transfer was not without its problems, as the riots that rocked Gujarat in 1981 and 1985 demonstrated. However, BJP took note of this division of Hindus along caste lines and crafted a common Hindutva strategy to unite the majority community against Muslims. The dalit identity gave way, in the face of urbanisation and sanskritisation in Gujarat, making the state a

breeding ground for communal hatred. The loss of identity assisted this assimilation process by building up an aversion to Muslims. The post-Babri Masjid riots in 1992 accelerated this process and changed the social geography of urban Gujarat, creating increasingly sharp distinctions along communal lines (Prakash 2002).

The new Hindutva strategy worked well in some of the urban locations of Gujarat where to some extent, caste identities merged with the economic upsurge to widen the definitions of middle class. In rural Gujarat, however, the Hindutva ideology meant the domination by the 'provincial bourgeoisie'[11] that rose from the dominant landed caste of Patels supported by newly-rich artisans such as Prajapatis (Roy 2002). The dominant landed class sensed power again, which seemed to have been lost to the KHAM combine. At the village level these changes were articulated in altering voting patterns. The dominant group that voted for INC in the past found their aspirations being articulated by BJP and hence moved towards strengthening their hands. The Prajapatis, with their new-found ambitions, followed Patels. It is interesting to note that the Thakores and Prajapatis belong to the same government class of OBCs but their voting pattern is concerned with the interest of the class they represent. The changing caste and class identities of Prajapati are articulated in some of the rituals. Earlier, the Thakores were associated with the Gaekwads, had higher ritual status than Prajapatis. During the time of marriage in Thakore households the Prajapatis, a potter caste, had to provide new earthen pots to be used in marriage rituals. For this, the Prajapati women used to go to the house where a marriage would take place and the pots were accepted by Thakore women by performing a ritual at the front door of the house. Since the earthen pots were to be used in a marriage ritual, they were considered sacred. In return, the Prajapati women were rewarded with money and clothes. The same ritual is operational now also but with a small change. Now the Prajapati women do not go to Thakore houses but instead the Thakore women come in procession to take the earthen pot. The Prajapati also do not make the pots but they buy them in advance if any of the Thakore families want to come for the ritual. The incident speaks volumes about the changing status of castes in the social hierarchy and the feedback mechanisms that work from the micro-to-macro level, responding to the changing times.

In this chapter, through the everyday village politics, I showed how power extends beyond the structures of domination in the village to cover the larger arena of socio-political, economic and ideological spheres. In the protracted process of increased control over resources, the upper class seems to be winning on all major fronts. The working class tried to work through the democratic processes. However, the so-called democratic institutions reflected the social structure where the powerful groups dominated the village. These structures of power were reflected in the virtually unchallenged control over three formal institutions– panchayat, dairy and credit cooperatives. The social power generated through this political and economic control was challenged through electoral struggle by the working class but this largely did not succeed. The majority of the socially and economically oppressed were also working class and their organisation was subject to various levels of subjugation by the upper classes. The changing nature of state politics also gave power to the dominant dass and provided legitimacy to their combines. Political domination together with economic and social power facilitated increasing control over critical resources for the upper class.

Notes

[1] For a historical review of the concept, see Béteille 2002.

[2] Thakores and the scheduled castes such as Chamars, Vagharis, Senmas and Rawals are non-vegetarian. In Gujarat and elsewhere, there is a stigma attached to being non-vegetarian as meat eating is related to being impure. The meat-eating Thakores are looked at by Patels and Prajapatis from this angle.

[3] The word *Patel* has been derived from another word *Patidar* that means people who own land. The word *Patidar* has now become extinct. The Patidars in Gujarat are divided in four sub-castes- kadvas, levas, anjanas and matias (Vyas 1998: 279).

[4] The sale of water during those days was based on crop sharing rather than an hourly basis. The rationale for this was that because the land productivity was much higher during those days, there was not much of risk involved in selling of water based on crop sharing. Slowly when crop failure became rampant, the hourly charge for water was institutionalized.

[5] 'Political history: How a Congress bastion went the BJP way'. News article appeared at Hindustan Times dated November 23, 2002. Sourced at http://www.hindustantimes.com/news/5905_105647,00160005.htm

[6] Mehsana Doodh Sagar Dairy, located in Mehsana town, is considered as Asia's largest dairy plant with a daily processing capacity of 1.5 million liters (Singh and Kishore, 2004).

[7] According to a study undertaken by the IWMI-Tata Water Policy Program in north Gujarat, the effective net water productivity of a buffalo and crossed-breed cow calculated from the farmer's point of view came up to Rs 5.22 and Rs 5.57 respectively. This is more than all the crops grown (cotton – 0.68, mustard – 2.01, potato – 2.98 and tobacco- 4.04) in the sample village except for castor whose water productivity was calculated as 7.21. The study showed that farmers were increasingly moving towards dairying even with increased water scarcity due to returns being much higher than agriculture (Singh and Kishore 2004: 4-7)

[8] Here the caste identities go along with the relation of *Beti* (daughter) and *Roti* (literal translation is flat bread). This means that there can be marriages (marrying *Beti*) within the same caste if they have similar or higher ritual status than their own. The relation of *Roti* means accepting food from other caste groups. The upper castes do not eat or drink in lower caste households. A major breakthrough in caste barriers is that the two castes start eating together on social occasions or otherwise. This relation is maintained among Patels, Prajapatis, Darbars and some Thakores but has not been observed among other caste groups such as Chamars and Vagharis. Another indicator of caste restrictions is in entering each other's houses. There are some castes such as Patels, Prajapatis, Darbars and Thakores that can enter each others' houses. However there is a restriction of entry in all the above four castes for people belonging to Parmar, Rawad and Vaghari castes who are considered lower in the caste hierarchy.

[9] Here I reject Dumont's understanding of caste as 'discrete systems where political and economic aspects are relatively secondary and isolated' (Dumont 1998: 21-32, 235). For a detailed critique, see Gupta 1991 and Das 1982.

[10] The Navnirman movement started in 1974 as a students movement with the increase of canteen bills in the engineering college hostels. Soon it took more political overtones against the Chimanbhai Patel's government that were considered corrupt. At the heart of the agitation was the issue of rising food prices. The protesters demanded fresh elections initiating the issue of 'right to recall' a corrupt government. The opposition party was quick to pick up on this and fully supported the agitations. The word nav-nirman symbolised the new order of the state free from corruption. As a result, for the first time, Gujarat elected a non-

INC government, the Janata Morcha (a conglomeration of many political parties including today's BJP), which became the base for anti-emergency activities in 1975. Largely, nav-nirman was an urban movement espousing the rising aspirations of the middle class (Babu 2002). (Also based on personal communication with Bhanubhai Mistry, UNNATI, Ahmedabad, February 17, 2004 and interview of Mukesh Patel, the then leader of Nav Nirman Movement sourced at www.in.rediff.com/news/1999/aug /13guja.htm)

[11] At the state level, the rise of a business class from the dominant peasant caste and the artisan shudra castes developed into an expanding propertied class. In Gujarat, it was from the peasant patidars and the artisan castes like panchals and prajapatis. Their caste cohesion remained embedded in the emerging secular economic and political organizations, becoming a means of enabling formation of new capital from money income, a social agency for breaking economic barriers and creating economic space and creating political support for state assistance for economic expansion and the accumulation of capital. In the initial period of economic expansion, the competition between this upwardly mobile propertied class and the existent vaniya-brahmin forces remained subdued, and gradually evolved into a core of the forward caste – the *savarna* identity. These forward caste communities constituted more than three fourths of the middle class and overwhelmingly of the provincial bourgeoisie (Roy 2002).

7

Conclusions

'Groundwater is a dry topic unless you happen to have a dry well' (Moench 2000)

'Maintaining a tubewell is like rearing an elephant' said an old woman while discussing the problems related to groundwater irrigation in Sangpura village. Using this metaphor, she explained how deep tubewells are difficult, particularly expensive to own and maintain. This is chiefly because everything concerned with a tubewell is as big as an elephant and not everyone has the resources and capacity to own them. An individual's access to groundwater in Sangpura is determined by having a share in a tubewell. Equating tubewells with elephants speaks volumes about who can own one and who cannot. This book has dealt with these concerns through an intensive case study of the Sangpura village, closely looking at its patterns of agrarian transformation. Sangpura's irrigation and livelihood needs rely on access to groundwater. This resource has been overexploited in recent years. The overexploitation threatens the livelihood support systems especially for people who directly depend on it for their survival. This book focused on the process of groundwater development as characterised by differential access and inequity in resource distribution. Looking at the triadic framework of agrarian institutions, ecological variables in agrarian change and state functioning, the book explains the process of social change taking place in a village in north Gujarat. The problem of groundwater depletion and its social consequences were placed in the broader socio-economic landscape, of which irrigated agriculture and socio-political institutions are an intrinsic part.

This concluding chapter summarises the arguments of the book. It divides into three sections. The first section recapitulates the issues of agrarian transformation in Sangpura and asks the question who wins and who loses in the process and why. The second section deliberates on the role of the groundwater market, which contributed to and mediated the process of agrarian transformation. The last section discusses the politics of groundwater irrigation. This politics of interlocking triadic control of agrarian institutions, socio-ecological variables in crop production system and social characteristic of the state defines and reproduces the course of groundwater exploitation.

A Some-Win All-Lose Game

In Sangpura, in 2002 groundwater irrigation built on the inequality in ownership of land and helped the large farmers. The gains from agriculture flowed more towards people who were already well off and socio-politically powerful. Few benefits reached down the hierarchy. This study showed that the ownership of land and groundwater was skewed towards the higher castes. The caste structure closely correlated with the class hierarchy in the village, determining an individual's access to the means of production. While the access to land, to a considerable extent, was historically determined, the access to irrigation in Sangpura is based on either having shares in the tubewells or through buying water from the groundwater market. The household-level analysis showed that around 40 per cent of the households did not have any access to irrigation. Groundwater access has largely tilted towards Patels who belonged to the higher caste. A large majority of them fell in the economically higher class. Constituting a little over 30 per cent of the total village households, Patels had shares in 29 out of the total 34 tubewells, amounting to 65 per cent of total tubewell shares of the village (Chapter 3). Their control over groundwater not only contributed to their economic domination but also added to the unrestrained use of groundwater. This was because the control added to an individual's resource base, which strengthened their capacity to drill deeper and deeper. With depleted aquifers, the resource poor and marginal farmers lost access to groundwater and became more dependent on upper classes for work and survival.

Government intervention to check groundwater overexploitation largely concentrated on indirect forms of regulation such as cutting the supply of electricity and controlling institutional finance (Chapter 2). This electricity cut was largely due to the inability of the government to increase the price for electricity use in agriculture. The electricity charges could not be increased because of the compulsions to sustain the interests of large farmers, who also constituted the political base of the ruling political party. However, the government was also under pressure from civil society institutions to check groundwater extraction, together with demands from international financial institutions for cutting agricultural subsidies. An escape route for the government, which avoided direct confrontation with farmers, was to reduce the electricity supply rather than increase the tariff. The reduction in electricity supply drastically curtailed the operation of water markets. The reduced hours of electricity supply led to a drop in the availability of water. This curtailed the command areas of tubewells and the sale of excess water. Another cause of shrinking groundwater markets was the drawdown of the aquifer leading to increased cost of pumping. Access to water was redefined in the changed scenario. With command areas shrinking, the first preference to irrigate rested with well owners, pushing out water buyers from the market. Controlling institutional finance did not deter the new installation of tubewells and neither did it help in checking the wells from going deeper and deeper to access groundwater. Farmers could access funds from other sources and hence controlling institutional finance only affected the late entrants. They were mostly small farmers who generated some resources and tried to have a tubewell of their own. These indirect forms of regulations came into force only when groundwater had become inaccessible to the majority of the population.

Agricultural productivity in Mehsana district and in Sangpura declined in the late 1990s. The major causes of this were intensive cultivation resulting in fertility loss of the soil, declining groundwater and reduced hours of electricity supply leading to increased irrigation costs and reduced availability of water, and lack of innovation in agriculture suitable to dry-land ecology. The case study of four tubewells (Chapter 4) showed how tubewell cooperatives were dealing with increasing groundwater prices and how only well-resourced farmers were able to cope with the

changes. The unsustainable resource use did not generate contestation in relation to the declining groundwater, as one might intuitively expect but shaped and structured responses in the direction of water mining. The strategies of the farmers did not address or confront ecological concerns, but aimed at avoiding and postponing them. With the depletion of groundwater, declining productivity of agriculture and shrinking of water markets, a sharp rise in sharecropping contracts was observed in Sangpura. For the upper class, the sharecropping system was cheaper than cultivating through hired labour as it saved them the transaction costs of supervising and managing labourers. With productivity decline and irrigation prices increased, the sharecropping system was introduced to share this burden. No matter how unfavourable an arrangement, the lower classes did take up land under the new sharecropping arrangements, as most of them were excluded from water markets and hence needed work to survive. Farming was necessary as it ensured household food security. This aspect explains why sharecropping in Sangpura was not only a technical arrangement for allocating productive resources but also a product of changing social relationships.

As a strategy to combat declining productivity, upper class farmers, mainly Patels, started migrating to the USA in the early 1990s. They paid huge sums of money to agents and used social networks to settle there. The money generated in the USA travelled back making them partially independent of the agricultural production system. Due to the new source of income, Patels were in a position to take more risks and did not defer from investing in tubewells or going deeper to chase the water table. It also increased their bargaining power in day-to-day management of agriculture, controlling and deriving surplus in extreme scarcity situations. The marginal and near-landless farmers could not cope with this and were trapped in a situation of land degradation, water scarcity and increasing irrigation prices. It resulted in lower profit margins in agriculture threatening their household food security (Chapter 5).

The struggles over resources between different social groups were also negotiated through the control over socio-political institutions and their strategies to cope with the changing scenario. A close examination of everyday village politics showed how political power extended beyond the structures of domination in the village. The broad social characteristics of the state provided

strength to local power structures and defined the course of everyday politics in Sangpura. Political domination facilitated an increased and sustained control over resources for powerful people. The working class worked through democratic institutions and contested the power structure through various means. However, the democratic institutions reflected the social structure dominated by powerful social groups. The everyday politics in Sangpura contributed to increase in the social power of the dominant classes, which was generated through their control over economic resources and by maintaining the socio-political hierarchy (Chapter 6).

The case of Sangpura showed that the development of groundwater irrigation led to differential access and control over a productive resource such as groundwater. The water markets helped the upper class farmers in extracting surplus from the sale of water in the early 1980s and 1990s, which was maintained through the new institutional arrangement of sharecropping. It showed that local water use was embedded in the social hierarchy, structures of power and accumulation and distribution of productive resources such as land and groundwater. All together, the prevalent property relations contributed to a small minority of dominant social groups winning over a sizable majority of middle and lower class farmers. The upper classes also defined the course of the agrarian production systems and flows of surplus in an extreme water scarcity situation. Access to groundwater and other material and symbolic resources are part of this process of social change taking place in the villages of north Gujarat.

Market and Social Differentiation

The case of Sangpura points towards a complex web of regulation, market and social relationships that led to emergence of a class of people controlling and redefining the course of production relations in a situation of water scarcity. Social differentiation clearly divided those with and those without the ability to escape the agrarian trap and political influence to defy regulation. This differentiation is defined as the power and ability of the dominant classes to shift the cost of irrigation to others whenever necessary. This process also emphasises the dynamic interlinkage between the

physical nature of the groundwater and the larger social-economic, political and institutional context within which it is presently managed.

Two major generalisations can be made looking at the case of Sangpura. The first relates to the loopholes in the regulatory nature of the formal groundwater legislation. This legislation does not capture the socio-economic realities or understanding of how water rights are defined at the local level. In the existing legal framework of 2002, the rights are in a private regime: the groundwater belongs to the person who owns land. In this legal framework, the landowners have all the rights while landless are left out. One of the consequences of this law is that it gives power to the rich property owners to become water-lords and indulge in water sales (Singh 1995). However, having a land right does not ensure access to groundwater in areas such as that of Sangpura. Ownership of the means of water extraction is much more important in ensuring this right to be exercised than access to land alone. The case of Mahendrabhai and Lakhaji (Chapter 1) elaborate this point. Both had access to land, but the latter lacked the means to access groundwater and hence was in a dependency relationship to the former. The absence of a clear-cut groundwater rights initially led to a spurt in the groundwater markets leading resourceful farmers to acquire tradable rights. The differential access to groundwater leads to situation of social conflict.

Secondly, the transactions in groundwater markets are socially contested and embedded in the way societies are organized historically. In Sangpura the introduction of new irrigation technology supported by material and financial subsidy by the state resulted in an increasingly unequal distribution of irrigation resources. The phrase of 'irrigation against rural poverty' (Chambers 1986) applied only temporarily in Sangpura. Irrigation access was defined though water markets, which built upon the inequality in resource allocation. It created differential access to irrigation for water buyers and sellers. The caste-based system of hierarchy and disproportionate access to economic resources such as land and water represented the prevalent production relations, which were reinforced through water markets. Meinzen-Dick (2000) documents a similar situation in Pakistan. Similar to Sangpura, in Pakistan, the control over groundwater is with those who can afford to invest in the tubewells. Under groundwater

market conditions, water purchasers cannot always obtain access to groundwater especially at times of peak demand, when tubewell owners use much of the well's capacity for their own fields. This unreliable access of subordinates limits agricultural productivity for those who must depend upon water from other people's wells. Janakarajan (1994, 1997) and Bhatia (1992) narrate similar situations (see chapter 1) pointing towards unequal resource access and exploitation of small and marginal farmers by dominant classes. These issues are said to be one of the 'important causes of the agricultural stagnation in the south Asian region where intervention through existing market channels reinforces the iniquitous impacts of policies. Intervention in one market produces a chain reaction that frustrates the original design or, far worse, upsets the precarious initial production balances. 'Commercializing' or 'modernizing' one segment of the complex web of production and exchange relations, if not followed by commensurate supportive changes in others, can frustrate the policy objectives of such interventions' (Bharadwaj 1985: 345-46).

The proponents of water markets advance two basic arguments. The first relates to the demand for reallocation of water to the highest valued uses, considering that groundwater is a scarce resource. It is argued that water markets allocate the resource to the 'highest valued uses' (Rosegrant and Binswanger 1994: 1616). Water is allocated to the sector with the highest marginal benefit and is considered a useful means of achieving efficient water allocation if it is given a right price tag (Tsur and Dinar 1997). Under the 'efficient' water market system, competitive water sellers would bring down the cost per unit of water and hence water would be available for a more competitive price. Further, the water sellers would cut the water price close to the average cost of pumping which would generate a larger irrigation surplus and more livelihoods for the resource poor and landless. Referring to efficiency arguments, Shah (1993) argues for charging electricity for pumping at a flat rate, which would create competitive markets. In the competitive water market, the forces of demand and supply determine prices and the highest bidder gets water. It is assumed that the price paid for the resource reflects the value of the resource to the person. From the case of Sangpura, we have seen that this argument ignores the implications of the existing distribution of income wherein the price at which water is bought

does not reflect the use value of the resource. The analysis of groundwater pricing in sample tubewells in Sangpura showed that there is no 'marginal' value of water that informs price. Instead, water prices are determined by, and embedded in a variety of other social factors (Chapter 4). Further, market allocations of groundwater generated externalities such as a declining water table. These externalities are not reflected in market transactions and are poor indicators of value for commodities for which property rights are not concisely defined (Brajer et al. 1989). Many also believe that the water markets are responsible for depleting aquifers, due to competition among farmers to overexploit an open access resource, and therefore create negative equity impacts (Bhatia 1992, Janakarajan 1993, Saleth 1994). In the process, resource poor and marginal farmers are losing access to groundwater and finding it hard to cope with the declining water table.

The second argument pertains to groundwater markets being an appropriate way to increase control over resources and reduce constraints in irrigation supply (Rinaudo et al. 1997). Water markets are considered equitable because the sale of water in the open market benefit many farmers who otherwise do not have access to the resource. It is also argued that buyers are minimizing their risk by not investing in the modern water extracting mechanisms (Shah 1993). As we have seen in Sangpura, the accessibility of groundwater to the farmers has increased due to the water markets in the early stage of tubewell expansion. However, in a short span of time, the resource poor farmers were at a distinct disadvantage in their inability to compete in chasing the water table, which involved high costs (Moench undated). The water buyers became dependent on the sellers for irrigation access who had resources to go deeper with the aquifer. A new class of water lords emerged, which benefited from the sale of and direct access to water. These water lords accumulated large surpluses from the sale of water. Thus, the argument of increased accessibility of the groundwater resource through water markets undermines the prevalent social relations of production. They are characterised by the dominance of resource-abundant upper caste farmers. The inequitable distribution of resources contributes to a structural pattern that underpins a mechanism towards increased social differentiation. The argument that groundwater markets increase accessibility to the resource does not hold true in the end. As we have seen in Sangpura, the groundwater markets are no longer

expanding, even decreasing and are hardly existent. The sellers are not affected by this as they still enjoy accessibility and have diversified from agriculture through the surplus generated in the process.

Groundwater Irrigation, Politics and Social Power

As described, Sangpura's case clearly demonstrated changing relations between production technology and socio-political institutions. The rise in groundwater irrigation was an immediate response to technological changes in agriculture, which created a demand for irrigation. Numerous wells and tubewells were installed to meet this demand. Water markets further mediated in this process of providing initial access to the resource. However, as discussed, groundwater markets not only built on existing social relations to production but also reproduced inequality in resource access and distribution. The control of groundwater by the privileged few was not limited to the agricultural production system but spilled over into other arenas of social life defining the course of agrarian change. It helped in consolidating the power positions of dominating classes, feeding back into political linkages and working against regulatory mechanisms for checking groundwater overexploitation. These factors define the political economy of groundwater governance of north Gujarat, which is detrimental to its limited groundwater resources. In the next section, I summarise these trends while looking at the interlocking triadic control of social power, (which defines access to resource for different social groups), socio-ecological variables in crop production systems, (which determines level of surplus generation for households) and domains of state functioning, (which reproduce unequal and unsustainable pattern of groundwater utilisation). These interlocking control systems are detrimental to the livelihood and survival strategies of the poor and marginalised sections of the rural population in north Gujarat.

Social power and distribution of groundwater

Politics is about the mediation of social power and the strategic action related to that negotiation. It is the process through which the social relations of power are constituted, negotiated, reproduced, transformed or otherwise shaped. In the context of resource use, four levels of power are identified. The first level consists of the everyday struggle over access and use of resources. The second level includes the political nature of policy formulations contested by different interest groups. The third level deals with the state and party politics alternatively identified as hydropolitics. The fourth level refers to institutions, agreements and conventions at global level that shape and influence water use (Mollinga and Bolding 2004). This book showed a great deal of interlinkage between the first, second and third level of groundwater politics. I showed that the contestations over groundwater resources are linked to the everyday village politics and political power, which extend beyond the structures of domination in the village into the larger state politics. The democratic process operates at different territorial levels and works through the social structure linking various structures of power occupied by different social groups within the society. It also leads to organised articulations of social, economic and political power in favour of the dominant classes. The politics of domination enhance the control over resources for powerful social groups. The distribution of groundwater in the village is intertwined with the distribution of power, which leads to the mining of groundwater. This is due to the ability of dominant classes to generate a surplus from agriculture and elsewhere and reinvest in drilling deeper down the aquifer. The fact that Sangpura is situated in an alluvial area with a large aquifer enables the process of exploitation to continue unhindered.

One of the important questions leading this analysis regards the mechanisms that reproduce class/caste domination and provide power and legitimacy for dominant groups to define the level of surplus extraction. I showed that groundwater irrigation in Sangpura built on the pre-existing inequality in land distribution, which provided economic power to some social groups over others to access a productive resource. The link between land and tubewell ownership is established to a very large extent. These

linkages defined the level of household surplus extraction from booming agriculture and water markets in the early stages of their growth. The large farmers, mainly Patels, were able to mobilise caste ties to access institutional finance and inputs needed for commercial agriculture. The unbridled access to groundwater along with the mobilisation of material, financial, and symbolic resources reinforced the economic and political dominations of upper classes. However, the arena of access and control over groundwater resource did not go uncontested. Other social groups challenged the dominant alliances in more than one way but did not succeed. This is mainly due to two reasons. First, the upper classes have constantly strategised ways to reproduce the domination and tried to have control over the process through various means. These strategies also included sharing of limited profit from institutional arrangements such as sharecropping so that the conflict does not lead to the level of organised contestation. I showed that the relations of exploitation in Sangpura are embedded in the class/caste structure and the ability of dominant classes to control the labour process. The strategies of upper castes are quite visible in various alliances that can form collective consciousness, behaviour and organisation for achieving and defending their interests. The upper castes form dominant alliances to transform 'class-in-themselves' to 'class-for-themselves'. Their alliances result in conscious strategies, which have both planned and unintended consequences in everyday politics and day-to-day decision-making by dominant classes to keep control. The choices made are part of a much broader political agenda closely coinciding with the present social characteristics of the state. The control over groundwater resources is result of this larger consciousness-making. Second, the cultural dimension of caste diffuses the economic inequalities and subordination as they are seen more as 'given' or 'natural' facts. This implies that the castes lower in the present social hierarchy do not form a 'class-for-themselves'. However, this does not downplay their strategies in devising plans for resisting this process of domination. In fact, their resistance includes various exit options and a search for alternative livelihoods rather than confronting and questioning unequal distribution of resources.

Socio-ecological variables and crop production systems

I have shown that ecology has a role in defining the course of agrarian change. The very existence of a deep aquifer that can be mined in Sangpura provided avenues for not confronting the ecological problem of a declining water table. In 2002, Sangpura was situated in a 'dark' zone of groundwater utilisation with an ecological crisis manifested in declining productivity of agriculture in recent years. I showed that the crop production base in the village was reaching a threshold due to intensive agriculture and other ecological factors, which undermined dry land agriculture. However, the declining profitability has not led to agriculture becoming uneconomic at least for the dominant and economically powerful classes. These people still derived a surplus even in case of declining agricultural growth due to their ability to control the labour process and increase in input use under new production systems. The large area that came under sharecropping was also used as an instrument to control labour and ensuring that the water markets take a new form. In the early stages of water market development, the water charges were based on crop sharing. This gave away when profit from the sale of water superseded the profit from crop sharing. Crop sharing also shared the risk in agriculture between tenant and landlord. When the productivity of the land was highest, this risk was minimal and hence water charges were collected on an hourly basis and in cash. With decline in agricultural productivity and shrinking of water markets, the risk in agriculture went up many-fold. The rise in the institution of sharecropping during this time was a response to share this risk by creating a stake for tenants. Water charges were again calculated against crop share while labour costs were minimised by using lower-caste women tenants and keeping the wage rate constant for over a decade. This power of the dominant classes to shift the risk and pricing of groundwater whenever necessary as suited to their class interest throws light on the social relations in Sangpura.

A pertinent question is what farmers' strategies can be to restore productivity, and why new technological changes are not adopted in Sangpura. Out of all the measures to maintain the productivity, using compost is most popular among farmers. This is largely because of its availability in the village due to dairy farming activities and its time-tested result in keeping up productivity

without any harmful effect to crops. Regarding new technological choices, there has been little innovation suited to the requirements of the present day agriculture in Sangpura. Even if the technology exists, information is not widely available. In the era of productivity decline only a few rich farmers have been able to experiment with different varieties of crop and some of them who experimented in the past benefited. The case of Vervabhai Patel (Chapter 6) illustrated this. Vervabhai could experiment with the new high input tobacco crop and reaped a large profit. However, Vervabhai is one of the most resourceful farmers of Sangpura and not everyone has capacities to experiment as he did. Therefore, experimentation is limited to a few people and to their 'capability' to take the risk to experiment. The increasing irrigation cost is not complemented by using water efficiency devices such as drip irrigation systems. This is chiefly because under the largely popular one-third sharecropping system, the gain from the land and water component goes to the landlord. A drip irrigation system reduces the labour cost for irrigation but the cost of installing a drip system is much greater than the cost of total labour charge in irrigating the field. Under the flat rate electricity system, accessing water is still economic in combination with cheap labour under sharecropping and profits from milk production systems. The landlord hence rationalises to use manual labour over drip irrigation. These aspects show how technological adoption is the product of changing social relationships. Policy prescriptions to popularise a particular technology can have very limited effects if they are not backed by sound understanding of prevalent social relations.

The declining productivity does not have a universal effect on all social groups, as the case suggests. The large farmers could cope with these situations through partial diversification from agriculture and have been able to derive surplus. It is the small and marginal farmers that have been at the receiving end of these changes. This aspect makes a case for devising strategies to protect the interest of historically marginalised groups in the wake of extreme scarcity situations. The answers to the productivity question lie in devising strategies and promoting technology that consider the present resource constraints and innovation suiting the particular ecology. This may include water-use efficiency measures and recharging shallow water aquifers. The concept of water use efficiency needs to be broadened to incorporate issues of productivity, equity and

sustainability in resource management (Hussain, Yokoyama and Hunzai, 2001). North Gujarat has numerous ponds and tanks that have silted up over the years due to neglect and non-dependability. Restoring these tanks could be used as a long-term strategy for recharging shallow aquifers. The other aspect of productivity is to innovate and sustain seed varieties. As the case of Sangpura shows, indigenous wheat provides almost similar yield with less external inputs while the HYV seeds have lost their genetic potential due to repeated use. There is a dire need for research and development in ecologically suitable agricultural technology for input efficiency, especially for water-starved areas such as north Gujarat. Stabilising agricultural production and the environmental system is fundamental: if they are affected badly in an irreversible manner, as the case largely suggests, this will lead to larger social consequences. However, productivity-enhancing measures do not guarantee that the rich and the powerful classes will not siphon off the benefits. The social characteristics of the state have to be adapted for realising such benefits to cover historically marginalised groups through special efforts and affirmative actions. This is what I turn to next.

The social characteristics of the state

While defining the functioning of the state, Abrams (1988) referred it as a structure or agency, which is hidden behind a set of institutions. This hidden entity is difficult to study because of the 'backstage institutionalisation of political power behind the on-stage agencies of government' (ibid: 63). He analysed the functioning of the state as an ideological power, which introduced the study of relationships between the state-system and the state-idea and other forms of power in understanding the characteristics of the state. In this section, I discuss the state-system represented by a set of institutions and public agencies and the overall ideology of the political system ruling the state of Gujarat. I seek to answer how different institutions of the state interacted and played a role in controlling agrarian institutions and socio-ecological variables at the local level defining the course of groundwater distribution and exploitation in north Gujarat.

I have shown that the present form of groundwater distribution and control is based on the ability of individuals to afford the costs of investing and deepening the tubewells. This gives economically powerful sections of society an edge to monopolise control over groundwater, which has larger socio-political consequences. At the local level, this manifests itself in control by dominant classes over various arms of the state institutions such as the panchayat, dairy and credit cooperatives. This is not a unidirectional agenda for controlling groundwater but part of the broader agenda of dominant social groups to manipulate material, financial and symbolic resources, which helps in reproducing their socio-political and economic domination. These agendas are also set and driven by the overall ideology of the political party ruling the state. In Gujarat, except for the brief period of KHAM (Khsatriya, Harijan, Adivasi and Muslim) politics, which allied the marginalised groups with the dominant Khsatriya caste, politics has been dominated by the coalition of what Bardhan (1984) calls the dominant 'proprietary classes'. They include the industrial capitalists, rich farmers and a class of bureaucrats and professionals. The state's ideology was directed by the interest of these classes and their balance of power. The replacement of KHAM with Hindutva politics post-1980s was part of the broader social engineering by the BJP to diffuse the dissention among caste-divided Hindus of Gujarat. The differences between upper and lower caste Hindus were clearly visible in the 1981 riots in Gujarat, which erupted against affirmative action and public policy designed to benefit lower castes. Dalits and lower caste people were brutally killed and burned alive showing the sharp divisions on caste lines. Hindutva politics inevitably dispersed the divisions on caste identities and instead combined the Hindus against 'well-defined enemies' identified as Muslim and Christian minorities (Yagnik 2002, Babu 2002). As shown among the voting behaviour of different classes in Sangpura, the Hindutva base was largely concentrated in the propertied class of Patels and Prajapatis (Chapter 6). The ruling political party thus provided impetus to local politics where the rich and powerful could consolidate and maintain their class positions and define the course of agrarian change. I asked a Patel farmer who was installing a new tubewell why he should not be prosecuted in defying the law as no new installation of tubewell is allowed in Mehsana without permission. He replied, 'no one dares

to touch a Patel and put them behind bars as the majority of MLAs (member of legislative assembly) are Patels. Not only this, we also have a hold over police, bureaucracy and institution of justice'. The answer clearly shows the interlinkages between local social power and the various arms of the state machinery.

Several observers document this connivance of social power and state power. Chakravarti (2001) showed how the local or village-based agrarian power structures are interwoven with the power of the state. At the local level, it leads to exploitation of working class by the dominant social groups resulting in 'long working day, rigorous surveillance, lower wages and the ever present possibility of being subjugated to taunts and physical abuse'(ibid.: 287). The linkages have also been powerfully projected in the course of agrarian violence against the organisation of the working class. 'The critical factor in the struggles of the rural working class against their opponents is the capacity of the political party or agency that is instrumental in organising them to breach the nexus between social power and state power' (ibid: 288). Providing evidence from the study of tank irrigation in south India, Shah (2003) illustrated how state policies are made in a politically contested field in which sections of society actively participate. Farmers' politics at the state level indirectly influenced the new tank designs. Her study showed how the landed farmers' alliances have influenced state policy on paddy price, decentralisation of administrative power and tank irrigation. These policies affect diverse sections of the peasantry differently. Some of them have been detrimental to the situations of small and marginal farmers. Prahladachar (1994) studied the innovations in the use and management of groundwater in the hard rock regions of India and indicated that because of advantageous resource position and bureaucratic-political influence, owners of large farms have appropriated the gains of lift irrigation disproportionately more than small farmers. He called for innovative institutional arrangements to improve access of water to small farmers especially in the water scarce hard rock regions.

Analysing the relationship between the state and local agrarian communities in a canal-irrigated region of south India, Ramamurthy (1995) showed local irrigation organisations cannot and do not change the local power structure. In fact, the strategies of the local collective organisations, politicians and government bureaucrats compromised the efficiency and long-term

sustainability of the canal system. 'Given the structural disability of their class positions, small farmers just could not afford to opt out if they wanted to continue to be economically viable. The ties interlocking different classes included not only water but also employment, sharecropping, credit, loans, and brokerage of concessionary green revolution inputs such as fertiliser. These ties were legitimated by both the cultural ideology and the real or threatened use of force' (ibid.: 283). Studying the landless classes of Halpatis in south Gujarat, Breman (1993) observed limited improvements in their pitiable conditions. This was in the framework of society's institutional and governance structure. The affirmative action of support to the underprivileged class through reservation policies had resulted in violent protests by middle and upper classes. Though, Halpatis derived little advantage from the policy, 'even that little is too much in the eyes of their former masters' (ibid.: 361). He concluded that though the traditional legitimacy of inequality was non-existent, Halpatis would have to fight a long battle due to lack of political visibility.

These cases clearly show the link between local power structure and the social characteristic of the state, providing evidence to draw parallels for the case of north Gujarat. I showed that the state's inability to enforce strict laws and regulations to check the exploitation of groundwater rests largely on its political unwillingness. The political leadership of the state does not want to go against the large farmers' lobby, which is an important vote bank, and hence sustains their interest for mining deep aquifers. This process is not limited to Gujarat but has been part of populist agricultural policies all over India in mobilising vote banks. 'While farmers have long been dependent on the state for essential inputs to agriculture, in recent years politicians in the state governments have also become dependent on farmers' (Dubash 2002: 251). It brings us to the fact that resource exploitation is not apolitical. One of the ways to resolve this is to work on approaches based on balance of power concepts with explicit recognition of the political nature of management needs (Moench 2000). As shown, dominant classes in Sangpura have been effective in controlling productive resources without much affirmative action by the state to provide a safety net for people lowest in the class hierarchy. In addition, there is a particular way in which the state has identified the problem and created programs reflecting their political constituency. This

includes building a large dam on the river Narmada and the political rhetoric associated with how it will solve the problems of water scarcity in Gujarat. 'State-directed technocentric development projects which do not involve the people but treat them simply as objects of the development process often end up primarily as conduits of largesse for elite groups, middlemen, contractors, officials, politicians and favoured special interest groups and very little reaches the intended beneficiaries. Even when a significant amount reaches the latter, the benefits are sometimes of the wrong kind, inappropriate technologically, and environmentally unsustainable, corrosive of local institutions of community bonding and self-help and always leaving untapped the large reservoir of local potential, ingenuity and information' (Bardhan 2003: 291-292). The state, thus, is doing very little to stop groundwater exploitation, deliver technological options, choice, and access to resources for the empowerment of the working class. This defines the social characteristics of the state in present day Gujarat.

Through the case of Sangpura, I captured the changes in production relations through the introduction of deep tubewells. The initial expansion and demise of water markets and the level of surplus generation changed social relationships and an individual's access to groundwater resource. Dominant social groups devised strategies to control material and financial resources through various means. This control did not go uncontested. However, the contest was heavily weighted in favour of dominant classes chiefly because of their ability to cope with changes. Groundwater was an important part of the interlocking control where agrarian institutions, socio-ecological variables and domains of state functionally interacted. This is chiefly because of the characteristics of groundwater, which transformed agriculture based on an individual's level of accessibility. Further, this accessibility got translated in to ways of surplus extraction for the farming households. The social characteristics of the state provided strength for the local power structure to control access to groundwater. Together, they led to unchecked exploitation of groundwater, which only benefited the small minority of upper class farmers. Through the shift in labour contract according to the groundwater pricing, the risk of agriculture was spread through sharecropping contracts. As accessibility reduced and the market

shrunk, upper classes maintained their relative social and economic positions and brought the working classes into a new dependency relationship, defining the course of agrarian change in north Gujarat.

Though, this book tried to capture some aspects of the relationships between technological variables and the reproduction of power and inequality, it could be further captured through a detailed study focusing on the changing forms of contacts and markets. This includes the multi- dimensionality of patron-client relationship in favour of market driven prices and wages. The information asymmetry in the market is reinforced by the relative diversification option of different players in these contracts, especially in relation to exit options. The transactions of these evolving markets are a matter of further analysis.

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Summary

From the second half of the last century, agriculture in India has gone through enormous changes because of the introduction of green revolution technology. The technology demanded more control over irrigation, which the large canal systems were unable to provide. Groundwater irrigation was seen as a feasible alternative to the bureaucracy controlled canal systems. In addition, groundwater irrigation could cover areas that were historically not part of the surface irrigation schemes. These advantages of groundwater over surface irrigation led to sharp increase in its use. However, due to the large areas being irrigated by groundwater, over-development and depletion of aquifer systems is becoming common. Gujarat is no exception to this process where groundwater supports more than seventy-seven per cent of its irrigation water requirements. Due to the increased dependence on groundwater, many regions in Gujarat have become water scarce from water abundant areas in just four decades. Increased groundwater use coupled with rising pollution level in surface water bodies has resulted in water scarcity further leading to groundwater exploitation. With the increased groundwater use, a spurt in water markets has been reported in the early 1980s. Dense markets developed in alluvial central and northern regions of Gujarat, which were suitable for sinking deep tubewells. The rise in water markets led to debates often to the level of rhetoric, over its nature and way of functioning. A group of academician advocated for having dense and competitive groundwater markets on the ground of efficiency and accessibility to the resource without unpacking nuances of unequal social relationships, natural and historical functions that shaped and determine groundwater access and use. Apart from few very recent studies, the debate lacked detailed methodological and empirical inputs in understanding how

groundwater irrigation and markets functions at the level of ground zero.

The present study fills this gap while focussing on the politics of groundwater markets and its interrelation with social differentiation and class-caste relations. It is based on an intensive case study of Sangpura village situated in the Mehsana district of north Gujarat. Mehsana district is famous for its widely developed groundwater markets and depletion of aquifer system due to excessive pumping. The study seeks to understand how groundwater depletion and inequity have become intrinsically related elements of this process. First, it investigates the factors that shaped unrestrained use of groundwater and the responses of various social groups characterised by class and caste, to this process of social change. These factors range from the issues of access and control over productive resources such as land and groundwater, a local ecology that endorsed groundwater development and institutions such as groundwater markets and sharecropping that mediated the change process. Together they present a new social differentiation between those who are able to escape the agrarian trap and the ones who are forced to bear the consequences. It also examines the ability of dominant classes to maintain control over groundwater in such a way that it allows transfer of surpluses even in case of water scarcity. Second, the overexploitation of groundwater and its social consequences are the result of certain processes of development in irrigated agriculture occurred at the cost of depleting aquifers and sustainable farming systems. The state intervened initially through agrarian reforms and later by providing credit facilities and indirectly supporting milk and tubewell cooperatives. It has also interceded in creating law for limiting groundwater overexploitation. However, the state also became inefficient and ineffective in checking depletion of resources largely due to keeping the interest of large farmers' lobby that feeds into the political system. The various institutions of the state and their control provide impetus to an agrarian politics that tilts toward the interest of dominant social groups. These mechanisms work right from the lowest panchayat and dairy cooperative level to the level of the state reflecting the overall political economy. On the ground, they help the dominant classes to consolidate their position and determine differential access to groundwater resources through various sources of legitimacy and power.

The book is divided into seven chapters. Chapter 1 maps the social-geography of the village while locating them in the theoretical arena. It reviews the literature on groundwater irrigation from the perspective of agrarian change showing the lack of detailed information on internal characteristics of groundwater irrigation institutions. Through a triadic framework of the theory of agrarian institutions, ecological variables in agrarian change and the domain of the state in influencing institutions, nature and society, the study locates the context of present study. In addition, it introduces the focus of research and the central research questions followed by the study design and an overview of the chapters.

Chapter 2 sketches the distribution and causes of groundwater scarcity in different eco-regions of Gujarat, which is grounded in local ecology. The causes of water scarcity are seen in the historical context of agricultural development that heavily relied on groundwater irrigation. The chapter looks into the various responses of the state for the management of groundwater. It also updates information on the famous Sardar Sarovar Project (SSP) and its distribution networks and shows how it will not address the problem of groundwater scarcity in north Gujarat as it covers only part of the scarcity zones.

Chapter 3 analyses the organization of tubewell irrigation cooperatives as shareholders and water buyers. It shows how the pattern of groundwater irrigation is embedded in prevalent social relations of production and where the class structure closely subsides with the caste structure. The small dominant minority controls the groundwater irrigation institutions and define the manner in which groundwater is accessed and distributed in the village. This control, which stems from the differential access and control over groundwater resource for different classes, leads to a much sharper social differentiation.

Chapter 4 maps the responses of increasing irrigation costs due to decreasing supply of electricity and groundwater depletion. Through the entry point of four tubewells, this chapter provides the worm eye view of the organisation of tubewell cooperatives and their coping mechanisms in meddling with increasing groundwater prices. The cases provide information towards a broader dynamics and strategies of different social groups in confronting the declining trend of groundwater and rising input costs in agriculture. It shows how unsustainable resource use does not generate contestation in relation of declining groundwater but

shapes and structures responses towards the progression of water mining.

Chapter 5 documents the rise in sharecropping contracts in the village and illustrates how it is a part of the changing history, rooted in social and economic contingencies. It also looks the aspects of production relations where sharecropping becomes preferred form of contract. Powered by the new economic might generated through long distance migration, the dominant classes define the manner in which labour is appropriated. Through the description of the basic features of sharecropping in Sangpura such as historical evolution, coverage and types of contracts, the chapter outlines the social relations of production in sharecropping arrangements. It focuses on the rationale of landlords and tenants for taking up sharecropping and shows how dominant classes transfer the burden of resource depletion to people other than them.

Chapter 6 closely examines the every-day village politics of Sangpura, which contributes to the social power generated at two levels, from the control over economic resources and by maintaining and reproducing the social and economic hierarchy. It also leads to increased tussle over groups of people claiming control by gaining more power and room to manoeuvre. The chapter shows how the structure of power and politics of the village is reflected in controlling institutions such as panchayat, dairy and credit cooperatives by dominant groups, which in turn reproduces legitimacy and power for them. These institutions and their control provide impetus to an agrarian politics helping dominant classes to consolidate their power positions and define the course of resource exploitation and agrarian change.

Chapter 7 summarises the major arguments of the thesis and revisits the key concepts. It opens up debate on the dynamics of agrarian change and the process of social interaction in the context of groundwater exploitation. Departing from the popular theories that looked at institutions and groundwater markets, the study shows a triadic relationship where access to resources, crop production systems and social relations interact and define the course of social change in groundwater dependent economies. It also looks into the feasibility of some of the solutions to the problem of groundwater depletion discussed by scholars and activists.

The case of Sangpura clearly showed the changes in production relations through the introduction of deep tubewells. The initial expansion and demise of water markets and the level of surplus generation changed social relationships and an individual's access to groundwater resource. Dominant social groups devised strategies to control material and financial resources through various means. This control did not go uncontested but was heavily weighted in favour of dominant classes chiefly because of their ability to cope and resist with changes. Groundwater was an important part of the interlocking control where agrarian institutions, socio-ecological variables and domains of state functioning interacted. This is mainly because of the characteristics of groundwater irrigation, which transforms agriculture and accessibility to groundwater in a village like Sangpura, determines the level of surplus extraction for the households. The social characteristics of the state provided strengths for local power structure to control access to groundwater. Together, it only led to unchecked exploitation of groundwater, which benefited the small minority of upper class farmers. It brought small and marginal classes in a dependency relationship with the upper classes defining the course of agrarian change in north Gujarat. In sum, the study shows how social relationships shape and determine access and use of groundwater in the context of specific agro-ecology, prevailing social relations of production, ineffective regulation of groundwater exploitation and large inequality in resource ownership.

Nederlandse Samenvatting

De Groene Revolutie heeft, sinds the tweede helft van de vorige eeuw, enorme veranderingen in de Indiase landbouw teweeggebracht. Sommige van die veranderingen hebben te maken met water. De nieuw geïntroduceerde zaadvariëteiten vereisten nauwgezettere watergiften, die moeilijk realiseerbaar waren met de aanwezige oppervlakte-irrigatiesystemen. Grondwater dat middels putten kon worden opgepompt vormde een aantrekkelijk alternatief voor deze bureaucratisch beheerde grootschalige systemen. Gebruik van grondwater maakte het bovendien mogelijk om nieuwe gebieden te bevloeien. De aantrekkelijkheid van grondwater als bron voor irrigatie hebben geleid tot een scherpe stijging in het gebruik ervan. Enorme arealen worden geïrrigeerd met grondwater. Het gebruik van grondwater begint echter langzaam te leiden tot problemen van uitputting van de ondergrondse watervoorraden. Deze problemen doen zich ook voor in Gujarat, waar meer dan 70% van de irrigatie afhankelijk is van grondwater. Veel gebieden in Gujarat zijn in een periode van slechts 4 decennia veranderd van waterovervloedig in water schaars. De sterk gestegen vervuiling van oppervlakte water heeft deze schaarste nog verergerd, doordat het nog meer mensen heeft genoopt hun toevlucht te nemen tot grondwater. Vanaf de vroege jaren tachtig heeft de stijging in het gebruik van grondwater ook geresulteerd in een enorme groei van watermarkten. In de alluviale vlaktes van Noord Gujarat, die uitermate geschikt zijn voor het slaan van diepe grondwaterputten, is een bloeiende handel in water ontstaan. Het feit dat water verhandeld wordt, en de zichtbare aanwezigheid van markten in water, is koren op de molen van een groep wetenschappers en beleidsmakers die pleiten voor de privatisering van water. Het stimuleren van competitieve water markten, zo luidt hun argumentatie, zou leiden tot het vergroten van de efficiëntie van het gebruik van water evenals tot een effectievere en efficiëntere verdeling ervan. De voorstanders van water privatisering laten zich over het algemeen weinig gelegen liggen aan bestaande ongelijke sociale verhoudingen, noch bekommeren ze zich erom dat de toegang tot en het gebruik van grondwater mede bepaald worden door natuurlijke en historische omstandigheden. Met uitzondering van een paar recente studies, wordt het privatiseringsdebat gevoerd op basis van simplistische en foutieve aannames over hoe de toegang tot en het gebruik van

grondwater georganiseerd.

De analyse in dit boek probeert deze lacune op te vullen door aandacht voor de organisatie van het gebruik van grondwater op het niveau van de alledaagse werkelijkheid. De studie hanteert een politiek-economische benadering van grondwater markten en onderzoekt hoe deze markten samenhangen met sociale differentiatie en kaste en klassenverhoudingen. De analyse is gebaseerd op een intensieve casus van het dorp Sangpura, in het Mehsana district in Noord Gujarat. Het Mehsana district staat bekend om zijn goed ontwikkelde grondwatermarkten en vanwege de waterschaarste die het gevolg is van uitputting van de watervoerende grondlaag door overbepomping. De studie probeert de processen die geleid hebben tot de uitputting van grondwater te begrijpen als intrinsiek samenhangend met processen van sociale differentiatie. Als eerste wordt een historische beschrijving gegeven van de processen die hebben geleid tot het ongebreidelde gebruik van grondwater. Tevens wordt een inventarisatie gemaakt van hoe verschillende sociale groepen, geordend naar kaste en klasse, zijn omgegaan met de veranderende watersituatie. De analyse kijkt naar de toegang tot en de controle over hulpbronnen als land en water, de locale ecologische omstandigheden die gunstig waren voor het gebruik van grondwater voor irrigatie, en naar instituties zoals watermarkten en deelpacht die het veranderingsproces mede vormgaven. Samen leidden deze tot een nieuwe sociale differentiatie, met aan één kant degenen die profiteren en aan de andere kant degenen die slachtoffer zijn van de veranderingen. De studie laat zien hoe de heersende klasse in staat is geweest controle over grondwater te behouden. Deze controle was dusdanig dat deze landbezittende groep, zelfs in tijden van waterschaarste, het water dat ze zelf niet nodig hadden konden verhandelen. De studie vervolgt met een analyse van de overexploitatie van grondwater die laat zien hoe de sociale gevolgen ervan voortvloeien uit bepaalde historische ontwikkelingsprocessen in de geïrrigeerde landbouw. Aanvankelijk trachtte de staat sociale differentiatie binnen de perken te houden middels landhervormingen, en later door kredietvoorzieningen en indirecte steun aan melk- en watercoöperaties. De staat voorzag tevens in een wet die de overexploitatie van grondwater moest tegengaan. Er kon echter weinig effectief gebruik worden gemaakt van deze wet, doordat deze werd tegengehouden door enkele succesvolle allianties van grotere boeren. De politieke macht van grote boeren was

aanzienlijk, en heeft ertoe geleid dat de diverse staatsinstituties feitelijk een politiek in stand houden die vooral de belangen van deze groep behartigde. Dit gebeurde middels mechanismen die werken vanaf de laagste niveaus van bestuur, op *panchayat* en melkcoöperatie niveau, tot op het hoogste niveau van de staat. Op het laagste niveau gebruikte de heersende klasse de regels en instituties van de staat ter bestendiging van de eigen positie, en maakte gebruik van deze regels om gedifferentieerde toegang tot grondwater verder te legitimeren.

Het boek bestaat uit zeven hoofdstukken. Hoofdstuk 1 brengt de sociale geografie van het dorp in kaart, en positioneert het boek in theoretische zin. Het geeft een overzicht van de bestaande literatuur over grondwater irrigatie vanuit het perspectief van landbouw ontwikkeling, en laat zien hoe weinig er bekend is over de interne karakteristieken van grondwater irrigatie instituties. Middels een driekantig raamwerk bestaande uit theorieën over agrarische instituties, theorieën over de rol van ecologie in agrarische veranderingen, en een theorie over de staat helpt dit hoofdstuk de rest van het onderzoek theoretisch te kaderen. Het hoofdstuk gaat verder kort in op het gekozen onderzoeksperspectief, presenteert de belangrijkste onderzoeksvragen en geeft een overzicht van de hoofdstukken.

Hoofdstuk 2 schetst, vanuit een ecologisch perspectief, de verdeling en oorzaken van grondwaterschaarste in de verschillende ecologische regio's van Gujarat. De oorzaken van waterschaarste worden gezocht in de historie van een agrarische ontwikkeling die zwaar afhankelijk was van grondwater irrigatie. Het hoofdstuk bekijkt de verschillende manieren waarop de staat heeft getracht het beheer van grondwater te reguleren. Het geeft ook de stand van zaken weer over het beroemde Sardar Sarovar project (SSP) en de daaraan gekoppelde waterdistributienetwerken, en laat zien dat dit project geen oplossing zal bieden voor de grondwaterschaarste in Noord Gujarat, omdat het slechts een klein gedeelte bestrijkt van de gebieden waar schaarste heerst.

Hoofdstuk 3 analyseert de organisatie van grondwater irrigatiecoöperaties als belangrijke aandeelhouders in en kopers van water. Het laat zien hoe grondwaterirrigatie patronen ingebed zijn in de bestaande sociale productieverhoudingen waarin klasse structuren neigen te overlappen met kaste structuren. Een kleine heersende minderheid heeft de controle over grondwaterirrigatie instituties en bepaalt de manier waarop de toegang tot en de verdeling van grondwater geregeld is in het dorp. Deze controle is

geworteld in de sterk gedifferentieerde toegang tot grondwater en leidt op haar beurt tot een steeds groter wordende kloof tussen arm en rijk.

Hoofdstuk 4 brengt in kaart hoe de kosten van irrigatie steeds zijn blijven stijgen door het afnemende aanbod van elektriciteit en de uitputting van grondwater. Middels een gedetailleerde analyse van 4 diepe grondwaterpompen geeft dit hoofdstuk een beschrijving van de organisatie van grondwater coöperaties en laat zien hoe deze omgaan met stijgende grondwaterprijzen. De beschreven voorbeelden illustreren de algemenere dynamiek en strategieën van verschillende sociale groepen in het omgaan met de afnemende beschikbaarheid van grondwater en met de stijgende productiekosten van de geïrrigeerde landbouw. Ze laten zien dat onduurzaam gebruik van een natuurlijke hulpbron niet hoeft te leiden tot protesten waarin dit gebruik aangeklaagd wordt, maar in tegendeel gedrag kan genereren dat de verdere uitputting van de grondwaterbronnen tot gevolg heeft.

In hoofdstuk 5 wordt verslag gedaan van de toename in deelpachtcontracten in het dorp, en wordt aangetoond hoe deze toename deel uitmaakt van een veranderende geschiedenis die is geworteld in sociale en economische samenlopen van omstandigheden. Het hoofdstuk kijkt ook naar veranderingen in productieverhoudingen doordat deelpacht de meest favoriete manier wordt om arbeid te organiseren. Economische gesteund door inkomens afkomstig uit overzeese migratie van familieleden, is de heersende klasse in staat de manier te bepalen waarop arbeid gerekruteerd en beloond wordt. Middels de beschrijving van de basiskenmerken van deelpacht in Sangpura (de historische evolutie, verspreiding en types contracten) geeft het hoofdstuk een indruk van de sociale productieverhoudingen die besloten liggen in deelpachtafspraken. Het hoofdstuk legt de nadruk op de motieven van landbezitters en pachters om deelpachtrelaties aan te gaan, en laat zien hoe de heersende klasse erin slaagt de kosten van de uitputting van natuurlijke hulpbronnen af te wentelen op anderen.

Hoofdstuk 6 onderzoekt van dichtbij de alledaagse dorpspolitiek van Sangpura, waarbij de werking van sociale macht op twee niveaus wordt geanalyseerd. Ten eerste op het niveau van de controle over economische bronnen, en ten tweede op het niveau van het in standhouden en reproduceren van de sociale en economische hiërarchie. De dorpspolitiek manifesteert zich ook in toenemend geharrewar veroorzaakt door groepen mensen die meer

zeggenschap eisen als ze meer macht en onderhandelingsruimte krijgen. Het hoofdstuk laat zien hoe de politieke en machtsstructuren in het dorp worden weerspiegeld in het bestuur van officiële instanties zoals de panchayat en de melk- en krediet coöperaties. Deze instanties en hun macht spelen daardoor een belangrijke rol in de agrarische politiek bij het bestendigen van machtsposities, bij het bepalen van de manier waarop natuurlijke hulpbronnen worden gebruikt en bij het bepalen van de loop van de agrarische ontwikkeling.

Hoofdstuk 7 vat de belangrijkste argumenten van het proefschrift nog eens samen, en herhaalt de belangrijkste bevindingen. Het gaat het debat aan over de dynamiek van agrarische verandering en processen van sociale differentiatie in de context van grondwater gebruik. De studie neemt afstand van de gangbare theorieën over instituties en grondwatermarkten en laat een driezijdige verhouding zien waarin toegang tot hulpbronnen, gewasproductiesystemen en sociale relaties elkaar wederzijds beïnvloeden en gezamenlijk de loop van sociale veranderingen bepalen in economieën die afhankelijk zijn van grondwater. Het hoofdstuk neemt ook een aantal van de voorgestelde oplossingen voor de grondwaterproblematiek, zoals voorgesteld door wetenschappers en beleidsmakers, kritisch onder de loep.

De Sangpura casus heeft duidelijk aangetoond welke veranderingen productieverhoudingen ondergaan door de invoering van diepe grondwaterpompen. De aanvankelijke uitbreiding en vervolgens het ter ziele gaan van watermarkten, samen met de manier waarop meerwaarde gegenereerd werd, hebben diepgaande gevolgen gehad voor sociale verhoudingen en de toegang van individuen tot grondwater. Heersende sociale groepen ontwikkelden verschillende strategieën om te kunnen beschikken over materiële en financiële middelen die hen in staat stelden blijvend toegang tot grondwater te houden. Dit leidde tot protesten, maar uiteindelijk bleek de heersende klasse toch in staat te overleven en om te gaan met veranderingen. Grondwater was een belangrijke schakel in het instandhouden en versterken van de macht van deze klassen, een schakel tussen agrarische instituties, socio-ecologische variabelen en verschillende domeinen van staatsinvloed. Het belang van grondwater hangt voornamelijk samen met de kenmerken van grondwater irrigatie, met de historische karakteristieken van de landbouwontwikkeling, met de manier waarop toegang tot water is georganiseerd in een dorp als Sangpura, en met het niveau van meerwaarde onttrekking voor

huishoudens. De sociale kenmerken van de staat hielpen de locale machthebbers hun greep op water verder te verstevigen. Dit alles samen leidde tot een ongecontroleerde ontginning van grondwater waar een kleine minderheid van boeren uit de hogere klassen van profiteerde. Kleinere en marginale klassen werden in toenemende mate afhankelijk van de hogere klassen, die de loop van de agrarische veranderingen in Noord Gujarat bepaalden. Samenvattend, de studie laat zien hoe sociale verhoudingen de toegang tot en het gebruik van grondwater kunnen bepalen, in de context van een specifieke agro-ecologie, de aanwezige sociale productieverhoudingen, weinig effectieve regulering van grondwater gebruik en grote ongelijkheid in bezitsverhoudingen.

Curriculum Vitae

Anjal Prakash was born in Jamshedpur in eastern India in a family oriented towards arts and literature. In 1992, after graduating in Science, he obtained two-year diploma in Rural Development and Management course from the Centre for Research on New International Economic Order (CReNIEO), Chennai in southern India. His interest in developmental studies led him to join the Department of Urban and Rural Community Development (URCD) for pursuing Masters in Social Work (MSW) at the prestigious Tata Institute of Social Sciences (TISS), Mumbai in western India. A premier institute of social work education, TISS offered great learning and nurtured the interest in developmental research created at CReNIEO. After graduating from TISS in 1997, he joined VIKSAT, Nehru Foundation for Development in the western Indian city of Ahmedabad to be associated with its groundwater management programme. The job offered him to interact with villagers and understanding nuances of natural resource depletion and its effect on different social groups. In 2000, he won the Ford Foundation scholarship to pursue PhD from the Irrigation and Water Engineering Group at the Department of Environmental Sciences, Wageningen University and Research Center, The Netherlands. He is currently working with Water and Sanitation Management Organisation (WASMO) in Gandhinagar, Gujarat in western India.