Research Bulletin No. 26

DRIVERS OF CHANGE

Dynamics of Rural Livelihoods and Poverty in SAT India

Uttam Deb | Cynthia Bantilan | GV Anupama

ICRISAT Science with a human face

International Crops Research Institute for the Semi-Arid Tropics

CGIAR RESEARCH PROGRAM ON Policies, Institutions and Markets

Citation: Deb U, Bantilan C and Anupama GV 2014. Drivers of Change, Dynamics of Rural Livelihoods and Poverty in SAT India. Research Bulletin No. 26. Patancheru 502 324, Telangana, India: International Crops Research Institute for the Semi-Arid Tropics. 50 pp.

Photos: VDSA project team.

Drivers of Change

Dynamics of Rural Livelihoods and Poverty in SAT India

Research Bulletin no. 26

Uttam Deb, Cynthia Bantilan and GV Anupama

ICRISAT Science with a human face
International Crops Research Institute for the Semi-Arid Tropics

CGIAR RESEARCH PROGRAM ON Policies, Institutions and Markets

2014

About the authors

Uttam Deb – Principal Scientist-Economics, Markets, Institutions and Policies, ICRISAT, Hyderabad-502 324; email: u.deb@cgiar.org.

Cynthia Bantilan – Research Program Director, Markets, Institutions and Policies, ICRISAT, Hyderabad-502 324; email: c.bantilan@cgiar.org

GV Anupama – Lead Scientific Officer, Markets, Institutions and Policies, ICRISAT, Hyderabad-502 324.

Abstract

This paper studies structural change and development pathways in six villages of the Indian semi-arid tropics over the last three and a half decades: 1975 to 2011. Two villages are from Mahbubnagar district in Telangana and two from Solapur and Akola districts in Maharashtra. While the villages are located in the disadvantaged agro-climate of the semi-arid tropics, they are also located in two rapidly growing states. The study is based on quantitative and qualitative data collected by ICRISAT: (a) longitudinal household survey panel data for every year of the periods 1975-1984, 1989 and 2001-2011 respectively, and (b) information and data gathered through focus group discussions with the villagers.

In all the six but one villages, owned land per household has declined to less than half. Adoption of high yielding varieties and hybrids has been widespread across the villages and crops. Land preparation and threshing have been almost fully mechanized, but not other operations. Average yields have increased very significantly for most crops. Real agricultural wages over the period have increased by a factor of 1.8 in the most disadvantaged village in Akola district while they have increased by nearly five-fold in the Solapur village that has benefited from canal irrigation and a sugar factory nearby, and by more than four fold in three other villages. The male-female wage gap has slightly reduced. Except in Akola district, households diversified towards non-farm income sources, with most of the changes occurring since 2001. As in India as a whole, non-farm wages have always exceeded farm wages. Between 1975/76, and 2011/12 average years of schooling of males increased from 2.4 to 7.8 years. Females, initially disadvantaged, increased their average education from 1.6 to 7.4 years. In the younger generation, equality in education has been nearly achieved. A number of villagers are participating in ICT employment in India and overseas, and computer literacy is spreading into some of the villages.

Real asset ownership (net of debt) stagnated in all villages in the beginning of this century, but then grew rapidly. One of the Mahbubnagar villages lost assets during a continuous drought in the first half of the last decade, in which its irrigation tank completely dried up, but between 2007 and 2009 made up for much more than its losses. The other Mahbubnagar village, less than 30 km from the new Hyderabad airport, saw sharp gains in land and asset values.

Real incomes increased five-fold in the same Solapur village that benefited from canal irrigation and the sugar factory, but only by about 50 percent in the poorest village in Akola, with the other villages getting 2.8 to 3.8 fold increase. Most of these increases occurred from the beginning of this century. But real incomes fluctuate wildly across years, with the most droughts stricken Mahbubnagar village experiencing a year with negative net agricultural income.

Between 80 and 90 percent of the sample households were poor in the first two years of starting of the VLS study in 1975, while in the most recent year (2011) the poverty rate varies between less than 5 percent in the village near the airport and 55 percent in the poorest village in Akola, with the other villages having poverty rates between 15 and 35 percent. Clearly most of these villages have participated in the poverty declines of their states. While there was a trend towards poverty declines before 2001, it has accelerated since then, except in the Akola villages that are more agricultural than the rest. Poverty declines were driven both by positive agricultural developments, such as canal irrigation and Bt cotton, and non-agricultural developments, such as factory jobs, temporary migration, or the new airport. The depth of poverty has not changed much in the entire period except in the village near Hyderabad airport. In three of the villages where we have nutrition

data for women in 1992 and 2007, the BMI indices have improved for women. During the late 1970s and early 1980s, inequality as measured by the Gini ratio stagnated or tended to decline, but since then has improved, except in the poorest Akola village. Facilities such as shops, eating places and flour mills have increased sharply in all villages. Cell phones have become ubiquitous, and motorbikes have spread. LPG connection, fans, refrigerators, TV sets, and toilets have improved living conditions. Pucca houses have replaced thatched houses built from local materials.

The pathways to and success with development have differed sharply between villages depending on their agricultural endowment, their cropping and livestock opportunities, new agricultural technology, their access to canals, opportunities for well irrigation, their proximity to new factories and cities, and according to the way they have involved themselves in education, migration and diversification opportunities. The most successful villages benefited from several of these factors, including a sugar factory in a Shirapur village and the proximity to Hyderabad's new airport in a Mahbubnagar village. That agricultural opportunities are not necessarily the main factors shaping village development is strikingly illustrated by the Mahbubnagar village hardest hit by drought and major loss of tank irrigation: It has been able to significantly compensate for declining agricultural opportunities via non-farm labor participation, education and migration. The village with the poorest performance that is located in Akola did not get canal irrigation, has saline groundwater, is far from urban employment, is poorly served by its local government, and is riddled with factions. It has suffered both from poor agricultural and non-agricultural opportunities and governance problems.

The villages therefore range from very successful to very unsuccessful participants in economic development. While agricultural endowments, developments and opportunities remain very important factors for prosperity, the importance of the non-farm and urban economy has become much more important. Income growth and poverty reduction have been most striking since the acceleration of economic growth in these two states, and most villages have found ways to benefit from it.

Acknowledgments

The authors would like to thank Hans Binswanger, Jim Ryan and Thomas Walker for reviewing this report and providing constructive comments. We thank A Sudha Rani for her excellent research assistance in completion of the study and Pamela Samuel for helpful comments for linguistic improvement. We are grateful to Amit Chakravarty who has copy edited this volume and to Rajkumar B, for page layout. The views expressed in this publication are those of the authors who alone are responsible for any errors in it.

Contents

List of Tables

List of Figures

Acronyms

BMI: Body Mass Index

BT : Bacillus Thuringiensis

GDP: Gross Domestic Product

D2H: Dish to House

FGD: Focus Group Discussions

HCI: Head-Count Index

HYV: High Yielding Variety

ICRISAT: International Crops Research Institute for the Semi-Arid Tropics

ICT: Information and Communication Technology

LPG: Liquid Petroleum Gas

RFS: Regular Farm Servants

SAT: Semi-Arid Tropics

SHG: Self-Help Group

ST: Scheduled Tribe

USD: United States of America Dollars

VDSA: Village Dynamics in South Asia

VLS: Village Level Studies

1. Introduction

India has made remarkable progress in economic development, poverty reduction and educational attainment. Gross Domestic Product (GDP) in India has grown at more than 5 percent since the mid-1980s. Since 2005/06, the Indian economy grew at more than 9 percent. Poverty in India has declined from 54.9 percent in 1973/74 to 36.0 percent in 1993/94 and subsequently to 32.0 percent in 2009/10 (Planning Commission, 2011). Maharashtra and Telangana, the two steadily growing states of India, have also prospered over time. The per capita GDP in Maharashtra has increased from USD 140 in 1975, to USD 509 in 2001, and subsequently to USD 1563 in 2009/10. On the other hand, per capita GDP in Andhra Pradesh and Telangana has increased from USD 110 in 1975, to USD 351 in 2001, and subsequently to USD 1077 in 2009/10. Poverty level in Maharashtra has declined from 53.24 percent in 1975/76 to 25.02 per cent in 2001/02 and subsequently to 16.18 percent in 2005/06. In Andhra Pradesh and Telangana states, poverty has declined from 48.86 percent in 1975/76 to 15.77 percent in 2001/02 and subsequently to 8.49 percent in 2005/06. (IndiaStat, 2011). It is often argued that economic growth has mostly benefited the urban India. Rural India was not able to equally, if not all, benefit from the "shining India". It is also argued that the impressive agricultural development which has increased productivity and overall production of crops, livestock and fisheries has been concentrated primarily in the irrigated villages rather than rainfed and erratic rainfall semi-arid tropics (SAT) of India.

Policy makers and managers of agricultural research institutions constantly want information about nature, extent and drivers of changes in rural economies as well as upcoming challenges and threats in achieving higher agricultural growth, poverty reduction targets, and ensuring food and nutritional security for all. They also want to know to what extent and how sources of livelihood and dependence on traditional occupations have been changing with new opportunities and the farmers' responses to new technologies, marketing opportunities as well as policy changes, so that they can design research programs for development and delivery of new technologies, and formulate appropriate policies and strategies for public investment and development. Lack of longitudinal and representative data often precludes researchers to empirically investigate such issues. Therefore, it is useful to know about the evolution of villages located in different economic settings within the SAT over a long-period of time. It is also important to have a precise idea about the underlying forces for such changes and uncover the dynamic relationships among different interventions and developments. An assessment on the effectiveness of various government programs implemented in a village can provide useful insights and suggestions for the formulation and modification of policies for technology generation and exchange, investment strategies improved food security, livelihood resilience and poverty reduction. An attempt has been made in this report to understand and document the changes, and the driving forces underlying for such changes in the study villages of Maharashtra and Telangana.

1.1 Objectives of the Study

Broad objective is to understand and document the dynamics of the study villages over a period of three and a half decades. Specific objectives of the study are as follows:

(i) To document the changes in livelihood system and their underlying factors.

(ii) To analyze the poverty dynamics observed in the villages and factors contributing towards poverty reduction.

(iii) To understand the development pathways of the study villages over this defined period.

Finally, based on the results and findings of the study, some policy suggestions have been proposed for promoting growth in rural areas, fostering technology generation and exchange, improving food and nutrition security, enhancing resilience in livelihood systems and speeding up poverty reduction.

1.2 Data and Research Methods

This study is primarily based on Village Level Studies (VLS) dataset generated by International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) for the periods 1975-1984, 1989 and 2001-2011. VLS dataset has been generated by ICRISAT's resident field investigators who lived in the villages to periodically revisit the same households over the years. In May 1975, ICRISAT Economics Program initiated the VLS in two villages of Telangana (*Aurepalle* and *Dokur*) and four villages (*Shirapur, Kalman , Kanzara* and *Kinkhed*) of Maharashtra (Walker and Ryan, 1990 ; Nageswara Rao et al. 2009).The aim was to understand the traditional methods of farming in the SAT region. Data from 40 households (10 each from landless, small, medium and large landholding groups) for each of the study villages was collected during 1975-1984 (see Table 1). Sample size was not proportional to the number of households in each category of households in the village. In 2001, village studies were resumed in these VLS villages. This initiative commenced with a fresh census of all households and a more representative sample proportional to the number of households was included. In 2001-2004, total sample size was 446. In 2005 and 2006, this number increased to 590 and then to 599, which included split-offs of the original VLS households. In 2007, some of the split household merged together, thereby, bringing the total to 595. However, in 2008, the non-VLS households were detached from the data including the old VLS sample households and their split-offs, thereby, bringing the sample to 669 households. In 2009, only original households along with their splits were included and total sample size was 384. In addition to VLS dataset, we have conducted several Focus Group Discussions (FGDs) on specific issues for preparation of the current report.

Table 1. Distribution of sample households in ICRISAT VLS dataset, 1975-2011.

Years	Aurepalle	Dokur	Shirapur	Kalman	Kanzara	Kinkhed	All
1975/76-1984/85	40	40	40	40	40	40	240
2001/02-2004/05	100	80	88	94	52	32	446
2005/06	123	94	145	110	64	54	590
2006/07	133	98	145	106	63	54	599
2007/08	133	98	144	102	63	55	595
2008/09	131	98	142	106	101	91	669
2009/10	70	50	89	61	62	52	384
2010/11	70	49	89	64	62	52	386
2011/12	68	48	93	64	62	50	385

Source: VDSA Project.

1.3 Layout of the Report

Following this introductory section, a brief description of the study villages is also given in Section 2. Section 3 reports major changes that have taken place in the study villages since 1975. These include changes in labor market and real wage, agrarian structure and tenancy, rural institutions and credit market, cropping pattern, sources of income and inequality in income, poverty situation, access to and achievements in education, and the living standards of the villagers. Section 4 identifies the pathways for development in the SAT villages. Conclusions and implications for development strategies and policies are proposed in the last section (Section 5).

2. General features of the study villages

Out of the six studied villages of Indian Semi-Arid Tropics, two were from Telangana (Aurepalle and Dokur villages of Mahbubnagar district) and four were from Maharashtra (Shirapur and Kalman under Solapur district, Kanzara and Kinkhed under Akola district). Aurepalle and Dokur have erratic rainfall and red soil with heterogeneous soil quality (see Table 2). On the other hand, Shirapur and Kalman have deep black soils in lowlands and shallower lighter colored soils in uplands. Rainfall is erratic in Shirapur and Kalman. In case of Kanzara and Kinkhed, soils are black and of homogeneous quality, and rainfall is assured.

Over the years, coverage of irrigation has increased in all the villages except Dokur (see Table 3, 4, and 5). Irrigation coverage has decreased in Dokur due to persistent drought over a decade. In 1975, average family size ranged between 5.45 in Kinkhed and 6.90 in Shirapur. Average family size declined in all the villages. In 2010, average family size was in the range of 4.84 (in Aurepalle) and 5.42 (in Kinkhed). Literacy rates have increased significantly in all the villages. Number of farm equipments (tractors, power sprayers, irrigation pumps, sprinkler irrigation systems) increased in all the villages. In the 1970s, self-help groups (SHGs) were not formed in any of the villages but in 2011, a number of SHGs were made functional in all the villages.

Table 2. Key descriptive phrases distinguishing the study regions and villages in 1975/76.

Mahbubnagar		Solapur		Akola	
Aurepalle	Dokur	Shirapur	Kalman	Kanzara	Kinkhed
Rainfall unassured; pronounced rainfall uncertainty at sowing		Rainfall unassured; frequent crop failure		Rainfall assured	
Red soil; marked soil heterogeneity		Deep black soils in lowlands; shallower lighter soils in uplands		Black soils; fairly homogeneous	
Kharif or rainy season cropping		Rabi or post rabi season cropping		Kharif cropping	
Paddy, castor and local Kharif sorghum		Rabi sorghum		Upland cotton, Mungbean and hybrid sorghum	
Agricultural intensification around dug wells and tanks		Some dug wells		Limited irrigation sources in 1970s and early 1980s	
Neglected dry land agriculture		Technological stagnancy		Sustained technical change in dry land agriculture	
Harijans and caste rigidities; inequitable distribution of land ownership		Tenancy; dearth of bullocks; more equitable distribution of land		More educated	

Source: Walker and Ryan (1990).

Table 3. General statistics of the study villages in Mahbubnagar, Telangana, 1975-2009.

Characteristics	Aurepalle 1975	Aurepalle 2009	Dokur 1975	Dokur 2009
Geographical area (Sq. km)	16.28	16.28	13.58	13.58
Cultivated area (Ha)	1180	1265	1192	1303
Irrigated area (%)	20	34	32.0	80
Annual rainfall (mm)	850	1546	813 (avg. 1976-80)	877
Tanks	2	0 (2 dried)	3	1
Open dug wells	80	9	80	3
Bore wells	0	232	Nil	170
Total number of households	476	984	313	545
Total population	2711	4764	1783	3006
Average family size	6.00	4.84	6.00	5.31
Literacy %	25.3	59	16	48
Migrants	50	896	25	1000
Number of electric pump sets	139	220	40	200
Sprinkler/drip irrigation	0	14	0	8
No. of tractors	6	19	0	9
No. of power sprayers	5	60	NIL	8-10
Total pensions	0	439	0	223
Self Help Groups (SHGs)	0	51	NIL	35

Source: ICRISAT VLS Database.

Table 4. General statistics of the study villages in Solapur district, Maharashtra, 1975-2010.

Characteristics	Shirapur 1975	Shirapur 2010	Kalman 1975	Kalman 2010
Geographical area (Sq. km)	14.72	14.72	25.91	25.91
Cultivated area (Ha)	1327.46	1069	2511.03	2511.03
Irrigated area (%)	NA	NA	9.7	24.8
Annual rainfall (mm)	597	620.3	569	647.2
Tanks	1	1	3	3
Open dug wells	NA	55	NA	315
Bore wells	NA	450	0	190
Total number of households	297	546	423	660
Total population	1989	2518	2683	3344
Average family size	6.90	4.99	6.37	5.03
Literacy %	41.4		34.7	86.5
Migrants	8	NA	6	40
Number of electric pump sets	NA	1000	NA	245
Sprinkler/drip irrigation	0	55	0	NA
No. of tractors	0	6	NA	11
No. of power sprayers	0	5	0	8
Total pensions	NA	13	NA	NA
Self Help Groups (SHGs)	NA	16	0	25

Source: ICRISAT VLS Database.

Table 5. General statistics of the study villages in Akola district, Maharashtra, 1975-2010.

Characteristics	Kanzara 1975	Kanzara 2010	Kinkhed 1975	Kinkhed 2010
Geographical area (Sq. km)	5.96	5.96	5.18	5.18
Cultivable area (Ha)	539.61	539.61	471.11	471
Irrigated area (%)	3.75	26.9	2.4	16.9
Annual rainfall (mm)	975.7	903.2	946	666.7
Tanks	0	1	0	0
Open dug wells	NA	100	7	22
Bore wells	NA	32	0	5
Total number of households	169	319	143	189
Total population	930	1427	657	876
Average family size	5.93	5.23	5.45	5.42
Literacy %	42.70	83.63	54.9	88
Migrants	NA	NA	3	30
Number of electric pump sets	NA	NA	4	9
Sprinkler/drip irrigation	0	80	0	3
No. of tractors	0	8	1	5
No. of power sprayers	0	50	0	10
Total pensions	NA	18	NA	NA
Self Help Groups (SHGs)	0	20	0	12

Source: ICRISAT VLS Database.

3. Major changes in the study villages

3.1 Land Ownership and Tenancy

Average farm size has declined in all the villages. Leased in on a fixed rent basis is more preferable in 2011/12 than shared cropping (see Table 6). Main reason for declining farm size is split of households and formation of nuclear families.

Table 6. Distribution of landholding and land ownership (in acres) per household, 1975/76 and 2011/12.

	1975/76				2011/12				
	Owned	Leased in	Shared in	Leased out/ shared out	Owned	Leased in	Shared in	Leased Out	Shared out
Aurepalle	7.48	0.28	0.00	0.00	3.39	0.70	0.24	0.79	0.03
Dokur	4.55	0.24	0.05	0.01	3.86	0.65	0.09	0.36	0.00
Shirapur	7.61	0.08	0.00	0.00	4.06	0.14	0.30	0.04	0.03
Kalman	10.06	0.00	1.58	0.18	5.92	0.00	0.90	0.05	0.32
Kanzara	9.96	0.24	0.13	0.15	4.99	0.98	0.22	0.29	0.44
Kinkhed	10.39	0.11	0.65	0.00	4.98	0.28	0.34	0.56	0.97

Source: ICRISAT VLS dataset.

3.2 Cropping Pattern

It is the pattern of crops for a given piece of land or the proportion of area under various crops at a point of time in an unit area or it is indicated by the yearly sequence and spatial arrangements of crops and fallows in an area. The cropping pattern has changed substantially in all the villages over the years (see Figure 1 - Figure 4).

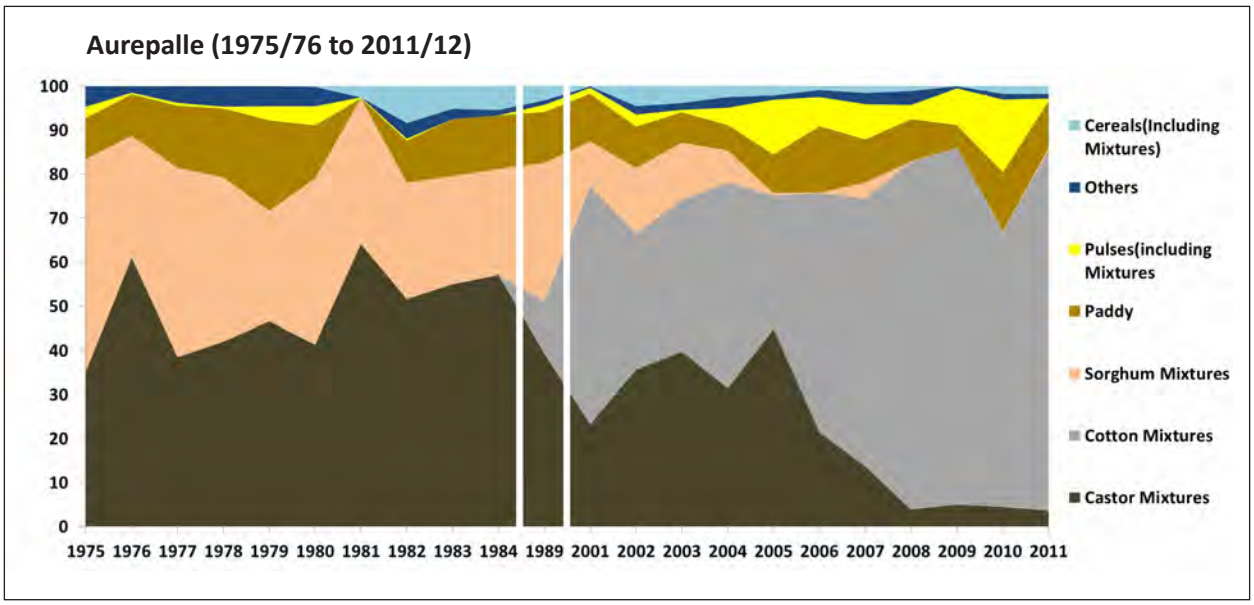
Aurepalle: In Aurepalle, cereals (Sorghum, millet in rainfed condition and paddy in irrigated condition), castor and pigeonpea were major crops which were cultivated solely or as mixed crop in the Kharif season during the mid-1970s. In the early-2010s, cotton was the major crop grown by farmers followed by castor, cereals (sorghum and millet) and pigeonpea in Aurepalle. The area under paddy was limited but steady under irrigated conditions. In the 1970s, farmers usually did not grow any crop in the Rabi season. However, in the recent years they have cultivated sunflower and groundnut in some of their lands.

Dokur: In the mid-1970s, Dokur farmers grew paddy in irrigated conditions and sorghum, groundnut as well as pigeonpea under rainfed conditions in Kharif season. In Rabi season, farmers used to grow paddy and groundnut under irrigated conditions. In the 2000s, farmers introduced castor particularly during the drought years. Paddy was being cultivated in the normal years when water for irrigation was available in addition to pigeonpea. In the recent years, farmers were not growing sorghum and groundnuts in Kharif season. In Rabi season, farmers grew mostly paddy and some groundnut under irrigated conditions. About 30 percent of the net cropped area was cultivated in the Rabi season.

Shirapur: In the 1970s and 1980s, farmers of Shirapur used to grow sorghum in the Rabi season. Kharif season was not the main season for them since they had unpredicted rainfall. With the availability of irrigation, they started growing sugarcane which is now their major crop. Among the crops grown in Kharif season, pulses (Matki, Mungbean, and pigeon pea) were the major crops followed by maize, onion, and other crops in the 1970s and early 1980s. In the 2000s, fodder crops (maize, sorghum, and grass) became very important since they had livestock revolution. These were followed by onion, pulses, and maize in Kharif season. In the Rabi season, farmers have been growing sorghum and wheat. They also have been growing chickpea as intercrop with sugarcane.

Kalman: Rabi season was the main season for crop production in Kalman, both then (in 1970s and 1980s) and in 2000. During the Kharif season, pigeonpea was the major crop grown in Kalman in the 1970s and early 1980s. It was also the most important crop in the late 2000s. Groundnut, other pulses (Mungbean, black gram), and maize were also grown in the 1970s and early 1980s. In the 2000s, the area under groundnut and pulses declined. The area under vegetables and maize increased in the late 2000s. In the Rabi season, farmers have always been growing sorghum, wheat, chickpea and vegetables and some farmers have also been growing grape, banana and other fruits in addition to it.

Kanzara: Kharif season was the major crop growing season in Kanzara. In the 1970s, major crop in the Kharif season was cotton, occupying about 60 percent of the net cropped area. It was then followed by sorghum, groundnut, and pulses. Farmers increased area under cotton until 2006 and after that the area under cotton was replaced by soybean. In the late-2000s groundnut was not grown by the farmers in Kharif season. Area under sorghum declined significantly but area under pulses (Mungbean, pigeon pea) increased to some extent. In the 1970s and early 1980s, farmers used to grow more mixed crops than in the recent years. Increased availability of irrigation probably helped farmers to minimize their production risks and encouraged them to grow more sole crops



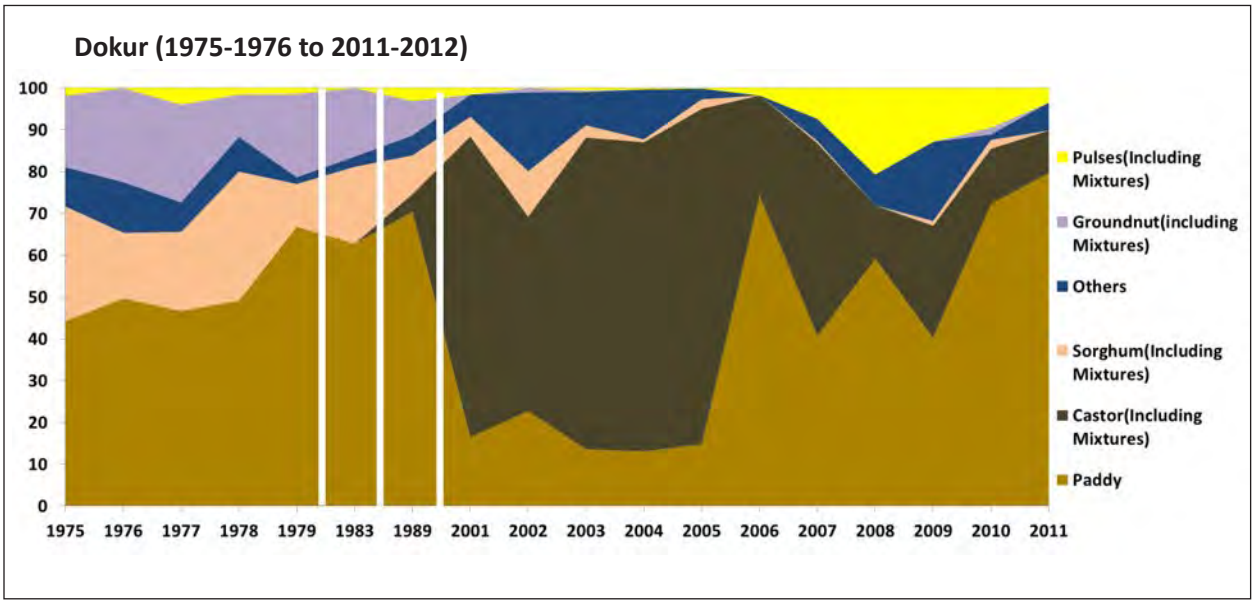


Figure 1. Cropping pattern in the study villages of Telangana, Kharif season, 1975/76 to 2011/12.

than mixed crops. In the Rabi season, farmers allocated more area under chickpea in the good rainfall years. Production of vegetables then increased in the recent years with better market linkages.

Kinkhed: In Kinkhed, Kharif was the main season for crop production. Cotton, grown either as a sole or a mixed crop, was the most important crop grown in Kinkhed in the 1970s and early 1980s, followed by sorghum (grown either as a sole or as a mixed crop), groundnut, and other pulses. In the late-2000s, area under sorghum and pulses declined and farmers are not growing groundnut. The area under cotton also declined. Soybean was the dominant crop in Kinkhed in the recent years which was cultivated either as a sole or a mixed crop. The area under mixed crop has declined substantially in the recent years than in 1970s.

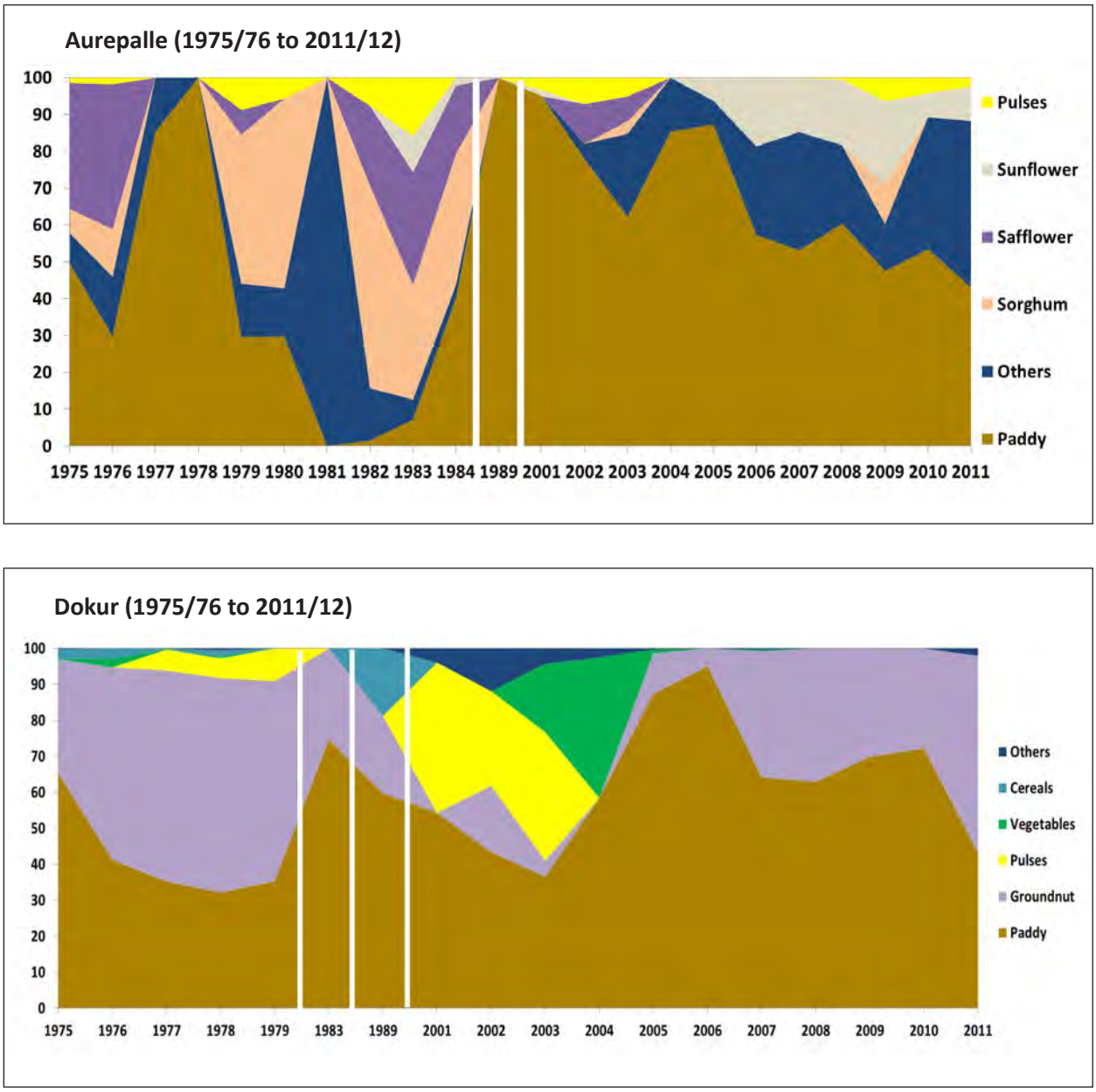
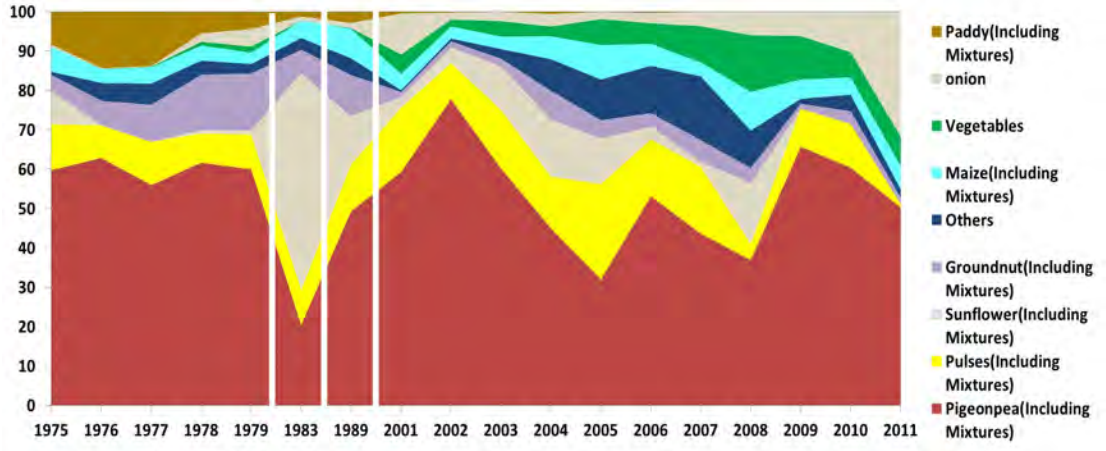
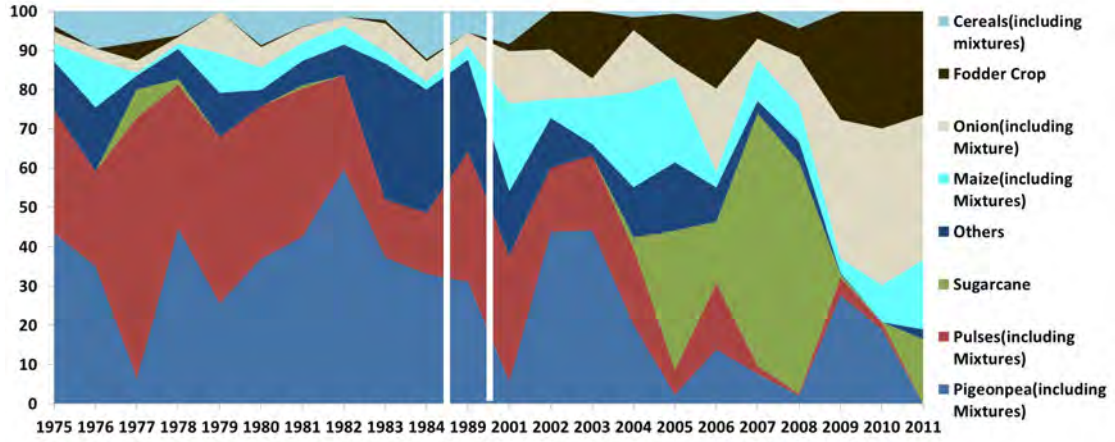


Figure 2. Cropping pattern in the study villages of Telangana, Rabi season, 1975/76 to 2011/12.

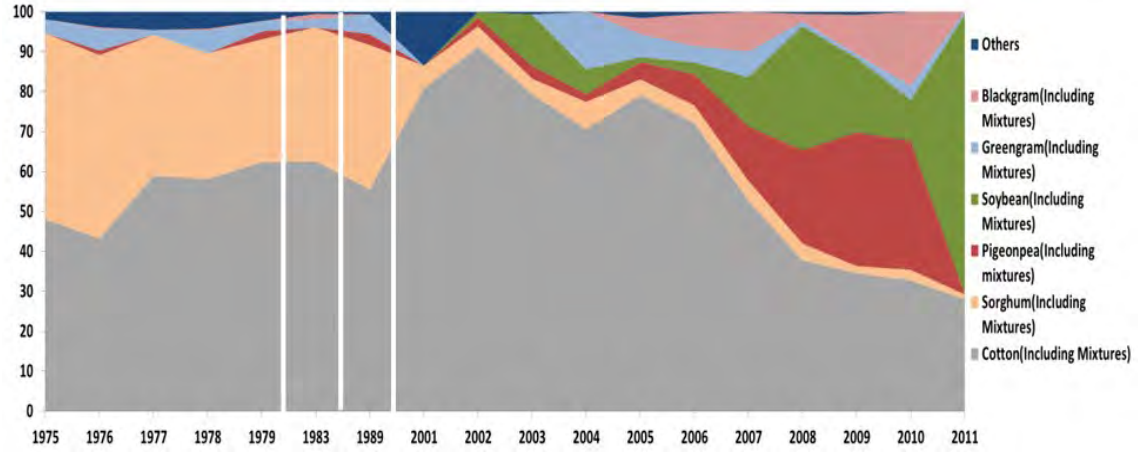
Kalman (1975/76 to 2011/12)



Shirapur (1975-1976 to 2011-2012)



Kinkhed (1975/76 to 2011/12)



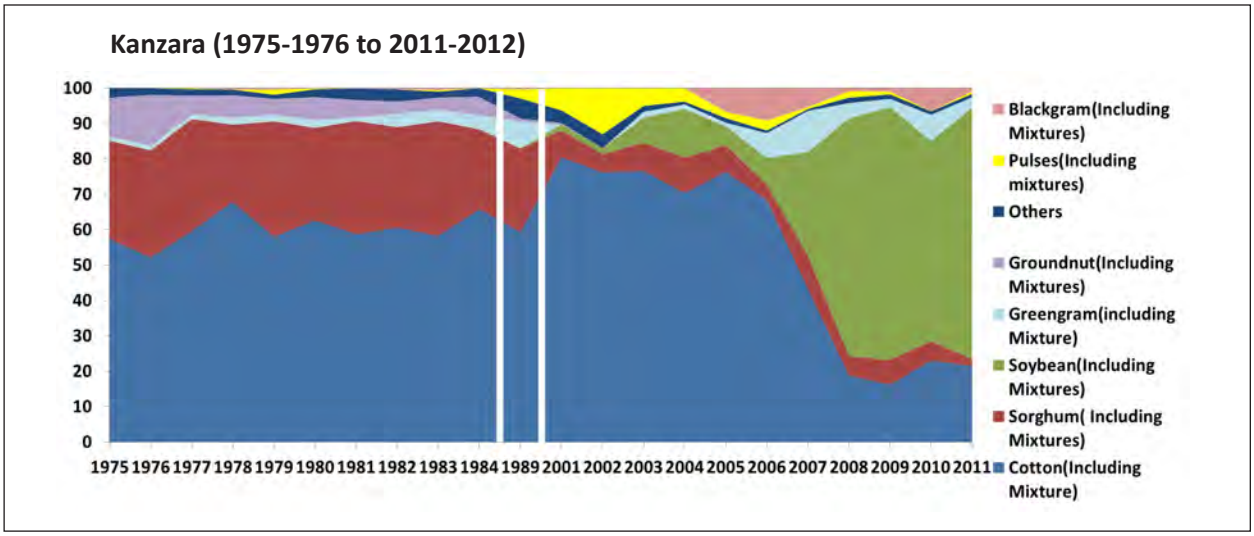
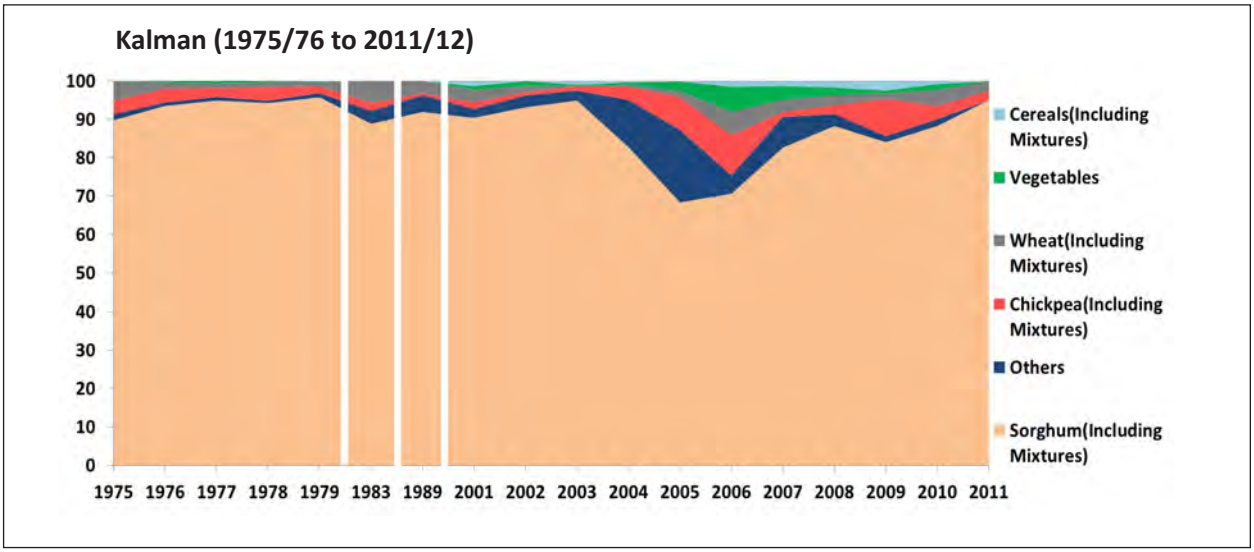
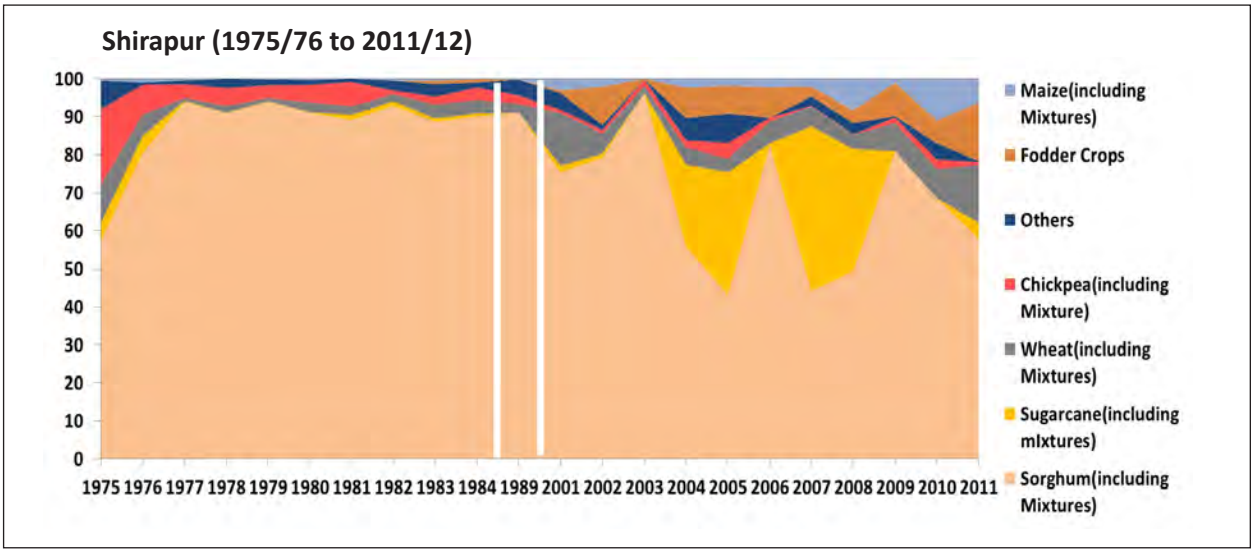


Figure 3. Cropping pattern in the study villages of Maharashtra, Kharif season, 1975/76 to 2011/12.





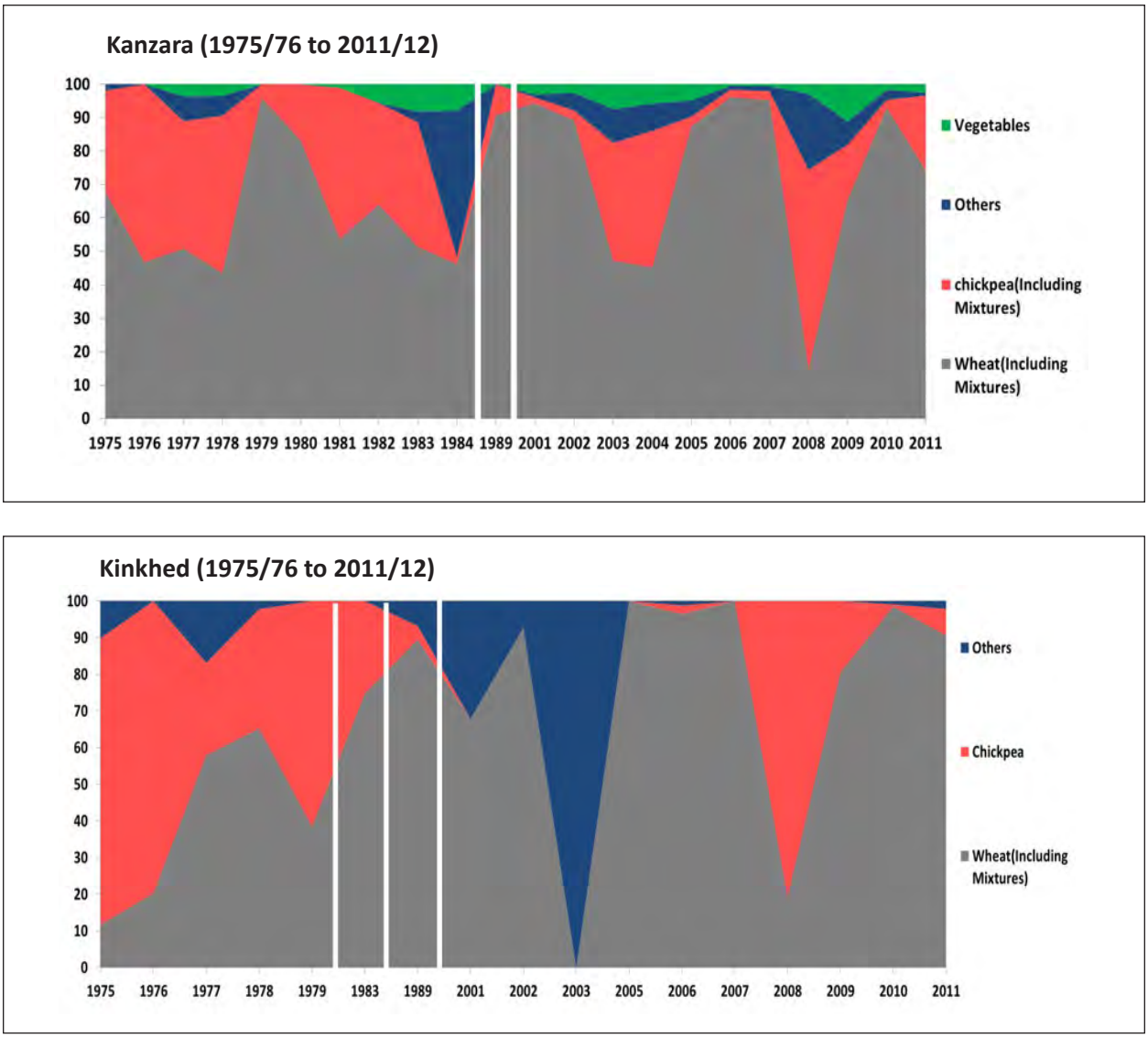


Figure 4. Cropping pattern in the study villages of Maharashtra, Rabi season, 1975/76 to 2011/12.

3.3 Crop Productivity and Profitability

Crop productivity has generally increased in all the study villages (see Table 7). For computation of per hectare yield, the yield of mixed crops was converted into sole crop equivalents. During the early-2010s (2009-2011), as compared with the mid-1970s (1975-1977), it was seen that average yield of chickpea has increased by 183 percent in Kanzara, 413 percent in Shirapur, 226 percent in Kalman, and 779 percent in Kinkhed. In the case of cotton, average yield increased by 177 percent in Kinkhed and 305 percent in Kanzara. Groundnut yield increased by 42 percent in Dokur, 82 percent in Kalman, 92 percent in Aurepalle, 288 percent in Shirapur and 82 percent in Kanzara. Maize yield increased by 309 percent in Shirapur and 373 per cent in Kalman. Onion yield increased by 34 percent in Shirapur, 363 per cent in Kanzara, and 68 percent in Dokur but declined by 6 per cent in Kalman. Pigeonpea yield increased by 65 percent in Aurepalle, 67 percent in Dokur, 184 percent in Kinkhed, 257 percent in Kalman, 284 percent in Shirapur, and 868 percent in Kanzara. For the other pulses, average yield has increased by 141 percent in Kinkhed, 428 per cent in Kanzara, 663

per cent in Shirapur, and 325 per cent in Kalman. Sorghum yield increased by 5 percent in Aurepalle, 53 percent in Kalman, 56 percent in Dokur, 208 percent in Kanzara, 50 percent in Shirapur, and 138 percent in Kinkhed. Sugarcane yield increased by 194 percent in Shirapur and 224 percent in Kalman. Wheat yield increased by 47 percent in Kanzara, 87 percent in Kinkhed, 234 percent in Kalman, and 501 percent in Shirapur. Increase in average yield was the outcome of the adoption of improved varieties, use of fertilizers, irrigation, pesticides and better management practices.

Table 7. Comparison of average per hectare yields (kg) of crops grown by the sample farms, 1975-1977 and 2009-2011.

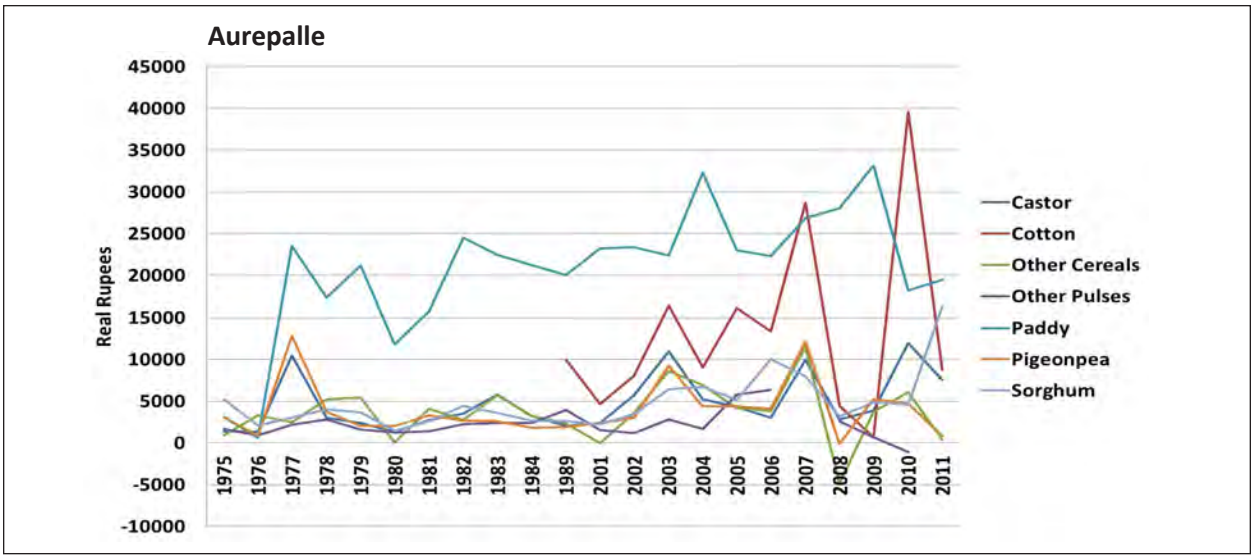
	Aurepalle		Dokur		Shirapur		Kalman		Kanzara		Kinkhed	
	1975-1977	2009-2011	1975-1977	2009-2011	1975-1977	2009-2011	1975-1977	2009-2011	1975-1977	2009-2011	1975-1977	2009-2011
Castor	248	492	NA	363	NA	NA	NA	NA	NA	NA	NA	NA
Chickpea	0	NA	206	NA	303	1,556	156	509	371	1,051	133	1,169
Cotton	NA	1,192	NA	NA	190	NA	NA	NA	302	1,223	251	695
Cotton BT	NA	1,057	NA	340	NA	NA	NA	NA	NA	2,013	NA	864
Groundnut	852	1,637	1,341	1,907	362	1,405	474	865	601	1,093	475	NA
Maize	NA	595	NA	181	376	1,539	336	1,589	NA	198	NA	NA
Onion	7,232	7,265	2,718	4,571	7,132	9,559	8,273	7,793	4,975	23,053	20	15,814
Paddy	2,488	4,808	2,700	4,426	45	NA	175	NA	530	NA	420	NA
Pearl Millet	294	771	NA	NA	NA	NA	58	56	105	NA	39	NA
Pigeonpea	164	271	86	144	110	422	82	293	187	1,811	297	843
Pulses	189	114	75	NA	24	183	53	225	164	866	278	670
Sorghum	323	338	306	478	261	392	301	460	650	1,999	453	1,077
Soybean	NA	NA	NA	NA	NA	NA	NA	1532	NA	1,379	NA	1,124
Sugarcane	NA	NA	NA	NA	23,954	70,351	13,179	42,706	4,942	NA	NA	NA
Wheat	807	247	680	NA	337	2,025	476	1,589	1,752	2,577	1,393	2,599

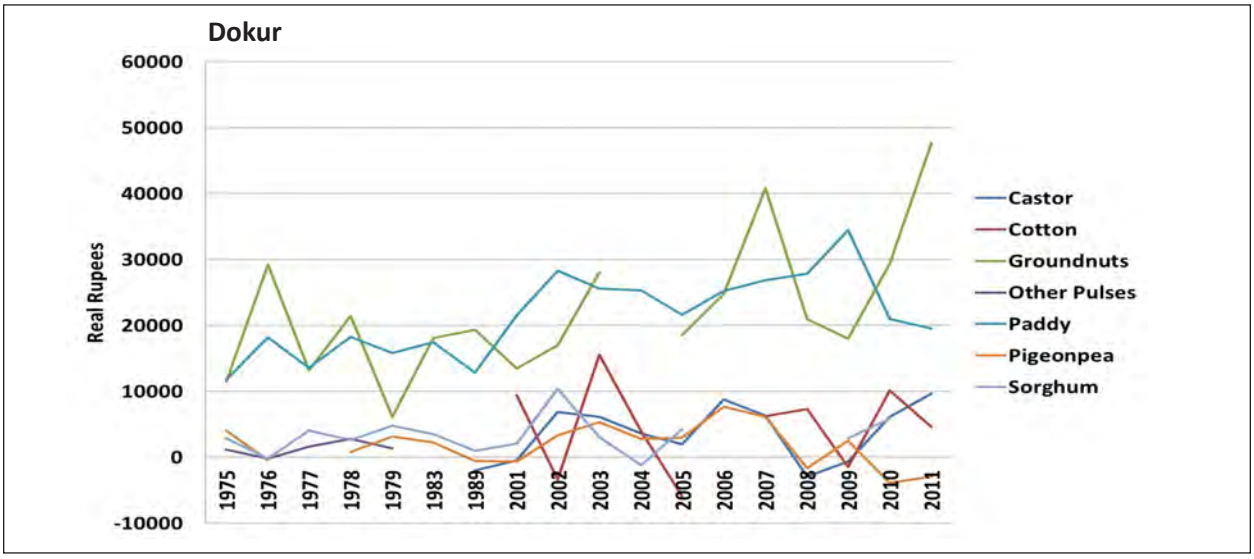
Profitability in crop cultivation is very important. Farmers tend to allocate more areas to those crops which have higher profitability. Profitability can be measured in different ways. We have used the concept of returns to land, family labor and management. It is the difference between gross return and total cost for all inputs except family labor and land. Gross return was obtained through summing up of the value of the main product and the by-product. Total cost was obtained through adding of all costs for inputs (seed, fertilizer, irrigation, pesticide, hired labor). Costs of family labor and rental value of the land was not included. It allowed comparisons to be made over a long-period of time and across the villages in a meaningful way. It is pertinent to mention here that rental market for land and opportunity costs for family labor is not exactly the same as that of hired labor, since many people are ready to work in their own land but unwilling to work as a wage laborer due to social stigma.

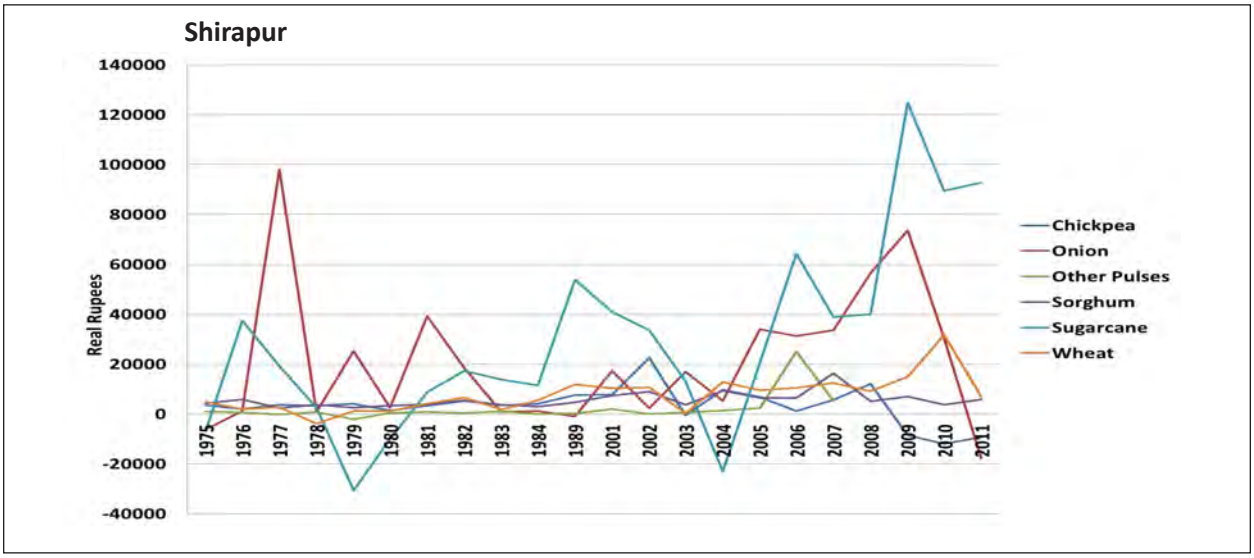
Rapid adoption of cotton in Aurepalle can be explained through higher profit (see Figure 5). In order to enable comparability across years, we have converted nominal profits into 2009-2010 equivalent rupees using wholesale price index. Therefore, all the following discussion relates to the profit earned in 2009-2010 equivalent rupees. Per hectare average return from cotton cultivation in Aurepalle in

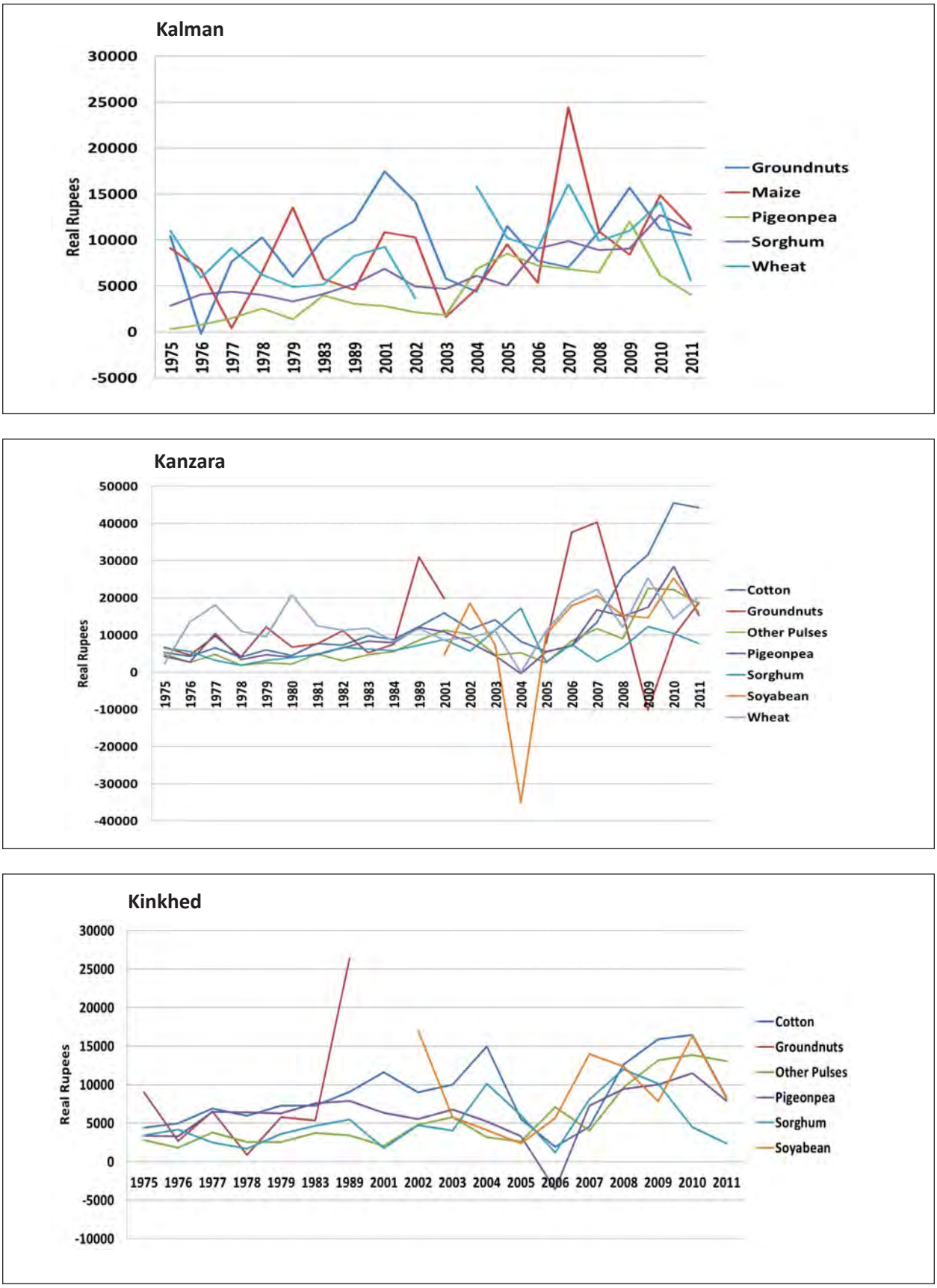
2009-2011 was ₹16,336 against ₹7,790 for castor, ₹3,399 for other cereals. On the other hand, it was negative for pulses (loss of ₹207 per hectare). Farmers of Dokur very often face drought, but whenever they can grow paddy, they prefer to do so instead of growing any other crops. Area under groundnut declined in Dokur mainly due to the wild boar problem. Due to rainfall problem farmers tried to grow castor but the profitability was very low compared to paddy and other crops. So, they had to return back to paddy cultivation whenever they could grow it. Per hectare average return from paddy cultivation in Dokur during 2009-2011 was ₹24,988 against ₹31,683 from groundnut and ₹5,063 from castor. In Shirapur, farmers have been cultivating sugarcane to a large extent after the introduction of canal irrigation in the mid-1990s. Sugarcane provides good returns and sugar factory provides input and interest free loans to the farmers. On the other hand, onion cultivation provides a high but fluctuating return to the farmers. Prices of onion have been subject to very wide fluctuations. During 2009-2011, per hectare average return was ₹102,412 from cultivation of sugarcane, ₹28,643 from onion, ₹5,709 from sorghum and ₹9,702 from pulses. Cultivation of fodder increased in this village with the increase in commercial milk production by the villagers. In Kalman, per hectare average return was ₹11,010 from cultivation of sorghum (sole crop) and ₹7,413 from pigeonpea (as a sole crop) in 2009-2011. On the other hand, per hectare returns from cultivation of maize was ₹11,549.

During 2009-2011, farmers of Kanzara received per hectare return of ₹6,089 from groundnut, ₹10,106 from sorghum, and ₹21,088 from pulses. In Kanzara and Kinkhed, a number of factors contributed towards rapid switch from cotton to soybean. Since 2005, farmers have been benefiting from good rain which allows them to grow a second crop (wheat) in Rabi season, if they could grow soybean in Kharif season which is a three-month crop. Cotton requires eight to 10 months to reap the to its full harvest potential in this region. The total profit from soybean and wheat is higher than cotton. Average return to soybean in Kanzara during 2009-2011 was ₹18,589. Farmers growing soybean in kharif and chickpea in rabi received an amount of ₹42,858 and those who were growing soybean in kharif and wheat in rabi received ₹38,631 (2009-2011 average). On the other hand, the amount for soybean was ₹10,560 in Kinkhed. Kinkhed farmers also received an amount of ₹13,719 from cultivation of Soybean in Kharif season followed by Chickpea in Rabi season and ₹24,466 from cultivation of Soybean followed by wheat. During the same period, average return from cotton cultivation was ₹40,489 per hectare in Kanzara and ₹13,552 per hectare in Kinkhed. Fluctuations in cotton prices were very high in the recent years, while fluctuations in soybean prices were relatively stable and high. Earlier cotton board used to provide a fixed price to the farmers, but now private traders provide market rates which fluctuate to a great extent across different months. Labor cost for plucking of cotton balls have increased with the shortage of labor. Sometimes farmers have to pay up to ₹12 for plucking a kg of cotton balls from the field. Since 2006, farmers of six suicide-prone districts (*Akola, Amravati, Yeotmal, Buldhana, Wasim* and *Warda*) of Vidharba region of Maharashtra have been entitled to receive up to ₹1,000 as seed subsidy (which accounts to 50 percent of the seed cost for growing up to one hectare of land) from the Prime Minister's special package. Besides, an assistance of ₹25,000 per family is given towards purchase of farm equipment, seeds and building storage, among others. Drip irrigation sets are given at 50 percent subsidy to farmers with more than five acres farm holding and 60 per cent to those with less than five acres. Similarly in Telangana region, an amount of seed subsidy is provided to farmers for ₹1,000 per quintal for coarse cereals, including, millets used for fodder, ₹700 per quintal for cereals and ₹2,000 per quintal for pulses and oilseeds.


Aurepalle
Real Rupees
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
-5000
-10000
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1989
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Castor
Cotton
Other Cereals
Other Pulses
Paddy
Pigeonpea
Sorghum


Dokur
Real Rupees
60000
50000
40000
30000
20000
10000
0
-10000
1975
1976
1977
1978
1979
1983
1989
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Castor
Cotton
Groundnuts
Other Pulses
Paddy
Pigeonpea
Sorghum


Shirapur
Real Rupees
140000
120000
100000
80000
60000
40000
20000
0
-20000
-40000
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1989
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Chickpea
Onion
Other Pulses
Sorghum
Sugarcane
Wheat



Source: Author's calculation based on VLS dataset.

Figure 5. Trends in per hectare returns to land, family labor and management (in 2009 ₹) from cultivation of different crops, 1975-2011.

Soybean requires about 75 kg seed per hectare and soybean seed price is usually ₹30-40 per kg. Thus, farmers can get full amount of seed subsidy if they plan to grow soybean. Thus, all these factors together explain rapid shift in the cropping pattern in Kanzara and Kinkhed.

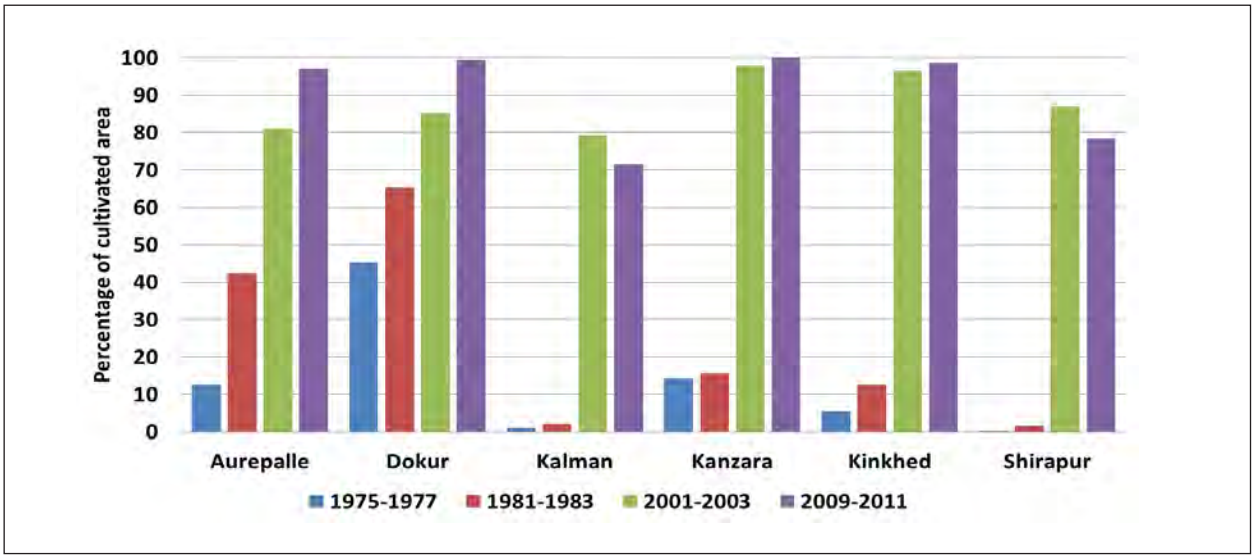
Harvesting of sorghum in Maharashtra villages is costlier while the variability in yield increased and profitability fluctuated in the 2000s with erratic rainfall condition and volatility in prices.

Area under mixed crop has declined in all the study villages for several reasons: (a) mixed crop requires more labor which is less remunerative when done with hired labors, who are increasingly becoming scarce due to increased employment opportunities in the on-farm and non-farm activities, (b) changing attitude of the farmers (growing all types of crops for own consumption over growing for profit), (c) low profitability from the mixed crops compared to the sole crops.

In comparison to 1975-1977, during 2009-2011, average per hectare returns (in real terms) to cultivation of sorghum was 148 percent higher, castor was 78 percent higher, and other cereals were 52 percent higher in Aurepalle. Paddy was 72 percent higher and groundnuts were 77 per cent higher in Dokur; sorghum was 192 percent higher, maize was 112 percent higher and pigeonpea was 7 times higher in Kalman; cotton was 656 percent higher, sorghum was 98 percent higher and pulses were 4 times higher in Kanzara; cotton farmers received 149 per cent higher returns and farmers growing pulses received 391 percent higher returns in Kinkhed; sorghum farmers received 35 per cent higher returns and pulses farmers received 20 times higher returns in Shirapur. Due to adoption of the high yielding varieties, the sugarcane farmers in Shirapur received more than 5 times higher returns in 2009-2011 as compared to 1975-1977.

Aurepalle farmers received reduced returns to cultivation of other pulses in the late 2000s than in mid-1970s. Farmers in Dokur received reduced returns in cultivating pigeonpea and farmers in Kanzara received reduced returns in cultivating groundnut, respectively. It is pertinent to mention here that the Kanzara farmers lost their groundnut crop due to excessive rainfall.

In the mid-1970s, Kanzara farmers were growing pigeonpea only in a very limited land for their home consumption. But in the 2000s, they grew pigeonpea in large quantities as it was very profitable. This was possible because of the high yielding pigeonpea variety (called ICP 8863, also



Source: Author's calculation based on VLS dataset

Figure 6. Trends in adoption of improved cultivars in the study villages, 1975/76-2011/12.

known as Maruti) and hybrid variety (called ICPH 2671), developed by ICRISAT which were providing higher return in Kanzara. Thus, it was clear that changes in cropping pattern was due to the relative profitability of the competing crops and not because of the increase in profitability of the same crop. It has important implications for the agricultural research policy for sorghum, groundnut, and pulses. Increase in the productivity and profitability of the crop to be adopted by the farmers is required to outperform all other alternative crops which may be grown by the farmers.

3.4 Adoption of Improved Technology

Adoption of improved technology may be defined as percentage of area under high-yielding varieties (HYVs) and hybrids to the total area under crops. The trends in the adoption of improved technologies in the study villages are reported in Figure 6. Technology adoption in terms of usage of improved or HYV seeds had already begun in some of the villages in 1975. This was most notable in the Telangana village of Dokur, where improved or HYV seeds were already being used on 48% of the cultivated land. Dokur's main crop during this decade was paddy, of which 95% was already of the improved variety in 1975. The other village in the same region, Aurepalle, was the second of the study villages to begin using the improved seeds in large numbers in the early 1980s. Farmers in this village were using significant amounts of improved paddy varieties as well; 62% of the paddy grown in 1975 was HYVs, and the introduction of an improved variety of castor (a major cash crop in the region), led to allocation of even more land to the cultivation of improved or HYV seeds.

The Maharashtra villages in the Akola district, Kanzara and Kinkhed, were also using some improved and HYV seeds in 1975. Most of these were improved varieties of sorghum, their second-most important crop. Sorghum grown in Kanzara that year was of 28% improved variety, while the one grown in Kinkhed was of 9% improved variety. In addition to sorghum, cotton(the main cash crop), was also being cultivated in small quantities as well. By 1983, only small amounts of improved cotton were still being grown there, and this growth in the adoption of improved seeds was due to the increased use of improved sorghum as well as the introduction of improved wheat.

While these villages were adopting seed technologies, the remaining villages in Maharashtra in the Solapur district, Shirapur and Kalman, were not using improved seed varieties between 1975 to 1984. Though sorghum was their main crop and improved sorghum varieties were being readily adopted in the Akola district, it was only being used in the rare cases in the Solapur district. The importance of sorghum grew during this decade, accounting to 35 percent of the cultivated land in 1975 and 60 percent in 1983, respectively. Even then, improved and HYV varieties of sorghum, maize and wheat could not establish themselves in this region, and Shirapur and Kalman on an average, were still, the lowest adopters of seed technology for the period 2001-2008.

Between 2001 and 2008, the Akola villages of Kanzara and Kinkhed, consistently used improved or HYV seeds for all the crops grown by them. This increase was due to the introduction of improved pigeonpea and soybean, which had become the most important crops in this region. Pigeonpea has also become an important crop in the Telangana villages, Aurepalle and Dokur, with advanced varieties of cotton and sunflower outpacing paddy and sorghum in terms of importance in Aurepalle, while Dokur retained its original cropping pattern of being paddy and sorghum-based.

3.5 Farm Mechanization

Farm mechanization occurred to a significant extent in the recent years. In the late-1970s and early-1980s, use of machines was very limited. Table 8 shows the hours of use of different machines in the years 1975-2011. It appears that land preparation and threshing was mostly done by machines. Mechanical harvester was used only in Kanzara. Since 2006, farmers of six suicide-prone districts (*Akola, Amravati, Yeotmal, Buldhana, Wasim* and *Warda*) of Vidharba region of Maharashtra have

been entitled to receive upto ₹25,000 per family as assistance from the Prime Minister's special package towards purchase of farm equipment, seeds, and building storage, among others. Drip irrigation sets are given at 50 percent subsidy to farmers with more than five acres of farm holding and 60 percent to those with less than five acres, respectively. Along with the other factors such as rise in agricultural wages, scarcity of labor during the peak seasons, the above-mentioned subsidy policy has also contributed towards rapid mechanization in the study areas.

Table 8. Use of different types of machines (hours) in the study villages, 2011-2012.

Type of Use by Year	Aurepalle	Dokur	Shirapur	Kalman	Kanzara	Kinkhed
1975						
Tractor	Nil	Nil	Nil	Nil	Nil	Nil
Thresher	Nil	Nil	Nil	Nil	Nil	54
Harvester	Nil	Nil	Nil	Nil	Nil	Nil
Irrigation pumps (Electricity and diesel operated)	8,288	10,072	3,757	1,258	1,126	307
2001						
Tractor	251	256	361	782	574	282
Thresher	32	31	129	168	292	112
Harvester	0	0	0	0	0	0
Irrigation pumps (Electricity and diesel operated)	NA	NA	NA	NA	NA	NA
2008						
Tractor	743	595	549	54	1,192	640
Thresher	5	2	421	172	736	620
Harvester	2	69	0	0	9	30
Irrigation pumps (Electricity and diesel operated)	32,508	37,600	22,579	6,439	3,996	Canal irrigation
2011						
Tractor	637	722	891	222	1,093	1,040
Thresher	0	10	169	77	740	366
Harvester	2	106	0	0	61	129
Irrigation pumps (Electricity and diesel operated)	22,844	35,449	30,839	7,482	7,844	1,352

Source: Authors' calculation based on VLS dataset.

3.6 Access to Credit from Formal Sources

Amount of loans taken by households, both in nominal and real terms, has increased over the last three decades (see Table 9 and 10). In 2011-2012, average amount of loan taken by households was ₹102,745 in Aurepalle, ₹62,392 in Shirapur, ₹59,052 in Kanzara, ₹58,663 in Kalman and ₹44,419 in Kinkhed. In nominal terms, loans taken by households in the late 2000s were six to 75 times of

the amount taken in the late-1970s. On the other hand, in real terms loans taken by the sample households have been two to eight fold in the recent years as compared to three decades back. An analysis of credit from formal, semi-formal and informal sources has been carried out to know the extent of access to the formal credit sources. Formal sources include credit from nationalized and private banks. Semi-formal sources include loans taken from self-help groups (SHGs), co-operatives, advances forwarded by output purchasing agencies such as sugar factories, and milk processing units. Informal sources include loans taken from money lenders, friends ,relatives and large farmers. We have followed that category in our analysis. In all the villages, share of credit from formal sources to the total credit, fluctuated across years (Figure 7, 8 and 9). Fluctuation was high in Aurepalle, Shirapur and Kanzara. In 1975, the contribution of formal credit in Kanzara was 95% and it was zero in Dokur. In the other study villages, it ranged between these two values. It was observed that in normal years and agriculturally good years, share of formal credit to the total credit was substantially higher. In drought years, share of formal credit to the total credit declined at a high rate. It may be recalled that, except for the village Dokur, drought occurred in all the other study villages in 2008. Drought affected four villages (Aurepalle, Dokur, Shirapur and Kalman) in 2002 and three villages (Dokur, Kanzara and Kinkhed) in 2003 and 2004. This indicates that farmers have been able to get better access to agricultural credit. However, , they are unable to have access to the formal sources of credit for coping up with drudgeries arising due to drought or bad weather conditions. This is a concern since credit from the informal sources very often comes with higher interest rates and/or of exploitative nature. Therefore, institutional innovation for credit disbursement is needed to cater to the credit requirements of rural households in the years of drought and economic hardship.

Table 9. Per household average amount of credit (nominal) from institutional and non-institutional sources, 1975/76-2011/12.

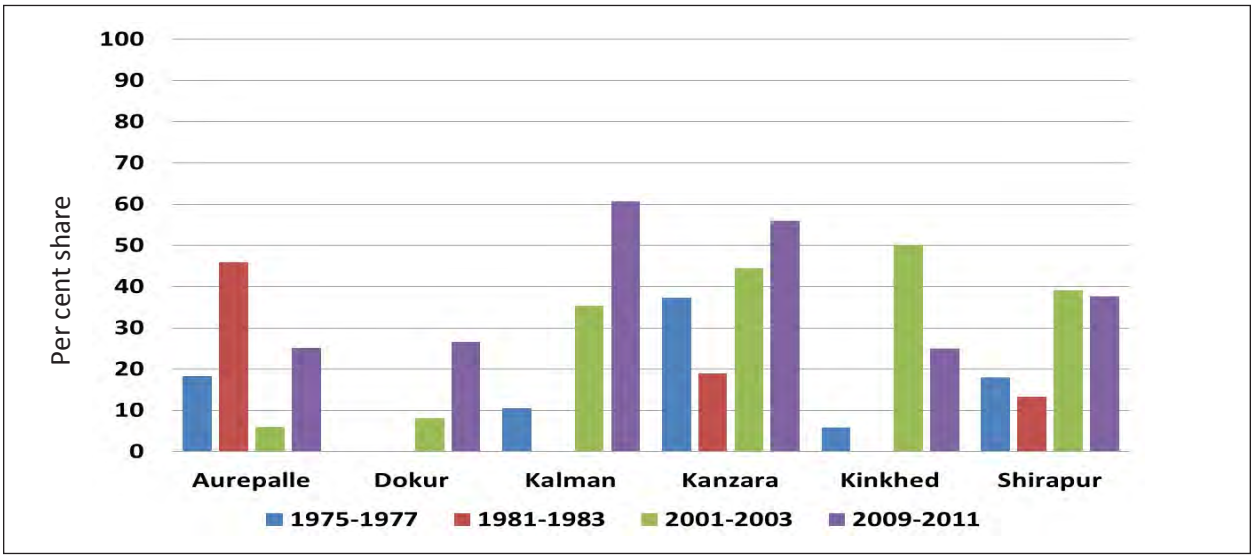
Year	Aurepalle	Dokur	Shirapur	Kalman	Kanzara	Kinkhed
1975	1,663	75	2,418	1,551	4,139	1,673
1976	1,657	47	1,850	4,690	1,288	1,326
1977	1,231	536	1,711	2,217	1,176	1,912
1978	1,387	1,822	1,966	2,269	1,613	1,929
1979	2,391	2,057	3,291	2,290	1,610	2,470
1980	4,233	3,461	1,761	NA	2,522	1,994
1981	3,669	NA	2,482	NA	2,676	NA
1982	3,022	NA	2,706	NA	1,834	NA
1983	2,968	NA	3,494	NA	2,416	NA
1984	1,918	NA	2,792	NA	4,535	NA
1989	4,730	4,638	4,524	11,619	4,767	2,202
2001	18,715	30,175	23,695	28,954	22,644	9,356
2002	23,751	34,208	28,031	24,928	23,040	11,231
2003	31,106	41,769	22,665	24,387	32,108	10,297
2004	35,933	44,956	47,568	28,859	23,090	11,881
2005	34,643	38,452	47,930	37,510	32,827	17,713
2006	43,908	34,601	45,094	37,315	30,386	28,755
2007	53,034	41,660	39,158	35,511	39,933	33,289
2008	58,131	50,097	44,807	45,503	24,951	20,367
2009	80,040	83,326	53,203	26,177	34,463	34,041
2010	94,341	55,127	54,231	41,616	40,152	29,552
2011	1,02,745	83,410	62,392	58,663	59,052	44,419

Source: Author's calculation based on VLS dataset.

Table 10. Per household average amount of credit (₹ 2009/10 equivalent) from institutional and non-institutional sources, 1975/76-2011/12.

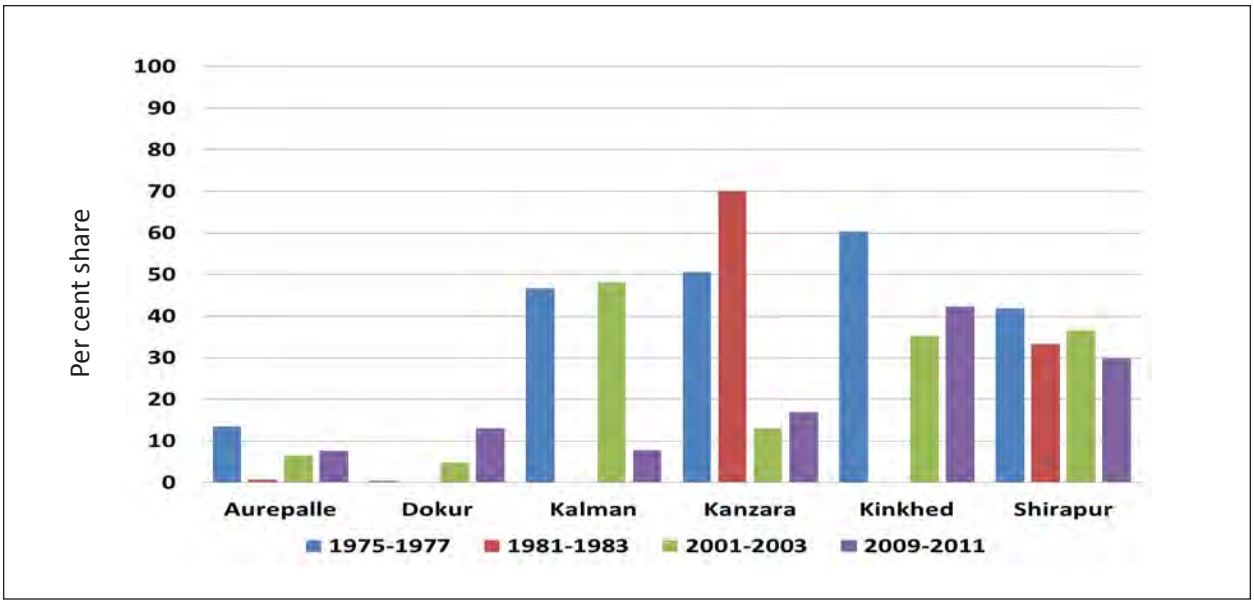
Year	Aurepalle	Dokur	Shirapur	Kalman	Kanzara	Kinkhed
1975	16,267	734	23,648	15,164	40,476	16,362
1976	15,869	450	17,724	44,929	12,342	12,700
1977	11,204	4,876	15,576	20,185	10,710	17,410
1978	12,629	16,588	17,905	20,659	14,682	17,560
1979	18,586	15,991	25,584	17,804	12,515	19,202
1980	27,833	22,756	11,581	0	16,581	13,111
1981	18,373	0	16,093	0	14,928	0
1982	17,326	0	15,513	0	10,516	0
1983	15,826	0	18,628	0	12,881	0
1984	9,603	0	22,707	0	13,981	0
1989	15,372	15,075	14,703	37,763	15,494	4,882
2001	28,160	45,403	35,653	43,566	34,072	14,078
2002	34,559	49,773	40,786	36,271	33,525	16,342
2003	42,919	57,631	31,272	33,649	44,301	14,207
2004	46,561	58,254	61,638	37,394	29,920	15,396
2005	43,007	47,736	59,502	46,566	40,752	21,989
2006	51,705	40,746	53,102	43,941	35,782	33,862
2007	59,618	46,832	44,019	39,919	44,890	37,422
2008	60,318	51,982	46,492	47,215	25,890	21,133
2009	80,040	83,326	53,203	26,177	34,463	35,350
2010	86,114	50,319	49,502	37,987	36,651	26,975
2011	86,100	69,898	52,285	49,159	49,485	37,223

Source: Author's calculation based on VLS dataset.



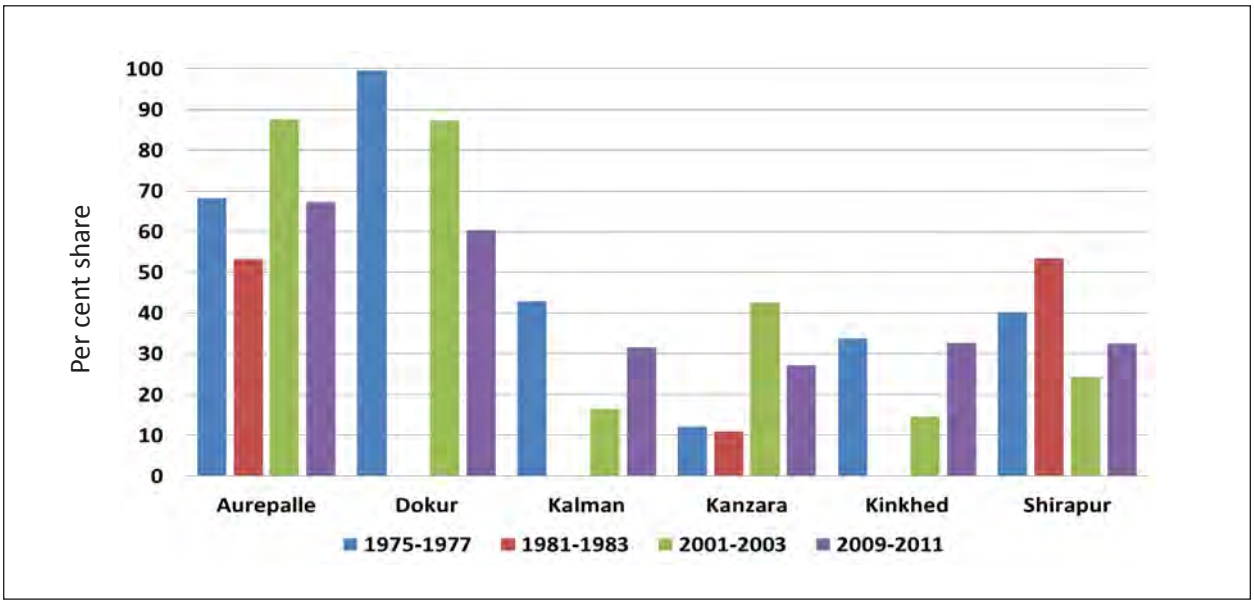
Source: Author's calculation based on VLS dataset.

Figure 7. Percentage share of formal sources of credit in VLS villages, 1975-2011.



Source: Author's calculation based on VLS dataset.

Figure 8: Percentage share of semi-formal sources of credit in VLS villages, 1975-2011.



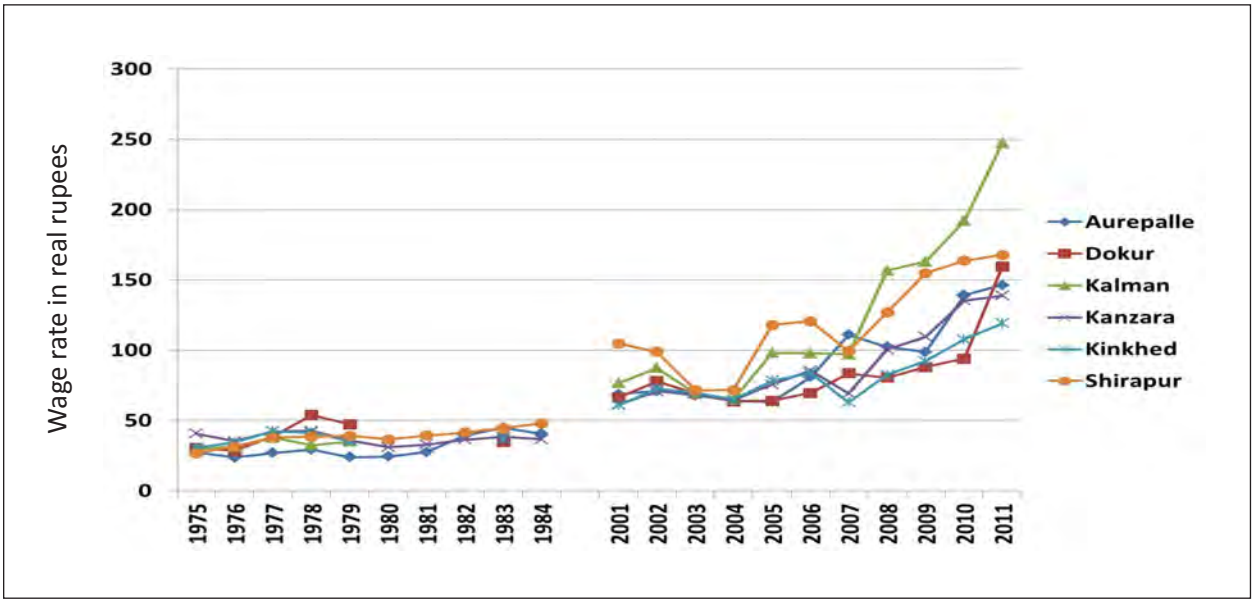
Source: Author's calculation based on VLS dataset.

Figure 9. Percentage share of in-formal sources of credit in VLS villages, 1975-2011.

3.7 Labor Market and Real Wages

Labor markets in the study villages have experienced substantial changes. In the 1970s, many families had regular farm servants (RFS). RFS were paid in cash and kind. They used to work according to the requirements of the employer although their works were primarily in the crop fields. Usually RFS were recruited for over a year and paid after the end of the contract period. With the ease in availability of work opportunities throughout the year, laborers didn't desire to work as RFS. Thus, the number of RFS households reduced substantially in all the villages.

Real wage for agricultural workers has continuously increased over the time in all the villages (see Figure 10). During the last three and a half decades (1975/76 to 2011/12), daily real wage rate (in 2009/10 ₹ equivalent) for male agricultural workers has increased by 2.4 times (in Kanzara) to 7.3 times (in Kalman) (from ₹41 to ₹139 in Kanzara and from ₹30 to ₹247 in Kalman). High increase in real wage was mainly observed in economically diversified villages and villages from where large scale temporary migration of laborers took place. On the other hand, real wage for male laborers increased more than four times in Aurepalle, Dokur and Shirapur whereas it increased by only 2.9 times in Kinkhed. In 2011-2012, daily wage rate of male agricultural workers was ₹119 in Kinkhed, ₹139 in Kanzara, ₹146 in Aurepalle, ₹159 in Dokur, and ₹168 in Shirapur. Non-farm real wage was always higher than agricultural wage in all the study villages. During the last six years (between 2005 to 2011), average daily non-farm real wage for male workers has increased from 136 percent in Aurepalle to 218 percent in Kanzara. Difference between male-female wage rates has reduced slightly over the time but the gap is still wide. It was true for both agricultural and non-agricultural wage. Aurepalle and Dokur in Telangana have the highest wage parity for women, followed by all of the Maharashtra villages.

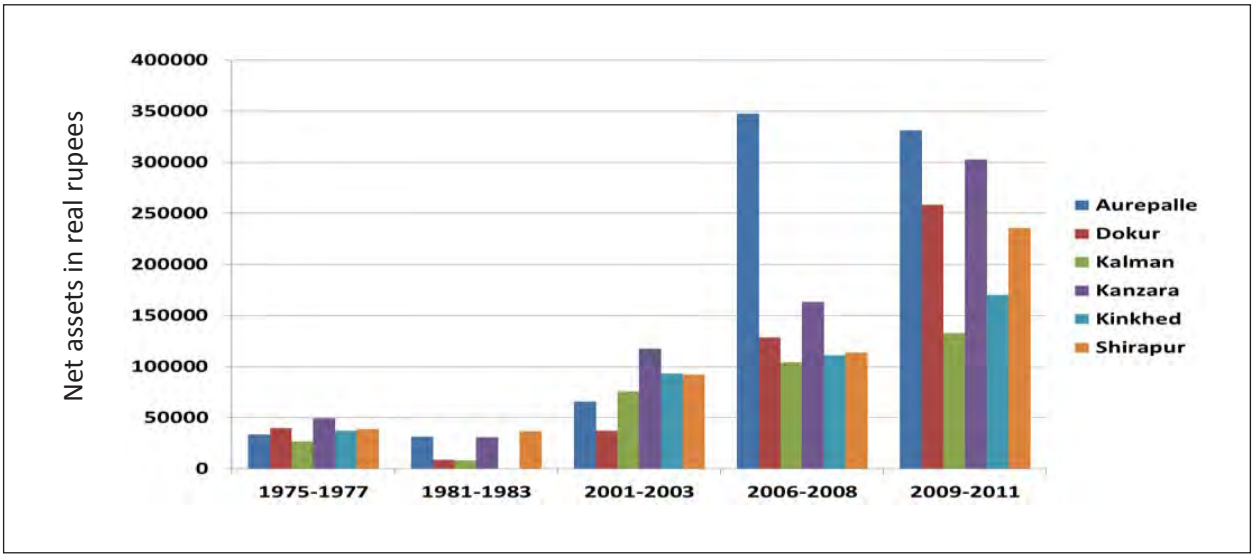


Source: Author's calculation based on VLS dataset.

Figure 10. Daily real wage rates (in 2009/10 ₹ equivalent) for male agricultural workers in Telangana and Maharashtra villages: 1975/76 to 2011/12.

3.8 Ownership of Assets

Trends in asset ownership indicate wealth status as well as capital accumulation by the households. Monetary value of different types of assets (land, livestock, residential house and farm buildings , farm equipment and consumer durables), owned on a per capita basis, was calculated for the period 1975/76 to 2011/12. For the purpose of comparison across years, these values were converted into ₹ 2009-10 equivalents. Households also had savings, borrowings and lending transactions. Net value of assets was obtained through the summation of all the assets plus savings plus lendings minus borrowings. Calculated value of net assets indicated that asset ownership level was stagnant in the 1970s (1975-1977) and early 1980s (1981-1983) in all the study villages (see Figure 11). In other words, there was no capital accumulation in the study villages during that period. In the early 2000s (2001-2003), compared to early 1980s, asset ownership level had increased in all the villages except Dokur. Asset ownership level declined in Dokur village in the early 2000s due to continuous drought faced by the Dokur villagers. In the early 2010s (2009-2011), rapid rise in asset ownership was observed in all the villages however, it was the highest in Aurepalle. Value of per capita asset holding in the late 2000s was ₹331,262 in Aurepalle, ₹258531 in Dokur, ₹235,759 in Shirapur, ₹133,062 in Kalman, ₹302,837 in Kanzara, and ₹170,061 in Kinkhed. Compared to the early 2000s, it was five times in Aurepalle, 6.9 times in Dokur, 6.5 times in Shirapur, 1.8 times in Kalman, 2.6 times in Kanzara and 1.8 times in Kinkhed. Rapid rise in land value was the major reason behind the high increase in asset value in Aurepalle. This was possible because of the establishment of new Airport in Shamsabad (Hyderabad) which had increased connectivity and land value in Aurepalle village. Accumulation of all types of assets, on a per capita basis, has been high during this period (see Table 11). Value of livestock owned by the Aurepalle villagers in late 2000s was 2.7 times than that of early 2000s. In case of Dokur, it was 4.3 times and ranged between 1.3 to 1.6 times in Shirapur, Kalman, Kanzara, and Kinkhed. During the same period, ownership of consumer durables increased to the range of 7.4 times in Dokur and 1.5 times in Kinkhed. Ownership of farm equipment and farm buildings also increased substantially. Ownership of farm buildings increased to 3.6 times in Aurepalle, 3.5 times in Dokur, 2.1 times in Kalman, 1.9 times in Kanzara, 2 times in Kinkhed, and 1.8 times in Shirapur.



Source: Author's calculation based on VLS dataset.

Figure 11. Trends in per capita ownership of net assets (₹ 2009/10 equivalent) in the study villages of Telangana and Maharashtra, 1975/76 to 2011/12.

1. The category of Residential house and Farm buildings include residential house, cattle shed, farm house, residential plots and storage structures.

Table 11. Trends in per capita values of assets (₹ 2009-10 equivalents) owned in the VLS villages, 1975/76-2011/12.

Type of Asset	Year	Aurepalle	Dokur	Shirapur	Kalman	Kanzara	Kinkhed
Land value	1975-1977	13,247	23,765	26,156	23,308	26,692	27,186
	1981-1983	15,987	NA	28,650	NA	18,753	NA
	2001-2003	41,442	22,604	68,408	56,715	85,526	68,149
	2006-2008	2,75,142	70,447	83,208	69,179	1,07,349	80,760
	2009-2011	2,43,696	1,49,786	1,86,921	85,715	2,39,874	1,33,743
Livestock	1975-1977	4,936	2,926	3,487	2,034	3,000	2,367
	1981-1983	2,729	NA	2,184	NA	1,434	NA
	2001-2003	3,596	2,697	4,921	2,806	3,047	2,167
	2006-2008	7,626	4,383	5,767	3,900	3,305	3,057
	2009-2011	9,589	11,621	6,443	4,370	3,810	3,210
Farm equipment	1975-1977	2,747	2,157	1,609	1,167	1,859	657
	1981-1983	2,625	NA	671	NA	1,441	NA
	2001-2003	5,187	2,639	4,286	4,610	4,944	1,350
	2006-2008	4,400	3,631	8,485	3,791	11,169	3,023
	2009-2011	5,480	4,982	6,221	5,124	8,150	3,406
Farm buildings	1975-1977	8,580	8,858	6,880	1,965	9,157	3,974
	1981-1983	5,854	NA	3,872	NA	4,933	NA
	2001-2003	14,954	12,941	10,766	10,694	17,875	11,609
	2006-2008	38,926	26,640	11,448	18,647	27,154	16,225
	2009-2011	54,270	45,687	19,840	22,377	33,272	23,372
Stock inventory	1975-1977	859	868	865	1,041	3,279	1,862
	1981-1983	491	NA	787	NA	1,405	NA
	2001-2003	NA	NA	NA	NA	NA	NA
	2006-2008	1,287	921	1,098	1,470	1,876	1,212
	2009-2011	2,230	1,676	1,435	1,982	2,185	786
Consumer durables	1975-1977	4,741	1,609	1,551	1,209	6,567	2,208
	1981-1983	6,416	NA	1,562	NA	4,314	NA
	2001-2003	5,822	4,062	7,965	5,469	7,951	7,360
	2006-2008	21,177	21,541	9,679	10,359	16,483	10,330
	2009-2011	25,745	35,006	17,914	17,685	17,932	8,408
Savings	1975-1977	690	208	650	13	1,718	1,620
	1981-1983	247	NA	990	NA	576	NA
	2001-2003	1,552	1,491	2,296	2,455	3,265	5,446
	2006-2008	7,923	6,633	3,351	4,965	2,955	2,999
	2009-2011	7,539	12,379	6,854	2,889	4,905	2,744

Source: Authors' calculation based on VLS Dataset.

3.9 Income, Sources of Income and Inequality in Income

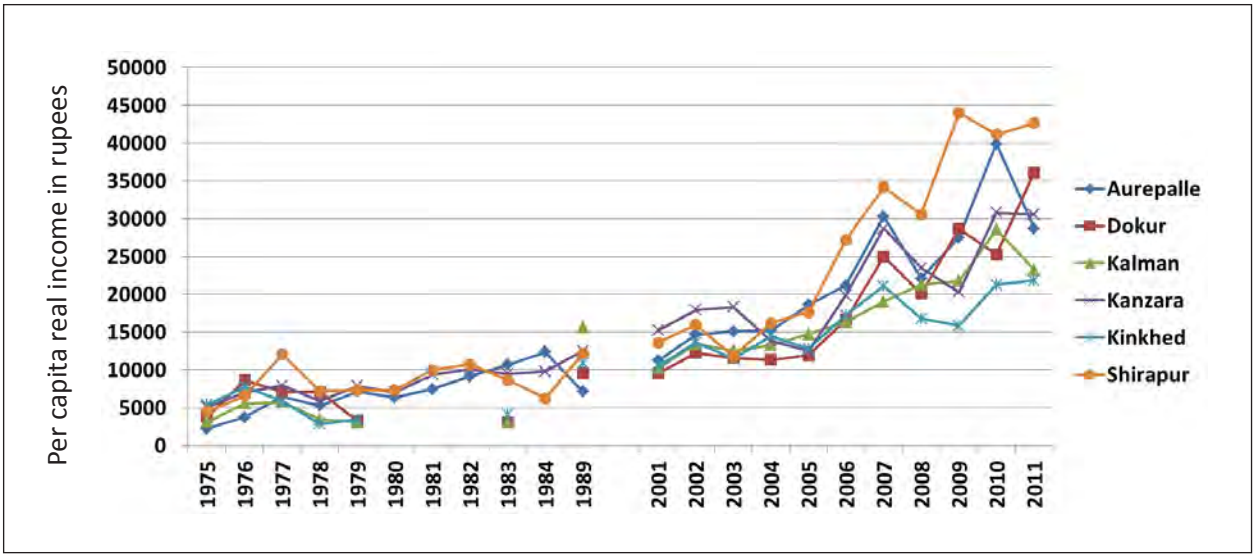
Income for all the households were computed by calculating income from different sources such as crop, livestock, farm labor, caste occupations, non-farm labor, migration, interests, rental income, gifts and remittances. Income from crops and livestock were calculated as net incomes. These also included the values of home consumption of farm production. Caste occupations covers toddy tapping, gold smith, carpenter, washer man, barber, potter, weaver, blacksmith, priest, etc. Non-farm labor income is the income obtained from sources such as construction work, mud work, and work in government schemes. Other non-farm income basically comprises of income from jobs and other sources not included in caste occupations, migration, farm labor, non-farm labor, agriculture. Migration income includes income obtained by the members due to temporary migration during the year. Any income received from permanent migrants is recorded as remittances. The income received from temporary migrants and any remittances received from permanent migrants are included in the total household income. Only temporary migrants and not permanent migrants are counted as members of the family.

All the study villages have experienced a rise in their income level. Per capita real income (₹ 2009/10 equivalent) increased substantially over time (see Table 12 and Figure 12). A comparison of per capita real annual income during the mid-1970s (1975/76 to 1977/78) and in late-2000s (2009/10 to 2011/12) revealed that it has increased to 7.7 times in Aurepalle, followed by Shirapur (5.5 times), Dokur (4.6 times), Kalman (4.5 times), Kanzara (4.1 times), and Kinkhed (3.1 times). Per capita average real income in late-2000s was ₹32,021 in Aurepalle, ₹29,996 in Dokur, ₹42,593 in Shirapur, ₹21,484 in Kalman, ₹27,210 in Kanzara, and ₹19,631 in Kinkhed.

Table 12. Trends in per capita real income (₹ 2009/10 equivalents) in study villages of Telangana and Maharashtra, 1975/76 to 2011/12.

	Aurepalle	Dokur	Shirapur	Kalman	Kanzara	Kinkhed
1975/76 - 1977/78	4,144	6,493	7,714	4,808	6,668	6,323
2009/10 - 2011/12	32,021	29,997	42,593	21,484	27,210	19,631

Source: Authors' calculation based on ICRISAT VLS dataset.



Source: Author's calculation based on ICRISAT VLS dataset.

Figure 12. Trends in per capita real income (₹ 2009/10 equivalents) in the study villages of Telangana and Maharashtra, 1975/76-2011/12.

An analysis of the sources of income has revealed that income sources have diversified in all the villages except Kanzara and Kinkhed (see Figure 13 and 14). In these two villages, agriculture is the dominant source of income. Other sources of income include labor and livestock. In 1975, study villages almost didn't have any income from the non-farm sources. In the 2000s, non-farm and other income sources increased substantially. Income from livestock also increased. From 2001 to 2009, the economy of Aurepalle, Dokur, Shirapur and Kalman became more diversified. Absolute income from crop production increased but its share to total income declined due to rise in income from other sources such as non-farm, caste occupation (toddy tapping), migration etc.

Along with the increase in income, all the study villages also experienced an increase in the income inequality (see Figure 15). Estimated values of the Gini coefficient indicate that income inequality among sample households declined until early 2000s in all the study villages. After that, it varied across the study villages and it has been showing an upward and fluctuating trend in Kanzara. In Shirapur, it has been declining. It had declined in Aurepalle until 2009 and increased a bit in 2010 and 2011. For Dokur, it had increased during 2004 to 2007 and then declined in the recent years. In the case of Kalman, it had increased in the early 2000s and then continuously declined since 2005. Kinkhed experienced an increase in the income inequality between 2003 and 2006, which was followed by a consistent decrease in inequality. It implies that all households were not able to take the equal advantage of the new earning opportunities emerging in the villages and that the villagers will take time to benefit from the new opportunities.

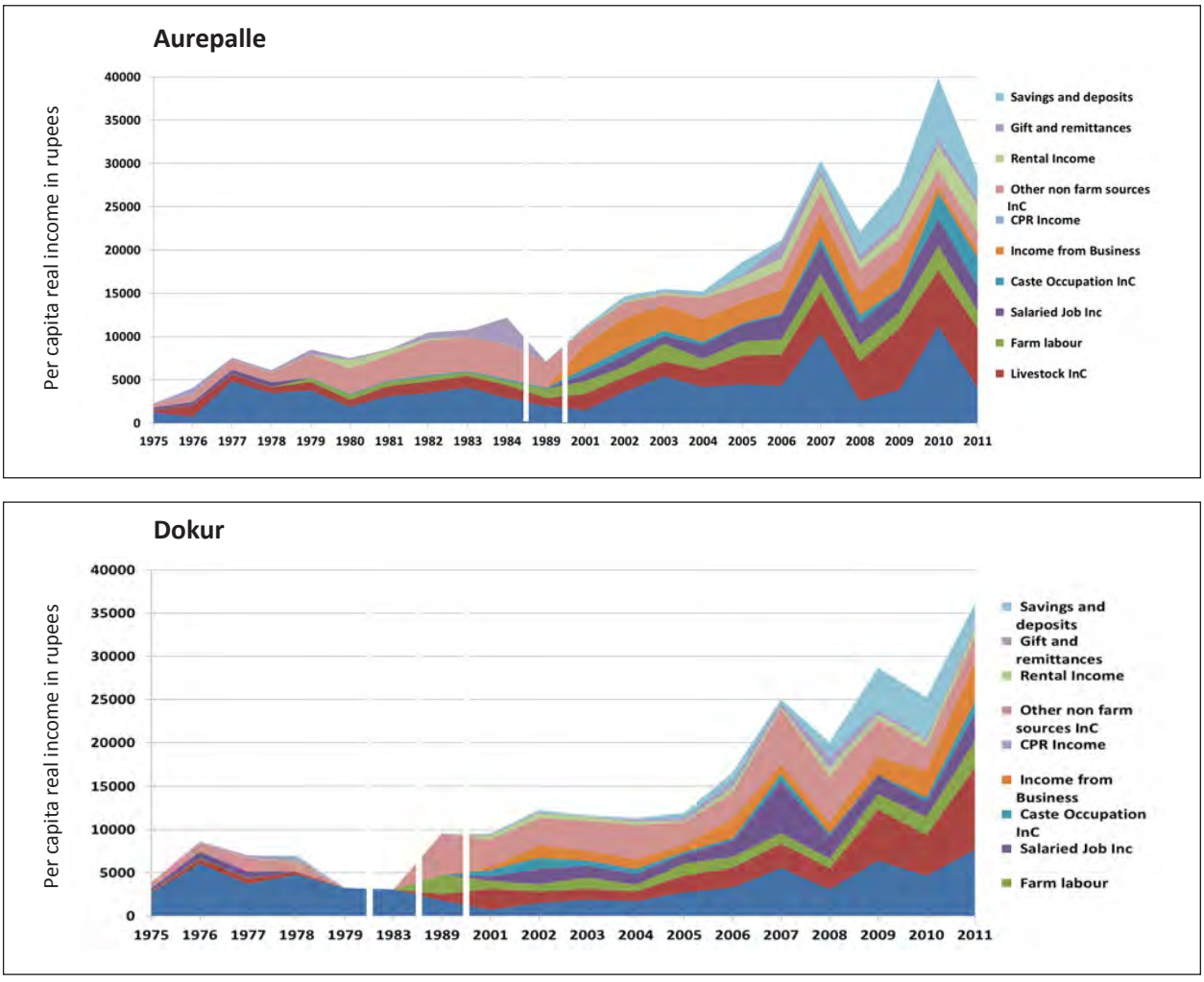
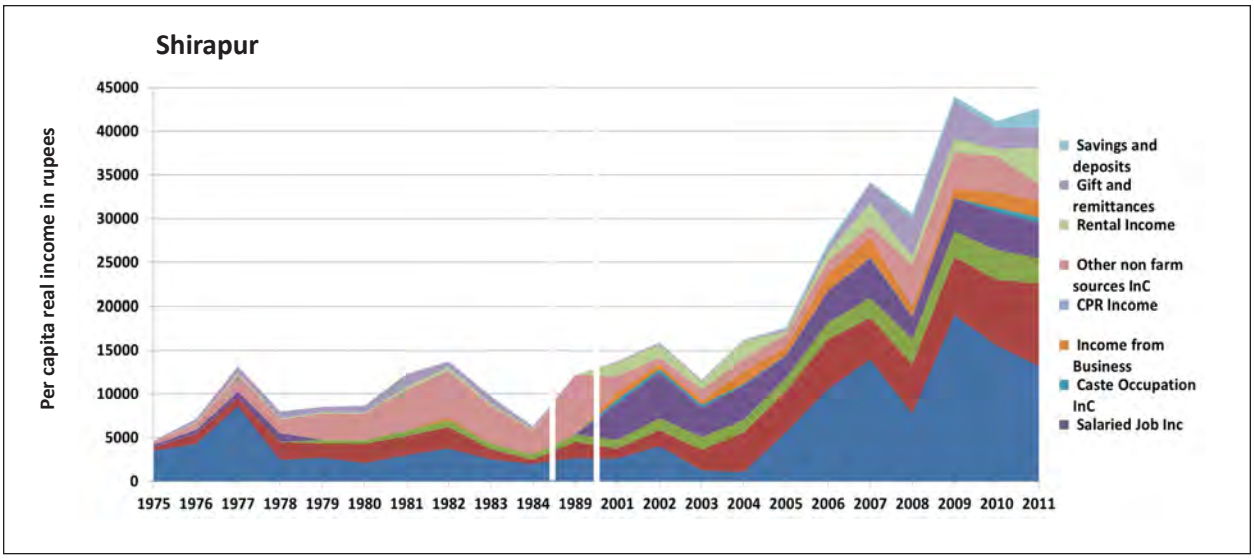
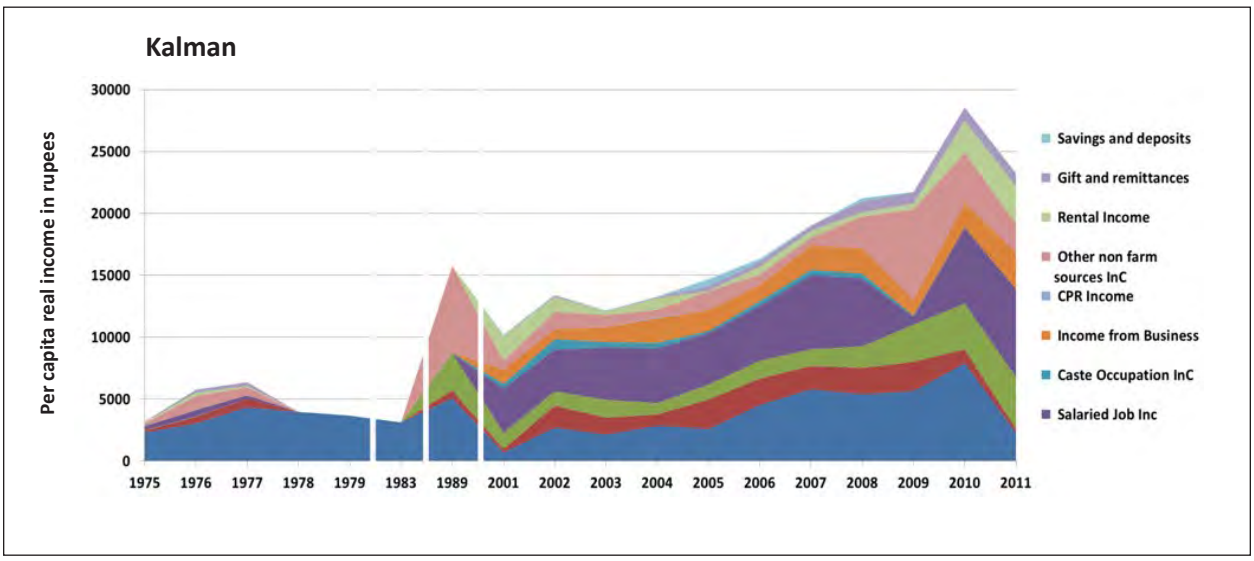
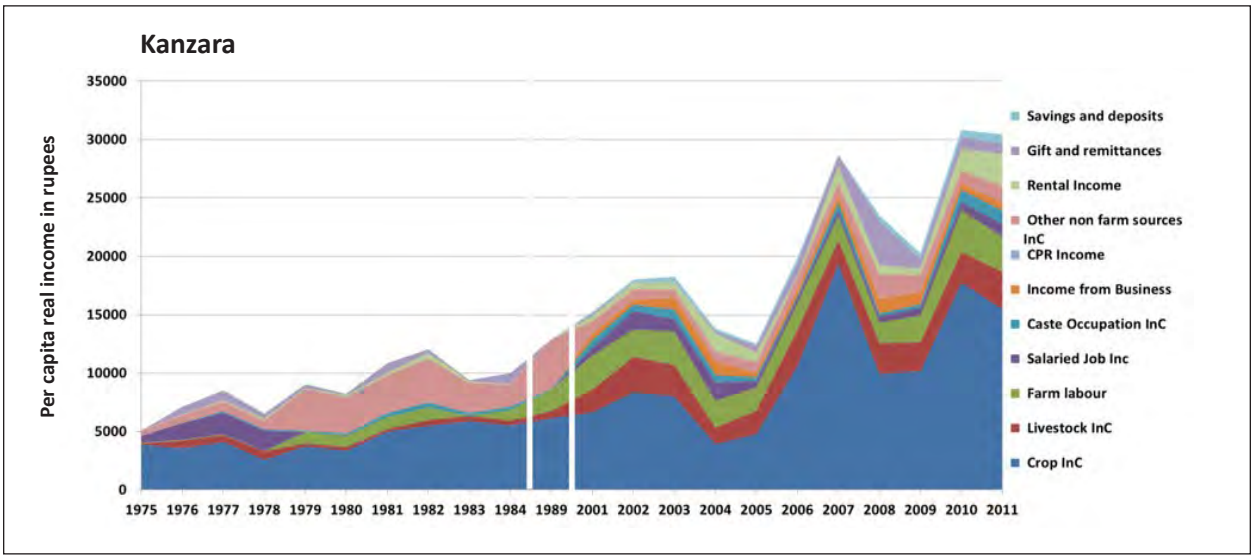


Figure 13. Trends in per capita income (Rs) in the villages of Telangana (₹ 2009-2010 equivalent), by source, 1975/76 to 2011/12.


Shirapur
Per capita real income in rupees
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1989 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011
Savings and deposits
Gift and remittances
Rental Income
Other non farm sources InC
CPR Income
Income from Business
Caste Occupation InC
Salaried Job Inc


Kalman
Per capita real income in rupees
30000
25000
20000
15000
10000
5000
0
1975 1976 1977 1978 1979 1983 1989 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011
Savings and deposits
Gift and remittances
Rental Income
Other non farm sources InC
CPR Income
Income from Business
Caste Occupation InC
Salaried Job Inc


Kanzara
Per capita real income in rupees
35000
30000
25000
20000
15000
10000
5000
0
1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1989 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011
Savings and deposits
Gift and remittances
Rental Income
Other non farm sources InC
CPR Income
Income from Business
Caste Occupation InC
Salaried Job Inc
Farm labour
Livestock InC
Crop InC

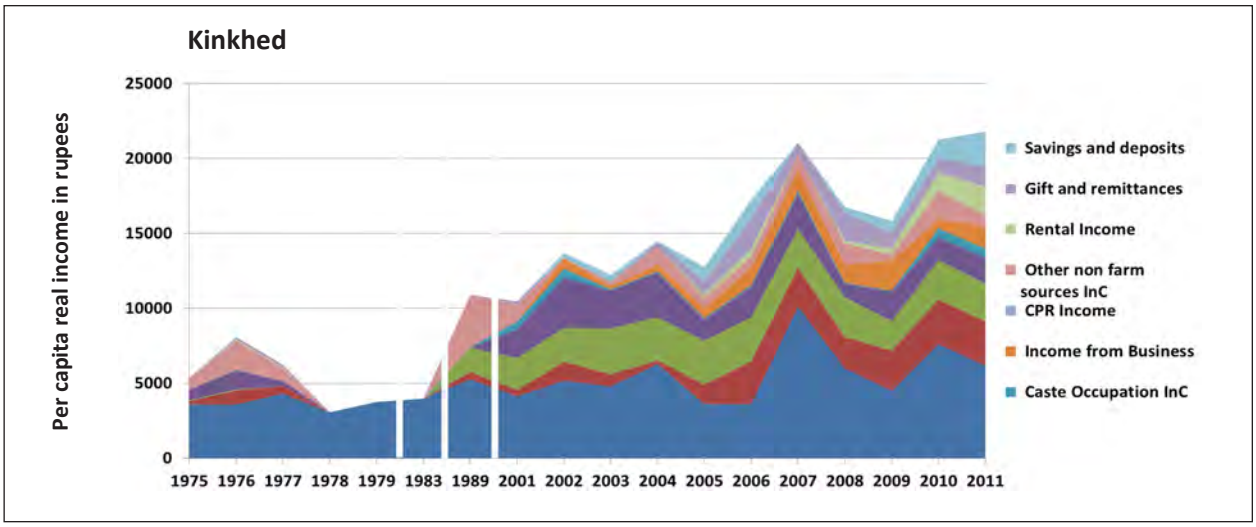
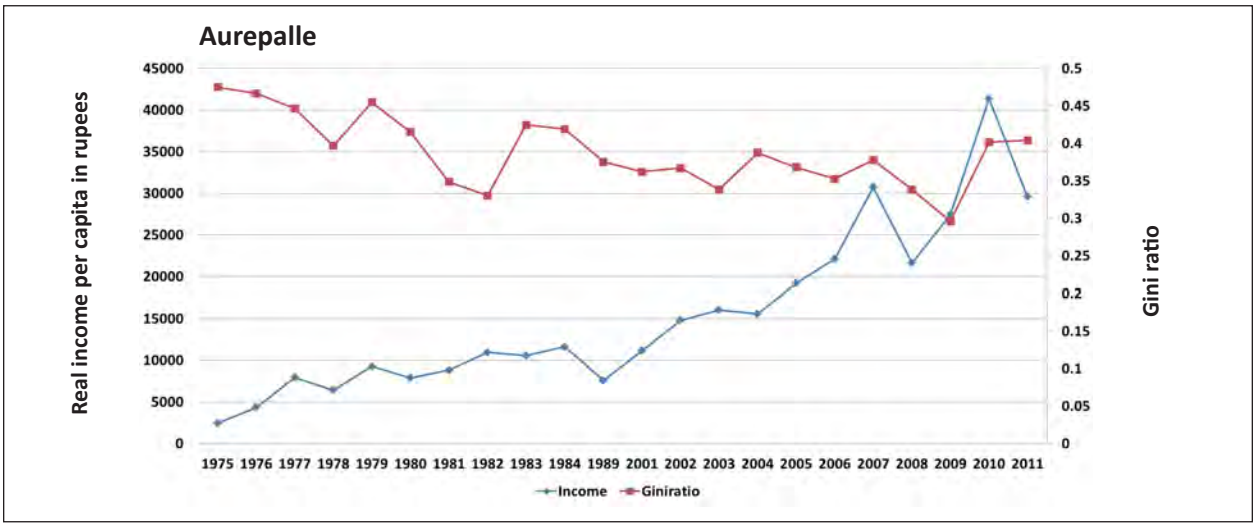
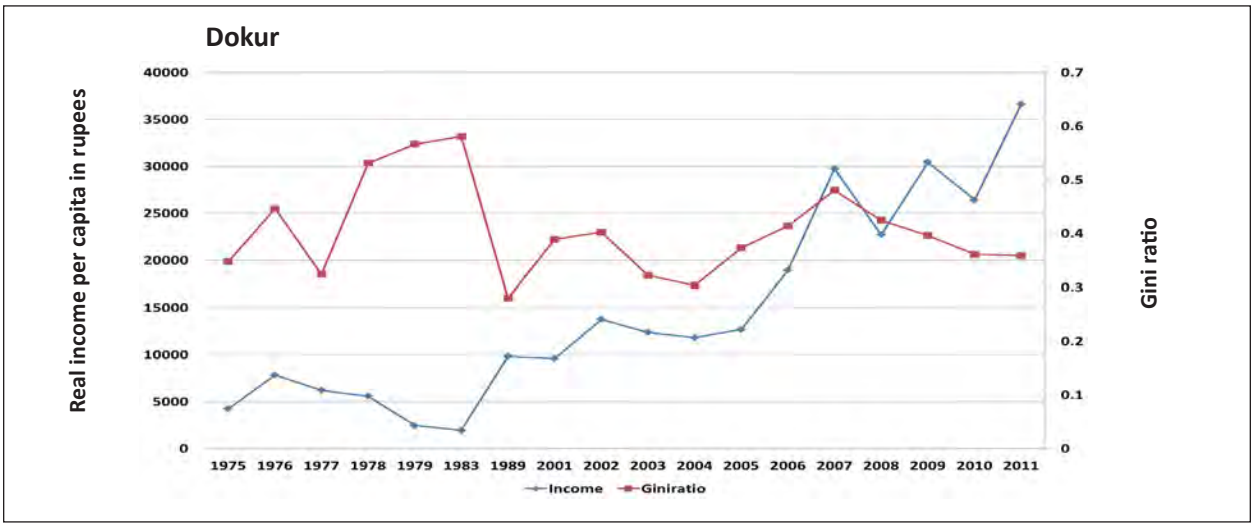
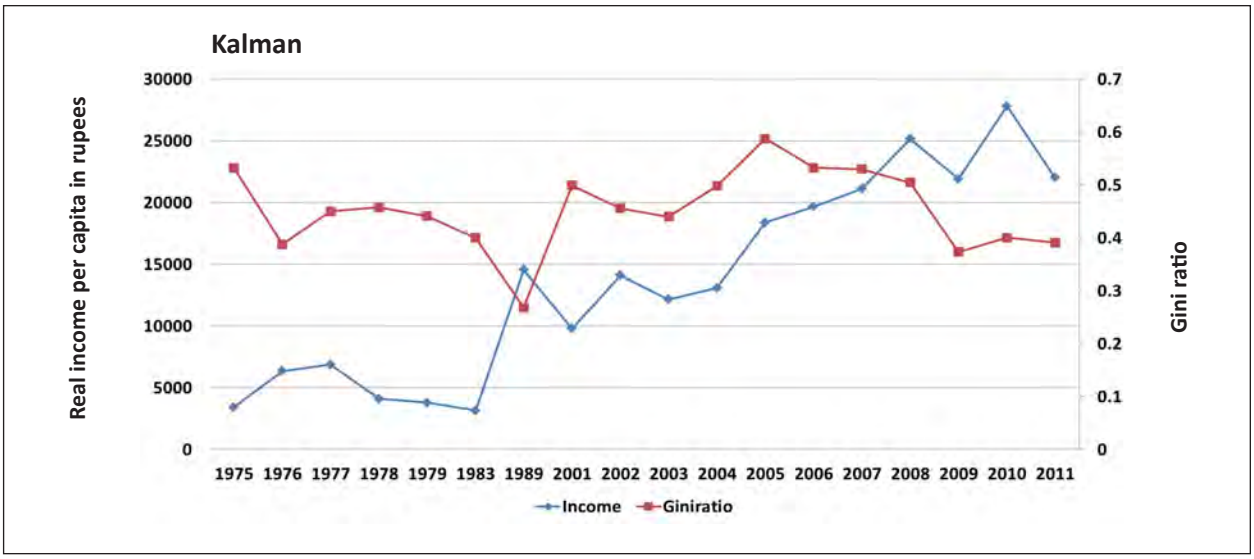
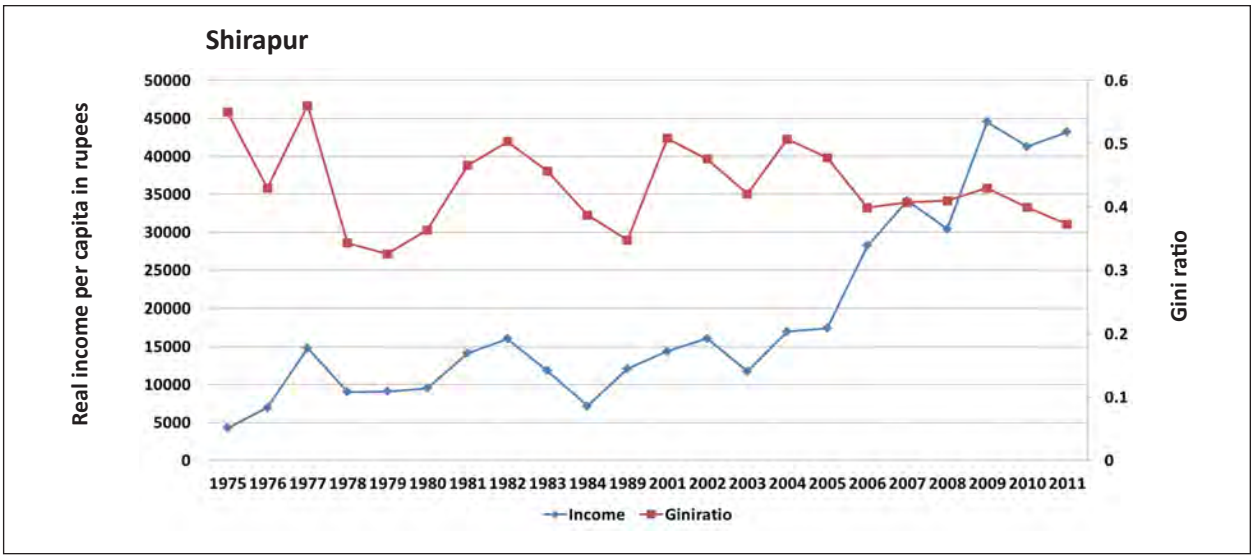


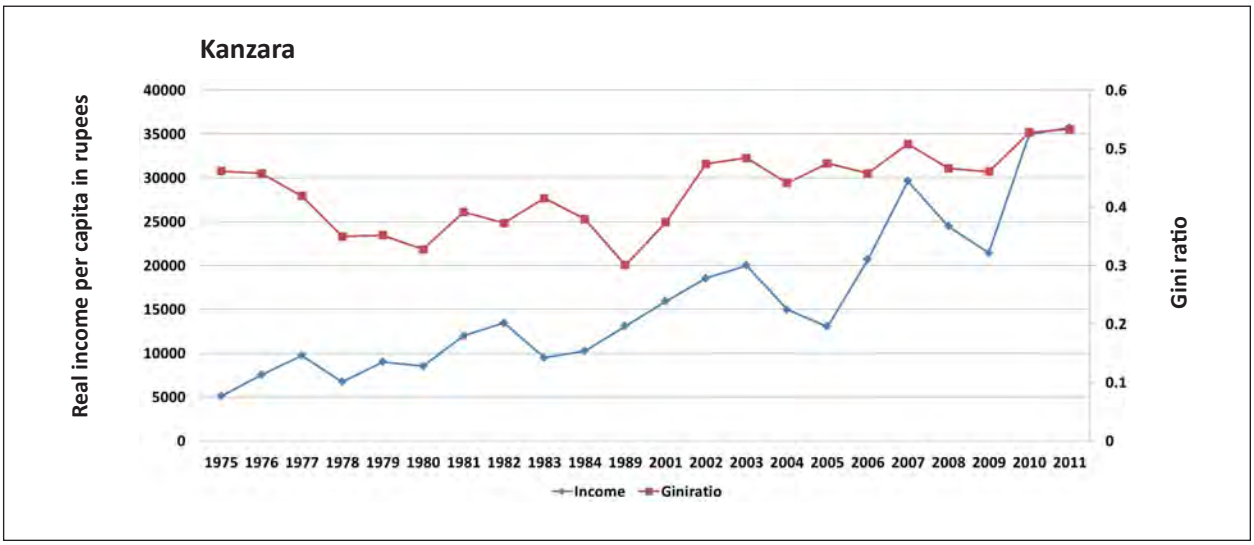
Figure 14. Trends in per capita income (Rs) in villages of Maharashtra (₹ 2009-2010 equivalent), by source, 1975/76 to 2011/12.

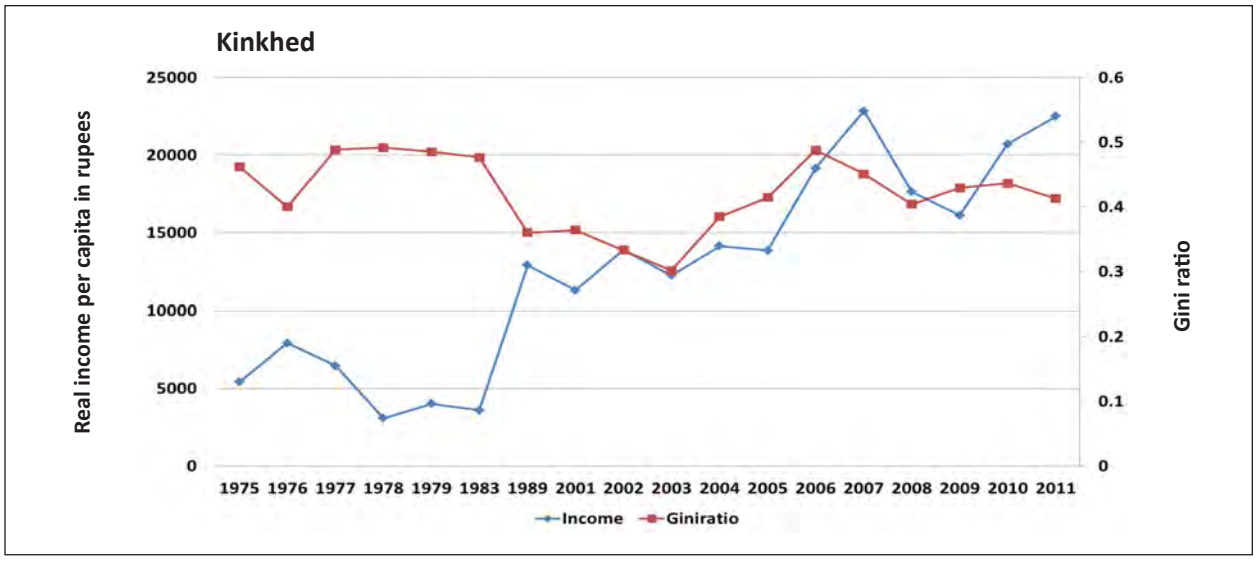





Kalman
Real income per capita in rupees
Gini ratio
30000
25000
20000
15000
10000
5000
0
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1975 1976 1977 1978 1979 1983 1989 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011
Income
Giniratio


Shirapur
Real income per capita in rupees
Gini ratio
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
0.6
0.5
0.4
0.3
0.2
0.1
0
1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1989 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011
Income
Giniratio


Kanzara
Real income per capita in rupees
Gini ratio
40000
35000
30000
25000
20000
15000
10000
5000
0
0.6
0.5
0.4
0.3
0.2
0.1
0
1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1989 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011
Income
Giniratio



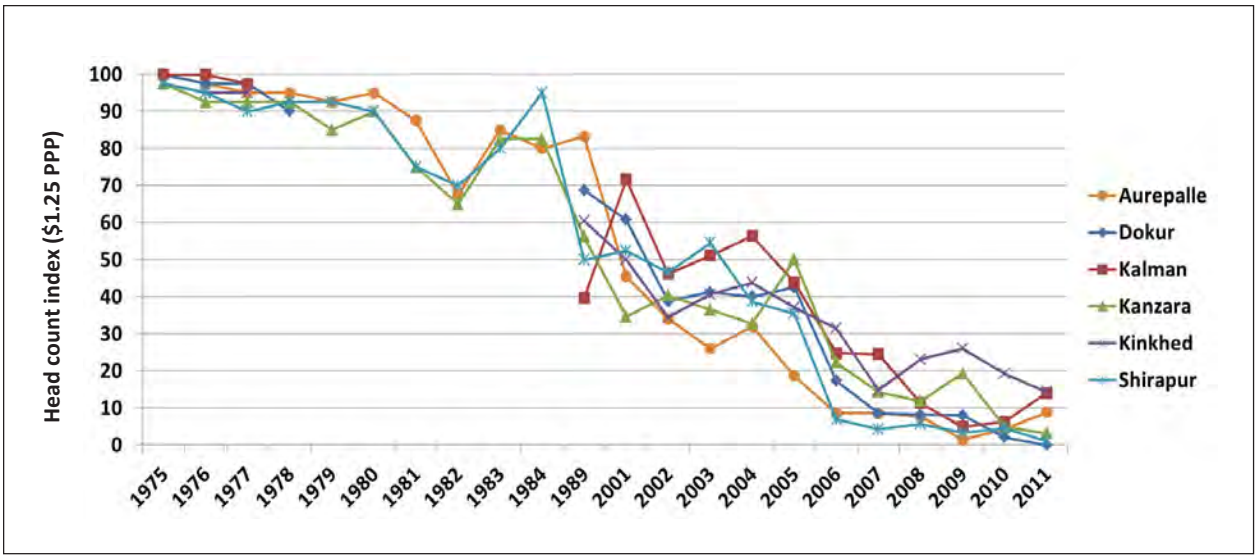
Source: Authors' calculation based on Household Survey data.

Figure 15. Trends in per capita real income (₹ 2009-2010 equivalents) and inequality in income in the study villages of Telangana and Maharashtra, 1975-2011.

3.10 Poverty Situation: Extent, Intensity and Severity

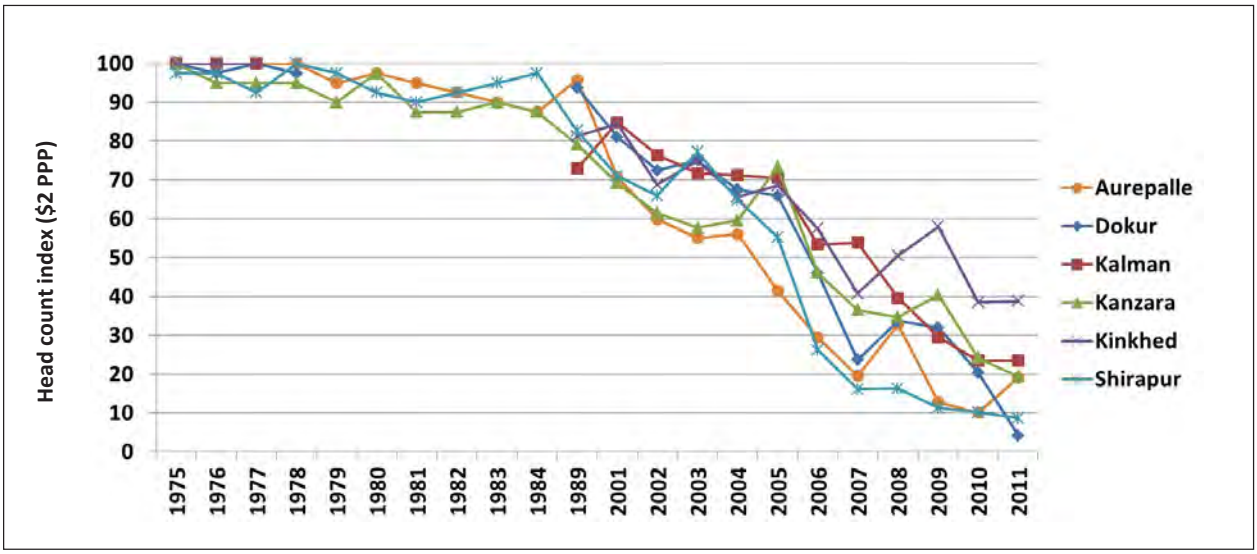
Understanding changes in the poverty situation is an important aspect to study the village dynamics. A conventional way to measure poverty is to establish a poverty line, which is defined as the threshold level of income needed to satisfy the basic minimum food and non-food requirements, and then determine the number of households (or people) below that line as a percent of the total households (population). This Head-Count Index (HCI) is a measure of the incidence of poverty. This measure is easily understood by general public and hence is popular with the policy makers and development practitioners. The limitation of this measure is that it is insensitive to changes in the level and distribution of income among the poor. Estimation of poverty line plays a very important role on the incidence of poverty. We have calculated poverty among the households using lower poverty line (daily $1.25 PPP per capita) and upper poverty line (daily $2.00 PPP per capita). Using exchange rates for PPP dollars, we have calculated equivalent rupees for poverty line for the study years.

The other measures of poverty commonly used to take into account the distribution issue are (a) the Poverty Gap Index and (b) the Squared Poverty Gap Index. The Poverty Gap Index measures the average (of both poor and non-poor households) of the percentage of income gap of the poor households from the poverty line, and is used as a measure of depth or intensity of poverty. It measures the percentage of total income needed to be transferred from the non-poor to poor households to lift the poor above the poverty line. However, if the society is averse to inequality in the distribution of income among the poor, the poverty measure must be sensitive to income transfers from the moderate to the extreme poor. It means that higher priority must be given to the improvement in the economic conditions of the extreme poor compared to that of the moderate poor. On the other hand, the Squared Poverty Gap Index satisfies this condition, and is used as a measure of the severity of poverty. For this study we have measured the HCI (extent or incidence of poverty), Poverty Gap Index (intensity of poverty) and the Squared Poverty Gap Index (severity of poverty).



Source: Authors' calculation based on Household Survey data.

Figure 16. Trends in poverty (Head-Count Index) measured at lower poverty line (daily $1.25PPP per capita) in the study villages of Telangana and Maharashtra, 1975/76 to 2011/12.



Source: Authors' calculation based on Household Survey data.

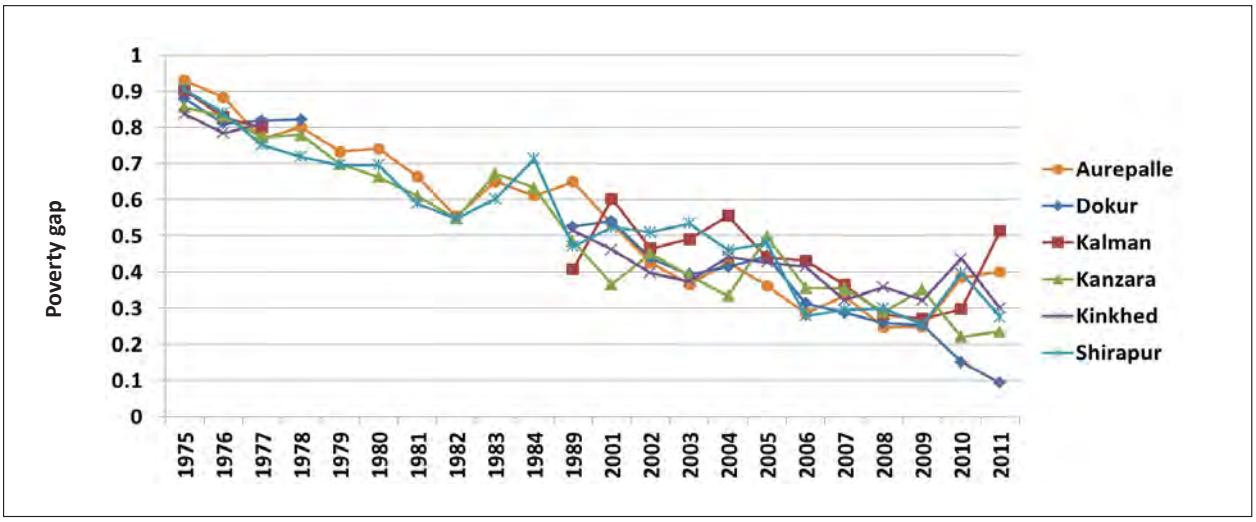
Figure 17. Trends in poverty (Head-Count Index) measured at upper poverty line (daily $2.00 PPP per capita) in the study villages of Telangana and Maharashtra, 1975/76 to 2011/12.

Extent of Poverty: In the observed period, incidence of poverty had declined in all the study villages using both upper and lower poverty lines (see Figure 16 and Figure 17). In 1975-1976, poverty was at an extremely high level using even lower poverty line. Amongst the study villages, Kanzara, Shirapur and Kinkhed had one family each that was not poor in this period as per the lower poverty line while all others were poor. As per the upper poverty line, only one household in Shirapur was non-poor while all other sample households were poor. Four study villages of Maharashtra (Shirapur, Kalman, Kanzara and Kinkhed) had experienced drought for three consecutive years 1971-1974. Poverty situation improved in subsequent years but was fluctuating with vagaries of weather.

In the 1970s and early 1980s (1975-1984), crop was the main source of income followed by labor income (crop) and income from livestock. Crop income used to fluctuate with weather conditions. Thus, poverty situation was also depending on the weather situation. Poverty situation started to improve in the villages with the availability of irrigation and/or adoption of improved cultivars of different crops. Rapid rate of poverty reduction was visible in the recent years in all the villages except Kinkhed. In Kinkhed, poverty has been fluctuating in the recent years.

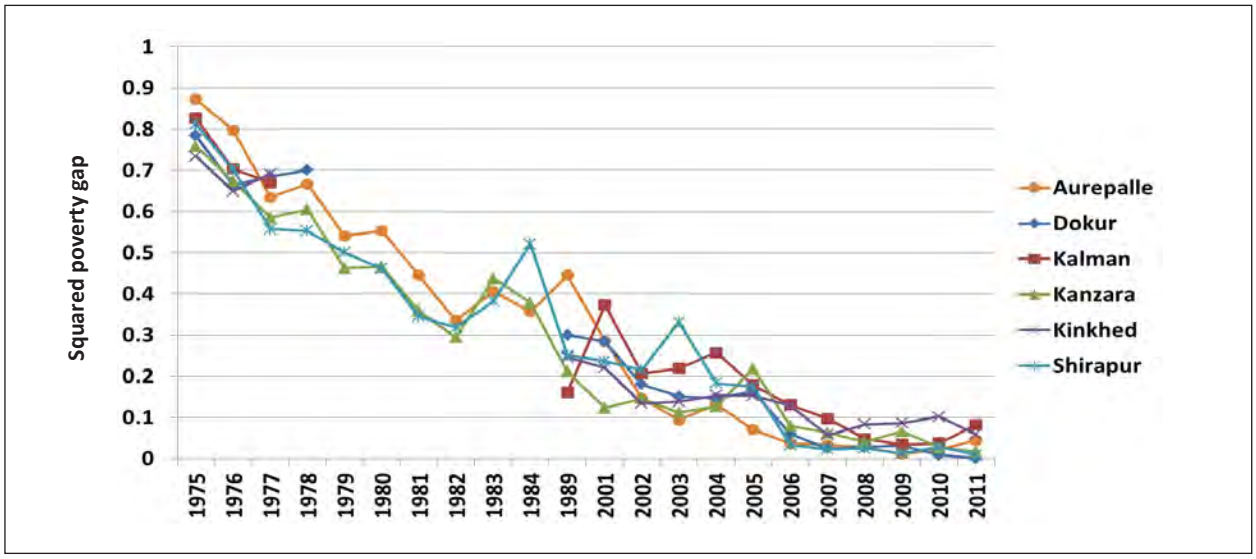
Poverty situation started to improve in Aurepalle in the 2000s with the adoption of HYVs and hybrids, cultivation of cash crops, milk production on a commercial basis, opportunities for participation in non-farm activities created through the development of Airport at Shamshabad and better communication facilities. Rapid increase in land value in Aurepalle after the establishment of the Airport also contributed towards income generating opportunities. Income from temporary migration by a large number of households was the major force behind poverty reduction in Dokur. Rapid growth in income due to income from cash crops, livestock (milk and dairy products), poultry, non-farm work and salaried jobs were the main driving force behind poverty reduction in Shirapur. Poverty situation started to improve in Kalman in the 2000s with the expansion of irrigation facilities, cultivation of high value crops and participation in non-farm activities and salaried jobs. In the case of Kanzara, the major drivers contributing towards poverty reduction were availability of irrigation facilities, adoption of improved cultivars and cultivation of high value crops which were promoted through better market linkage and connectivity. However, Kinkhed villagers could not prosper much due to lack of governance, social capital and collective action. Recent increase in poverty in Kinkhed is due to vagaries of nature.

Intensity of Poverty: Intensity or depth of poverty was high in 1975-1976 (see Figure 18). For example, the estimated value of Poverty Gap Index in Aurepalle was 0.93, 0.88 in Dokur, 0.90 in Kalman, 0.86 in Kanzara, 0.84 in Kinkhed and 0.91 in Shirapur in 1975-1976, which means that the average income of the poor was only 16 percent of the poverty line (1 – 0.84 = 0.16) in Kinkhed bringing it to the best position over the other study villages. In Aurepalle, the average income of the poor was the lowest, i.e., 7 percent of the poverty line in 1975-1976. In subsequent years, there was a continuous declining trend in Poverty Gap Index in the study villages. However, by 2000, many of the households moved out of poverty and this situation has continuously been improving over the years. In 2011, Poverty Gap Index across the study villages ranged between 0.094 in Dokur and



Source: Authors' calculation based on Household Survey data.

Figure 18. Trends in intensity or depth in poverty (Poverty Gap) in the study villages of Telangana and Maharashtra, 1975/76 to 2011/12



Source: Authors' calculation based on Household Survey data.

Figure 19. Trends in severity in poverty (Squared Poverty Gap) in the study villages of Telangana and Maharashtra, 1975/76 to 2011/12

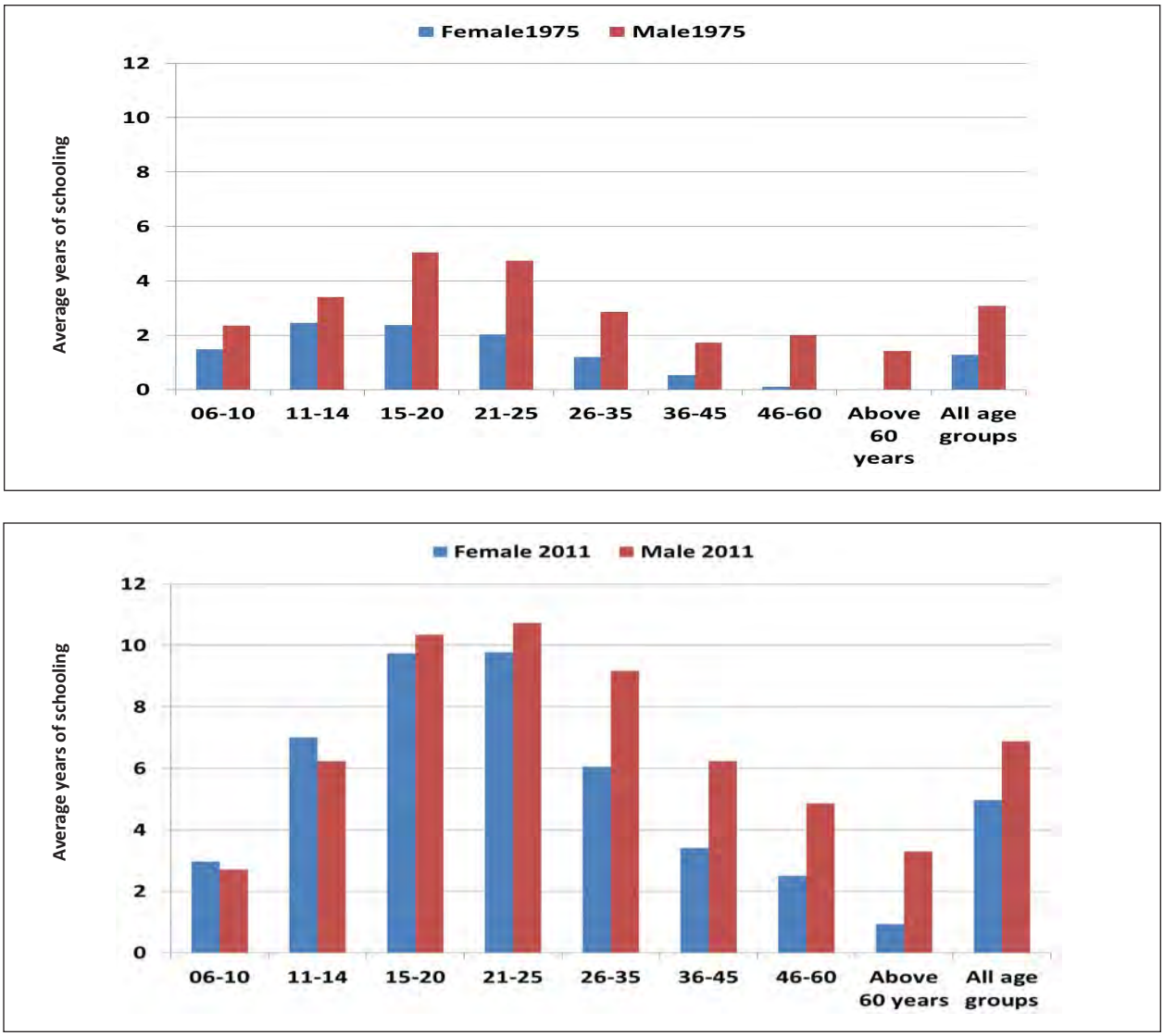
0.51 in Kalman. In other words, poor households in Dokur now had an income level which was 99.6 percent of the poverty line and poor households in Kalman have an income level which was 87.9 percent of the poverty line income.

Severity of Poverty: Severity of poverty has consistently declined over the years in all the study villages (see Figure 19). Rate of decline in severity was slow in the 1970s and early 1980s but it declined sharply after 2004. This implies that the lowest income groups in the study villages have also been able to increase their income over the years and relatively at a higher rate in the recent years.

3.11 Access to and Achievement in Education

Education is very important in life. Access to education helps to gather knowledge, skills and enhances abilities of individuals to take part in the economic activities. It provides scope for income earning opportunities and helps to get out of poverty. In all the study villages, schools were established and subsequently upgraded at different times. These schools (high schools) were taken care by the villagers and government on a twin sharing benefit basis. Infrastructure facilities were developed both by the local committees and the government. The government took care of the salaries of the teachers and sponsored the pro-poor schemes including free text books distribution, scholarships to the economically backward students and mid-day meal scheme. Villagers contributed to school infrastructure through student-fees. In Maharashtra villages, students also benefitted from some schemes which included (i) National Scholarship scheme for meritorious rural students, (ii) Savitribai Phule scholarships, (iii) AhilyaBai Holkar free Scheduled Tribes concession for female students, (iv) Free textbooks from 5th -8th standard, and (v) Exemption of fees for students whose parents income does not exceed ₹15,000/ per month.

Average years of schooling in the study villages increased in 2011/12 for both male and female children irrespective of their family wealth status and castes. In 1975/76, male population of sample households, on an average, had 3.1 years of schooling while it was 1.3 years for female population (see Figure 20). In 2011/12, average years of schooling for male and female population increased to 6.9 years and 5.0 years, respectively. In the case of younger generation (aged below



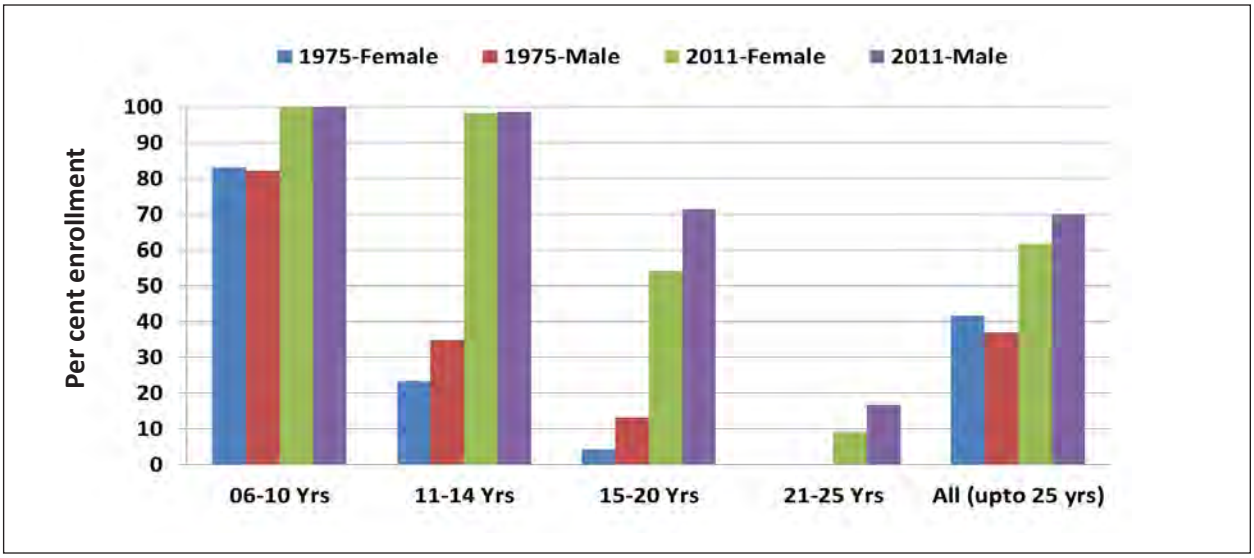
Source: Authors' calculation, based on Household Survey 1975-1976 and 2011-2012.

Figure 20. Level of educational attainment (average years of schooling) by gender in the study villages of Telangana and Maharashtra, 1975/76 and 2011/12.

25 years), equality in education is more prominent. It is pertinent to mention here that the government has provided emphasis to education for all. Expenditure on education by both central and state governments has increased. In order to increase access to education, central and state governments have provided reservation to backward castes, scheduled castes, scheduled tribes and minorities. Mid-day meals have been introduced in the school. The 86th Constitutional Amendment Act 2002 (through insertion of Article 21-A in Part III of the Constitution) made education free and compulsory for all children between 6 and 14 years of age. Total combined expenditure on education by the central and the state governments has increased, both in monetary terms as well as in terms of budget share (Ministry of Planning, 2010). An enquiry into the school enrollment of children revealed that 99 percent boys and all girls of the sample households in the study villages aged up to 10 years were going to the school in the year 2011/12 (see Figure 21). In 1975/76, 82 percent of the boys and 83 percent of the girls aged between six to 10 years used to go to the school. In the case of children aged between 11-14 years, 99 percent of the boys and 98 percent

of the girls went to school in 2011/12 while 35 percent of the boys and 23 percent of the girls in the same age group were in school in 1975/76. It is pertinent to mention here that children aged between 11-14 years, who dropped out from school, were from labor and small farm households. All the children from medium and large households were still continuing their education. It appears that wealth situation of the household still plays an important role in the continuity of education for children. In 2011/12, 54 percent of the girls and 71 percent of the boys aged between 15 to 20 years were studying against 13 percent of boys and 4 percent of girls in 1975/76. In 1975/76, 3 girls each in Kanzara and Shirapur and one girl in Kalman in the age group of 11-14 were studying and only one girl in Shirapur in the age group of 15-20 was studying and none of the girls who were above 20 years of age in 1975/76 were studying. In 2011/12 these numbers increased and one girl in Aurepalle, two each in Dokur and Kalman and one girl in Shirapur in the age group of 21-25 were studying. Thus, it appeared that government's efforts accompanied by awareness and positive attitude of parents towards education have increased access to and achievement in education for the new generation. However, access to tertiary education by female children and children from lower economic strata still remains very limited.

In Andhra Pradesh and Telangana, computer education expanded very rapidly in the 2000s. Many people from these states with degrees in information and communication technology (ICT) have been working in the USA. We were inquisitive to know whether villages of Aurepalle and Dokur have benefited from such development. We came to know that eight ICT educated persons and one cook from Aurepalle village have been working in USA. On the other hand, six ICT educated persons of Dokur village have been working in USA while about 30 laborers have been working in the middle-east (Dubai, UAE). In the case of Maharashtra villages, two persons of Shirapur village were in the USA. One household has an internet connection and a number of families have computers at their homes. Computer literacy has been spreading in Shirapur. Kalman villagers are also exposed to computer education. There are about 15 computers in the village. The village has about 100 teachers,



Source: Authors' calculation, based on Household Survey 1975/76 and 2011/12.

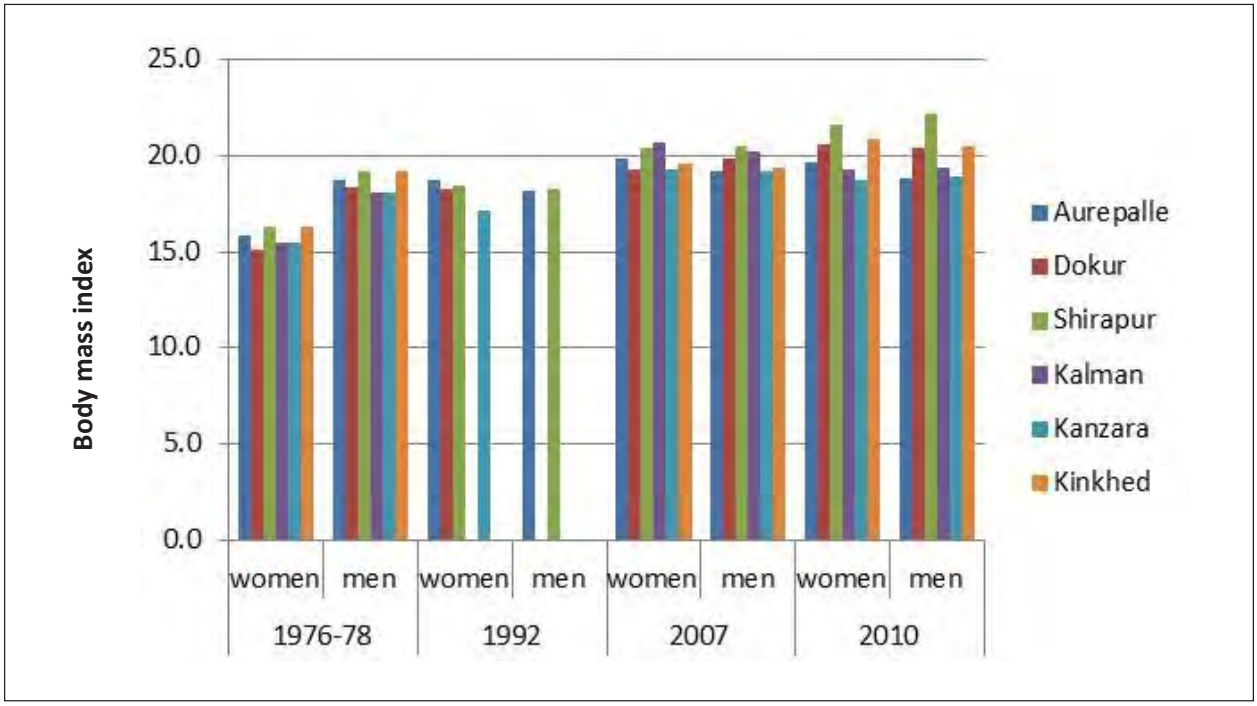
Figure 21. School enrollment of male and female children in the study villages of Telangana and Maharashtra, 1975/76 and 2011/12.

2 medical doctors, four engineers and about 20 ICT trained persons who are working in Pune. Kanzara village has some special characteristics. Fifty five well-off families of Kanzara permanently migrated from the village after 1985, first to the nearby town of Murtizapur and then to other cities mainly for better education of their children. Among the current residents of Kanzara, none is working in the ICT related field. Kinkhed village is lagging behind. Computer literacy could not reach the villagers yet.

3.12 Health and Nutrition

A comparison of general health status, access to health services and maternity care in the study villages were made through review of published data and information, and analysis of data collected through VDSA project. Average body mass index (BMI) for women (and men where possible) was calculated for this purpose. BMI is basically a ratio of weight to height and is considered as a decent indicator of overall health. A BMI between 18.5 and 23 is considered as normal range, and BMI below 18.5 implies malnourishment or eating disorders. In 1976-1978, the average BMI for women in all the villages reached below the 18.5 malnourishment threshold (see Figure 22). For men it was below the threshold level in Dokur, Kanzara and Kalman but slightly higher than the threshold level in the other three villages (Aurepalle, Shirapur and Kinkhed). From Figure 22, it is clear that general health as indicated by average adult BMI has gradually improved since 1976; likewise, malnourishment rates have reduced as well.

Palacios (2011) focused on women's access to prenatal and maternal care for healthier pregnancies, safer deliveries, and healthier children. Women in all the villages reported that 40 years ago, all women gave birth at home in the presence of few female family members, with no trained medical staff. High rates of maternal and child mortality was prevalent in the villages. Now, all pregnant



Source: For 1976-1978 Authors' calculation using data of Ryan et al. (1984); for 1992 and 2007, calculation by Palacios (2011); and 2010, Authors' calculation.

Figure 22. Average body mass index (BMI) for adults over 15 years of age.

women go to a government hospital, if not a private hospital, for delivery. Government hospitals do not charge for deliveries and even provide quality food worth 1000 rupees' to the mother. Prenatal, maternal and child health has improved in the villages due to the presence of government health care workers, some stationed permanently in the villages and some who make regular weekly rounds to check up on women and children and distribute medications. Thus, health status of men and access to maternity care for women has improved.

3.13 Living Standard

Educational opportunities increased through establishment of new schools and upgradation of existing schools (see Table 13, 14, and 15). Healthcare facilities also improved. A health clinic was established in the Dokur village. Number of provision shops increased in all the villages. Number of rice and flour mills increased in all the villages. Tremendous improvement in communication occurred. This was possible because of the cell phones and motor bikes. Number of agricultural equipments increased rapidly. LPG gas connections and procurement of fridges and electric fans improved living conditions. Number of television sets (both black and white and color) increased very rapidly along with connection to Dish (D2H). Toilet facilities increased in all the villages. Many houses which used to be thatched houses earlier are now Pucca buildings. Many villagers now read newspapers on a regular basis. Thus, all these amenities confirm that the living conditions in the villages have improved over time.

Table 13. Changes in civic facilities and living standards in the study villages in Mahbubnagar, Telangana, 1975 to 2009.

Description	Aurepalle 1975	Aurepalle 2009	Dokur 1975	Dokur 2009
Education Facilities:				
Primary Schools	1	3 (214 students)	7	1 (113 students)
High School	0	1 (192 students)	0	1 (123 students)
Private school	0	0	0	0
Total No. of school going children	NA	406	NA	236
Medical practitioners	2	2	1	2
Post office	1	1	1	1
Provision shops	8	19	4	5
Rice and Flour mills	2	2	1	3
No. of two, three and four wheelers	1	63	0	65
LPG gas connections	0	375	0	150
Fridges	0	46	0	15
No. of land line and cell phones	0	1500	NIL	1000
No. of television sets	1	412	NIL	300
Number of families having news papers	0	20	2	30

Source: ICRISAT VLS Database.

Table 14. Changes in civic facilities and living standards in the study villages in Solapur district, Maharashtra, 1975 to 2010.

Description	Shirapur 1975	Shirapur 2010	Kalman 1975	Kalman 2010
Education Facilities:				
Primary Schools	1	1	1	1
High School	1	1	1	1
Private school	0	0	0	0
Total No. of school going children	NA	569	NA	928
Medical practitioners	0	3	1	4
Post office	1	1	1	1
Provision shops	1	16	4	18
Ration shop	1	2	NA	NA
Rice and Flour mills	1	5	1	8
No. of two, three and four wheelers	NA	210	2	186
LPG gas connections	0	115	0	165
Fridges	0	14	0	24
No. of land line and cell phones	1	875	0	1700
No. of television sets	1	156	0	223
Number of families having news papers	NA	8	2	6

Source: ICRISAT VLS Database.

Table 15. Changes in civic facilities and living standards in the study villages in Akola district, Maharashtra, 1975 to 2010.

Description	Kanzara 1975	Kanzara 2010	Kinkhed 1975	Kinkhed 2010
Education Facilities:				
Primary Schools	1	2	1	1
High School	0	1	0	1
Private school	0	1	0	1
Total No. of school going children	NA	502	NA	NA
Medical practitioners	1	1	0	1
Post office	0	1	1	1
Provision shops	2	9	2	6
Fair price shops	NA	1	NA	NA
Rice and Flour mills	2	4	1	1
No. of two, three and four wheelers	0	63	0	16
LPG gas connections	0	35	0	21
Fridges	0	20	0	11
No. of land line and cell phones	0	476	0	
No. of television sets	0	275	0	92
Number of families having news papers	0	40	0	2

Source: ICRISAT VLS Database.

4. Development pathways

All the study villages experienced varied levels of development. Pathways for development of the villages are also different in many ways and has been explained in the following section.

Aurepalle: Developments in Aurepalle village were driven by a number of factors including diversification in farm and non-farm sectors, active community participation, out-migration and better education and increased awareness, generally supported by government development programs (Mohan Rao et al., 2014). Income and welfare of households improved over time with adoption of improved crop production technologies, cultivation of commercial crops and high value crops such as BT (Bacillus thuringiensis) cotton, drilling successful borewells, out-migration for non-farm activities, caste occupations and diversification including livestock production. The village harnessed improved access to roads, markets and communication. Education levels and literacy rates improved for both male and female children as the village school was upgraded to high school and the private schools were also established in the nearby township. Education greatly benefited the households in terms of getting knowledge and salaried jobs and also in accessing information about new agricultural technologies. Health conditions improved due to the availability of health facilities, improvement in sanitation and supply of protected drinking water.

Dokur: Transformation of Dokur village has been significantly influenced by the environmental, political and socioeconomic changes particularly during the last two decades (Nageswara Rao et al. 2009). Due to the persistent drought conditions for more than a decade, and increasing water scarcity in Dokur, a large number of households opted for temporary migration to the nearby and far away cities and engaged in non-farm activities. Literacy and education levels significantly increased with greater diversification of livelihoods and substantial income opportunities from migration and non-farm sectors. Greater social and household empowerment of women was evident as they overcame social barriers to participate in government welfare programs, village development activities and acquired membership in Self-Help Groups (SHGs). Transformation of Dokur village was driven not only by agriculture but also by the diversification into non-agricultural sources of livelihood, and opportunities presented by higher education, improved awareness, women empowerment, and most importantly, temporary migration.

Shirapur: Shirapur villagers were able to begin their journey to prosperity with the introduction of canal irrigation in the village which reduced their dependence on monsoon rain for crop production and also provided the opportunity to grow sugarcane and other cash crops. In addition to that, they were able to adopt different improved varieties of other crops. The establishment of the sugar factory in the 1990s in a nearby village gave them the access to ready market for sugarcane. Close proximity of the village to the Lokmangal Dairy gave them another opportunity for harnessing livestock production. Access to and achievement in education along with road connectivity allowed them to take advantage of the non-farm employment opportunities in nearby areas. Thus, Shirapur has been able to achieve prosperity through adoption of technologies, market access, diversification in economic activities and livelihood opportunities (Chopde et al., 2014a).

Kalman: Main drivers of development in Kalman were diversification in both farm and non-farm sectors, but mostly in the latter (Kiresur et al. 2011). Educational facilities (up to 12th standard is available within the village) helped the villagers to develop their human capital and avail employment in non-farm sector especially government or organized sectors. Options for better livelihoods expanded in Kalman with increased participation in salaried jobs, petty business, out-migration for labor earnings, small-scale industries, etc.

Kanzara: Development in Kanzara advanced through agriculture. The village was able to hold dryland agriculture against irrigated agriculture, with its assured and stable rainfall. The village agriculture flourished through intensification and diversification, adoption of new technologies with good linkages and access to input and product markets. Increased investments in education helped to enhance awareness about changing external environment, risk taking attitude and competitiveness among farming community and gradual break-down of caste and class barriers. Per capita real income of Kanzara households also increased by five times and showed an upward but fluctuating trend. Poverty level declined. Along with the rise in per capita income, inequality in income also increased. Access to education and average years of schooling increased for all children in the 2000s—irrespective of their wealth, castes and gender. This economic and social transformation was also fostered through trust, collective action and good networks which enabled knowledge sharing and wide range of choices leading to the empowerment of both men and women. With good governance and institutions in place, Kanzara will continue to prosper in agriculture in the coming 10 years. Alongside agricultural development and intensification, Kanzara farmers will also have to consider diversification of livelihood options to sustain growth and to exit out of poverty. In brief, Kanzara has been flourishing in agriculture through diversification and intensification of agriculture, adoption of new technologies with good linkages and access to input and product markets (Chopde et al., 2014b).

Kinkhed: Kinkhed village experienced very limited growth and development compared to the other villages. Real wage and per capita real income growth was lowest in this village. Poverty level declined but still had dependancies on agriculture which in turn fluctuates with the vagaries of nature. Lack of progress in Kinkhed may also be due to risk-averse nature of farmers, lack of collective action and good leadership, absence of role models in the village, lack of governance (group gram panchayat) and lack of awareness and participation in government welfare programs (Chopde et al., 2014c).

5. Conclusions

All the six study villages have progressed over time and rapid changes were observed in the 2000s. Agrarian structure and cropping pattern had changed. Crop productivity had increased with the adoption of improved technologies. Real wages for both agriculture and non-agriculture workers had increased. Per capita real income of the villagers had also increased over time and importance of different sources of livelihoods had changed. Role of non-farm income as a source of livelihood had increased in all the villages except Kinkhed. In the 1970s and 1980s, villages were growing very slowly in terms of per capita income, diversification of income sources and cropping pattern. Even changes were very limited in 2001, as compared to 1983. Although the per capita real income rose over time, the income inequality situation worsened in the recent years. Economic growth in the villages brought increased prosperity for the villagers. There has been a substantial decline in poverty level particularly in the recent past. Access to and average level of education had increased across all the villages, castes, gender and economic groups. However, access to tertiary education by female children and children from lower economic strata still remained very limited. The overall living standard had improved in all these villages. However, these changes varied in degree in the VLS villages. Common drivers of change in the villages were access to irrigation facilities, adoption of modern technology, better road connectivity and market linkages, educated workforce, diversity in economic activities and livelihood opportunities. The main engine for development were: growth of non-farm activity in Aurepalle; migration income in Dokur; diversification of crop production and

economic activities (including industries) in Shirapur; diversification of farm and non-farm activities in Kalman; intensification of agriculture and technology adoption in Kanzara and increase in farm productivity in Kinkhed. Amongst these villages, development in Kinkhed was relatively less due to lack of social capital and collective actions. Despite all round developments in these villages, they faced some common challenges such as ending poverty and ensuring food security for all, dealing with labor shortage during the cropping season and sustaining agricultural production through adaptation to various sources of risks including climate change. Most likely, villagers will be able to address these challenges and move ahead in the road of prosperity and social well-being with continued and increased public investment for agricultural research, technology generation and dissemination, better connectivity, and greater access to domestic and international market. To this end, targeted welfare programs and poverty reduction programs will be needed.

References

GOI (2011). Annual Report 2011-12. New Delhi: Planning Commission, Government of India, Retrieved from www.planningcommission.gov.in

Chopde VK, S Dutta S, K Kavitha, VD Duche, MCS Bantilan and **Uttam Deb.** 2014a. Prosperity through Diversity: The Dynamics of Progress in Shirapur. Patancheru ,Telangana, India: International Crops Research Institute for the Semi-Arid Tropics.

Chopde VK, R Padmaja, MCS Bantilan and **Uttam Deb.** 2014b. Dynamics and Development Pathways in the Semi-Arid Tropics: Kanzara Village Profile. Patancheru, Telangana, India: International Crops Research Institute for the Semi-Arid Tropics.

Chopde VK, GV Anupama, LS Likhitkar, Soumitra Pramanik, Uttam Deb and **MCS Bantilan.** 2014c. Dynamics and Development Pathways in the Semi-Arid Tropics: Kinkhed Village Profile. Patancheru 502 324, Telangana, India: International Crops Research Institute for the Semi-Arid Tropics.

IndiaStat (2011).IndiaStat website (www.indiastat.com), retrieved on 25 March 2011.

Kiresur VR, VK Chopde, PR Bangar and **MCS Bantilan.** 2014. Diversification – The Driving Force for Development of Kalman Village. Patancheru, Telangana, India: International Crops Research Institute for the Semi-Arid Tropics.

Mohan Rao Y, VR Kiresur, MCS Bantilan and **JO Kamanda.** 2014. Village Aurapalle: Harnessing Livelihoods Beyond Agriculture. Patancheru, Telangana, India: International Crops Research Institute for the Semi-Arid Tropics.

Nageswara Rao GD, AnandBabu P and **Bantilan MCS.** 2009. Dynamics and Development Pathways in the Semi-Arid Tropics: Dokur Village Profile. Research Bulletin no. 23.Patancheru 502 324,Telangana, India: International Crops Research Institute for the Semi-Arid Tropics. 80 pp.

Palacios, Alison. 2011. Drivers of Change: Agricultural Modernization and Women's Condition in SAT India. Patancheru, Telangana, India: International Crops Research Institute for the Semi-Arid Tropics.

Planning Commission. 2011. As reported by the PTI on April 20, 2011 (in http://in.news.yahoo.com/indias-poverty-declined-32-pc-2009-10-plan-110000869.html).

Rao KPC, and **D Kumara Charyulu.** 2008. Changes in Agriculture and Village Economies. Research Bulletin no.21. Patancheru 502324, Telangana, India: International Crops Research Institute for the Semi-Arid Tropics.

Ryan JG, Bidinger PD, Rao NP, and **Pushpamma P,** 1984. The determinants of individual diets and nutritional status in six villages of southern India. Order Code No: 170, Research Bulletin no. 7 (Summary in Fr.), 140pp.

Walker TS and **JG Ryan.** 1990. Village and household economies in India's semi-arid tropics. Maryland, USA: The Johns Hopkins University Press. 394 pp.

About ICRISAT

International Crops Research Institute for the Semi-Arid Tropics

The **International Crops Research Institute for the Semi-Arid Tropics** (ICRISAT) is a non-profit, non-political organization that conducts agricultural research for development in Asia and sub-Saharan Africa with a wide array of partners throughout the world. Covering 6.5 million square kilometers of land in 55 countries, the semi-arid tropics have over 2 billion people, of whom 644 million are the poorest of the poor. ICRISAT innovations help the dryland poor move from poverty to prosperity by harnessing markets while managing risks – a strategy called Inclusive Market-Oriented Development (IMOD).

ICRISAT is headquartered in Patancheru, Telangana, India, with two regional hubs and six country offices in sub-Saharan Africa. It is a member of the CGIAR Consortium. CGIAR is a global research partnership for a food secure future.

About ICRISAT: **www.icrisat.org**

ICRISAT-India (Headquarters)
Patancheru 502 324
Telangana, India
Tel +91 40 30713071
Fax +91 40 30713074
icrisat@cgiar.org

ICRISAT-Liaison Office
CG Centers Block, NASC Complex,
Dev Prakash Shastri Marg, New Delhi 110 012, India
Tel +91 11 32472306 to 08
Fax +91 11 25841294

ICRISAT-Ethiopia
C/o ILRI Campus, PO Box 5689
Addis Ababa, Ethiopia
Tel: +251-11 617 2541
Fax: +251-11 646 1252/646 4645
icrisat-addis@cgiar.org

ICRISAT-Kenya (Regional hub ESA)
PO Box 39063, Nairobi, Kenya
Tel +254 20 7224550, Fax +254 20 7224001
icrisat-nairobi@cgiar.org

ICRISAT-Malawi
Chitedze Agricultural Research Station
PO Box 1096, Lilongwe, Malawi
Tel +265 1 707297, 071, 067, 057, Fax +265 1 707298
icrisat-malawi@cgiar.org

ICRISAT-Mali (Regional hub WCA)
BP 320, Bamako, Mali
Tel +223 20 709200, Fax +223 20 709201
icrisat-w-mali@cgiar.org

ICRISAT-Mozambique
C/o IIAM, Av. das FPLM No 2698
Caixa Postal 1906, Maputo, Mozambique
Tel +258 21 461657, Fax +258 21 461581
icrisatmoz@panintra.com

ICRISAT-Niger
BP 12404, Niamey, Niger (Via Paris)
Tel +227 20722529, 20722725
Fax +227 20734329
icrisatsc@cgiar.org

ICRISAT- Nigeria
PMB 3491
Sabo Bakin Zuwo Road, Tarauni, Kano, Nigeria
Tel: +234 7034889836; +234 8054320384,
+234 8033556795
icrisat-kano@cgiar.org

ICRISAT-Zimbabwe
Matopos Research Station
PO Box 776, Bulawayo, Zimbabwe
Tel +263 383 311 to 15, Fax +263 383 307
icrisatzw@cgiar.org

ICRISAT's scientific information: **http://EXPLORE*it*.icrisat.org**

ICRISAT is a member of the CGIAR Consortium

ISBN: 978-92-9066-563-2 Order code: RBE 026 477-2014