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AGRICULTURE IN AN INTERCONNECTED WORLD



Revisiting Tenancy and Agricultural Productivity in Southern India:

Insights form Longitudinal Household Surveys¹

Uttam Deb, Soumitra Pramanik, Patan Elias Khan and Cynthia Bantilan²

Abstract.

The study reconfirmed prevalence of reverse tenancy in dryland agriculture in Southern India in the recent years (2009-11) as was in the mid-seventies. Household level panel data collected from six villages by ICRISAT under its Village Level Studies (VLS) and Village Dynamics Studies (VDS) program were used. Area under tenancy has increased in the recent years, mostly in the form of share cropping. Panel Data Probit analysis revealed that likelihood of a household to be a tenant is positively linked with number of agricultural worker, bullock ownership and male-headed household. Land ownership, age and education of household head, and dependence on non-farm income had negative association. Crop yield and profitability were generally higher in owned land than that of land under tenancy. Reduction of reverse tenancy in dryland agriculture will require risk reducing technologies (drought-resistant varieties, supplementary irrigation) and availability of critical inputs (for example, bullock for intercultural operations).

Keywords: Tenancy, Dryland Agriculture, Panel data, Probit, Profitability

JEL codes: Q10, Q15

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² Authors are, respectively, Principal Scientist, Scientific Officer, Scientific Officer and Director, Research Program on Markets, Institutions and Policies, International Crops Research Institute for Semi-Arid Tropics (ICRISAT), Patancheru 502324, Telangana, India.

1. INTRODUCTION

Relation between tenancy and agricultural productivity has long been investigated in Indian agriculture. Number of studies (Jodha 1981; Pant, 1981; Radwan, 1987; Walker, Singh and Ballabh, 1988) has investigated the situation in the semi-arid tropics (SAT) regions (also known as dryland agriculture regions) in southern India in the seventies and early eighties. Basically SAT region is very vulnerable compared to other regions in the country. The SAT region has some special characteristics such as erratic rainfall, persistent drought and less fertile soil along with high risk in crop production. These factors accompanied by other factors such as skewed distribution of land among landless and large land owning farmers had resulted widespread tenancy in dryland agriculture in the seventies and early eighties. Much of the prevailing wisdom in the seventies and eighties about the land market in South Asia stemmed from perceptions about and experiences in irrigated agriculture, particularly in the Indo-Gangetic Plain spanning northwestern and northeastern India (Walker and Ryan 1990). Views about the “frozen”, uncompetitive nature of the land market, economic polarization, distress sales as a means to accumulate land, increasing landlessness, landlords' exploitation of tenants, and extreme fragmentation of holdings were common (Myrdal 1968; Ladejinsky 1965). Earlier studies (Bardhan 1978, Bardhan and Rudra, 1978) on tenancy and agricultural productivity focused have revealed wide spread tenancy in irrigated agriculture and tenancy had a negative impact on agricultural productivity. Tenants did not have adequate financial resources and access to formal institutional credit and thereby, they were unable to provide required inputs to the crops grown. As a result, productivity or crop yield in the plots under tenancy was less than the yield of crops in the plots owned by the cultivating farmer. Tenants have underutilized resources such as bullocks and family workers who can be used in farming and thereby increase employment and household income. Large farms and land owners have more land which they can effectively manage and get maximum benefit from their land.

Contrary to the irrigated agriculture, situation of dryland was quite opposite. Jodha (1981) reported dominance of reverse tenancy in the six study villages of Mahbubnagar district united Andhra Pradesh (which are now in Telangana state) and Maharashtra. The study observed that large farmers had emerged as tenants and small farmers as landowners in the mid-1970s. This contradicts the conventional presumption, where the tenant is usually thought of as a poor and small operator while the landlord is believed to be invariably a large farmer. In the study villages, 42 to 52 per cent of total leased-out land was acquired by large farmers; and 56 to 89 per cent of total leased-out land belonged to small and medium farmers. Tenancy was primarily an out-growth of bullock power adjustments and credit market imperfections (linked transactions with credit). The study by Jodha

(1981) observed that human labour market seemed to be functioning sufficiently well, and few households seemed to lease land for reasons of excess or shortage of family labour in relation to owned land or because of difficulties in hiring daily labour. Terms of tenancy were flexible and responsive to the resource positions of tenants and landowner and to mid-season contingencies affecting either of the parties. Terms of tenancy were very flexible and depended on: (1) land productivity (2) capital availability on the part of landowner and tenant, and (3) mid-season contingencies affecting either of the parties. This was true both across villages and within villages. Due to the practice of direct linking of output shares to input shares and because crop choice was largely the tenant's decision, tenancy does not appear to discourage adoption of (high cost) new technology (Jodha 1981).

During the last three decades there are many changes in rural India. Land preparation and harvesting of many crops have been mechanized. Custom hiring services for machines and irrigation equipment have emerged as a service. Providers of such services receive a fixed amount of rent. Thereby, some constraints of managing farms have been removed. Optimum scale of operation because of such changes might have also been changed. Therefore, tenancy market might have changed and owner cultivation might have been expanded. On the other hand, expansion of economic opportunities and increasing scarcity of labor might have paved the way for a vibrant tenancy market in the rural areas. It is because cultivation of land might be no longer constrained by ownership of bullocks and machine power. Tenant farmers who have surplus labor now might be able to rent in land from the land owners and cultivate their own lands. There is lack of empirical literature about changes in tenancy situation and impact of tenancy on agricultural productivity in dryland agriculture in India. In this context, it is important to empirically examine the following research questions: What is the extent of tenancy in dryland agriculture? Has it changed over time? Who rents out? Who rents in? What are the terms and conditions (operational modalities) for tenancy? Are there any major changes over time? Why tenancy exists? What are the consequences of tenancy on productivity and profitability?

This paper has investigated the changes in tenancy situation in dryland agriculture in Southern India, factors contribute towards tenancy and impact of tenancy on agricultural productivity and profitability.

After this introductory section, next section (Section 2) discusses about data and research methodology. Extent and determinants of tenancy are reported in Section 3. Linkages between tenancy and agricultural productivity and profitability are analyzed in Section 4. Conclusions and policy implications are put forward in the last section.

2. DATA AND METHODOLOGY

Data: Household level panel data collected from six villages by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) under its Village Level Studies (VLS) and Village Dynamics Studies (VDS) program are used in this study. The VLS-VDS dataset has been collected by ICRISAT's resident field investigators who lived in the villages to periodically revisit the same households over the years. Six study villages fall under SAT region of south and south western part of India. Out of the six villages, two villages (Aurepalle and Dokur) are located in Mahbubnagar district of Telangana; two villages (Shirapur and Kalman) are in Solapur district of Maharashtra and another two villages (Kanzara and Kinkhed) Akola district of Maharashtra. The study villages and sample households are same as in the study of Jodha (1981) plus split households from the original households. Data collected for the period 1975-79, 1983 and 2005-2011 are analyzed in this paper. Thus, it is a real revisit and findings are comparable across time.

Farm size categories were defined in terms of operational holding and varied across study villages (see, Table 1). Distribution of sample households is provided in Table 2. Data from 40 households (10 each from landless, small, medium and large landholding groups) for each of the study villages was collected since 1975. Sample size was not proportional to the number of households in each category of households in the village. In subsequent years split households from the original sample households were included. In case of migration of a household from any farm size group it was replaced by another household of same farm size category. In 2011, total number of sample households increased to 384 from 240 in 1975.

Methodology: Analytical methods used to quantify the extent of tenancy and determinants of tenancy are described below. Tenancy is defined as a situation where tenant farms the land owned by another household and pays rent with cash or with a portion of the produce. Extent of tenancy in a particular year for a sample household was estimated as percentage share of land under tenancy to the total cultivated land area of the respective household. Following similar procedure, extent of tenancy was estimated both at the household and village level and for all sample households. Factors influencing tenancy were identified and their relative contribution was estimated at the household level using Panel Probit regression model. Variables used in the Probit analysis along with their expected sign is given in Table 3. We have used with a random effect panel data Probit model of the following form as in Equation (1):

$$Y = A + \beta_1 OLH + \beta_2 IRRR + \beta_3 HHAGE + \beta_4 EDHH + \beta_5 NAGW + \beta_6 NBULL + \beta_7 DRATIO + \beta_8 NFTOTINC + \beta_9 LKHRAIN + \beta_{10} PERIOD_D + \beta_{11} HHSEX_D + \beta_{12} Tractor_D + \beta_{13} V1 + \beta_{14} V2 + \beta_{15} V3 + \beta_{16} V4 + \beta_{17} V5 + \beta_{18} F1 + \beta_{19} F2 + \beta_{20} F3 + U_i \dots (1)$$

Where,

Y	is the Dependent Variable (Y=1 if Household is a tenant farmer and 0 other wise)
OLH	Own Land (Ha)
IRRR	Proportion of Irrigated Land owned by the household
HHAGE	Age of the household head in Years
EDHH	Years of Schooling of the household head
NAGW	Number of persons in the family whose primary occupation is agriculture
NBULL	Number of Bullocks owned by the household
DRATIO	Ratio of Dependent and Working Person
NFTOTINC	Proportion of non-farm Income to the total income
LKHRAIN	Previous Year Rainfall in Kharif season (June-October) in mm
PERIOD_D	Dummy for survey year (taken value 1 if year > 2000 and 0 Otherwise)
HHSEX_D	Dummy for Gender of the Household Head (Male=1 and female=0)
TRTCR_D	Dummy for Ownership of Tractor by the household (Owner=1, Non-owner= 0)
V1, V2, V3, V4, V5	are dummy for study villages. Aurepalle was considered as reference village (V1=1 for Dokur, V2=1 for Kalman, V3=1 for Kanzara, V4=1 for Kinkhed, and V5=1 for Shirapur)
F1, F2, F3	Dummy for Farm Size (Large farm group was considered as reference category; F1=1 for Labour, F2=1 for Medium, and F3=1 for Small)
U _i	random disturbance term which is assumed to be normally distributed with zero mean

We have considered a set of variables to reflect the household characteristics related to resource endowments, effects of farm size, village infrastructure and years.

3. EXTENT AND DETERMINANTS OF TENANCY

3.1 Basic Characteristics of the Sample Households

As mentioned earlier, the study villages represent three different agro climatic zones in peninsular semi-arid tropical India. Soil, rainfall, and crop characteristics of the study regions are reported in Table 4. Aurepalle and Dokur have erratic rainfall, red soil with heterogeneous soil quality. On the other hand, Shirapur and Kalman have deep black soils in lowlands and shallower lighter 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 (Walker and Ryan, 1990). In the mid-1970s, major crops grown by the sample farmers of the Mahbubnagar district in the Kharif, or rainy season were sorghum, castor, pearl millet, paddy (rice), pigeon pea, groundnut while in the Rabi or dry season they grew paddy, groundnut, safflower and Rabi sorghum. Rabi, or post-rainy season was the major growing season for the Solapur farmers and they cultivated sorghum, pigeon pea, minor pulses. On the other hand, farmers of Akola region used to grow Cotton, sorghum, mung bean, pigeon pea, wheat. Cropping pattern has changed in all the study villages over time. In the recent years (2009-2011), sample farmers of Mahbubnagar district grow Paddy, cotton, castor, kharif sorghum, groundnut and sunflower whereas Solapur farmers are growing Kharif pigeon pea, onion, Rabi Sorghum and sugarcane. On the other hand Cotton, kharif pigeon pea, kharif sorghum, soybean and wheat are the major crops among the Akola farmers.

Basic characteristics of the sample households in the mid-seventies (1975-77) and recent years (2009-11) are reported in Table 5. Household size has reduced over time in all the study villages with less number of children and split of joint families to nuclear families. Average household size has reduced from about six in the mid-seventies to five in the recent years in all the villages except Kinkhed where it was stagnant at about 5.3. Operational holding of the households decreased in all the villages. Age of the head of households varied between 42 to 53 years. Over the last four decades, average years of schooling of the household head have increased in all the villages by one to four years. Dependency ratio has decreased in all the villages except Dokur where there is slight increase in dependency ratio, this is an indication that now there are more bread earners than bread eaters in the family. Percent of irrigable area has increased in the recent years compared to the mid-seventies. In the mid-seventies, irrigable land area ranged between 0.8 percent and 12.1 percent in the study villages, except in Dokur where irrigable area was about 53 percent. Availability of water from a big pond was the source of irrigation in Dokur. Between 1975-77 and 2009-11, per capita household income has increased in all the villages by 5.77 to 13.28 times. Highest increase in income was in Aurepalle (from USD 56 to USD 744) and lowest income increase was in Kinkhed (from USD 79 to USD 456).

3.2 Trends in Tenancy among Sample Households

Extent of tenancy in the study villages is reported in Figure 1 and 2, and Table 6. In the recent years (2009-11), compared to the mid-seventies, area under tenancy (rented in land) on a per capita basis has increased in Aurepalle, Dokur and Kanzara. On the other hand, it has decreased in Kinkhed,

Kalman and Shirapur. It may be noted here that amongst the all study villages highest prevalence of tenancy was in Shirapur in the mid-seventies. Since the nineties, the village has canal irrigation facilities. Now, the farmers are less interested to rent out their land rather they prefer to cultivate on their own. Estimated Kernel density function showed that concentration of rented in land was less than 0.25 ha (Figure 3). In the recent years it has slightly declined.

It is important to know who lease out land and who rents in land. An analysis of characteristics of tenant householdholds vs leased out/ rented out households showed that average land ownership of the tenant households (1.04 ha) were higher than that of households who have leased out/ shared out their land (0.44 ha) in the mid-seventies (Table 7). During the same time, per capita income of tenant households were 130 dollars agaainst 51 dollars of the households who rented out their land. This clearly indicates the case of reverse tenancy in the mid-seventies. What is happening now? Per capita land ownership of tenant households was 0.39 ha compared to the 0.63 ha for the households who have leased out. Average percapita income of the tenant household during 2009-11 was 836 dollars against 574 dollars for the households who leased out their land.

Distribution of tenant households according to their operational holding revealed that in the seventies households along with the small and medium operational holdings large farmers were renting-in land. In the recent years, households having all types of operational holding are renting in land for cultivation. In the mid-seventies, not a single farmer of the large land holding category leased out their land in any of the six study villages (Table 8). In the recent years some of the leased out land were from large land owning households except in one village (Kalman) where none of the large land owning households rented out their land. Share of land leased out by the large farmers to the total leased out land in each of the study villages was 25 percent in Aurepalle, 21 percent in Dokur and 29 percent in Kanzata and 32 percent in Kinkhed and 14 percent in Shirapur. This is happening because labor is increasing becoming a scarce resource with rising wages. Regluar farm servnats (RFS) have abolished from all the study villages indicating a situation that marginal cost for labor is high and not zero like RFS.

An analysis of distribution of tenant farmers by farm size category reveals that large farmers in Dokur have rented in about 82 percent of the total rented out lands (Table 9). About one third of the tenant households in Aureplale, Kanzara and Kalman are large farms. It may be noted here that large farmers in Aurepalle did not leased in land in the mid-seventies. Thus, it is evident that reverse tenancy exists in these villages in the recent years. However, the extent of reverse tenancy has reduced in the recent years.

Compared to the mid-seventies, area under tenancy (rented in land) in recent years has increased. However, village level situation was mixed: tenancy has increased in four villages and decreased in the other two villages. Tenancy in the study villages has expanded in the form of share cropping which is quite opposite to the findings of recent literature on irrigated agriculture where fixed cash renting system has increased.

Studies (Bardhan and Rudra, 1978, Jodha 1981) have argued that agricultural land market in India is largely a tenancy market. We have investigated the issue. Table 10 presents a comparison of the land transfers occurred in the mid-seventies (1975-78) and in the recent years (2009-11) via leasing-in, leasing-out, return of land due to termination of earlier leases, sale, purchase, gift, succession property division, etc, in which at least one party was a VLS-panel respondent. In the seventies, in our study villages, every year, 14 to 46 percent of the operated area of the sample households was temporarily or permanently changing hands and new land transfers of different types. Furthermore, 77 to 97 per cent of new land transfers were due to tenancy transactions only (Jodha 1981). In the recent years (2009-11), 10 to 28 percent of the operated area of the sample households was temporarily or permanently changed hands. Majority of the transfers were in the form of tenancy in all the study villages. However, sale/ purchase was high in Shirapur (45 percent), Dokur (31 percent), and Kinkhed (23 percent). In all the villages except Aurepalle, share of purchase and sale to the total transfer has increased. This indicates that rigidity in rural land market has decreased in the recent years than four decades ago.

What has happened to the distribution of land ownership in the villages between 1975 and 2011? Has it been concentrated or equally distributed over time? To answer these questions, we have quantified the changes in land concentration over time. Figure 6 shows the Lorenz Curves depicting the concentration in land ownership in 1975 and 2011 for the land owning households. Our analysis revealed that the concentration of landholding has not changed for the total sample. However, there is slight variation among the villages. It has substantially decreased in Kanzara, increased in Kalman and Shirapur while remained almost at the same level in other villages (Figure 7).

We have also examined the issue of equality using scatter diagram (Figure 4 and 5). The plotted dots depict land ownership situation in 1975 and 2011. horizontal axis represent the situation in 1975 and the vertical axis shows the condition in 2011. The dots on the diagonal line represent the case of unchanged situation between 1975 and 2011. Dots located above the diagonal indicate the cases of upward movement in land ownership while the dots below the diagonal indicate downward movement of the household in terms of land ownership. Upward mobility was observed among 47

percent of the land owning households while downward mobility in terms of land ownership was observed among 48 percent of the land owning households. On the other hand, 5 percent households remained unchanged in terms of land ownership. A number of families, starting from a relatively small base at inheritance, have also purchased a sizable amount of land and now are in the category of large farm size group. Some of the households having more than 10 hectares of land reduced to small farm size category. Therefore, it can be concluded that there was significant changes in land ownership in favor of equality in land ownership.

Relative mobility situation is also studied through estimation of Spearman rank correlation coefficients for amount of land owned by the household in 1975 and 2011. Estimated value of the coefficient is 0.56. In other words, ranking the landed households by the size of landownership in 1975 is not a precise predictor of relatively how much land they have owned in 2011.

3.3 Operational Modalities in Tenancy

Two types of tenancy were observed among the sample households. These are share renting and cash renting. In the cash renting mode, the tenant farmer pay a certain amount of money for using the land for a period of one year for crop production usually before starting of the season. Cost of all inputs is born by the tenant and he also gets all outputs grown on that land. On the other hand, in the share renting method, the tenant shares a certain proportion of output with the land owner. Landowner may or may not share some of the input costs which depend on the negotiation between the land owner and the tenant farmer. The extent and pattern of tenancy contract is reported in Table 11. Share cropping has increased in all the study villages in the recent years compared to the mid-seventies. Cash renting was the dominant mode of tenancy in the seventies which have changed in the recent years in some villages. In the mid-seventies all rented in land in Aurepalle and Shirapur was under cash rent system. More than 90 percent of the rented in land in Dokur and Kanzara was under cash rent system. About two-thirds of the rented in land in Kinkhed and three-fourth of the rented in land in Kalman was under cash rent system. In the recent years, dominant mode of tenancy in Shirapur (79 percent), Kinkhed (67 percent) and Kalman (100 percent) is share renting. Share of rented land under share tenancy has also increased in three other villages (Aurepalle, Dokur and Kanzara).

3.4 Determinants of Tenancy

Determinants of the tenancy were identified using the Panel data probit model described as in Equation (1). Dependent variable was tenancy status of the household (tenant=1 and 0 otherwise). Probit analysis revealed that likelihood of a household to be a tenant household is positively linked

with number of agricultural worker in the household, bullock ownership and household head to be male (Table 12). On the other hand, it is negatively related with land ownership, irrigated land ownership, age and education of household head, and dependence on non-farm.

In the seventies reverse tenancy was linked with the interlinked factor market (Jodha 1981). With the spread of formal credit, availability of custom hiring of machines, free availability of seeds in the market, easy access to the market through better connectivity and change of cropping patterns towards crops which have better marketability and relatively less fluctuation in prices have eased the situation to a large extent. With the increased scarcity of labor, it was expected that reverse tenancy would have been abolished. However, some constraining factors have been contributing to the other way. For example, bullock has been found statistically significant at one percent level of significance both in the seventies and in the recent years. While land preparation activities has largely been mechanized and no bullocks are used for threshing purposes, bullocks are still critical for land leveling and for intercultural operations such as hoeing and harrowing. Bullocks are also rare and custom hiring is very limited. Usually large farmers own the bullocks. This is one important reason for existence of reverse tenancy among the sample households.

4. TENANCY AND CROP PRODUCTIVITY

There are two schools of thought in explaining the outcome of tenancy. These are Marshallian Inefficiency theory and Cheungian (or “transactions costs”) theory. The Marshallian view argued that sharecropping was inefficient because it assumed that enforcing the landlord’s preferred level of effort was prohibitively costly. Therefore, the tenant will not invest on optimum level of inputs. On the other hand, the Cheungian (or “transactions costs”) view argued that sharecropping was efficient because it assumed that the landlord could costlessly enforce her preferred level of effort. (<http://www.encyclopedia.com/topic/sharecropping.aspx>). Review studies (Otsuka and Hayami, 1988; Singh, 1989; Hayami and Otsuka, 1993; and Otsuka, 2007) on empirical literature on the efficiency of sharecropping tenancy showed that the evidence on systematic downward bias in input use and productivity are far from universal. Some recent studies even tried to establish alternative conditions under which particular circumstances share tenancy can be no less efficient than owner operated or fixed rent contracts. Therefore, we have made an attempt to empirically investigate the situation where production environment is risky and uncertain and at the same time reverse tenancy is present among the sample households.

4.1 Tenancy and Agricultural Productivity

In the seventies, productivity in own land was generally higher than that of cash rented and share rented land except for chickpea and wheat (Table 13). Productivity in the owner operated land was 12 to 172 percent higher than that of cash rented land for different crops except chickpea. Compared to the share rented land, productivity in the owner operated land was 22 to 220 percent higher for all crops except wheat. In the recent years, productivity of Chickpea, Pearl millet, Pigeon pea, and Sorghum was higher in cash rented land. For all other crops, productivity was higher in owner operated land. Productivity of share rented land was lower than that of owner operated land for all crops.

4.2 Tenancy and Profitability

In the seventies, Per hectare returns to land, family labor and management in own land was generally higher than that of cash rented and share rented land except Dokur and Kanzara villages (Table 14). Profitability in the owner operated land was 172 to 286 percent higher than that of cash rented land for different villages except Dokur in case of rented land in cash basis. Compared to the share rented land, profitability in the owner operated land was 150 to 350 percent higher for all villages except Dokur and Kanzara. In the recent years, per hectare returns to land, family labor and management was higher in owner operated land compared to cash rented land for all villages.

In case of Per Hectare Net returns in own land was generally higher than that of cash rented and share rented land except Aurepalle and Dokur villages (Table 15). Profitability in the owner operated land was 184 to 1600 percent higher than that of cash rented land for different villages except Aurepalle and Dokur in case of rented land in cash basis. In the recent years, Per Hectare Net returns was higher in owner operated land compared to cash rented land for all villages except Aurepalle and Kalman.

5. SUMMARY AND CONCLUSIONS

Land ownership per household has decreased among large farm group over time. Extent of tenancy has increased among the sample households. Modalities for tenancy have also changed across villages. Cash rent has increased in Aurepalle, Dokur and Kanzara whereas share cropping has increased in Kinkhed, Kalman and Shirapur. Prevalence of reverse tenancy in the dryland agriculture even in the recent years (2009-11) has been revealed through this study. This is quite opposite from the recent literature which covers mostly irrigated agriculture. However, the extent of reverse tenancy has reduced in the recent years than in the seventies. Tenancy has increased in four

(Aurepalle, Dokur, Kanzara and Kinkhed) of the study villages in the recent years compared to the seventies and eighties. These villages have less availability of irrigation and the production environment is more risky. Tenancy has decreased in two villages (Shirapur, and Kalman) where irrigation has expanded and thereby, reduced production risk. Probit analysis revealed that likelihood of a household to be a tenant household is positively linked with number of agricultural worker in the household, bullock ownership and household head to be male. On the other hand, it is negatively related with land ownership, irrigated land ownership, age and education of household head, and dependence on non-farm. Crop yield was generally higher in owned land than that of land under tenancy. Profitability was also higher in own land than in rented-in land.

Reduction of risks in Shirapur has not only reduced tenancy but also abolished reverse tenancy. Share tenancy has expanded more than the cash renting system. Expansion of share cropped tenancy can be viewed as a mechanism for sharing risks among the owner of land and the tenant farmer. Reduction of reverse tenancy in dryland agriculture will require reduction in production risk either through drought resistant crop varieties or through availability of supplementary irrigation accompanied by custom hiring services for some critical inputs (for example, bullock for intercultural operations).

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Table 1: Farm-size classification based on operational landholdings (ha) in the study villages

Farm size (ha)	Region					
	Mahbubnagar		Sholapur		Akola	
	Aurepalle	Dokur	Shirapur	Kalman	Kanzara	Kinkhed
Landless	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Small	0.2-1.2	0.2-0.9	0.2-2.0	0.2-3.6	0.2-1.8	0.2-2.0
Medium	1.2-3.2	0.9-2.1	2.0-5.3	3.7-8.5	1.8-5.3	2.0-4.5
Large	>3.2	>2.1	>5.3	>8.5	>5.3	>4.5

Note: Operational farm size is defined as owned land minus rented/sharecropped-out land plus rented/shared cropped-in land.

Source: Walker and Ryan (1990) and Authors' calculation, based on VLS-VDS Database.

Table 2: Farm-size group wise distribution of sample households in the study villages

Village	1975				2011			
	Labour	Small	Medium	Large	Labour	Small	Medium	Large
Aurepalle	10	10	10	10	18	11	21	20
Dokur	10	10	10	10	5	12	8	25
Kalman	10	10	10	10	8	37	13	3
Kanzara	10	10	10	10	15	21	16	10
Kinkhed	10	10	10	10	6	28	9	9
Shirapur	10	10	10	10	17	48	20	4
All	60	60	60	60	69	157	87	71

Source: Authors' calculation, based on VLS-VDS Database.

Table 3: Description of the variables

Variables Notation	Description	Definition	Expected sign
Y	Dependent Variable. Take value 1 if Household is tenant and 0 other wise	Tennant land (Ha)	
OLH	Own cultivable land	Own Land (Ha)	-
IRRR	Proportion of Own Cultivable land under Irrigation	Proportion of Irrigated Land	-
HHAGE	Age of the household head	Age in Years	+
EDHH	Head Years of education	Year of Schooling	-
NAGW	Number of person whose primary occupation is agriculture	Number of Agriculture workers	+
NBULL	Number of bullocks	Number of Bullocks	+
DRATIO	Dependency ratio	Ratio of Dependent and Working Person	+
NFTOTINC	Proportion of non-farm income in total income	Proportion of non-farm Income	-
LKHRAIN	Lag Kharif Rainfall	Previous Year Rainfall June-October (mm)	+
PERIOD_D	Period dummy	Taken value 1 if year > 2000 and 0 Otherwise	-
HHSEX_D	Household head sex dummy	Male=1 and female=0	+
TRTCR_D	Tractor dummy	Taken value 1 if the household have tractor/s and 0 otherwise	+
V1, V2, V3, V4, V5	Village dummy	Aurepalle consider as reference category, Thus V1=1 for Dokur, 0 otherwise; V2=1 for Kalman, 0 otherwise; V3=1 for Kanzara, 0 otherwise; V4=1 for Kinkhed, 0 otherwise and V5=1 for Shirapur, 0 otherwise	
F1, F2, F3	Farm group dummy	Large farm group consider as reference category, Thus F1=1 for Labour, 0 otherwise; F2=1 for Medium, 0 otherwise and F3=1 for Small, 0 otherwise	
Ui	Error Term	random disturbance term which is assumed to be normally distributed with zero mean	

Table 4: Soil, rainfall, and crop characteristics of the study regions

Characteristics	Mahbubnagar (Aurepalle and Dokur)	Sholapur (Shirapur and Kalman)	Akola (Kanzara and Kinkhed)
Soil	Red soil; marked soil heterogeneity	Deep black soils in lowlands; shallower lighter soils in uplands	Black soils; fairly homogeneous
Rainfalls	Rainfall unassured; pronounced rainfall uncertainty at sowing	Rainfall unassured; frequent crop failure	Rainfall assured
Amount of rainfall (mm)	In 1975-77: Aurepalle (565 mm), Dokur (861 mm); In 2009-11: Aurepalle (817 mm), Dokur (643 mm)	In 1975-77: Shirapur (517 mm), Kalman (656 mm); In 2009-11: Shirapur (666 mm), Kalman (729 mm)	In 1975-77: Kanzara (743 mm), Kinkhed (699 mm); In 2009-11: Kanzara (787 mm), Kinkhed (747 mm)
Variability in rainfall (CV)	In 1975-77: Aurepalle (22%), Dokur (12%); In 2009-11: Aurepalle (46%), Dokur (29%)	In 1975-77: Shirapur (47%), Kalman (42%); In 2009-11: Shirapur (27%), Kalman (17%)	In 1975-77: Kanzara (35%), Kinkhed (50%); In 2009-11: Kanzara (25%), Kinkhed (32%)
Irrigation facilities (1975-1977)	Agricultural intensification around dug wells and tanks	Some dug wells	Limited irrigation sources in 1970s and early 1980s
Irrigation facilities (2009-2011)	Bore well, tank and pond	Open well and bore well	Canal and open well
Major Crops (1975-1977)	Kharif or rainy season cropping	Rabi or post rabi season cropping	Kharif cropping
	Paddy, castor and local Kharif sorghum	Rabi sorghum	Upland cotton, mug, bean and hybrid sorghum
Major Crops (2009-2011)	Paddy, cotton, castor, kharif sorghum, groundnut and sunflower	Kharif pigeon pea, onion, rabi sorghum and sugarcane	Cotton, kharif pigeon pea, kharif sorghum, soybean and wheat

Source: Walker and Ryan (1990) and Authors' calculation, based on VLS-VDS Database.

Table 5: Basic characteristics of the sample households, 1975-77 and 2009-11.

Characteristics	Aurepalle		Dokur		Kanzara		Kinkhed		Kalman		Shirapur	
	1975-77	2009-11	1975-77	2009-11	1975-77	2009-11	1975-77	2009-11	1975-77	2009-11	1975-77	2009-11
Household Size (No.)	5.78	3.85	5.35	4.63	6.21	5.04	5.25	5.36	6.23	4.99	6.70	4.90
Average age of Household Head (Yrs)	51	50	47	47	42	47	42	49	44	53	47	48
Household Head Average Schooling Year	1.35	2.32	1.09	3.25	2.71	6.84	4.55	7.22	2.58	4.26	2.29	5.11
Per Household Own land (Ha)	2.86	1.40	1.68	1.54	4.12	2.03	4.22	2.04	4.74	2.39	3.56	1.63
Per Household Rented out land (Ha)	0.00	0.29	0.00	0.10	0.03	0.29	0.00	0.64	0.02	0.20	0.00	0.03
Per Household Rented in Land (Ha)	0.04	0.50	0.13	0.31	0.23	0.64	0.28	0.25	0.85	0.33	0.67	0.10
Per Household Operational Holding (Ha)	2.90	1.90	1.81	1.85	4.35	2.67	4.49	2.29	5.59	2.71	4.24	1.73
Dependency Ratio	0.50	0.28	0.25	0.35	0.68	0.35	0.63	0.39	0.53	0.36	0.67	0.50
% of Female Headed Household	8.33	15.38	25.00	19.04	9.16	1.61	0.00	9.09	5	5.82	9.16	11.07
Irrigable area (%)	12.05	26.24	53.82	70.80	1.09	70.92	0.78	46.12	8.69	32.94	9.19	77.15
Number of Agricultural Worker per Household	1.24	0.63	1.31	1.27	1.6	1.52	1.77	1.36	1.56	0.92	1.67	0.76
Per Capita Income (USD)	56	744	79	697	84	632	79	456	62	570	101	990

Source: Authors' calculation, based on VLS-VDS Database.

Table 6: Distribution of operational holding (in ha per capita), by Ownership and Tenancy Status, 1975-77 and 2009-11.

Village Name	1975-1977				2009-2011			
	Owned Land	Operate d Land	Land Leased in	Land Leased Out	Owned Cultivated Land	Operated Land	Land Leased in	Land Leased Out
Aurepalle	0.524	0.529	0.005	0.000	0.469	0.469	0.110	0.109
Dokur	0.263	0.284	0.021	0.001	0.372	0.426	0.082	0.028
Kanzara	0.606	0.640	0.038	0.001	0.514	0.564	0.117	0.067
Kinkhed	0.885	0.941	0.056	0.001	0.474	0.409	0.046	0.111
Kalman	0.819	0.968	0.152	0.003	0.596	0.607	0.058	0.047
Shirapur	0.496	0.608	0.111	0.000	0.377	0.391	0.025	0.010
All Villages	0.599	0.662	0.064	0.001	0.464	0.475	0.071	0.059

Source: Authors' calculation, based on VLS-VDS Database.

Table 7: Comparaison of characteristics of the Tenants households vs Leased Out/ Shaed out Households, 1975-77 and 2009-11

Indicators	Tenant Household		Leased out/ Shared out Household	
	1975-77	2009-11	1975-77	2009-11
Household Size	6.65	5.20	5.67	4.23
Dependency Ratio (%)	65.00	38.00	54.44	34.30
Average Age of Head	44.02	47.81	36.50	51.80
Average Head Years of Education	2.36	4.86	1.67	5.18
Average Per Capita Own Total Area (Hectares)	1.04	0.39	0.44	0.63
Average Per Capita Farm Income (USD Current Price)	107	588	27	172
Average Per Capita Non-Farm Income (USD Current Price)	23	248	24	402
Average Per Capita Total Income (USD Current Price)	130	836	51	574

Source: Authors' calculation, based on VLS-VDS Database.

Table 8. Distribution of Leased out Households, 1975-77 and 2009-11

Village Name	1975-1977				2009-2011			
	Small	Medium	Large	All	Small	Medium	Large	All
Aurepalle	0.00	0.00	0.00	100.00	59.62	15.38	25.00	100.00
Dokur	100.00	0.00	0.00	100.00	45.83	33.33	20.83	100.00
Kanzara	0.00	100.00	0.00	100.00	23.81	47.62	28.57	100.00
Kinkhed	0.00	100.00	0.00	100.00	37.84	29.73	32.43	100.00
Kalman	0.00	100.00	0.00	100.00	58.82	41.18	0.00	100.00
Shirapur	0.00	0.00	0.00	100.00	85.71	0.00	14.29	100.00

Note: Labor households who participated in tenancy transactions are included with small farmers,

Source: Authors' calculation, based on VLS-VDS Database.

Table 9. Distribution of Tenant Households, 1975-77 and 2009-11

Village Name	1975-1977				2009-2011			
	Small	Medium	Large	All	Small	Medium	Large	All
Aurepalle	60.00	40.00	0.00	100.00	23.22	41.07	35.71	100.00
Dokur	0.00	62.50	37.50	100.00	0.00	18.18	81.82	100.00
Kanzara	16.66	33.33	50.00	100.00	45.46	23.64	30.91	100.00
Kinkhed	30.77	46.15	23.08	100.00	70.37	18.52	11.11	100.00
Kalman	41.67	20.83	37.50	100.00	47.06	17.65	35.29	100.00
Shirapur	40.00	26.67	33.33	100.00	92.85	7.14	0.00	100.00

Note: Labor households who participated in tenancy transactions are included with small farmers,

Source: Authors' calculation, based on VLS-VDS Database.

Table 10: Distribution of Total New Land Transfers by Type of Land Transactions in Six Study Villages, 1975-78 and 2009-11.

Village	1975-78				2009-11		
	Transferred Area (Ha)*	Percentage of Transferred Area Via:			Transferred Area (Ha)*	Percentage of Transferred Area Via:	
		Tenancy	Sale/ Purchase	Others		Tenancy	Sale/ Purchase
Aurepalle	64.3 (14)	89	10	1	111.92 (28)	93	7
Dokur	80.5 (20)	77	20	3	65.67 (24)	69	31
Kanzara	117.6 (16)	92	0	8	126.52 (25)	94	6
Kinkhed	87.7 (15)	96	2	2	48.62 (14)	77	23
Kalman	257 (36)	97	1	2	72.62 (14)	85	15
Shirapur	416 (46)	90	6	4	48.85 (10)	55	45

Note: * Figures in parentheses indicate the transferred land as percentage to total operated area of sample households

Source: Jodha (1981) for 1975-78 and VLS-VDS Database for 2009-11.

Table 11: Percentage distribution of Mode of land tenancy in respect to total tenant land

Village Name	1975-1977		2009-2011	
	Rented (Cash Basis)	Rented (Share crop Basis)	Rented (Cash Basis)	Rented (Share crop Basis)
Aurepalle	100.00	0.00	87.21	12.79
Dokur	95.49	4.51	71.11	28.89
Kanzara	92.66	7.34	83.51	16.49
Kinkhed	68.18	31.82	33.15	66.85
Kalman	75.04	24.96	0.00	100.00
Shirapur	100.00	0.00	21.21	78.79
All Village	85.36	14.64	61.03	38.97

Source: Authors' calculation, based on VLS-VDS Database.

Table 12: Results of the Panel Probit Regression of the Leasing Decisions of the Sample Households

Variables	Period 1 (1975-79 and 1983)	Period 2 (2005-2011)	All Years
A	-2.459*** (0.616)	-0.4930 (0.435)	-0.9981*** (0.304)
OLH	0.0341* (0.018)	-0.3023*** (0.037)	-0.0371*** (0.015)
IRRR	0.4300 (0.303)	-0.1856 (0.149)	-0.1393 (0.117)
HHAGE	-0.0079 (0.006)	-0.0015 (0.004)	-0.0119*** (0.003)
EDHH	-0.0732*** (0.027)	-0.0118 (0.016)	-0.0373*** (0.012)
NAGW	0.0455 (0.078)	-0.1280*** (0.052)	0.0138 (0.013)
NBULL	0.1813*** (0.051)	0.5204*** (0.060)	0.2598*** (0.034)
DRATIO	0.0832 (0.116)	0.0117 (0.096)	-0.0004 (0.069)
NFTOTINC	-0.7354*** (0.253)	-0.7822*** (0.155)	-0.7188*** (0.114)
LKHRAIN	-0.0002 (0.0003)	0.0001 (0.0002)	-0.0002 (0.0001)
HHSEX_D	0.1851 (0.185)	0.7291*** (0.266)	0.5535*** (0.177)
TRTCR_D	-3.4457 (680.45)	-0.0599 (0.413)	-0.1834 (0.354)
PERIOD_D			0.5113*** (0.511)
V1	0.5741 (0.365)	0.1008 (0.220)	0.1480 (0.179)
V2	1.0636*** (0.322)	-0.8220*** (0.260)	-0.3582* (0.190)
V3	1.1895*** (0.331)	0.4097* (0.226)	0.5692*** (0.179)
V4	0.8421*** (0.347)	-0.0543 (0.238)	0.0445 (0.193)
V5	1.3110*** (0.319)	-0.8549*** (0.232)	-0.3213* (0.176)
F1	0.0557 (0.314)	-1.5174*** (0.234)	-0.9088*** (0.167)
F2	0.6630*** (0.216)	-0.6634*** (0.185)	-0.2572** (0.122)
F3	0.4946** (0.216)	-1.0563*** (0.203)	-0.5900*** (0.136)
Log likelihood	-347.17	-1006.82	-1502.40
Prob > chi2	0.00	0.00	0.00
Number of observation	1195	3574	4769

Note: ***=1%, **=5% and *=10% level of significance.

Values in the parenthesis indicating standard error (SE)

Source: Authors' calculation, based on VLS-VDS Database.

Table 13: Tenancy and Agricultural Productivity of some selected crops (Kg/Ha)

Crop name	1975-1977			2009-2011		
	Own Land	Cash Rental In	Share Crop In	Own Land	Cash Rental In	Share Crop In
Chickpea	215	237	124	899	1243	759
Cotton	282	172	125	1178	917	1084
Paddy	2130	1906	1752	4701	4149	4299
Pearl millet	173	69	54	490	495	
Pigeon pea	174	64	118	717	856	417
Sorghum	385	174	101	539	778	366
Soybean	-	-	-	1330	1188	1008
Sugarcane	20658	-	-	70859	-	51813
Wheat	968	656	1660	2637	2565	2192

Source: Authors' calculation, based on VLS-VDS Database.

Table 14: Per hectare returns to land, family labor and management (Current USD)

Village Name	1975-1977			2009-2011		
	Own Land	Cash Rental In	Share Crop In	Own Land	Cash Rental In	Share Crop In
Aurepalle	48	17	0	368	358	698
Dokur	123	173	235	522	485	302
Kalman	43	24	12	320	0	159
Kanzara	63	29	71	610	388	448
Kinkhed	52	30	34	309	182	253
Shirapur	185	17	0	1313	0	568
All Village	80	33	30	618	387	339

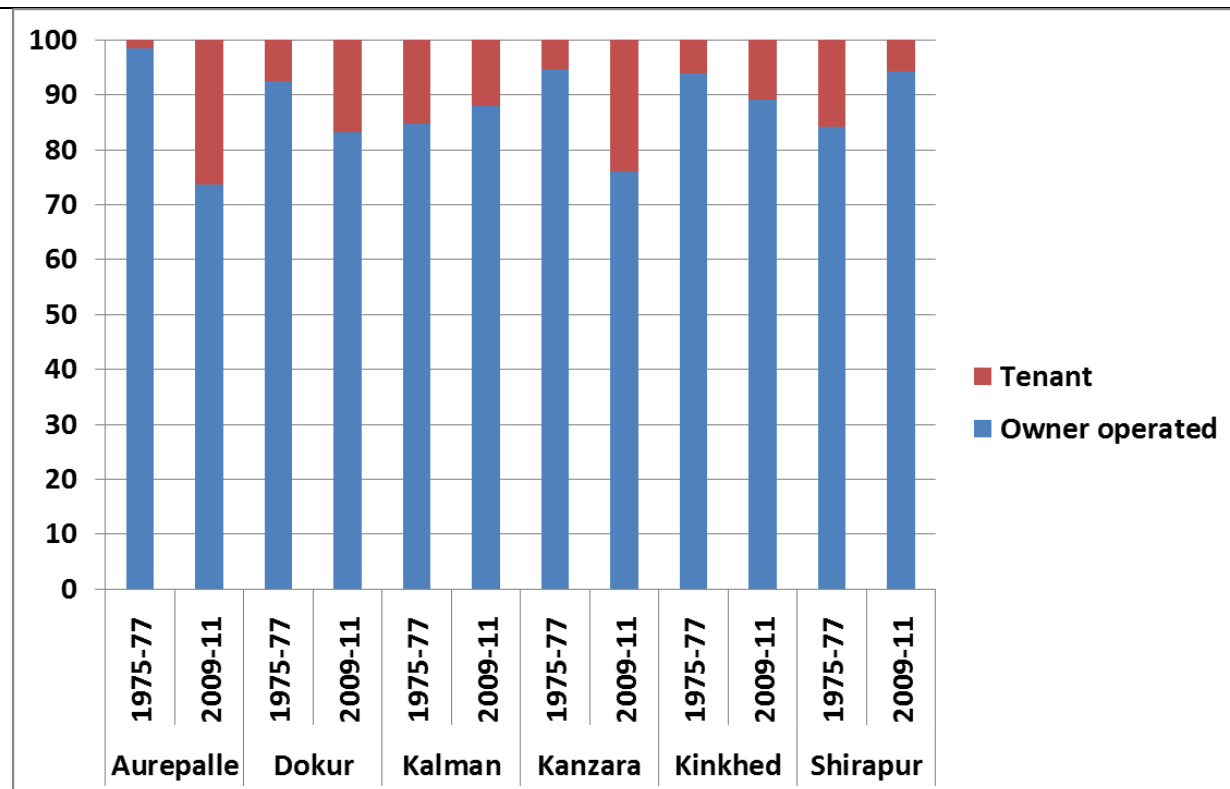
Source: Authors' calculation, based on VLS-VDS Database.

Table 15: Per Hectare Net returns (Current USD)

Village Name	1975-1977			2009-2011		
	Own Land	Cash Rental In	Share Crop In	Own Land	Cash Rental In	Share Crop In
Aurepalle	27	-1	0	94	85	390
Dokur	80	121	119	253	224	82
Kalman	31	17	6	127	0	-23
Kanzara	47	22	60	370	223	212
Kinkhed	35	13	21	153	49	68
Shirapur	172	11	0	812	0	92
All Village	62	22	17	339	170	95

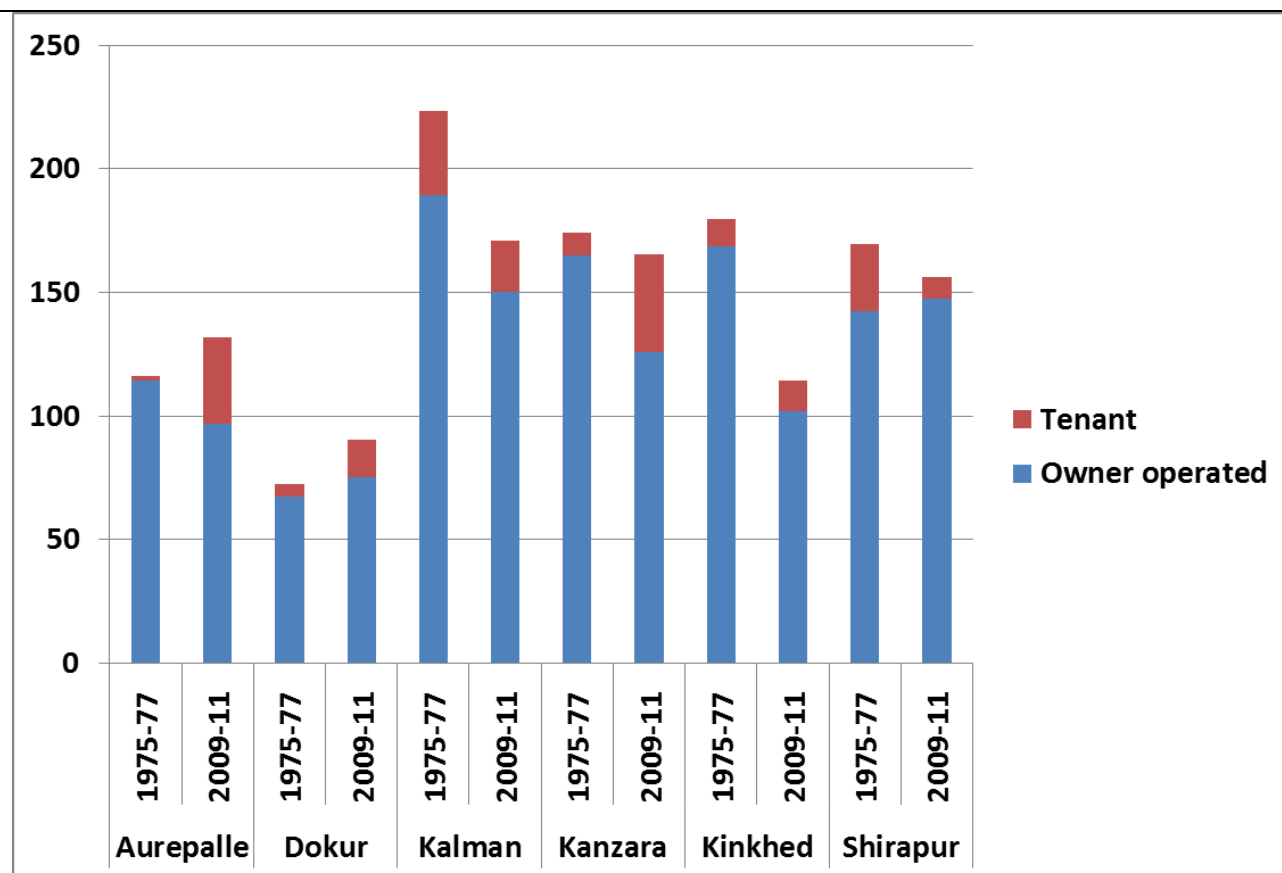
Source: Authors' calculation, based on VLS-VDS Database.

Figure 1. Percentage distribution of cultivated land by ownership status, 1975-77 vs 2009-11



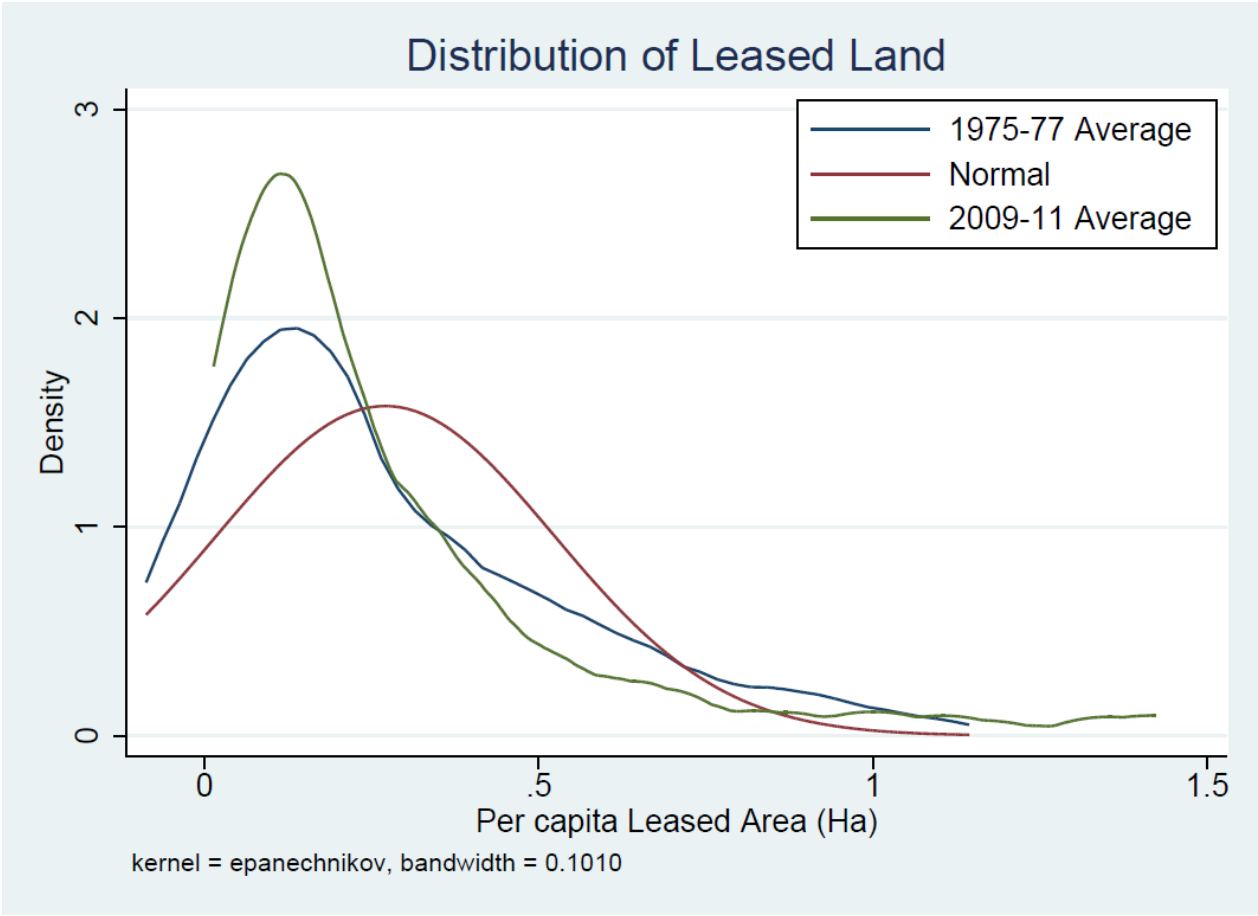
Source: Authors' Calculation, using VDSA Panel Household Survey dataset

Figure 2. Trends in total cultivated area by all sample households according to the ownership status, 1975-77 vs 2009-11



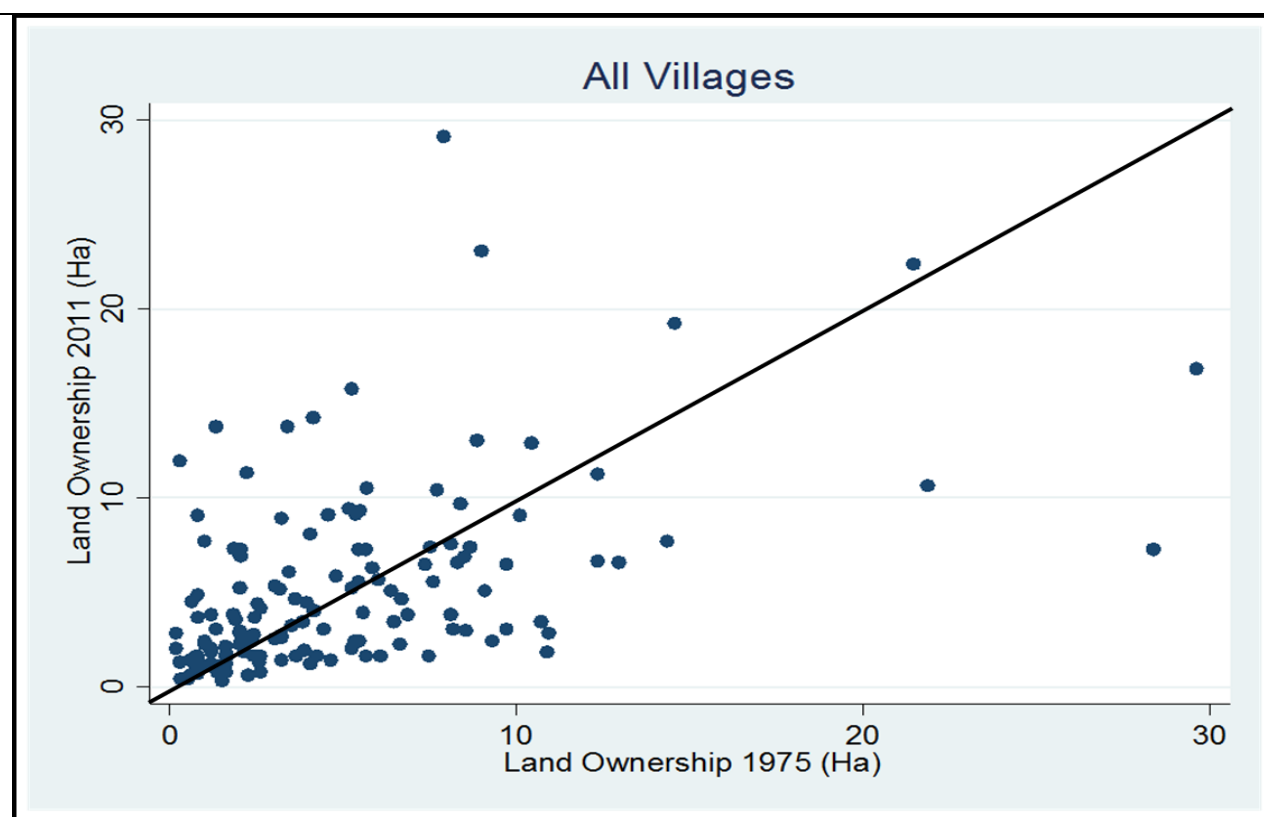
Source: Authors' Calculation, using VDSA Panel Household Survey dataset

Figure 3: Distribution of Per-capita Leased in Land (Ha), 1975-77 and 2009-11.



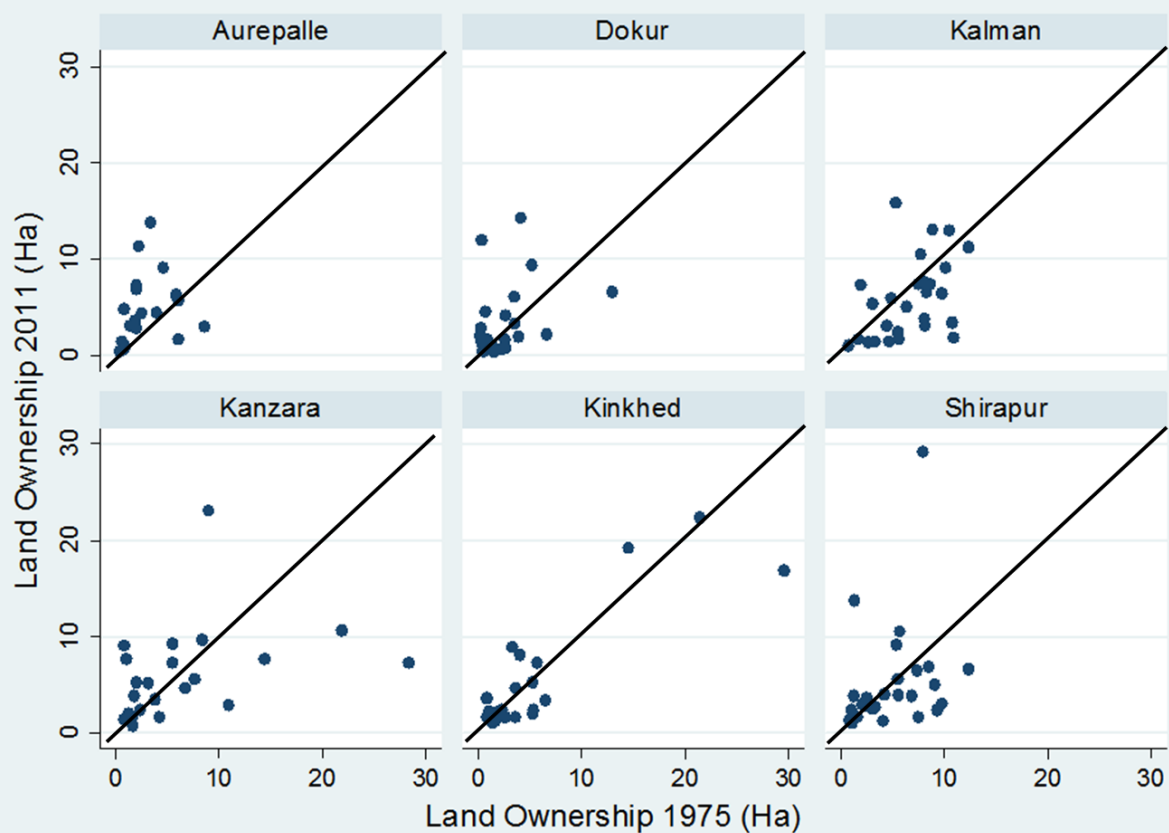
Source: Authors' calculation, based on VLS-VDS Database.

Figure 4: Changes in landownership between 1975 and 2011 (in ha) among the sample households



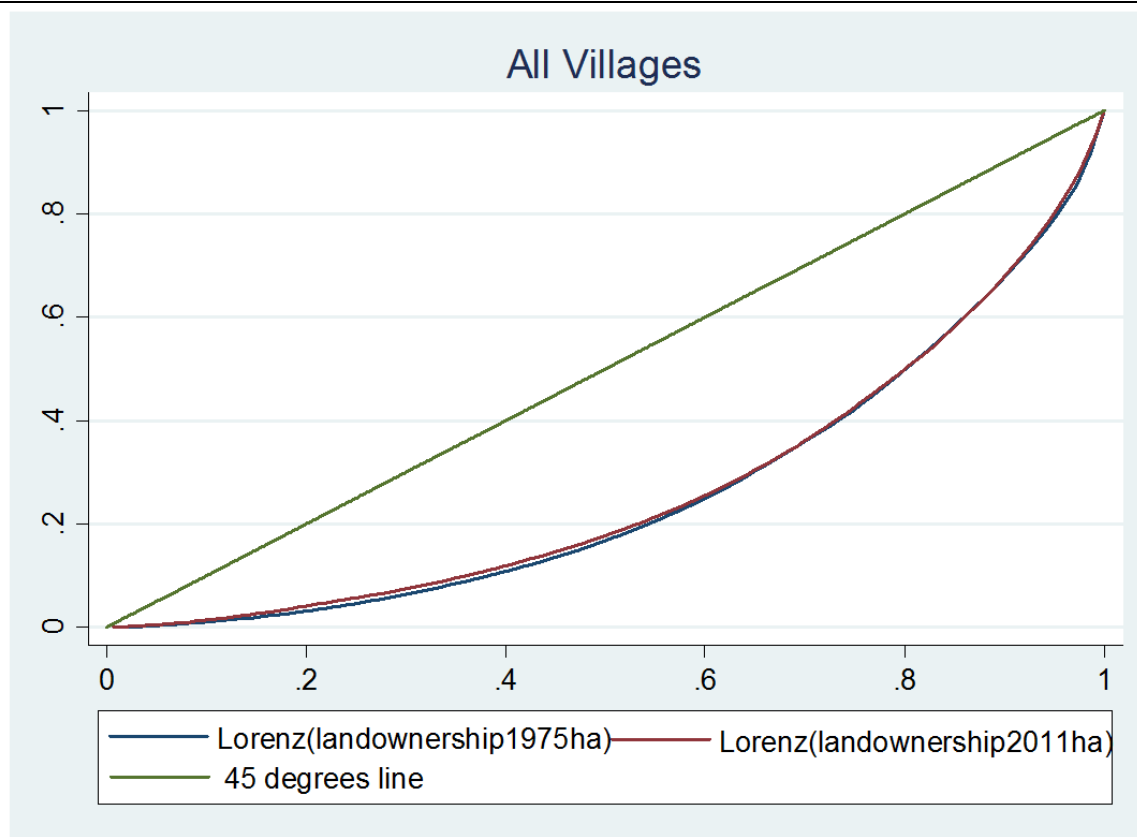
Source: Authors' calculation, based on VLS-VDS Database.

Figure 5: Changes in landownership between 1975 and 2011 (in ha) by Village



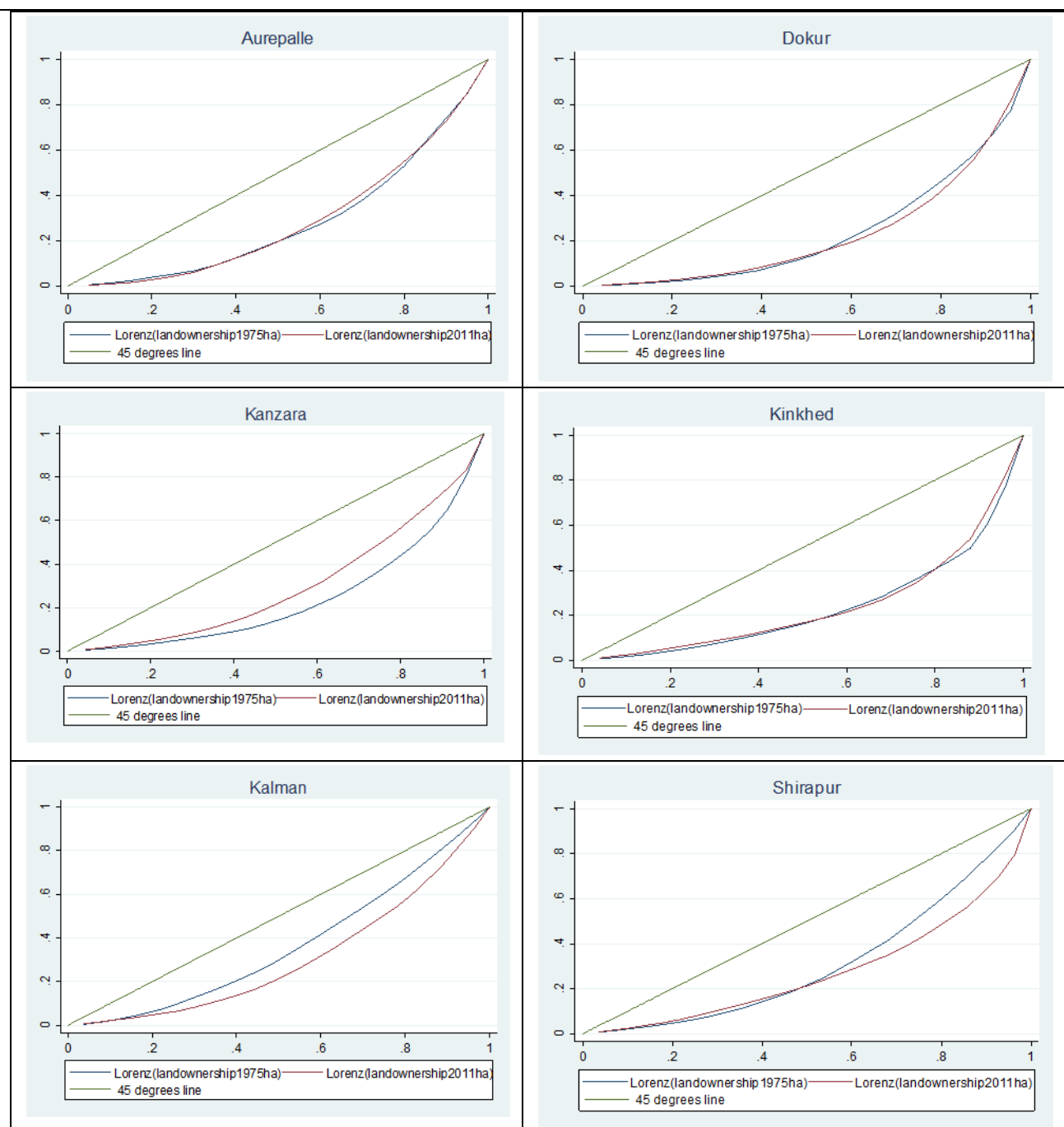
Source: Authors' calculation, based on VLS-VDS Database.

Figure 6: Changes in distribution of landownership between 1975 and 2011 (in ha) among the sample households



Source: Authors' calculation, based on VLS-VDS Database.

Figure 7: Changes in distribution of landownership between 1975 and 2011 (in ha) among the sample households, by village



Source: Authors' calculation, based on VLS-VDS Database.