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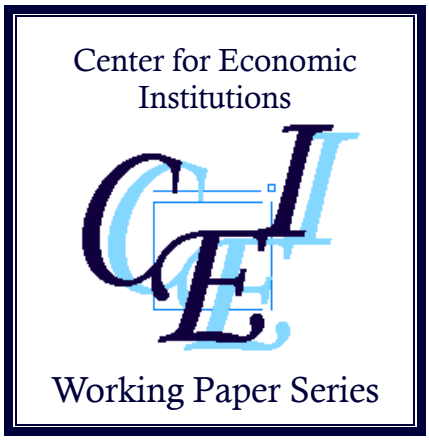

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Cost of Cultivation and Farm Business Incomes in India

Vikas Rawal

1 Introduction

Economic conditions in contemporary Indian countryside have often been characterised as one of an "agrarian crisis". It has been argued that policies of liberalisation and globalisation adopted since the 1990s have resulted in the crisis that the Indian countryside faces (see, for example, Ramachandran and Rawal, 2010). These policies included, in particular, slowing down of public investment, decline in provision of formal-sector credit, falling and fluctuating prices (as a consequence of both domestic policy mismanagement and integration with world markets), cuts in input subsidies and consequent rises in costs.[1]

In this context, studies of economics of farming – of cost of production and profitability – assume critical value. Despite this, very few comprehensive studies on cost of production and profitability have been conducted. The most important study, that deserves a special mention here, is by Abhijit Sen and M. S. Bhatia (Sen and Bhatia, 2004). A detailed review of studies on cost of cultivation has been done by Surjit (2008).

A major limitation of these studies is that they mainly analyse cost of cultivation and economics of farming in respect of individual crops.[2] This is primarily because the major source of official statistics on cost of cultivation – collected by the Commission for Agricultural Costs and Prices – provides data only for individual and selected crops. This is a serious limitation since most peasants grow multiple crops on their operational holdings in a season as well as grow crops in more than one season in a given agricultural year. Crop duration and seasons in which crops are grown vary. Often, seasons for crops cultivated in different plots in the operational holding of a household – and, sometimes, on the same plot of land – overlap. There are also periods in an agricultural year in which different parts of the holding remain fallow. As a result of these complexities, crop and technological choices are made, and by implication, the profitability of crop production is determined, for alternative crop mixes

[1] See Ramachandran and Rawal (2010).

[2] See, for example, Sen and Bhatia (2004).

and crop sequences rather than individual crops. In some cases, for example for perennial crops and crops that have ratoons, cropping pattern choices may even have long-term implications. Given these complexities, CACP data, which are provided only for individual and selected crops, cannot be used to study economics of farming households as units.

An alternative macro-level dataset, based on the Situational Assessment Survey (SAS) of Farmers conducted by the National Sample Survey Organisation in 2003, provides data on economics of crop production at the level of a household. The SAS statistics on economics of crop production, however, were poorly collected and were not based on a consistent method of cost accounting (see Bakshi, 2008). In view of this, recent studies based on SAS need to be used with a lot of caution.

Another limitation of CACP and SAS data is that these provide limited information on scale of production. Summary statistics published by the CACP do not provide data disaggregated by any measure of scale. Detailed plot-level data from CACP, which were difficult to obtain until recently, and detailed household-level data from SAS use physical extent of land as a measure of scale. It has been argued in the literature that physical extent of land is a poor measure of scale of production.[3]

CACP data, as well as official crop area statistics, conceal widespread farming practices like inter-cropping and mixed-cropping. Cultivation of multiple crops together (by either mixing the seeds and sowing them, by sowing the seeds in separate rows, or by planting additional crops on the field boundary) is not uncommon in India. CACP data do not provide any information for such crop-mixes.

Finally, like all other official statistics, CACP data seriously under-estimate the extent of tenancy, and by implication, underestimate rental costs in paid out cost of cultivation.

This paper presents statistical analysis of data on costs of cultivation and farm business income collected through primary surveys of rural households as part of the Project on Agrarian Relations in India (PARI) of the Foundation for Agrarian Studies. An important initiative of the Project on Agrarian Relations in India has been to develop and use a consistent methodology for estimation of incomes of rural households. As part of this initiative, the CACP methodology for estimation of cost of cultivation was adopted for estimation of incomes from crop production.

Detailed issues in respect of methodology of estimation used in the PARI dataset have

[3] See, for example, Ramachandran (1980), Patnaik (1987), Ramachandran (1990), and various contributions to the mode of production debate (in Patnaik, 1990), and various contributions to the size-productivity debate in Indian agriculture.

been discussed in Rawal (2008). Some major issues, in this respect, however need to be noted here. Estimates of income from crop production in the PARI dataset refer to net income over what is known as cost A2. Cost A2, a concept taken from the CACP methodology of estimation of cost of cultivation, broadly refers to paid out cost incurred by a cultivator. Importantly, in estimation of cost A2, no value is imputed for the cost of family labour or for the implicit rent of owned capital (including land).

Section 2 of the paper presents an overview of levels and disparities in crop production across cultivating households in ten villages. These villages are from Andhra Pradesh (Anantavaram, Bukkacherla and Kothapalle), Uttar Pradesh (Harevli and Mahatwar), Maharashtra (Warwat Khanderao and Nimshirgaon), Rajasthan (25F Gulabewala and Rewasi), and Madhya Pradesh (Gharsondi).[4]

In Sections 3-7, the paper presents a detailed analysis of economy of crop production from five villages – Harevli in Western Uttar Pradesh, Mahatwar in Eastern Uttar Pradesh, Nimshirgaon in southern Maharashtra, Rewasi in semi-arid region of Rajasthan, and 25F (Gulabewala) in the command area of Gang-canal in Rajasthan. In a recent paper, Rawal and Swaminathan (2012) used data from PARI surveys to argue that returns from crop production were positively related to scale of operation. Through analysis of economy of crop production in the above five villages, this paper attempts to further explore this relationship. In particular, it attempts to explore how different economic and technological choices made by households belonging to different classes in each village determine the relationship between scale of operation and net returns.

As in Rawal and Swaminathan (2012), the economic size of farm enterprise is measured in terms of the value of owned means of production, level and sources of household income, and pattern of labour deployment rather than just the physical extent of landholding. The overall methodology of identifying different classes of households in the PARI dataset is discussed in Ramachandran, Rawal and Swaminathan (2010) and Ramachandran and Rawal (2012). It may be noted here that, while a common overall methodology is used to identify the classes, number of classes and their character vary from village to village in important ways. It is for this reason that, after an overall comparative analysis in Section 2, the paper analyses the data in detail separately for each village. It may also be pointed out that in this paper, the class of hired manual workers refers to a section of hired manual worker households who also operated some land. Households that did not operate land have been excluded from the

[4] See http://www.agrarianstudies.org/pages.asp?menuid=16 for notes on location and basic description of these villages.

analysis.

2 Incomes from Crop Production

Studies of household income based on PARI data have brought out some striking findings in respect of low levels of household incomes and high degree of income disparities.[5] While a discussion of these results is outside the scope of this paper, it is relevant to reiterate some major findings in respect of distribution of annual income from crop production.

- PARI data show that crop production provided meagre incomes for a large majority of cultivating households in most of the villages. Table 1 shows median incomes from crop production in each village. The Table shows that the median annual income was only Rs. 1290 per household in Mahatwar, a village where agriculture was primarily rainfed. Even in Ananthavaram, where Xx of the gross cropped area was irrigated, annual income was only Rs. 2654 per household. In Warwat Khanderao, a cotton-growing village in Vidarbha region, median income from crop production was only Rs. 14755 per household. In Nimshirgaon, where sugarcane was the most important crop, the median income from crop production was only Rs. 9991 per household.[6]

- An important finding of the PARI studies has been that, in most villages, a substantial proportion of households incurred a loss in crop production in the given reference year. Table 2 shows that the proportion of cultivating households that incurred a loss in crop production was highest in Rewasi in Rajasthan (42 per cent) and Bukkacherla in Andhra Pradesh (35 per cent). Losses in crop production were primarily related to crop failures in some villages (for example, in Rewasi, Gharsondi, Bukkacherla, Kothapalle and Mahatwar) and to specific forms of tenancy relations in others (for example, in Ananthavaram and Harevli).

[5] See Ramachandran, Rawal and Swaminathan (2009), Ramachandran and Rawal (2010), Swaminathan and Rawal (2011a), Swaminathan and Rawal (2011b), and Swaminathan and Rawal (2012).

[6] 25 F Gulabewala stands out as an exception in Table 1. 25 F Gulabewala is a village with extremely high levels of differentiation. High median income in 25 F Gulabewala merely reflects high level of polarisation between landless households on the one hand and rich peasants/capitalist farmers on the other. 25 F Gulabewala is a village with exceptionally high levels of inequality. With 65 per cent of households being landless, 25 F Gulabewala had the highest degree of landlessness among all the study villages. On the other hand, the smallest category of farmers (classified as "Farmers: 2" in the PARI data on 25 F Gulabewala) comprised only 6 per cent of households in the village.

- While a majority of cultivating households obtained meagre incomes from crop production, there were small sections of households in most villages that derived substantial incomes. Table 1 shows that the ninth decile income were 18 times the median income in Rewasi, 15 times the median incomes in Harevli and Ananthavaram, and more than 5 times in all villages except two.

Figure 1 presents Lorenz curves of income from crop production for cultivator households. A remarkable aspect of the distribution of income from crop production is seen in this figure. It shows that cumulative income from crop production of bottom 84 per cent cultivator households in Ananthavaram was zero. In Bukkacherla, cumulative income of bottom 80 per cent cultivating households was zero. The corresponding proportion was 70 per cent in Rewasi, 59 per cent in Gharsondi and 54 per cent in Mahatwar.

Table 1: Median and ninth decile annual income from crop production, by village (2005-06 prices)

Village	Median income	Ninth decile income	D9/D5
Ananthavaram	2654	38427	14.5
Bukkacherla	6477	35504	5.5
Kothapalle	5869	16670	2.8
Harevli	8812	129218	14.7
Mahatwar	1290	9455	7.3
Warwat Khanderao	14577	79300	5.4
Nimshirgaon	9853	58353	5.9
25F Gulabewala	175001	457601	2.6
Rewasi	2361	42927	18.2
Gharsondi	9145	78862	8.6

A unique feature of PARI data set is that it allows us to estimate total annual income from crop production per acre of household operational holding. This can be analysed for variations across different classes, caste groups, and for different cropping systems. We can ask different questions here.

1. What is the average level of return from cultivation per acre of operational holding and how does it vary across villages located in different States and agro-ecological regions?

2. What is the difference in returns from cultivation across classes?

Table 2: Proportion of households having negative incomes from crop production, by village

Village	Proportion of households having negative incomes
Ananthavaram	30
Bukkacherla	35
Kothapalle	27
Harevli	12
Mahatwar	19
Warwat Khanderao	5
Nimshirgaon	20
25F Gulabewala	0
Rewasi	42
Gharsondi	20

3. What is the difference in returns from various combinations of crops cultivated by households?

Table 3 presents median level of return from cultivation per acre of operational holding. The table shows that the variation is very large, from only Rs. 918 per acre in Bukkacherla (Anantapur, Andhra Pradesh) to Rs. 7521 per acre in Nimshirgaon (Kolhapur, Maharashtra). These medians, of course, conceal a wide and skewed distribution of incomes from crop production within each village (Figure 2).

Rawal and Swaminathan (2012) analysed the PARI data to examine variation in returns from cultivation across classes. The paper shows that "there is a positive relationship between net incomes from farming and scale of operation, where scale or economic size of the cultivating unit is measured in terms of the value of owned means of production, level and sources of household income, and pattern of labour deployment rather than just the physical extent of landholding."

Table 4 shows median gross value of output per acre across different socio-economic classes in PARI villages. Table 5 shows median net income per acre across different socio-economic classes. A note of caution is due here. As has been pointed out, the number of classes and their character varies across PARI villages. For the purpose of a limited comparison, in these tables, lower-middle peasants and upper-middle peasants in Ananthavaram, Bukkacherla, Kothapalle, Harevli and Mahatwar were combined into a single category of mid-

dle peasants. Warwat Khanderao and Gharsondi had two categories of hired manual workers each. These were combined into a single category of hired manual workers in both these villages.

Tables 4 and 5 show that, in most villages, gross value of output per acre and net income per acre decline as one goes from rich peasants to middle peasants, and then to poor peasants. Take, for example, the case of Mahatwar (Ballia district, Uttar Pradesh). Median gross value of output per acre was Rs. 13849 for rich peasants, Rs. 9595 for middle peasants, and Rs 9371 for poor peasants. Median net income per acre was Rs. 6957 for rich peasants, Rs. 2656 for middle peasants, and Rs. 952 for poor peasants. In Rewasi (Sikar district, Rajasthan), median net income per acre was Rs. 3299 for rich peasants, Rs. 469 for middle peasants, and Rs. 517 for poor peasants. The extent of disparities across the three classes, of course, varies across villages.[7]

As argued by Rawal and Swaminathan (2012), this suggests that there is a positive relationship between scale of production and returns from cultivation.

It may be argued that the pattern of net returns over cost A2 may be driven by rental payments on leased in land, which are higher for poor peasants than for rich and middle peasants since a greater proportion of operational holding of poor peasants is leased in. To check this, we look at the net returns over cost A1, which, unlike cost A2, does not include rent for leased in land. Estimates of median income over cost A1, presented in Table 6, show that, although incomes of poor peasants in some villages (for example, Ananthavaram and Harevli) are significantly higher when computed over cost A1 rather than over cost A2, the overall positive relationship between scale and net returns remains unchanged.

Data on median level of incomes across classes show another feature that is noteworthy. In Kothapalle (Karimnagar district, Andhra Pradesh), Warwat Khanderao (Buldhana district, Maharashtra), Nimshirgaon (Kolhapur district, Maharashtra), 25 F Gulabewala (Sri Ganganagar district, Rajasthan), Rewasi (Sikar, Rajasthan) and Gharsondi (Gwalior, Madhya Pradesh), average net income of landlord households was higher than average net income of rich peasant households. In other villages, average net income of rich peasants was higher than that of landlords. It must be kept in mind that, in all the villages, number of landlord households is small. With this caveat in mind, this does indicate the difference across villages in terms of the class that has taken the lead in capitalist transformation of agriculture.

[7]The trend is distinctly different in case of Kothapalle where median net income rises as one goes from rich peasants to middle peasants, and then to poor peasants. The pattern is not so clear in case of median gross value of output per acre.

Table 3: Median gross value of output and net income per acre of operational holding, by village, (2005-06 prices)

Village	GVO per acre	Net income per acre
Ananthavaram	23160	1740
Bukkacherla	4689	918
Kothapalle	8600	2848
Harevli	17204	4517
Mahatwar	9194	1871
Warwat Khanderao	8501	4748
Nimshirgaon	15633	6714
25F Gulabewala	11797	5565
Rewasi	4295	469
Gharsondi	7894	3116

Table 4: Median gross value of output per acre of operational holding, by class (2005-06 prices)

Village	Landlord	Peasant: 1 (rich)	Peasant: 2 (middle)	Peasant: 3 (poor)	Hired manual workers
Ananthavaram	14500	32465	24892	20492	19595
Bukkacherla	7408	4611	7087	3387	5136
Kothapalle	8997	7703	10138	18083	6065
Harevli	19380	17496	20438	15164	11875
Mahatwar	9234	13849	9595	9371	9557
Warwat Khanderao	15288	11577	10250	9140	6133
Nimshirgaon	37225	29172	20904	13597	4083
25F Gulabewala	13058	12216	11287	0	0
Rewasi	6528	7403	3622	5123	581
Gharsondi	13923	11161	8469	7694	4923

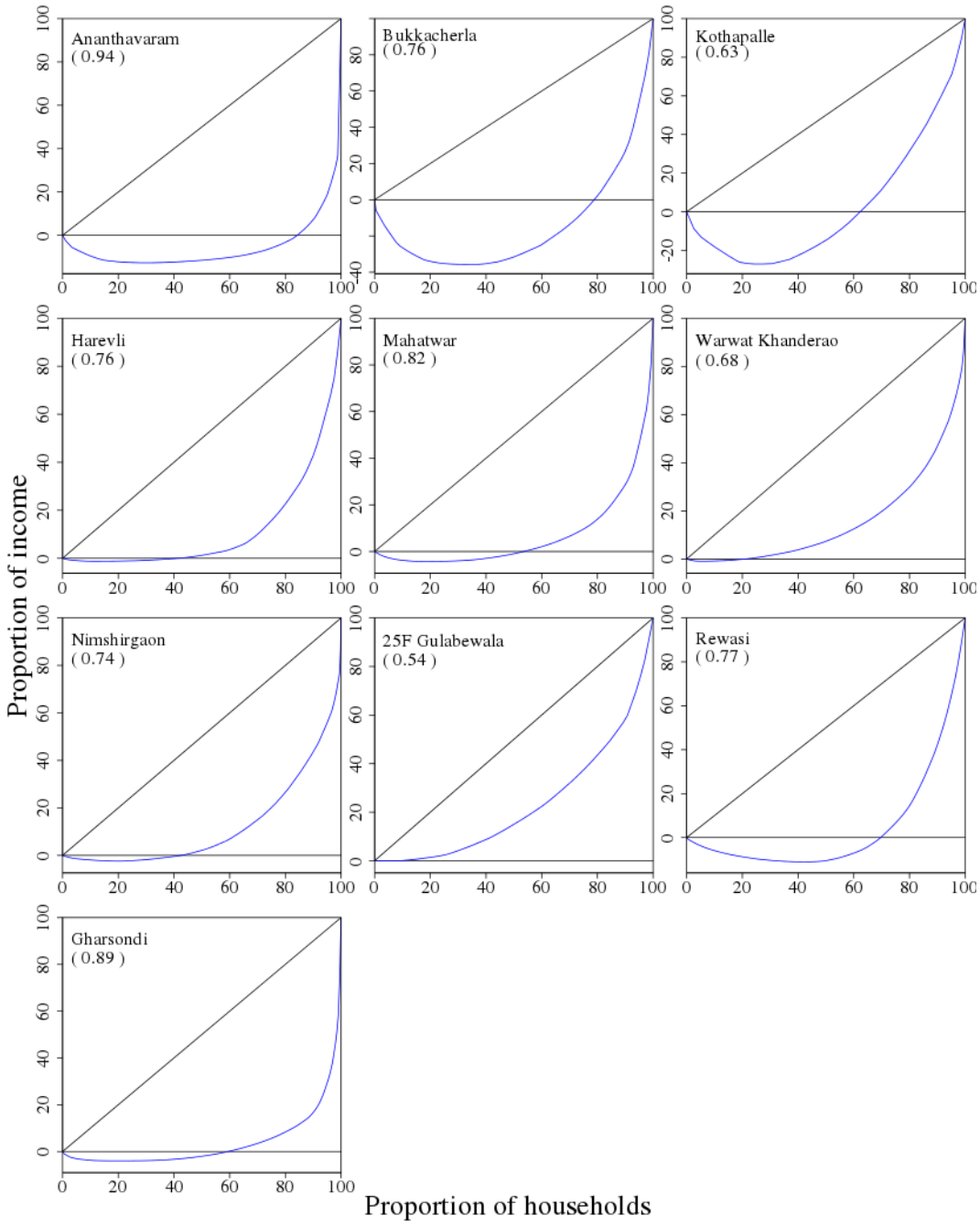

Figure 1: Lorenz curves of income from crop production, cultivating households, by village
Notes: Following Chen, Tsaur and Rhai (1982), these adjusted Gini coefficients account for negative incomes. The value of the adjusted coefficient lies between 0 and 1.

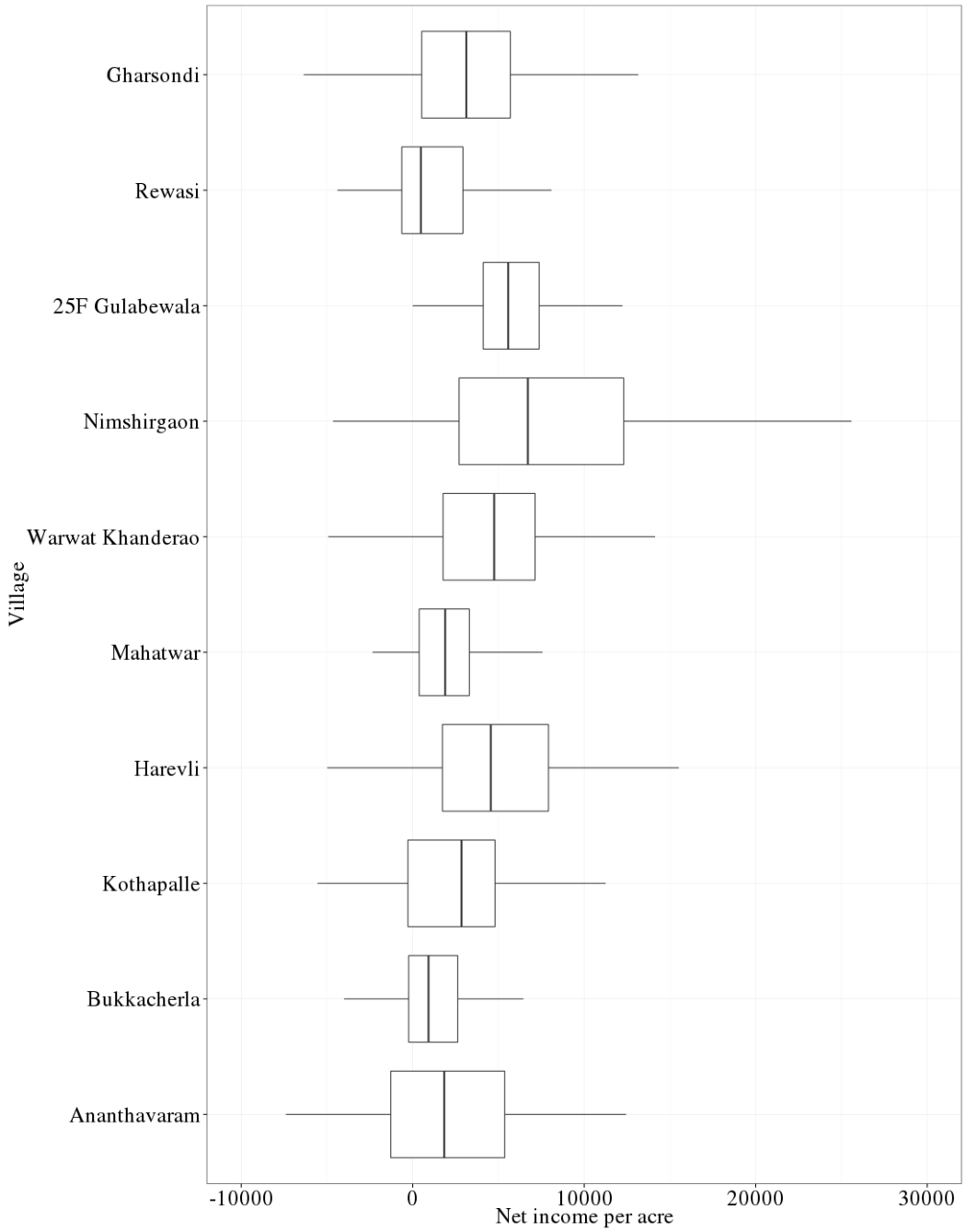

Figure 2: Box plots of income from crop production per acre of operational holding, by village, (2005-06 prices)

Notes: Outer vales have been omitted

Table 5: Median net income from crop production per acre of operational holding by class (2005-06 prices)

Village	Landlord	Peasant: 1 (rich)	Peasant: 2 (middle)	Peasant: 3 (poor)	Hired manual workers
Ananthavaram	7534	15022	3238	485	993
Bukkacherla	-274	1134	894	207	2159
Kothapalle	4839	2210	3188	3523	2039
Harevli	6636	8627	6640	2134	1634
Mahatwar	3458	6957	2656	952	1745
Warwat Khanderao	9576	7594	5515	5660	1358
Nimshirgaon	16231	13001	9449	5888	-58
25F Gulabewala	7077	6004	5890	0	0
Rewasi	3304	3299	469	517	-572
Gharsondi	7031	5634	3924	3035	1258

Table 6: Median net income over cost A1 from crop production per acre of operational holding by class (2005-06 prices)

Village	Landlord	Peasant: 1 (rich)	Peasant: 2 (middle)	Peasant: 3 (poor)	Hired manual workers
Ananthavaram	7534	15481	9698	7285	3642
Bukkacherla	754	1134	1726	1019	2159
Kothapalle	4839	3304	3678	6033	2039
Harevli	6636	9133	8281	7987	8791
Mahatwar	3458	6957	2945	2497	1745
Warwat Khanderao	9576	7594	5515	5660	1683
Nimshirgaon	16231	13001	9449	5989	-58
25F Gulabewala	7077	6502	6536	0	0
Rewasi	3611	3299	594	517	-572
Gharsondi	7497	5810	4235	3196	1258

3 Harevli (Western Uttar Pradesh)

Harevli is located in Najibabad block, Bijnor district, western Uttar Pradesh. Harevli is a small village; in 2006, 115 households and 674 persons were resident in Harevli. It is noteworthy that, although a small village in terms of population, the area of land in the jurisdiction of Harevli village is large (about 505 hectares). A substantial part of this land was owned by residents of neighbouring villages and by persons belonging to the Tyagi caste who had migrated from Harevli to cities for salaried jobs or to set up businesses. Many of these non-resident landowners leased out their land for cultivation to residents of Harevli.

Tyagi was the dominant caste in the village. Dalit households constituted 38 per cent of total households. About 21 per cent households belonged to Dheemar, an OBC caste. About 12 per cent households were Idrisi (tailor) Muslims.

The distribution of land across households belonging to different classes and castes was extremely unequal in Harevli. About 33 per cent of households in Harevli were landless at the time of the survey. Table 7 shows that there were three landlord households in Harevli. They all belonged to Tyagi caste. The rich and upper middle peasants also primarily belonged to Tyagi caste. There were a few Dheemar (OBC), Chamar (dalit) and Idrisi (Muslim) households in the upper and lower middle peasant classes. Most Dheemer households were poor peasants. Chamar households primarily belonged to poor peasant and hired manual worker classes. The class-wise analysis in this section primarily deals with differences between landlords, peasant classes and the section of hired manual workers who cultivated some land.

Agriculture was the mainstay of the economy of Harevli. Sugarcane was the most important crop in the village. In 2005-06, 62 per cent of operational holding of all households in Harevli had sugarcane on it. Of this, about 29 per cent had a planted crop of sugarcane in 2005-06 while the rest had a ratoon crop. Second most important crop was wheat, which was mostly cultivated as a standalone crop but sometimes intercropped with rapeseed. Together, wheat, as a standalone crop and when intercropped with rapeseed, covered about 26 per cent of the operational holding. In the kharif season, about 13 per cent of operational holding had fodder crops and about 11 per cent had paddy (Table 8).

Most cultivators harvested one ratoon crop of sugarcane before planting fresh sugarcane. In some cases, cultivators waited for two ratoon crops before fresh planting. Often, farmers cultivated a cycle of wheat and paddy before they planted a fresh crop of sugarcane. Fodder crops were also cultivated between two sugarcane crops (see Figure 3). Planting of sugarcane required an extremely intensive and prolonged period of land preparation during which a

substantial amount of labour had to be mobilised and a substantial expenditure on had to be incurred on tractors. Typically, large cultivators staggered planting of fresh sugarcane on different parts of their operational holding across different years. In addition, they needed wheat for their own consumption and fodder for their animals. Paddy, a premium *basmati* variety, on the other hand, was cultivated primarily as a cash crop. An important aspect of paddy cultivation in Harevli was that a large part of it was cultivated on seasonal tenancy contracts. Most commonly, large cultivators of Harevli leased out small plots of land on sharecropping contracts (in between two sugarcane crops) to their long-term workers for cultivation of paddy (Rawal, 2009).

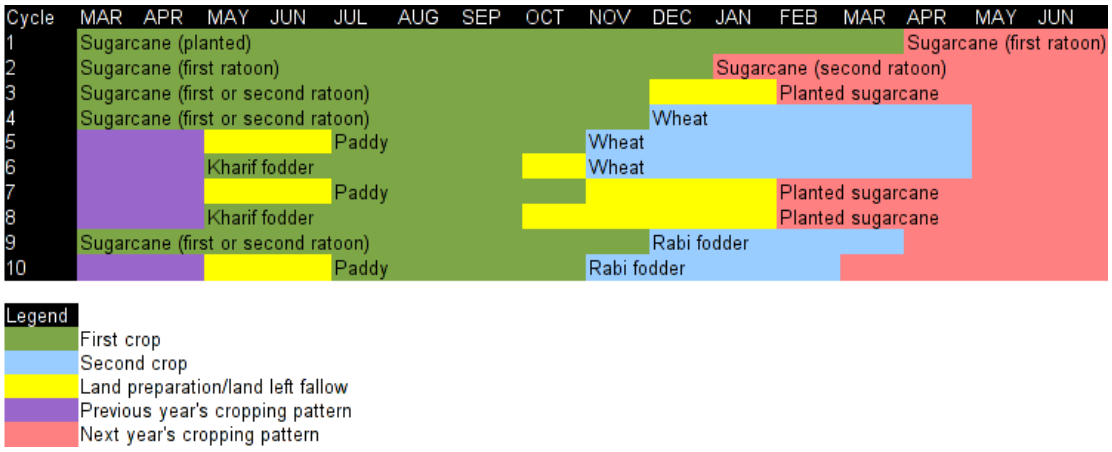

Figure 3: Crop cycles in Harevli

It is noteworthy that there were systematic variations in the mix of crops cultivated by households belonging to different classes. As shown in Table 9, landlords, rich peasants and middle peasants cultivated sugarcane on more than 60 per cent of land operated by them. On rest of the land, they primarily cultivated wheat and fodder crops. On the other hand, poor peasants and hired manual worker households with small operational holding primarily cultivated paddy on land leased in from larger landowners.

Land in Harevli was irrigated in the kharif season by a canal from the Eastern Ganga canal project. Tubewells (fitted with diesel or electric pumps) were used for additional irrigation, particularly in the rabi season. Most of the tubewells were owned by large landowning Tyagi households. Table 10 shows that there was a huge inequality in ownersip of irrigation equipment across classes. While all landlord, rich peasant and upper middle peasants had irrigation equipment of substantial value, only 18 per cent of poor peasants owned irrigation equip-

ment. Average value of irrigation equipment owned by a household was about Rs. 70,517 for landlords, Rs 29,900 for rich peasants and Rs. 23,096 for upper middle peasants. Poor peasants mainly owned small diesel pumpsets and the average value of their irrigation equipment was only Rs 9940. Table 11 shows that most of the land operated by landlords and rich peasants had access to supplementary irrigation from electric tubewells. The proportion of land irrigated by electric tubewells was considerably lower for middle peasants, who had to instead depend on diesel pumpsets for supplementary irrigation. On the other hand, poor peasants and manual worker households that cultivated land, had very little access to tubewell irrigation (and that too, received on payment from tubewells owned by other landowners).

It is noteworthy that average yield of sugarcane and wheat in Harevli was lower than the State-level average. An important feature of sugarcane production in Harevli was that the average yield for the planted crop was highest (50.5 tonnes per hectare), and the yield declined for subsequent ratoon crops (45.9 tonnes per hectare for the first ratoon, and 35.4 tonnes per hectare for the second ratoon). It may be noted that the official statistics on sugarcane yields do not separately provide data for planted and ratoon crops (Table 12). These, as a result, provide completely misleading estimates of cost of cultivation of sugarcane.[8]

Table 13 provides summary data on average value of per acre output, average cost A2 per acre and average net income per acre for different crops in Harevli, and the corresponding CACP data for UP as a whole. Following points may be noted from the Table.

First, the table shows that net income from cultivation of sugarcane, paddy and wheat were considerably lower in Harevli than the corresponding estimates from CACP data for UP as a whole. Low levels of net returns in Harevli were on account of both low yields (particularly of sugarcane and wheat) and a much higher cost of cultivation than the official estimates for UP as a whole. Average cost of cultivation of planted crop of sugarcane was Rs. 17,715 per acre. Cost of production in case of even ratoon crops was more than Rs. 8000 per acre. In comparison, average cost A2 in CACP data was only Rs. 6771 per acre. Similarly, average cost of production of wheat was Rs. 7721 per acre in Harevli and only Rs. 5097 per acre in UP as a whole.

Secondly, the table shows that gross value of output and returns from sugarcane cultivation were far higher than value of output and returns from cultivation of wheat, the second most important crop in Harevli. Returns from sugarcane were high even when one takes into account the fact that wheat was cultivated over a single season, while returns from sugarcane

[8]It is likely that the crop-cutting experiments are conducted primarily on fields that have a planted crop. This could be one source of yield gap between UP as a whole and Harevli. This however needs to be verified.

were realised roughly over one whole year.

Thirdly, corresponding to the pattern of yields, gross value of output was highest for planted crop of sugarcane and fell when ratoon crops were raised on the field. However, cost of cultivation was also considerably lower for ratoon crops in comparison with the cost for cultivation of planted crop. On balance, highest returns (Rs. 12014 per acre on average) were obtained from the first ratoon crop of sugarcane.

Fourthly, although the gross value of output for premium *basmati* rice cultivated in Harevli was high, the cost of cultivation was very high too. Paddy was cultivated primarily on seasonal tenancy contracts in Harevli. On account of high rental payments, the average profit in paddy cultivation was only Rs. 3686 per hectare.

Table 14 presents average gross value of output for planted and ratoon crops of sugarcane for different socio-economic classes. The table shows that the average gross value of output of both the planted crop and the ratoon crop of sugarcane declines very steeply as one goes from landlord to poor peasant households. Table 15 shows that although a broadly similar pattern is obtained in the case of net income from planted and ratoon crops of sugarcane, there is one important difference. On account of high cost of production (the level and structure of which we shall examine in the next section), landlord households had a marginally lower levels of net income than rich peasants. However, landlords and rich peasants ranked higher than middle and poor peasants in terms of net income also.

Let us examine the structure of cost of cultivation of different crops to identify which items contributed the most to high cost of cultivation.

Table 16 shows the average per acre expenditure on different items of cost. It is clear that between the ratoon crop and the planted crop, there is saving of cost on account of seed material, lower levels of use of manure and chemical fertilisers, lower spending on hired labour, and saving on cost of machinery for land preparation. Since there are plants in the earth, tractors cannot be used in ratoon crops. The ratoon crop, therefore, requires careful ploughing with bullocks between rows of sugarcane. This is reflected in higher cost of animals in ratoon crops rather than in machines.

In Harevli, 68 per cent of paddy cultivation was done on seasonal tenancy contracts. Land was leased out by landlord/rich-peasant Tyagi households on seasonal share contracts to dalit households for paddy cultivation. A central feature of these tenancy contracts was that the tenurial relationship was closely associated with other relations of dependence, through unfree labour relations and indebtedness. Most of these tenants worked for the landowner either as attached farm servants or as casual-workers-working-mostly-with-a-single-employer.

Given that, the terms of tenancy were closely tied to the extent and form of dependence of the worker on the landowner. Landowner would offer land at somwhat lower rents, plough the land with his tractor, or share a part of the costs if the land was given to a farm servant who had worked for several years and provided regular labour services. Such favours, however, were extended selectively based on relationships with individual tenants.

Typically, when land was given for cultivation of paddy, tenants were required to provide various kinds of labour services for the landowner. Paddy was cultivated in the kharif season primarily using canal irrigation to supplement monsoon. Work in sugarcane fields was relatively light during the months when paddy was cultivated (July to October) and mainly comprised weeding and irrigation. Farm servants continued to attend to these tasks while they were cultivating paddy on the land they leased. Even when the tenants were not employed as regular farm servants, they were required to perform various types of unpaid labour services for the landlord. Most commonly, the tenants were assigned tasks related to livestock tending like harvesting fodder, feeding livestock, milking them, and cleaning the cattleshed. The tenants were given no remuneration for these services.

Average value of gross rent on land leased in for paddy cultivation was Rs. 8914 per acre for one season. This was about 61 per cent of average gross value of output per acre. In comparison, net income of the tenant was 14.8 per cent of the gross value of output. Data reported by the landowners suggest that the average net rental income per acre of land leased out was Rs. 6294. This was about 46 per cent of average gross value of output from paddy on leased in land.

Table 7: Number of households, by class and caste, Harevli

Class	Brahmin	Tyagi	Dheemar	Carpenter	Chamar	Balmiki	Idrisi	(all)
Landlord	0	3	0	0	0	0	0	3
Peasant: 1 (rich)	0	9	1	0	0	0	0	10
Peasant: 2 (upper middle)	0	11	0	0	0	0	2	13
Peasant: 3 (lower middle)	0	6	4	0	2	0	3	15
Peasant: 4 (poor)	0	0	12	0	14	0	2	28
Hired manual workers	0	0	4	0	16	2	4	26
Household dependent on other occupations	1	2	2	1	4	2	2	14
(all)	1	31	23	1	36	4	13	109

Table 8: Proportion of different crops in gross cropped area and total operated land, Harevli

Season	Crop	Area	As proportion of GCA	As proportion of operational holding
Annual	Sugarcane (planted crop)	124.3	25.6	28.9
Annual	Sugarcane (first ratoon)	105.6	21.8	24.5
Annual	Sugarcane (second ratoon)	35.8	7.4	8.3
Annual	Sugarcane (total)	265.7	54.8	61.7
Kharif	Cereals (Paddy)	45	9.3	11
Kharif	Fodder crops	52.6	10.8	12.9
Kharif	Other crops	3.24	0.7	0.8
Rabi	Wheat and intercrops	107.5	22.2	25.3
Rabi	Fodder crops	9.6	2	2.3
Rabi	Other crops	1.2	0.2	0.3
Total	All	484.84	100	112.6

Table 9: Extent of different crops in land operated by households belonging to different classes, as per cent of operational holding, Harevli

Class	Sugarcane	Paddy	Wheat and intercrops	Fodder crops	Other crops
Landlord	66	4	26	15	0
Peasant: 1 (rich)	60	1	21	17	1
Peasant: 2 (upper middle)	65	5	32	23	0
Peasant: 3 (lower middle)	61	10	20	9	0
Peasant: 4 (poor)	47	68	46	5	6
Hired manual workers	0	72	0	8	0

Table 10: Proportion of households that owned irrigation equipment and average value of irrigation equipment, by class, Harevli

Class	Proportion of households that owned irrigation equipment	Value of irrigation equipment
Landlord	100	70517
Peasant: 1 (rich)	100	29900
Peasant: 2 (upper middle)	100	23096
Peasant: 3 (lower middle)	60	15306
Peasant: 4 (poor)	18	9940
Hired manual workers	20	7500

Table 11: Proportion of operational holding irrigated by different sources, by class, Harevli (per cent)

Class	Canal	Tubewell (electric)	Tubewell (diesel)
Landlord	100	100	31
Peasant: 1 (rich)	74	72	31
Peasant: 2 (upper middle)	55	37	53
Peasant: 3 (lower middle)	68	47	54
Peasant: 4 (poor)	71	25	15
Hired manual workers	77	32	14

Table 12: Average yields of selected crops in Harevli, Bijnor district, UP and India, 2005-06 (quintals per hectares)

Crop	India	UP (State)	Bijnor	Harevli
Sugarcane (Planted)	_	_	_	505
Sugarcane (1st ratoon)	_	_	_	459
Sugarcane (2nd ratoon)	_	_	_	354
Sugarcane (All)	669	582	604	473
Paddy	30	34	39	49
Wheat	26	29	27	26

Table 13: Average GVO, cost A2 and net income per acre, Sugarcane, Paddy and Wheat, Harevli

Crop	GVO per acre	Cost A2 per acre	Net income per acre
Sugarcane (planted crop)	25224	17715	7509
Sugarcane (first ratoon)	21003	8989	12014
Sugarcane (second ratoon)	16854	8550	8303
Sugarcane (Uttar Pradesh)	28686	6771	21915
Paddy	14341	10656	3686
Paddy (Uttar Pradesh)	8398	4328	4070
Wheat	8976	7721	1255
Intercrops (wheat and other crops)	9268	8405	863
Wheat (Uttar Pradesh)	10253	5097	5156

Table 14: Average gross value of output of planted and ratoon crops of sugarcane, by class, Harevli (Rupees per acre, 2005-06 prices)

Class	Sugarcane (planted crop)	Sugarcane (first ratoon)	Sugarcane (second ratoon)
Landlord	32220	26277	17003
Peasant: 1 (rich)	32318	24836	18352
Peasant: 2 (upper middle)	26583	20412	nil
Peasant: 3 (lower middle)	23071	20725	nil
Peasant: 4 (poor)	17951	18547	nil
Hired manual workers	nil	nil	nil

Table 15: Average net income from planted and ratoon crops of sugarcane, by class, Harevli (Rupees per acre, 2005-06 prices)

Class	Sugarcane (planted crop)	Sugarcane (first ratoon)	Sugarcane (second ratoon)
Landlord	10107	13133	9173
Peasant: 1 (rich)	13000	16934	9054
Peasant: 2 (upper middle)	6502	10918	nil
Peasant: 3 (lower middle)	7964	14672	nil
Peasant: 4 (poor)	2840	6281	nil
Hired manual workers	nil	nil	nil

Table 16: Average per acre cost of production of sugarcane, by different items of expenditure, Harevli (Rupees per acre, 2005-06 prices)

Item	Sugarcane (planted crop)	Sugarcane (first ratoon)	Sugarcane (second ratoon)
Seeds	2761	0	0
Manure	1779	518	295
Chemical fertilisers	1243	886	1150
Plant protection	147	104	32
Irrigation	1388	1371	1388
Hired labour	3536	1562	2396
Machines	2599	614	752
Animals	1243	1700	248
Rent	1129	1004	1135
Other costs	1019	793	765
Total cost	17715	8989	8550

Table 17: Gross value of output, various items of cost and net income for paddy, by tenancy status, Harevli (Rupees per acre, 2005-06 prices)

Variable	Owned	Leased (in)
Extent (acres)	14.4	30.6
Value of output	14004	14506
Seeds	268	117
Manure	953	59
Chemical fertilisers	543	506
Plant protection	88	14
Irrigation	458	197
Hired labour	1511	827
Machines	741	120
Animals	488	1119
Rent	0	8914
Other costs	414	178
Total cost	5627	12354
Net income	8378	2152

4 Mahatwar (Eastern Uttar Pradesh)

Mahatwar village is in Rasra tehsil, Ballia district, eastern Uttar Pradesh. Mahatwar is located on the side of the highway linking Rasra and Mau. There were 159 households and 1,114 persons resident in Mahatwar when the PARI survey was conducted in 2006. Mahatwar is a multi-caste village, with 10 different castes. Dalits, belonging to Chamar and Dusad castes, accounted for 60 per cent of all households. Rajput was the dominant land-owning caste. Landlord households in Mahatwar belonged to Brahmin and Rajput castes. Rich and middle peasant households primarily belonged to Yadav and Koiri castes, both belonging to OBC category. Poor peasants and hired manual workers primarily belonged to Chamar and Dusad, both dalit, castes (Table 18).

It is noteworthy that a substantial number of workers from Mahatwar, particularly from among poor peasant and hired manual classes and from among dalit castes, worked in non-agricultural occupations in villages and cities near Mahatwar as well as migrated to far off cities for non-agricultural wage labour. Wage labour in such non-agricultural occupations accounted for a substantial share of total household income not only of hired manual worker households but also of some poor peasant households (even though, in general, poor peasant households deployed a major share of family labour on their own land).

Major crops grown in Mahatwar were paddy, cultivated in the kharif season, and wheat, cultivated in the rabi season. Paddy was cultivated on about 77 per cent of operational holding in the kharif season in 2005-06. Wheat (sometimes inter-cropped with rapeseed) accounted for cultivation on about 75 per cent of operational holding in the rabi season (Table 19). Sugarcane was cultivated on about 7 per cent of operational holding. Sugarcane was primarily cultivated by landlord, rich peasant and middle peasant households (Table 20).[9]

Crop production in Mahatwar, particularly in 2005-06, took place under considerable stress due to deficiency of water. Tubewells powered by diesel or electricity were the only source of irrigation in Mahatwar. As shown in Table 21, ownership of tubewells was highly concentrated in the hands of landlords, rich peasants and upper-middle peasants. On the other hand, only 7 per cent of poor peasant and 13 per cent of cultivators among hired manual worker households owned irrigation equipment. These households owned small diesel-driven pumpsets having low value and low irrigation potential. As shown in Table 22, 81 per cent land cultivated by landlords and 84 per cent of land cultivated by rich peasants was irrigated

[9]Sugarcane cultivation in this area got a fillip with establishment of The Kisan Sahkari Chini Mills Limited, Rasra, which started operating in 1975.

by tubewells owned by them. In contrast, only 4 per cent of land cultivated by poor peasants and 2 per cent of land cultivated by hired manual worker households was irrigated by their own tubewells. In particular, poor peasants and cultivators among hired manual workers purchased water from diesel tubewell owners at a very high cost.

With high cost of irrigation, and its limited availability, paddy cultivation in kharif was particularly risky and yield levels were low. In 2005-06, average yield of paddy in Mahatwar was only 16 quintals per hectare. In comparison, average yield of paddy in UP as a whole in 2005-06 was 34 quintals per hectare. Average yield of wheat was 23 quintals per hectare in Mahatwar and 29 quintals per hectare in UP as a whole. Average yield of sugarcane, cultivated in Mahatwar primarily by landlords, rich and middle peasants, was 242 quintals per hectare in Mahatwar and 582 quintals per hectare in UP as a whole.[10]

Agriculture in Mahatwar was characterised by remarkably low levels of returns. In 2005-06, about 19 per cent of cultivators incurred a loss in crop production (Table 2). Median net income per acre of operational holding was only Rs. 1871 (Table 3). Data on average income from cultivation of different crops in Mahatwar in 2005-06 presented in Table 24 show that average income from cultivation of paddy was negative. Average income from cultivation of standalone wheat and wheat intercropped with rapeseed, although positive, were very low.

Table 25 shows that returns from paddy cultivation were low for all classes. Except landlord households, average returns from cultivation of paddy were either negative or negligible for households belonging to all socio-economic classes. It is interesting to note that, given low levels of returns from paddy cultivation, landlords, rich peasants and upper middle peasants left a substantial part of their land fallow during kharif season (Table 20). On the other hand, lower-middle and poor peasants, given that they had very little land and needed some rice for self-consumption, had to cultivate almost all their land in kharif even if they were dependent primarily on rain, faced high cost of irrigation and, consequently, incurred a loss in some years.

Data on structure of costs in cultivation of paddy in Mahatwar show that irrigation was the most important item of cost and accounted for, on average, about 27 per cent of cost A2 (Table 26). The share of irrigation in cost A2 was particularly high for lower-middle peasants

[10]Given that the extent of sugarcane cultivation in Mahatwar was small, we have not presented the results separately for planted and ratoon crops. However, as in Harevli, average yield of planted crop was higher than the average yield of ratoon crops. Data for 2008-09 from the Kisan Sahkari Chini Mills Limited, Rasra show that average production of sugarcane in the area covered by the mill was about 348 quintals per hectare. Data from Mahatwar for 2005-06, however, show considerably lower yields.

(28 per cent), poor peasants (27 per cent) and hired manual worker households that were engaged in some cultivation (32 per cent). Poor peasants also incurred, on average, higher cost on account of rental payments. As is expected, poor peasants saved on cost of hiring labour by substituting hired labour with family labour. As a result, average expenditure on hired labour declines as one goes from landlord and rich peasants to poor peasants.

Data on average returns from wheat cultivation in the rabi season show that rich peasants obtained highest returns, and that the returns fell sharply as one went to middle and poor peasants (Table 27). It is noteworthy that high returns were obtained on account of cost-saving by landlords and on account of a combination of high output and low cost by the rich peasants. On the other hand, poor peasants had relatively low per hectare output and a relatively high per hectare cost.

Data on structure of cost of cultivation of wheat (Table 28) shows that irrigation, seed, fertiliser and machinery were the most important items of cost. Of these, there was a clear pattern in cost of irrigation, which were lowest for landlords and rich peasants, and increased progressively for middle peasants and for poor peasants. For poor peasants, rent for leased in land also constituted a major item of cost.[11]

To summarise, given the inadequate availability of irrigation, crop production in Mahatwar was characterised by low levels of investment and poor yields. Peasants, in particular poor peasants, spent little on modern inputs like chemical fertilisers. On the other hand, cost of irrigation was high, particularly for lower-middle peasants, poor peasants and cultivators among hired manual workers. These households at best obtained meagre returns from crop production and often incurred losses.

[11]A noteworthy feature of data on incomes from crop production and cost of cultivation for Mahatwar is that hired manual worker households had lower cost of cultivation and higher net incomes than poor peasant households. This was primarily because cultivators among hired manual worker households primarily cultivated small owned holdings. On the other hand, a substantial proportion of land cultivated by poor peasants was leased-in. Difference on account of higher rental payments for poor peasant households accounted for the difference in level of cost and net returns between these and hired manual worker households.

Table 18: Number of households, by class and caste, Mahatwar

Class	Chamar	Dusad	Yadav	Koiri	Nai	Other caste	(all)
Landlord	0	0	0	0	0	4	4
Peasant: 1 (rich)	0	0	1	0	0	1	2
Peasant: 2 (upper middle)	0	0	4	1	0	1	6
Peasant: 3 (lower middle)	6	3	13	8	0	2	32
Peasant: 4 (poor)	21	3	1	4	0	1	30
Hired manual workers	28	5	0	3	0	0	36
Household dependent on other occupations	22	6	4	3	5	6	46
(all)	77	17	23	19	5	15	156

Table 19: Proportion of different crops in gross cropped area and total operated land, Mahatwar

Season	Crop	Area	As proportion of GCA	As proportion of operational holding
Kharif	Paddy	168	45	77.3
Kharif	Fodder crops	3	0.9	1.5
Kharif	Other crops	4	1	1.7
Rabi	Wheat and intercrops	164	43.9	75.5
Rabi	Fodder crops	3	0.8	1.3
Rabi	Other crops	16	4.4	7.6
Annual	Sugarcane	15	4	6.9
Total	All	374	100	172

Table 20: Extent of different crops in land operated by households belonging to different classes, as per cent of operational holding, Mahatwar

Class	Paddy	Wheat and intercrops	Sugarcane	Other crops (kharif)	Other crops (rabi)	Fallow (kharif)	Fallow (rabi)
Landlord	78	74	6	5	15	11	5
Peasant: 1 (rich)	68	78	19	1	1	12	2
Peasant: 2 (upper middle)	66	68	16	2	9	16	6
Peasant: 3 (lower middle)	84	77	11	4	9	1	2
Peasant: 4 (poor)	94	90	0	0	4	6	6
Hired manual workers	91	70	0	1	2	8	27

Table 21: Proportion of households that owned irrigation equipment and average value of irrigation equipment, by class, Mahatwar

Class	Proportion of households that owned irrigation equipment	Value of irrigation equipment
Landlord	100	24625
Peasant: 1 (rich)	50	52000
Peasant: 2 (upper middle)	50	21800
Peasant: 3 (lower middle)	28	9556
Peasant: 4 (poor)	7	3600
Hired manual workers	13	1867

Table 22: Proportion of operational holding irrigated by tubewells, by class, Mahatwar (per cent)

Class	Tubewell (electric, owned)	Tubewell (diesel, owned)	Tubewell (electric, government)	Tubewell (electric, water-seller)	Tubewell (diesel, water-seller)
Landlord	26	55	0	19	0
Peasant: 1 (rich)	84	0	5	11	0
Peasant: 2 (upper middle)	34	0	0	48	59
Peasant: 3 (lower middle)	11	7	7	45	49
Peasant: 4 (poor)	0	4	0	10	90
Hired manual workers	0	2	5	13	87

Table 23: Average yields of selected crops in Mahatwar, Ballia district, UP and India, 2005-06 (quintals per hectare)

Crop	India	Uttar Pradesh	Ballia	Mahatwar
Paddy	30	34	22	16
Wheat	26	29	21	23
Sugarcane	669	582	488	242

Table 24: Average GVO, cost A2 and net income per acre, Paddy, Wheat and Sugarcane, Mahatwar

Crop	GVO per acre	Cost A2 per acre	Net income per acre
Paddy (Mahatwar)	3190	3457	-267
Paddy (Uttar Pradesh)	8398	4328	4070
Wheat (Mahatwar)	6274	4435	1839
Wheat+Rapeseed (Mahatwar)	6441	3785	2657
Wheat (Uttar Pradesh)	10253	5097	5156
Sugarcane (Mahatwar)	19402	7704	11698
Sugarcane (Uttar Pradesh)	28686	6771	21915

Table 25: Average gross value of output and net income from cultivation of paddy, by class, Mahatwar (Rupees per acre, 2005-06 prices)

Class	Value of output	Cost A2	Net income
Landlord	4649	3162	1486
Peasant: 1 (rich)	2826	3137	-311
Peasant: 2 (upper middle)	3848	3810	38
Peasant: 3 (lower middle)	3232	3158	74
Peasant: 4 (poor)	3250	3786	-536
Hired manual workers	3020	3307	-287

Table 26: Average per acre cost of production of paddy, by different items of expenditure, by class, Mahatwar (Rupees per acre, 2005-06 prices)

Item	Land-lord	Peas-ant: 1 (rich)	Peasant: 2 (upper middle)	Peasant: 3 (lower middle)	Peas-ant: 4 (poor)	Hired manual workers	(all)
Seeds	368	591	333	378	429	378	395
Manure	17	240	142	45	46	57	57
Chemical fertilisers	687	375	663	392	462	410	444
Plant protection	0	0	6	22	40	19	25
Irrigation	170	156	849	876	1036	1155	952
Hired labour	1071	600	1019	453	220	0	333
Machines	442	1050	553	536	509	592	549
Animals	0	0	0	0	9	0	3
Rent	0	0	31	207	829	363	417
Other costs	348	61	132	181	123	266	182
Total cost	3162	3137	3810	3158	3786	3307	3432

Table 27: Average gross value of output and net income from cultivation of wheat, by class, Mahatwar (Rupees per acre, 2005-06 prices)

Class	Value of output	Cost A2	Net income
Landlord	5782	3483	2299
Peasant: 1 (rich)	8550	3278	5272
Peasant: 2 (upper middle)	7974	3941	4033
Peasant: 3 (lower middle)	5640	3719	1921
Peasant: 4 (poor)	6251	4957	1295
Hired manual workers	7021	4704	2317

Table 28: Average per acre cost of production of wheat, by different items of expenditure, by class, Mahatwar (Rupees per acre, 2005-06 prices)

Item	Land-lord	Peas-ant: 1 (rich)	Peasant: 2 (upper middle)	Peasant: 3 (lower middle)	Peas-ant: 4 (poor)	Hired manual workers	(all)
Seeds	529	600	647	603	609	671	618
Manure	16	30	72	39	51	38	43
Chemical fertilisers	808	960	867	722	840	734	782
Plant protection	4	0	0	23	12	0	11
Irrigation	208	216	561	753	1130	1185	927
Hired labour	711	0	257	63	124	6	121
Machines	647	1292	1093	797	835	934	857
Animals	0	0	0	0	0	0	0
Rent	0	0	56	297	986	190	473
Other costs	490	109	300	338	260	854	430
Total cost	3483	3278	3941	3719	4957	4704	4357

5 Nimshirgaon (Southern Maharashtra)

Nimshirgaon, in Kolhapur district of Southern Maharashtra, is situated in an area that has had a long history of cultivation of sugarcane. Large surpluses generated from cultivation of sugarcane have fuelled investments not only in agriculture but also financed industrialisation in the area. Control of landlords and big-capitalist farmers of the area extends not only on land and other resources in the village but also on sugar mills and other industries in the area.

Nimshirgaon is a large village. In 2007, when PARI survey was conducted, there were 757 households resident in the village. The PARI survey in Nimshirgaon was a sample survey. After a house-listing survey, 137 sample households were selected using a stratified random sample designed to ensure adequate representation of different occupational and land-size categories. Data presented in this section are population estimates derived from the sample.

Jain and Maratha were the dominant social groups in Nimshirgaon. The three landlord households were all Jain. They owned the largest extent of land and were wealthiest among all households. The rich peasants belong to Jain and Maratha caste groups. Poor peasants and hired manual workers were multi-caste socio-economic categories with representation of most major castes of the village, including Jain and Maratha. At the same time, most Mahar (dalit), Matang (dalit) and Muslim households belong to hired manual worker category (Table 29).

Cropping pattern in Nimshirgaon was very diverse (Table 30). Sugarcane, flowers, fruits and vegetables were cultivated on irrigated land. Sugarcane accounted for about 34 per cent of operated area. In Nimshirgaon, sugarcane, in particular the planted crop, was sometimes inter-cropped with fodder crops and vegetables that were harvested in the early stages of growth of sugarcane. Soybean was the second most important crop; it accounted for 23.5 per cent of operated area in the kharif season. Groundnut was cultivated on about 8 per cent of operated area in the kharif season. Sorghum, sown mainly as an early Rabi crop after harvesting Soybean, was an important cereal consumed by households in Nimshirgaon and accounted for cultivation on about 18 per cent of the operational holding in the rabi season. Of various fruits and vegetables cultivated in Nimshirgaon, grapes were the most important.[12] In addition to these crops, paddy, wheat, pulses and fodder crops were also cultivated on small extents of land.

Table 31 shows that the cropping pattern on land cultivated by landlords and rich peasants was dominated by cultivation of sugarcane, and fruits, vegetables and flowers. Table 31 also

[12]The variety of grapes grown in Nimshirgaon was mainly meant for final consumption in the form of raisins.

shows that the share of land sown with these crops falls sharply as one goes to middle peasants, poor peasants and to manual workers. Cropping pattern of households belonging to these classes was dominated by soybean, sorghum and groundnut.

In 2006-07, about 75 per cent of land in Nimshirgaon had some access to irrigation. Of this, about 65 per cent was irrigated by open wells and about 19 per cent by tubewells. In Nimshirgaon, there was a river lift irrigation scheme that pumped water from a stream; this scheme irrigated about 6 per cent of operational holdings in 2006-07 (Table 32). Data on access to irrigation across classes (Table 33) suggests that landlords and rich peasants had better access to tubewell irrigation while the middle and small peasants were mainly dependent on open wells and water from the river lift irrigation scheme.

Table 34 shows average gross value of output, cost A2 and net income from per acre cultivation of different crops in Nimshirgaon. The table shows that grapes and sugarcane were by far the most profitable crops. These, however, also required considerably higher investment than other crops. Average cost of cultivation of grapes was Rs. 90112 per acre and that of planted crop of sugarcane was Rs. 17850 per acre. As seen in case of Harevli, net income from ratoon crop of sugarcane was higher than net income from planted crop of sugarcane because of low cost of cultivation of ratoon crops. Table 35 shows that the cost of cultivation for the ratoon crop of sugarcane was about 60 per cent of the cost of cultivation of the planted crop of sugarcane. The cost of cultivation of ratoon crop was lower mainly on account of saving on seed cane, hired labour and machinery. It may be noted that, in Nimshirgaon, sugarcane was harvested by workers employed by contractors of sugar mill to which the cane was contracted. Cultivators did not incur any cost on account of harvesting of sugarcane.[13] This resulted in a considerable saving of cost of hiring labour and machinery in sugarcane cultivation.

It is noteworthy that returns from cultivation of soybean, groundnut, pulses and sorghum were very low. Average net income was only Rs. 3724 per acre from cultivation of sorghum, Rs. 1166 per acre from cultivation of soybean, and Rs. 205 per acre from cultivation of groundnut. Average income from cultivation of pulses was negative (Table 34). For these crops, cost of hiring labour and deploying machines were the most important items of cost. Expenditure on seed, fertilisers, manure and irrigation was relatively low in case of these crops (Table 36).

In Nimshirgaon, there was a very clear positive relationship between scale of production

[13] In this respect, sugarcane cultivation in Nimshirgaon was significantly different from sugarcane cultivation in other PARI villages.

on the one hand, and gross value of output and net returns on the other (see Table 3). This relationship was obtained as a result of better command of landlords and rich peasants on access to irrigation, credit and investible resources, and access to technical knowledge. These allowed landlord and rich peasant households to grow more profitable crops on a greater proportion of land. On the other hand, poor peasant and hired manual worker households had poorer access to investible funds, credit and technical knowledge.

Table 37 shows that landlord households were able to get agricultural credit from formal-sector and semi-formal institutions, and rich peasants borrowed from semi-formal institutions. Proportion of households which had borrowed from formal and semi-formal sources of credit, and the average amount of credit, declined sharply as one moved from landlord and rich peasant households to poor peasant and hired manual worker households.

Cultivation of horticultural crops and flowers not only required high investment but also required specialised knowledge. Only a few persons, mainly from among landlord and rich peasant households, had the technical know-how for cultivation of such crops.

Also, given smaller landholdings, poor peasant and manual worker households were required to use a greater proportion of their land for cultivation of subsistence crops like sorghum. Land cultivated with sorghum in the rabi season had to be planted with soybean and groundnut in the kharif season, and cultivation of long-term/annual horticultural crops like sugarcane and grapes could not be done on such land.

Table 29: Number of households, by class and caste, Mahatwar

Class	Dalit	Muslim	Nomadic tribe	OBC	Other caste	(all)
Landlord	0	0	0	0	3	3
Peasant: 1 (rich)	0	0	0	0	21	21
Peasant: 2 (middle)	9	0	9	0	116	135
Peasant: 3 (small)	44	1	20	23	47	133
Hired manual workers	154	44	5	18	78	299
Business activity/self-employed	8	2	0	10	50	70
Salaries, pensions and remittances	33	0	5	10	49	96
(all)	247	47	39	60	365	757

Table 30: Proportion of different crops in gross cropped area and total operated land, Nimshirgaon

Season	Crop	Area	As proportion of GCA	As proportion of operational holding
Annual	Sugarcane and intercrops	523	31.2	34.1
Annual	Fruits, vegetables and flowers	41	2.5	2.7
Annual	Other crops	6	0.3	0.4
Kharif	Fruits, vegetables and flowers	84	5	5.5
Kharif	Sorghum	16	0.9	1
Kharif	Soybean	360	21.5	23.5
Kharif	Groundnut	121	7.2	7.9
Kharif	Other cereals	23	1.4	1.5
Kharif	Pulses	16	1	1
Kharif	Other crops	72	4.3	4.7
Rabi	Fruits, vegetables and flowers	11	0.7	0.7
Rabi	Sorghum	274	16.4	17.9
Rabi	Other cereals	41	2.5	2.7
Rabi	Pulses	17	1	1.1
Rabi	Other crops	71	4.2	4.6
Total	All	1677	100	109.3

Table 31: Proportion of area under different crops in gross cropped area of households belonging to different classes, Nimshirgaon

Crops	Landlord	Peasant: 1 (rich)	Peasant: 2 (middle)	Peasant: 3 (small)	Hired manual workers
Sugarcane and intercrops	24	41	37	18	2
Fruits, vegetables and flowers	25	18	4	7	7
Sorghum	21	11	15	19	35
Soybean	17	11	21	25	27
Groundnut	2	6	7	11	10
Other cereals	5	4	3	1	7
Pulses	0	1	2	1	9
Other crops	6	9	10	16	1

Table 32: Proportion of operational holding irrigated by different sources, Nimshirgaon (per cent)

Source	Lift/Gravity	Area	Per cent
Open well	Electricity	983	64.1
Open well	Diesel	8	0.5
Tubewell	Electricity	287	18.7
River	...	92	6
Drain	Diesel	9	0.6
Unirrigated	...	382	24.9
Total operational holding	...	1534	100

Table 33: Share of irrigated area in operational holding, by class, Nimshirgaon (per cent)

Class	Tubewell	Open well	River	Drain	Unirrigated	Total operational holding
Landlord	58	72	0	0	11	100
Peasant: 1 (rich)	55	39	5	0	32	100
Peasant: 2 (middle)	12	84	4	0	9	100
Peasant: 3 (small)	0	68	7	4	23	100
Hired manual workers	0	12	0	0	88	100
Other households	14	47	15	0	45	100

Table 34: Average GVO, cost A2 and net income per acre, major crops, Nimshirgaon (2006-07 prices)

Crop	GVO per acre	Cost A2 per acre	Net income per acre
Sugarcane (planted crop)	31413	17850	13563
Sugarcane (ratoon crop)	28593	10627	17966
Grapes	174607	90112	84494
Tomato	29756	25202	4554
Sorghum	6689	2965	3724
Soybean	5985	4819	1166
Groundnut	5815	5610	205
Pulses	3830	4521	-691
Wheat	10038	6388	3650

Table 35: Average per acre cost of production of planted and ratoon crops of sugarcane, by different items of expenditure, Nimshirgaon (Rupees per acre, 2006-07 prices)

Item	Sugarcane (planted crop)	Sugarcane (ratoon crop)
Seed cane	2496	0
Manure	1977	1054
Chemical fertilisers	3419	3244
Plant protection	227	145
Irrigation	2351	2676
Hired labour	3734	1255
Machines	1430	673
Animals	136	14
Rent	0	0
Other costs	885	929
Total cost	17850	10627

Table 36: Average per acre cost of production of soybean (kharif), groundnut (kharif), sorghum (rabi) and wheat (rabi) by different items of expenditure, Nimshirgaon (Rupees per acre, 2006-07 prices)

Item	Soybean (Kharif)	Groundnut (Kharif)	Sorghum (Rabi)	Wheat (Rabi)
Seeds	419	779	121	395
Manure	244	701	161	354
Chemical fertilisers	402	527	249	516
Plant protection	189	51	22	187
Irrigation	85	390	193	977
Hired labour	1524	1471	1246	2246
Machines	1196	1181	659	1279
Animals	211	140	231	31
Rent	66	0	65	0
Other costs	372	242	205	263
Total cost	4819	5610	3222	6388

Table 37: Proportion of households and average amount of outstanding debt from loans taken for recurrent agricultural expenses, by class, Nimshirgaon, 2006-07

Class	Average debt (formal)	Proportion of households (formal)	Average debt (semi-formal)	Proportion of households (semi-formal)	Average debt (informal)	Proportion of households (informal)
Landlord	1400000	33	1222618	100	0	0
Peasant: 1 (rich)	0	0	93385	57	0	0
Peasant: 2 (middle)	53000	2	48405	12	55000	2
Peasant: 3 (small)	0	0	14950	21	10000	7
Hired manual workers	0	0	65915	3	0	0

6 Rewasi (Semi-arid region, Rajasthan)

Rewasi, in Sikar district in Rajasthan, was surveyed as part of PARI studies in 2010. Rewasi is a multi-caste village. Jats are economically and politically the dominant caste. Jat households, once tenants of Rajput jagirdars, obtained ownership rights over land as a result of the abolition of zamindari and jagirdari system. In contrast, Rajputs no longer hold the same position of dominance in the village that they once did. In 2010, rajput households in Rewasi were economically poor and owned small amounts of land. There were also Brahman, Meena (Scheduled Tribe) and Meghwal (Dalit) households in Rewasi.

Distribution of land ownership in Rewasi was characterised by substantial inequality in the extent of ownership of land across social groups and classes albeit with a relatively low level of landlessness.

The reference year of the survey in Rewasi, 2009-10, was a year marked by low rainfall and widespread crop failures in the kharif season. Data from Rewasi should be interpreted in light of this.

Pearl millet was the most important crop of the kharif season in Rewasi. In the rabi season, land irrigated by tubewells was sown with wheat, mustard, onions and fenugreek. Irrigation, access to which was extremely limited in Rewasi, played a critical role in a village characterised by sandy soils and low rainfall. In 2009-10, there were about 75 tubewells in the village.[14]

Given that the soil was sandy and temperatures during summer were high, irrigation water was seldom used on kharif crops. Table 38 shows that only 27 per cent of operational holdings were provided some irrigation in the kharif season. In 2009-10, pearl millet crop on almost all the land had failed completely because of inadequate rainfall.

Rabi crops were cultivated only on irrigated land. As seen in Table 38, only 49 per cent of operational holding was irrigated and cropped in the rabi season; rest of the land was left fallow. Table 39 shows that the share of irrigated area in the kharif and the rabi season was particularly low for lower middle peasants (Peasant: 3), poor peasants (Peasant: 4) and hired manual worker households. On the other hand, landlords and rural rich operated not only the highest area, their lands had relatively better access to irrigation.

Table 40 shows that, in the kharif season, 28 per cent of operational holding had a standalone crop of pearl millet, 20 per cent had standalone crops of pulses, and another 15 per cent had pearl millet inter-cropped with different kharif pulses. In the rabi season, wheat was

[14] This includes tubewells sunk inside traditional open wells because of a fall in water table.

sown on 21 per cent and rapeseed on 13 per cent of operational holding.

Income from crop production was very low in 2009-10 in Rewasi. Kharif crops had failed on most plots of land. As a result, cultivators incurrd losses in crop production on single-cropped land. On irrigated land, which could also be cultivated in the rabi season, income from rabi crops covered losses incurred in the kharif season. As a result, median net income per acre of operational holding in Rewasi was lowest among all the study villages (Rs. 469 per acre at 2005-06 prices) (Table 3).

At the village level, taking the whole year, income from crop production constituted only 11 per cent of total household income in Rewasi. Total income from crop production of 202 households which had cultivated land in Rewasi, in 2009-10 prices, was Rs. 36 lakhs. In comparison, total household income (from all sources together) of top two households in Rewasi was Rs. 50 lakhs. Out of 202 households that cultivated land in 2009-10, 85 households incurred a net loss. Crop production was the most important source of income for only 28 out of 202 cultivating households.

In Rewasi, there was a very clear positive relationship between net income and scale of production. As shown in Table 5, median net income per acre was relatively high for the top two categories, fell sharply when one went to the bottom two peasant classes, and was negative for hired manual workers. This was, most importantly, a result of the fact that the rural rich, with better access to tubewell irrigation, could cultivate a greater share of their operational holding in the rabi season.

Table 41 shows that the proportion of area on which kharif crops completely failed and the proportion of households that incurred losses in kharif cultivation rises clearly as one goes from top classes towards the poorest peasant classes. Table 42 shows that the average return from cultivation of kharif crops was marginally positive for the top two categories and negative for the rest, and declined from the top category to the bottom.

Data for Rewasi refer to a year in which kharif crops had failed. These data suggest that the economic impact of crop failures is not class-neutral. In Rewasi, lower-middle and poor peasants suffered the most on account of crop failures. Given poorer access to irrigation, they depended mostly on kharif cultivation. On the other hand, landlords, rural rich and rich peasants were able to contain their losses in kharif season by profitable irrigated cultivation in the rabi season.

Table 38: Share of irrigated, unirrigated and fallow land in total operational holdings, by crop season, Rewasi (per cent)

Crop season	Tubewell/openwell with sprinkler	Unirrigated	Fallow
Kharif	27	44	29
Rabi	49	0	51

Table 39: Share of irrigated area in total operational holding in kharif and rabi seasons, by class, Rewasi (per cent)

Class	Kharif	Rabi
Landlords and rural rich	41	57
Peasant: 1	37	56
Peasant: 2	34	58
Peasant: 3	21	39
Peasant: 4	24	54
Hired workers	12	29

Table 40: Share of different crops in operational holding and gross cropped area, Rewasi (per cent)

Season	Crop	Share in gross cropped area	Share in operational holding
Kharif	Cereals (Pearl millet)	23	28
Kharif	Pulses	17	20
Kharif	Intercrops (pearl millet and other crops)	13	15
Kharif	Fodder crops	2	2
Kharif	Oilseeds	2	3
Kharif	Other crops	2	3
Rabi	Wheat	17	21
Rabi	Rapeseed	11	13
Rabi	Barley	4	5
Rabi	Fodder crops	3	3
Rabi	Other crops	3	3
Rabi	Fenugreek	2	3
Rabi	Onion	1	1
Annual	All	100	120

Table 41: Proportion of land on which kharif crops failed and proportion of households that incurred loss in kharif cultivation, by class, Rewasi, 2009-10

Class	Proportion of area on which crops failed	Proportion of households that incurred losses
Landlords and rural rich	49	50
Peasant: 1	44	46
Peasant: 2	50	76
Peasant: 3	75	81
Peasant: 4	67	83
Hired workers	85	86
All households	64	78

Table 42: Average gross value of output, cost A2 and net income per acre in the kharif season, by class, Rewasi (2009-10 prices)

Class	GVO	Cost A2	Net income
Landlords and rural rich	1781	1670	110
Peasant: 1	1857	1487	370
Peasant: 2	1301	1677	-376
Peasant: 3	1030	1480	-450
Peasant: 4	854	1924	-1070
Hired workers	626	1904	-1278
All households	1044	1707	-663

Table 43: Average gross value of output, cost A2 and net income per acre in the rabi season, by crop, Rewasi (2009-10 prices)

Crop	Gross value of output	Cost A2	Net income
Wheat	19077	9023	10053
Rapeseed	12873	5660	7213
Barley	11316	6715	4601
Chick pea	5122	6910	-1788

Table 44: Average gross value of output, cost A2 and net income, Wheat, Rapeseed and Barley, Rewasi and Rajasthan (Rupeees per acre, 2009-10)

Crop	Village/State	GVO	Cost A2	Net income
Wheat	Rewasi	19077	9023	10053
Wheat	Rajasthan	21356	5910	15446
Rapeseed	Rewasi	12873	5660	7213
Rapeseed	Rajasthan	13571	3161	10410
Barley	Rewasi	11316	6715	4601
Barley	Rajasthan	17128	4884	12245

Table 45: Net income per acre from wheat and rapeseed cultivation, by class, Rewasi (Rupees per acre, 2009-10 prices)

Class	Wheat	Rapeseed
Landlords and rural rich	11616	8866
Peasant: 1	14197	7231
Peasant: 2	10781	6596
Peasant: 3	10371	6938
Peasant: 4	8548	6811
Hired workers	9012	4923

7 25 F (Gulabewala) (Gang canal region, Rajasthan)

25 F (Gulabewala), a village in the command area of the Gang canal project in Sri Ganganagar district, is marked by very high inequality in ownership of land and of incomes. In 2007, when the village was surveyed, 204 households lived in 25 F Gulabewala. Major castes in the village were: Jat Sikh, the dominant land-owning caste, Majhabi Sikh (dalit) and Nayak (dalit).

There was a very strong overlap between castes and classes in the village. As shown in Table 46, all households in the top three classes were Jat Sikh. There was only one non-Jat Sikh household in the fourth class. On the other hand, the class of manual workers primarily comprised dalit households; there were only two non-dalit households in this class.

The most striking feature of agrarian structure of 25 F (Gulabewala) was the level of inequality in ownership and operational holdings of land (Tables 47 and 48). The divide between landowning Jat Sikh community and the landless dalits was a defining feature of agrarian structure of the village. About 65 per cent of households in 25 F (Gulabewala) were landless. The largest landowning household had 287 acres of land. Agricultural land was owned primarily by Jat Sikh households; only three Dalit households, out of a total of 123 Dalit households resident in the village, owned any agricultural land. On the other hand, in 25 F (Gulabewala), inequality in ownership of land among the landowners (and inequality in operational holding of land among the cultivators) was relatively low.

Among all the PARI villages, 25 F (Gulabewala) stands out as a village with highest levels of capitalist differentiation. Agrarian structure in 25 F (Gulabewala) comprised capitalist Jat Sikh farmers (with a relatively low degree of disparity within them) and a large proportion of landless dalit agricultural workers. Low levels of economic disparities among farmers in 25 F (Gulabewala) and a strikingly different pattern in terms of returns from cultivation must be seen in light of this.

25 F (Gulabewala) was in the command area of the Gang Canal project. The command area of the Gang Canal was divided into chaks, and, in most cases, one village was settled in each chak. Each chak is provided irrigation by a separate outlet in the distributory canal that services it. Land of 25 F (Gulabewala) was irrigated by the 25th outlet of distributory F of the Gang canal system. Irrigation water from the canal reached each plot of land through a network of field channels designed to irrigate each plot of land one by one, by rotation. In a cycle of watering, each plot of land was entitled to irrigation for a specified duration, in proportion to the area of the land. Each plot received water at a pre-notified time of the day

or night, a schedule that was changed periodically.

Typically, the amount of water provided was inadequate to cultivate the entire land, particularly in the kharif season. Farmers were, however, allowed to combine water rights (in terms of minutes of watering) for different plots operated by them and use water on any set of plots. Some farmers even took land on lease to be able to utilise the water right of the leased land on their own land, while the leased land was left fallow. In addition, farmers used private tubewells to augment canal irrigation. However, given salinity of groundwater, groundwater could be used only to a limited extent. Limited supply of electricity also constraint the extent to which tubewells could be deployed for irrigation. Until 2006-07, only a few farmers had built water storage tanks on their land; this allowed them to store groundwater extracted using tubewells when electricity was supplied and use it for irrigation later.[15]

Limited supply of irrigation meant that only 37 per cent of operational holding of land was cultivated in the kharif season (Table 51). American cotton was the most important kharif crop while rapeseed and wheat were the two most important rabi crops in the village.[16, 17] Only 1 per cent of operational holding was covered by annual/long-term crops (sugarcane and kinnow oranges, cultivated by three big capitalist farmer households).

Table 52 shows per acre yield of selected crops in 25 F (Gulabewala). The table shows that the yields of cotton, wheat and rapeseed in 25 F (Gulabewala) were substantially higher than average yields for Rajasthan and average yields for India as a whole.[18]

[15] Many farmers in 25 F Gulabewala built field-level tanks after 2007-08 using subsidies provided by the State government for the purpose.

[16] American cotton or *narma* (*Gossypium hirsutum*) is the long-staple variety of cotton commonly grown in cotton growing areas of Rajasthan and Punjab. *Desi kapas* (*Gossypium arboreum*), the local short-staple variety, has low yields and is grown on a much smaller extent.

[17] There was a considerable increase in area sown with cluster beans in the Kharif season after 2007-08 because of a steep rise in prices of cluster beans. This rise was related to an increase in demand for cluster bean gum, which is used as a lubricant in the petroleum and gas extraction. Cluster beans require much less irrigation water than cotton, and the area left fallow in the kharif season would have declined to some extent on account of expansion of cluster beans cultivation.

[18] It may be noted that, until 2006-07, transgenic varieties of cotton were not cultivated in 25 F (Gulabewala). Despite that, the yield of cotton in 25 F (Gulabewala) were considerably higher than yield of even transgenic cotton in Warwat Khanderao (Vidarbha region, Maharashtra), surveyed under PARI in the same year. It is, however, important to note that the yields in 25 F (Gulabewala) and Warwat Khanderao were obtained in very different agronomic conditions and farming practices. Most importantly cotton was an irrigated crop in 25 F (Gulabewala) but mainly an unirrigated crop in Warwat Khanderao. The comparison of yields between the two villages, thus, should not be interpreted as an illustration of differences in yield potential of different types of cotton varieties.

Table 53 shows the gross value of output, cost A2 and net income per acre for major crops cultivated in 25 F (Gulabewala). In 2006-07, highest per acre net income was obtained from wheat (Rs. 7295 per acre) and rapeseed (Rs. 6320 per acre), both cultivated in the rabi season. In comparison, cotton, cultivated in the kharif season, had high cost of cultivation and, therefore, gave relatively lower returns (Rs. 4768 per acre). In the kharif season, returns from cultivation of cluster beans (Rs. 3709 per acre) and green gram (Rs. 4115 per acre) were even lower than net returns from cotton.

Table 54 shows that average returns in 25 F (Gulabewala) did not have any clear relationship with the scale of production. Except the top two households, who cultivated sugarcane and got high returns from it, the table does not show any systematic variation in per acre returns from crop production. Table 55 shows that there was no clear relationship between net income and scale of production for individual crops either.

Table 56 shows the average expenditure on different items of cost for cultivation of different crops in 25 F (Gulabewala). The table shows that in cultivation of cotton, expenditure on hiring of labour, on plant protection and on machinery contributed the most to the cost of cultivation. For all other crops, expenditure on machinery and expenditure on hired labour were the most important items of cost.

Farmers in 25 F Gulabewala, in particular, the big capitalist farmers, made large investments in farm machinery. Value of farm machinery, and thus the depreciation costs, goes down as one goes from "landlord/big capitalist farmers: 1" class to "farmer: 2" class. This is the most important component that results in declining overall cost of cultivation for wheat, rapeseed and cotton (see Tables 58, 59, 60).

Although some farmers in 25 F (Gulabewala) later started using transgenic varieties, their use was not common in 25 F (Gulabewala) even in 2010-11.

Table 46: Number of households, by class and caste, 25 F (Gulabewala)

Class	Majhabi Sikh	Other dalit	Jat Sikh	Other OBC castes	Others	(all)
Landlords and/or big capitalist farmers: 1	0	0	7	0	0	7
Landlords and/or big capitalist farmers: 2	0	0	13	0	0	13
Farmer: 1	0	0	26	0	0	26
Farmer: 2	1	0	11	0	0	12
Manual worker	56	56	0	2	0	114
Household dependent on other occupations	3	7	11	8	3	32
(all)	60	63	68	10	3	204

Table 47: Distribution of ownership holdings by class, 25 F (Gulabewala) (per cent)

Class	Households	Land	Access index
Landlords and/or big capitalist farmers: 1	3	33	9.76
Landlords and/or big capitalist farmers: 2	6	27	4.16
Farmer: 1	13	28	2.24
Farmer: 2	6	4	0.71
Manual worker	56	0	0
Business activity/ self-employed	6	0	0.03
Salaried person/s	5	2	0.31
Receives rents, remittances, pensions, handouts	5	6	1.18

Table 48: Distribution of operational holdings by class, 25 F (Gulabewala) (per cent)

Class	Households	Land	Access index
Landlords and/or big capitalist farmers: 1	3	34	10.09
Landlords and/or big capitalist farmers: 2	6	27	4.17
Farmer: 1	13	33	2.61
Farmer: 2	6	5	0.81
Manual worker	56	0	0
Business activity/ self-employed	6	0	0
Salaried person/s	5	0	0.08
Receives rents, remittances, pensions, handouts	5	1	0.14

Table 49: Share of irrigated and irrigated land in operational holding, 25 F (Gulabewala) (per cent)

Source of irrigation	Extent (acres)	Per cent
Canal	2526	99
Tubewell	1796	70
Unirrigated	9	0
Total operational holding	2552	100

Table 50: Area irrigated by tubewells as a proportion of total operational holding, by class, 25 F (Gulabewala) (per cent)

Class	Area irrigated by tubewells
Landlords and/or big capitalist farmers: 1	76
Landlords and/or big capitalist farmers: 2	64
Farmer: 1	76
Farmer: 2	29
Manual worker	0
Salaried person/s	0
Receives rents, remittances, pensions, handouts	82

Table 51: Proportion of different crops in gross cropped area and total operated land, 25 F (Gulabewala)

Crop season	Crop	Share of gross cropped area	Share of operational holding
Kharif	Cotton	21	27
Kharif	Cluster beans	5	6
Kharif	Fodder crops	2	3
Kharif	Other kharif crops	1	2
Kharif	All kharif crops	30	37
Rabi	Rapeseed	34	42
Rabi	Wheat	26	32
Rabi	Barley	5	7
Rabi	Fodder crops	2	3
Rabi	Other rabi crops	2	3
Rabi	All rabi crops	69	86
Annual	All annual crops	1	1
All	All crops	100	124

Table 52: Average yields of selected crops in 25 F (Gulabewala), Rajasthan and India, 2006-07 (kilograms per acre)

Crop	25 F (Gulabewala)	Rajasthan	India
Cotton	672	147	170
Cluster bean	384	nil	nil
Wheat	1449	1113	1096
Rapeseed	577	480	443

Table 53: Average GVO, cost A2 and net income per acre, by crop, 25 F (Gulabewala)

Crop	GVO	Cost A2	Net income
Cotton	12381	7613	4768
Cluster bean	7101	3392	3709
Green gram	7482	3368	4115
Rapeseed	10703	4383	6320
Wheat	13329	6034	7295
Barley	7896	4144	3751
Chick pea	10694	4787	5907

Table 54: Annual gross value of output, cost A2 and net income per acre of operational holding, by class, 25 F (Gulabewala)

Class	GVO	Cost A2	Net income
Landlords and/or big capitalist farmers: 1	18415	8751	9665
Landlords and/or big capitalist farmers: 2	12925	6840	6085
Farmer: 1	13323	6370	6952
Farmer: 2	11890	5212	6679
Salaried person/s	10448	6186	4262
Receives rents, remittances, pensions, handouts	6749	5411	1337
All households	12933	6427	6506

Table 55: Net income of major crops, by class, 25 F (Gulabewala), Rupees per acre

Crop	Landlords and/or big capitalist farmers: 1	Landlords and/or big capitalist farmers: 2	Farmer: 1	Farmer: 2
Cotton	5821	3959	4818	5841
Cluster bean	5617	3181	3559	1775
Green gram	4817	4650	3834	4696
Rapeseed	8512	5609	6206	6364
Wheat	9569	6438	7177	8475
Barley	4814	4234	4078	1440
Chick pea	6785	5029	nil	nil

Table 56: Average per acre cost of production of major crops, by different items of expenditure, 25 F (Gulabewala) (Rupees per acre, 2006-07 prices)

Item	Cotton	Cluster bean	Green gram	Rapeseed	Wheat
Seeds	209	174	238	40	487
Manure	120	0	0	123	19
Chemical fertilisers	707	231	239	540	943
Plant protection	1568	194	130	84	111
Irrigation	364	289	164	385	449
Hired labour (casual)	1401	432	477	360	723
Hired labour (long-term)	325	267	262	323	386
Machines	1357	1076	1136	1347	1544
Animals	0	0	0	0	0
Rent	477	225	74	411	449
Other costs	690	302	402	460	588
Total cost	7613	3392	3368	4383	6034

Table 57: Cost A2 of major crops, by class, 25 F (Gulabewala), Rupees per acre

Crop	Landlords and/or big capitalist farmers: 1	Landlords and/or big capitalist farmers: 2	Farmer: 1	Farmer: 2
Cotton	9368	8318	7369	6809
Cluster bean	3606	4316	2800	3367
Green gram	2631	3528	3632	2921
Rapeseed	4907	4410	4405	3509
Wheat	6791	6545	5824	4981
Barley	4475	4139	4220	3699
Chick pea	4687	4887	nil	nil

Table 58: Average per acre cost of cultivation of cotton, by different items of expenditure, by class, 25 F (Gulabewala) (Rupees per acre, 2006-07 prices)

Item	Landlords and/or big capitalist farmers: 1	Landlords and/or big capitalist farmers: 2	Farmer: 1	Farmer: 2
Seeds	204	212	220	194
Manure	61	72	160	144
Chemical fertilisers	1082	668	670	621
Plant protection	2575	1470	1511	1442
Irrigation	364	536	323	253
Hired labour (casual)	1925	1164	1383	1489
Hired labour (long-term)	764	272	352	0
Machines	1450	1501	1225	1421
Animals	0	0	0	0
Rent	216	319	552	737
Other costs	726	867	697	506
Total cost	9368	8318	7369	6809

Table 59: Average per acre cost of cultivation of rapeseed, by different items of expenditure, by class, 25 F (Gulabewala) (Rupees per acre, 2006-07 prices)

Item	Landlords and/or big capitalist farmers: 1	Landlords and/or big capitalist farmers: 2	Farmer: 1	Farmer: 2
Seeds	34	42	41	42
Manure	200	120	105	155
Chemical fertilisers	712	458	603	387
Plant protection	70	170	55	63
Irrigation	392	341	471	311
Hired labour (casual)	517	267	325	401
Hired labour (long-term)	599	252	317	0
Machines	1496	1303	1193	1246
Animals	0	0	0	0
Rent	215	282	534	521
Other costs	423	488	472	383
Total cost	4907	4410	4405	3509

Table 60: Average per acre cost of cultivation of wheat, by different items of expenditure, by class, 25 F (Gulabewala) (Rupees per acre, 2006-07 prices)

Item	Landlords and/or big capitalist farmers: 1	Landlords and/or big capitalist farmers: 2	Farmer: 1	Farmer: 2
Seeds	630	485	474	442
Manure	17	21	6	32
Chemical fertilisers	1260	941	988	713
Plant protection	241	94	105	85
Irrigation	459	527	471	277
Hired labour (casual)	682	486	694	984
Hired labour (long-term)	828	303	396	0
Machines	1747	1726	1312	1280
Animals	0	0	0	0
Rent	195	335	501	745
Other costs	604	802	553	423
Total cost	6791	6545	5824	4981

8 Concluding remarks

Official statistics on cost of cultivation and farm incomes have serious limitations. Most importantly, these provide data only for selected and individual crops, and, therefore, cannot be used for studying economy of farming households as units. Also, these data do not provide any measure of scale of production other than the physical extent of land. It has been argued in the literature that physical extent of land is a poor measure of scale of production.

This paper uses data from the Project on Agrarian Relations in India of the Foundation for Agrarian Studies to examine various issues in respect of incomes from crop production. Households for which data are used in this paper were surveyed as part of PARI between 2006 and 2010. As in Rawal and Swaminathan (2012), the paper uses socio-economic categories based on the value of owned means of production, level and sources of household income, and pattern of labour deployment to measure scale of production. The paper primarily uses estimates of income over cost A2, which is a measure of paid out cost, to study levels and variations in farm incomes.

Data on incomes from crop production show that median incomes per acre of operational holding are very low. In 2005-06 prices, these ranged from Rs. 918 per acre in Bukkacherla (Andhra Pradesh) to Rs 7521 per acre in Nimshirgaon (Maharashtra). The data also show that a substantial proportion of households in most villages had incurred a loss in crop production. The proportion was highest (42 per cent) in Rewasi, a village in Rajasthan, which had large-scale crop failures in the kharif season in 2009-10 on account of low rainfall. In five out of ten villages, this proportion was more than 20 per cent.

Data presented in Section 2 show that, in most villages, there was a positive relationship between scale of production and net per acre income from crop production. The relationship is seen clearly irrespective of whether income is measured over cost A2 or over cost A1 (which does not include rental payments). Data show that, in most villages, landlords, big capitalist farmers and rich peasants had the highest per acre incomes, and these declined progressively as one moved to middle peasants, and then to poor peasants and cultivators among hired manual workers.

In Sections 3-7, the paper analyses detailed data for five villages to examine variations in returns from different cropping systems, and to examine the relationship of scale of production with variations in cropping pattern, structure of costs, output and net returns. This analysis helps in exploring the sources of a positive relationship between scale of production and net incomes that is seen in the overall data. The analysis presented in these sections show that in

villages like Harevli and Nimshirgaon, better access to irrigation and investible funds allows landlords and rich peasants to grow a more profitable crop mix. Further, these sections of the producers are able to save on unit cost of irrigation and draught power because of ownership of means of production. As expected, the cost of hiring labour declines as one goes from landlords, big capitalist farmers and rich peasants to middle and poor peasants. This is because of a higher share of family labour in the total labour deployed on land cultivated by middle and poor peasants.

Sugarcane was the most important crop of Harevli and Nimshirgaon. Sugarcane was also the most profitable crop in both the villages. Data from both the villages show that there was a systematic difference in returns between planted and ratoon crops of sugarcane. Primarily on account of saving on the cost of seed cane and the cost of land preparation, cost of cultivation was much lower for ratoon crops. Consequently, despite the fact that ratoon crops had lower yields than the planted crops, net returns were highest for the first ratoon crop.

In most crops, hired labour, draught power, fertilisers and irrigation were major items of costs. In case of planted crop of sugarcane and for wheat, cost of seed material was also an important item of cost. Rent for leased in land was a major item of cost for poor peasants in some villages – for example, Harevli and Mahatwar – where tenancy was widespread.

Two of the study villages – Mahatwar and Rewasi – faced severe deficiency of rain and irrigation water during the reference year. In Mahatwar (eastern UP), access to irrigation was severely restricted and cost of irrigation was high particularly for lower-middle and poor peasants, who had to buy water from owners of diesel pumps. This, on the one hand, resulted in losses in the kharif crop in the year in which rainfall had been deficient, and on the other hand, limited the extent to which irrigated rabi crops could be cultivated. On the other hand, landlords and rich peasants contained their losses in kharif season by abandoning kharif cultivation on part of their holding, and by focusing on irrigated cultivation in the rabi season.

This differential response to crisis was even more stark in Rewasi (Rajasthan). Given that the soil was sandy and the summer temperatures were high, kharif cultivation was limited mainly to an unirrigated crop of pearl millet. On single-cropped land, this was the only crop cultivated in the year. In the rabi season, when wheat and rapeseed were the main crops, cultivation was done only on irrigated land. In 2009-10, pearl millet crop was completely abandoned because of deficient rainfall. Landlords and rich peasant households used their tubewells to save fodder crops on as much land as they could to support their livestock holdings. The extent to which losses in the kharif season could be covered by irrigated agriculture in the rabi season was directly dependent on the extent of ownership of tubewells. With bet-

ter access to tubewell irrigation, landlords and rich peasants cultivated rabi crops on a greater proportion of their holdings and also obtained higher per acre returns.

25 F (Gulabewala) is a village that stands in sharp contrast with other study villages. Of all the study villages, 25 F (Gulabewala), in Sri Ganganagar district of Rajasthan, had the highest levels of land, asset and income inequality. The village economy was characterised by a sharp divide between Jat Sikh landowners on the one hand and landless dalit agricultural worker households on the other. It was a feature of advanced levels of differentiation that the levels of disparities among farmer households were low. Farmers in 25 F (Gulabewala) made substantial investment in cultivation on their land. Despite limited availability of canal irrigation and sandy soils, yields of crops like cotton, wheat and rapeseed were high. It was on account of high levels of investment across all classes of farmer households in 25 F (Gulabewala) that no significant scale effects were seen in net returns from crop production.

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