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**Income Generation and Inequality in India's Agricultural Sector:
The Consequences of Land Fragmentation**

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This paper is a contribution to understanding income generation and inequality in India's agricultural sector. We analyse the National Sample Surveys of agriculture in 2003 and 2013 using descriptive, decomposition, and modelling tools, and estimate income inequality in the agricultural sector at the scale of the nation and its 17 largest states. We show that: (a) income inequality in India's agricultural sector is very high (Gini Coefficient of around 0.6 during the period), (b) about half of the income inequality is explained by the household-level variance in income from cultivation, which in turn is primarily dependent on variance in landownership, (c) there is a negative relationship between the amount of land owned by the household and share of wages in total income, and (d) there are significant state-level differences in the structures/patterns of income generation from agriculture.

JEL Classification: D31, D63

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1. Introduction

This paper is a contribution to understanding income generation and inequality in India's agricultural sector. We analyse the Situation Assessment Surveys of Farmers/Agricultural Households undertaken by the National Sample Survey Organisation (NSSO) in 2003 and 2013 using descriptive, decomposition, and modelling tools, and estimate income inequality in the agricultural sector at the national scale and disaggregated to the scale of the 17 large states. We locate this paper in the literatures on the sources of income in farmer households, the viability of small farms, and the drivers of inequality in rural areas of developing countries, especially India (Chakravarty 1987, Lanjouw and Stern 1993, FAO 1998, Adams Jr. 2001, Lanjouw and Shariff 2002, Davis et al. 2010, Himanshu et al. 2013, Hazell 2015, Davis et al. 2017). Our primary attention is on income inequality and its relationship to landownership, with a secondary focus on the sources of income in agricultural households. We show that: (a) income inequality in India's agricultural sector is very high (with a Gini Coefficient of about 0.6 during the study period), (b) about half of the income inequality is explained by the household-level variance in income from cultivation, which in turn is primarily dependent on variance in landownership, (c) there is a negative relationship between the amount of land owned by the household and share of wages in total income and (d) there are significant state-level differences in the structures/patterns of income generation from agriculture.

These findings are important for at least three reasons. First, these are the first estimates of income inequality in India's agricultural sector (that covers nearly 60 per cent of rural households) using official data. The data used for the analysis from the NSSO are available to all, but surprisingly have never been used to estimate income inequality. Second, these estimates of inequality challenge the widely-held belief that India is a low-inequality country based on the existing official estimates, which are all derived from expenditure or consumption data. We show that there is a large difference between the two measurement concepts—income vs. consumption inequality—where the Gini Coefficients of per capita income and consumption are 0.58 and 0.28 respectively in the agricultural sector in 2013. Third, these findings reinforce the idea that the extreme fragmentation of agricultural land is the root cause of poverty in India, and the fact that the fragmentation continues to grow more intense is the singular challenge of Indian development.

Consider first the issue of the level of inequality in India, which is inseparable from the idea of “inclusive” or “pro-poor” growth—one of the declared core objectives of the Indian state (Government of India 2006). Inclusive growth implies a reduction in inequality. In the absence

of data on income for the entire population, the literature on inclusive growth in India is based on analysing data on consumption expenditure¹. One worrying consequence of the absence of income data is a widespread conflation between income and expenditure inequality. They are assumed to be the same—which leads to the misleading conclusion that India is a low inequality country with a stable Gini hovering in the low to mid-thirties for decade after decade. The confusion is evident, for example, in the World Development Report which mentions that “India had fairly low income inequality” (World Bank 2007, p. 46) and in the UNDP which reports that the “income gini coefficient” in India is 0.339². This paper also strengthens the innovative findings of Chancel and Piketty (2017) who combine household surveys (including India Human Development Survey (IHDS)), national accounts, and tax data to argue that income inequality in India is very high, primarily because the share of national income accruing to the top 1% of income earners is at its highest level (about 22%) in a century. We submit that while our findings are narrower in coverage (being limited to the agricultural sector) that narrowness itself leads to greater robustness and a strong explanatory model linking landownership to income distribution.

Next, consider the issue of land fragmentation. Indian agriculture is characterized by small land holdings. Our finding that income inequality is driven by differences in landownership feeds into the larger on-going debate on whether small farm led development is a relevant strategy in Asia and Africa (Collier and Dercon 2014, Hazell 2015).³ Though this debate is ongoing, it is not new. Nearly three decades ago, Chakravarty (1987) explicitly noted that the challenge facing policy-makers in India was to make small farms viable. He wrote: “I believe that no sustainable improvement in the distribution of incomes is possible without reducing the ‘effective’ scarcity of land” (p. 5). This challenge has become even more acute, as we show later in the paper, with the continuing fragmentation of land holdings (to an average size that was down to 1.15 hectares in 2010-11) as a result of which the primary income source of marginal/small farmers is wages and not cultivation.

After examining the cross-country evidence and reviewing the debate on whether small farms are indeed “beautiful,” Hazell (2015, p. 195) concludes that while small farms might be efficient, the land sizes are “too small to provide an adequate income from farming.” As we point out later in this paper, this is depressingly true in India too. The monthly income of farmer

¹ Even this limited data on consumption suggests that growth has bypassed small farms. For example, Motiram and Naraparaju (2015) do not find growth to be inclusive for Indian farmers with less than one hectare of land (a size that constitutes two-thirds of all agricultural landholdings in India).

² See <http://hdr.undp.org/en/content/income-gini-coefficient>. These calculations based on consumption data continue to be used and conflated with income data on a regular basis. Also see Anand, Tulin, and Kumar’s (2014).

³ See Deininger and Byerlee (2012) for a concise discussion on the debate over whether small farms or large-scale farming is suited for facilitating agricultural growth and economic development. Also see the special issue of Food Policy (Volume 48, October 2014) Boserup and Beyond: Mounting Land Pressures and Development Strategies in Africa, edited by T.S. Jayne, Derek Headey and Jordan Chamberlin.

households with less than 0.5 hectares of land is barely sufficient to cover their reported monthly expenditure (low as they are). These marginal farms lead, almost inevitably, to marginal existences. Hazell also points out that since the beginning of the green revolution the average farm size has declined. As a result, one is likely to observe subsistence farming rather than market-oriented farming. In such a scenario, he conjectures that small farm size will be an impediment to rural non-farm growth. In fact, as we show in this paper, we do not see an increase in share of income from non-farm business in India: the contribution of non-farm business to total household income declined from 11% to 8% over the decade 2003-2013.

These core arguments and their supporting evidence are laid out in the rest of the paper. The data issues are discussed next (in Section 2) followed by some summary statistics (in Section 3). Section 4, which is key, provides estimates of income and consumption inequality and the contributions of various sources of income to total income inequality. In Section 5 we conclude with a dissection of the slowness of agrarian change in India and its consequences.

2. Data Sources

We analyse data from NSSO's Situation Assessment Survey of Farmers conducted in 2003 (hereafter referred to as the 2003 survey) and Situation Assessment Survey of Agricultural Households in 2013 (hereafter referred to as the 2013 survey). In both surveys, each household was visited twice. In the 2003 survey, households were visited once between January-August and then again between September-December. In the 2013 survey, households were visited first between January-July and then between August-December. The 2003 survey collected information from 51,770 and 51,105 households in visit 1 and visit 2 respectively. Thus the attrition rate was 1.28%. The 2013 survey collected information from 35,200 and 34,907 households in visit 1 and visit 2 respectively. The attrition rate was lower, at 0.83%. Both data sets are representative at the national and sub-national levels. In both surveys each household is given a sampling weight, which makes it possible to generate reliable estimates at the national and sub-national levels. The details of the sampling procedures are available in the reports published by Government of India (2005, 2014a).

Since there are some differences in the way households were sampled in the 2003 and 2013 surveys, we first outline how we made the data from these two surveys comparable. For the 2013 survey, NSSO defined an agricultural household "as a household receiving some value of produce more than Rs. 3000 from agricultural activities (e.g., cultivation of field crops, horticultural crops, fodder crops, plantation, animal husbandry, poultry, fishery, piggery, bee-

keeping, vermiculture, sericulture etc.) and having at least one member self-employed in agriculture either in the principal status or in subsidiary status during last 365 days” (p.3 Government of India 2014a). These agricultural households constitute about 57.8 percent of the total estimated rural households. An overwhelming majority of the remaining 42.2 percent of the rural households are agricultural labour households whose income is at the bottom end of the income distribution. In the 2003 survey, unlike the 2013 survey, there was no income cut-off specified. So, to compare the two surveys, it is necessary to only include households in the 2003 survey with an income corresponding to Rs. 3,000 at 2013 prices. Using the All India Consumer Price Index - Agricultural Labourers (CPI-AL) as a price deflator, we estimate that number to be Rs. 1,345 in 2003 prices and use this as the cut-off. This filter drops 5,055 households from the 2003 survey, constituting about 10% of the total sample.

Both surveys have information on the principal source of income of the household.⁴ In 2013, the distribution of households by principal source of income was: Cultivation (63.5%), Livestock (3.7%), Other Agricultural Activity (1%), Non-Agricultural Enterprises (4.7%), Wage / Salaried Employment (22%), Pension (1.1%), Remittances (3.3%), and Others (0.7%). In 2003, when we focus on households with an income from agriculture of at least Rs. 1,345, we find the distribution to be similar: Cultivation (64.7%), Farming other than Cultivation (2.2%), Other Agricultural Activity (3%), Non-Agricultural Enterprises (6%), Wage / Salaried Employment (19.9%), Pension (0.5%), Remittances (1.8%), and Others (1.9%). It is evident that in both 2003 and 2013 cultivation and wage or salaried employment were the two major sources of income, accounting for about 85% of the total.

In addition to the income filter mentioned above, we restrict the sample in both the surveys to households whose primary source of income is cultivation, livestock, other agricultural activity, non-agricultural enterprises, and wage/salaried employment. We ignore those households whose primary source of income is pension, remittances, interest and dividends or others—that is, what may be thought of as “unearned” income. It is necessary to do this because both data sets have detailed information on income received from only four sources: wages, net receipt from cultivation, net receipt from farming of animals, and net receipt from non-farm business. This filter based on the source of income—whereby we drop households whose primary income is unearned—removes an additional 2,411 households from the 2003

⁴ Consistent with what is found in other countries, although households report one major source of income, their members actually undertake multiple activities. Among agricultural households who report that cultivation is their principal source of income, 12 per cent report not undertaking any additional activity. Since 63.5 per cent of households report their principal source of income as cultivation, this implies that 7.6 per cent of all agricultural households are engaged only in cultivation. Among those who report livestock as their principal source of income, only 13 per cent report not undertaking any additional activity. The World Development Report 2008 made the observation that “individuals participate in a wide range of occupations, but occupational diversity does not necessarily translate into significant income diversity in households” (World Bank 2007, p. 72). This is true in the Indian context too.

survey (constituting another 5% of the original total sample) and 1,567 households (about 4%) of the total sample in 2013. Having applied these filters, we believe that it is indeed appropriate to undertake comparisons of the 2003 and 2013 surveys. The NSS report corresponding to the 2013 survey states that comparison of results of these two rounds is permissible as long as one takes into account the differences across the two surveys (Government of India 2014a, p. 4).

The one big methodological difference between the two surveys is the recall period for wages / salary: in the 2003 survey the reference period was 7 days, while it was 6 months in the 2013 survey. It is possible that shorter recall periods (as in 2003) tend to bias estimates upwards because respondents tend to forget older information (Silberstein 1989). If that is the case, then the means for 2003 may be biased upwards. We do not see this as a major problem. Changing the mean does not change the distribution, so the inequality estimates should be unaffected. If anything, our understanding of growth and structural change may be more conservative than in reality (because, since the 2003 incomes may be overestimated, the growth rate from 2003 to 2013 may be underestimated).

In both the 2003 and 2013 surveys, the reference period for collecting information on net receipts from farming of animals and non-farm business was 30 days preceding the survey. In both the surveys the net income from cultivation is calculated for the year as a whole; i.e., July 2002-June 2003 and July 2012-June 2013 respectively. Given the differences in the reference period for collecting information on the four income sources, we followed the procedure outlined in the NSSO's survey documentation to arrive at the household's estimated monthly income. The household's monthly income can be interpreted as being calculated using a mixed reference period. The household's per capita monthly income is arrived at dividing the monthly income by the household size. We believe that this method may yield a good indicator of welfare because it derives net income (after taking out the cost of agricultural production).

A final note on consumption: In both visits in 2013, the household's total consumer expenditure was asked with a recall period of 30 days. However, the 2013 survey used a short schedule and a uniform reference period of 30 days for collecting information on consumption, whereas the 2003 survey used a more detailed schedule and a mixed reference period, i.e. 30 days for frequently consumed items and 365 days for less frequently consumed items. We have concerns over the comparability of estimates of consumption inequality across the two surveys. Hence, in the analysis, we do not compare estimates of inequality in consumption over time. For

each year, however, we can compare the estimate of inequality in income with that of consumption inequality.⁵

3. Summary Statistics

As explained in the previous section, henceforth we restrict our discussions to the four income-generation categories on which detailed information are available; i.e., wages, and net receipts from: cultivation, farming of animals, and non-farm businesses. The nationwide and state-level income-generation from these four sources are shown in Table 1 (for 2013) and Table 2 (showing the ratio of 2013 to 2003, whereby the 2003 figures can be calculated). In Tables 3 and 4, we show similar data, where the key variable is not the state but size of landownership.⁶ These four tables lay out the basics of income generation in the agricultural economy by state and landownership.

<Insert Tables 1 and 2 here>

The *first* point to note is the most obvious feature of these distributions—that is, the considerable variation at the state-level. Monthly per capita incomes varied widely, from Rs. 3,872 in Punjab down to Rs. 736 in Bihar (a five-fold difference); incomes from cultivation varied even more widely, from Rs. 2,311 in Punjab to Rs. 250 in West Bengal (a nine-fold difference). Most disturbing is the finding that monthly expenditures exceeded income in three of the largest states in the country—West Bengal, Uttar Pradesh, and Bihar—and, correspondingly, that the average income of households with less than one hectare of land was less than consumption. The data do not allow us to explain how the additional expenditure was financed—through borrowing (from non-institutional sources such as moneylenders⁷ since formal institutions are unlikely to lend to the poorest; this may correlate with the alarming media reports on farmer suicides), or sale of assets (which are likely to be minimal), or social transfers, or unaccounted income from common property resources, or unearned incomes (like pensions and remittances, which we do not study here). It is an issue that requires a separate analysis.

The *second* important point to note is the continuing importance of cultivation as an income source. It provided close to half (49%) of total income in both surveys, and more than

⁵ Later in this paper we establish that the estimates of monthly per-capita consumption expenditures calculated using the 2003 and 2013 surveys are comparable to the estimates generated using the quinquennial large sample NSS consumption expenditure surveys of 2004-05 and 2011-12 respectively. The quinquennial large sample NSS consumption expenditure surveys are considered the gold standard for measurement of consumption data.

⁶ Note that the land possession data includes land owned as well as wholly or partially leased-in lands. The lands leased, however, constitute only about 2.4% of the total both by number of holdings and area. We do not separate out this small fraction in the analyses and use the terms ‘landownership’ and ‘land possession’ interchangeably.

⁷ Studies of the sources of borrowing by almost all classes of Indian society (other than the uppermost) in rural and urban settings show that moneylenders continue to be the single most important source of credit (see Krishna 2013 for a recent analysis).

half the income in 2013 in several important states (Punjab, Haryana, Karnataka, Telangana, Maharashtra, Assam, Madhya Pradesh, Chhattisgarh, Uttar Pradesh, and Bihar). Land possession was the key variable in determining income from cultivation, which, as we show later, accounted for half of income inequality, and hence was the key variable in explaining income inequality. Wages were important (providing about 31% of incomes in 2013) but had grown more slowly than income from cultivation. The significance of wages to total income also varied widely between states: from 53% in West Bengal to 19% in neighbouring Assam. The most rapid income growth was from farming of animals, an activity that provided 12% of total agricultural income in 2013. The least significant income source was off-farm business (8%). It is important to note that non-farm businesses did not provide more than 10% of total income in any but three states (Kerala, 22%; West Bengal, 16%, Tamil Nadu, 14%).

Our *third* point is about the growth in incomes over the decade 2003-13, where we find that the average monthly income increased in all states except two (Bihar and West Bengal) and in the country as whole by a factor of 1.34 in real terms (Table 2). Among the components of total income, wages increased by a factor of 1.22, net income from cultivation by 1.32 times, net income from farming of animals by a factor of 3.21 and the net income from non-farm business was unchanged (which implies that its share in total income declined from 11% to 8%). We find evidence of doubling of income among households with over 10 hectares of land. In fact, all households with at least 1 hectare of land saw their income from cultivation and total income increase by at least 1.5 times (Table 4).

<Insert Tables 3 and 4 and Figures 1 and 2 here>

This brings up the *fourth* and most important point, which we now discuss at length: the significance of land in the determination of income, its source, and its distribution. In Tables 3 and 4, we use the six-fold classification for rural landholding used in India's Agricultural Census: the landless, the marginal (0.01-1 hectares), small (1-2 hectares), small-medium (2-4 hectares), medium (4-10 hectares), and large (over 10 hectares) holdings.⁸ As evident from Table 3, there is a negative relationship between extent of land owned and share of wage income with the share decreasing from 64 percent for those owning less than 0.01 hectares to 3 percent for those owning more than 10 hectares. The opposite is true for the share of cultivation income which increases from 1 percent for those owning less than 0.01 hectares to 86 percent for those owning more than 10 hectares. This finding is consistent with evidence from countries such as Mexico, Chile, Ecuador, China, etc. (see Winters et al. 2009 and the references therein) and this

⁸ We note that these designations are India-specific. 10 hectares is not considered a "large" landholding in many parts of the world. In Europe, landholdings average around 100 hectares, they are over 180 hectares in the U.S., and even more in Brazil and Argentina (Chakravorty, 2013).

relationship is expected to be stronger in countries where "land scarcity is a greater issue, such as in parts of Asia, and limited land ownership suggests limited options" (p.1437).

The agricultural census of 2010-11 found 138 million discrete land parcels covering about 160 million hectares in the country; an average of 1.15 hectares per holding. Two-thirds (67%) of the parcels were under 1 hectare (and covered 22.5% of the area), another quarter (27.9%) were 1-4 hectares (covering over 45% of the area), and less than 5% were larger than 4 hectares but covered almost 32% of the agricultural land. Figure 1 provides long-term context to this current condition of extreme fragmentation, emphasizing the massive growth in the number of marginal farms (tripled in 40 years) and equivalent decline in the area covered by large farms (down to one-third in 40 years). The condition is unambiguous and unrelenting: agricultural land in India continues to fragment into increasingly unsustainable sizes as a result of the continuing growth of the agricultural population, the intergenerational subdivisions of already-small holdings, the inability to move enough of the population into salaried jobs in the formal sector (instead of casual labour) or business or other non-farm occupations, and the inability of the urban sector to absorb low-skill rural labour (caused, among other things, by the slow growth of urban jobs, the failure to create a labour-intensive manufacturing base, and the abysmal quality of urban life for the poor).

It is worth noting that the nationwide average of 1.15 hectares masks the reality that small holdings (92 million of the 138 million land holdings) averaged just 0.39 hectares. In several major states, the average landholding size was less than 1 hectare: Kerala (0.22 ha.), Bihar (0.39 ha), Uttar Pradesh (0.76 ha), West Bengal (0.77 ha), and Tamil Nadu (0.8 ha); together, these states covered close to one-quarter of all the agricultural land in the country. Figure 2 shows a Pen's Parade (following the vivid description of Jan Pen, 1971) depicting how average incomes have changed by land size class across the Indian states. Since the average size of land holding all India is just over 1 hectare of land, we group households in each of the 17 major Indian states into two groups: those with up to 1 hectare of land and those with over 1 hectare of land. For each state and for each land class, we calculate the weighted average per capita monthly total income and per capita monthly net income from cultivation. The Pen's Parade is presented for the years 2003 and 2013 in Figure 1a for total income and Figure 1b for net income from cultivation.⁹

⁹ The spearman rank correlation in the ranking of average per capita monthly total income of state-land class size pair for the years 2003 and 2013 is 0.78. The spearman rank correlation in the ranking of average per capita net income from cultivation of state-land class size pair for the years 2003 and 2013 is 0.85.

We undertook the same calculations using more landownership categories (but have not shown them here to reduce information clutter)¹⁰. Those figures simply replicate, in greater detail, the core, and at this point unsurprising, finding that landownership is the most important determinant of income and, therefore, income inequality. This is compounded by the relative lack of non-cultivation income sources in India's poorest states (Bihar, Jharkhand), so that, in 2013, the total income of the larger landowners in these poorer states averaged less than that of smaller landowners in states like Punjab, Kerala, and Haryana, of course, but also less productive states like Tamil Nadu, Karnataka, and Gujarat.

4. Estimates of Consumption and Income Inequality

Among the widely used measures for estimating inequality are the Gini, Log Mean Deviation and Theil Index. The Log Mean Deviation and Theil Indices cannot be estimated when there are zeros or negative values. In our data, there are many households for whom one of the sources of income is negative. Further, there are many households for whom total (net) income is negative. In light of this, we estimate inequality using the Gini Coefficient (G).

$$Gini\ Coefficient\ (G) = \frac{1}{(2n^2\mu)} \sum_{j=1}^m \sum_{k=1}^m n_j n_k |y_j - y_k|$$

where y_j, y_k are net per-capita income receipts of households j and k respectively; n_i is the number of households with per-capita income receipts y_i ; m denotes the number of distinct per-capita incomes; n is the total number of households; μ is the mean of per-capita income receipts across households.

We also estimate inequality using another measure, G.E.(2), which is half the-squared coefficient of variation. This measure is a member of the family of single-parameter Generalized Entropy Measures, with a corresponding parameter value of 2.

$$G.E.(2) = \frac{1}{2} [C.V.(y_i)]^2$$

Where y_i denotes the net per-capita income receipts of a household i.

These measures allow for estimation of inequality despite some households having negative net incomes.

¹⁰ We ran OLS regression using 2013 data where the dependent variable is the household's net receipts from cultivation. The household level control variables are: area of land owned, square of area of land owned, share of land irrigated, social group to which the household belongs (Scheduled Tribe, Scheduled Caste, Other Backward Class, or Others), and place of residence (state dummies). The coefficient on area of land owned and share of irrigated land is positive and statistically significant. These results confirm that the size of land owned is an important driver of inequality in income. Results available on request

4.1 Inequality in Income and Consumption

We find that in both 2003 and 2013 income inequality¹¹ was higher than inequality in Monthly Per Capita Expenditure, or MPCE (Table 5). This is true at the all India level and for all the major states¹². Income and consumption inequality in 2013 as measured by Gini was 0.58 and 0.28 respectively. In 2003, the Gini of income was 0.63 and for MPCE it was 0.27.¹³

<Insert Tables 5 and 6 here>

Did overall income inequality really decline during the period covered by our surveys? The inequality in per-capita incomes in 2003 as measured by the Gini was 0.63, with the 95% confidence interval of this estimate being 0.62-0.64. The corresponding confidence interval for 2013 was 0.57-0.59. Since the two confidence intervals do not overlap, it is possible to conclude that income inequality did reduce between 2003 and 2013. However, when we measure inequality in per-capita incomes by computing half the-squared coefficient of variation (G.E. (2)), we find that in 2013, inequality was 1.84 (95% confidence interval: 1.48-2.20). In 2003, it was 2.49 (confidence interval: 1.71-3.27). Since the confidence intervals of the G.E. (2) measure overlap, it is not possible to unambiguously infer that the income inequality came down.

If at all there was a real reduction in income inequality at the national scale, it may be partially attributable to changes in three states—Madhya Pradesh, Chhattisgarh, and Rajasthan—where we observe the largest reductions in income inequality. Earlier, in Figure 2, we saw that Madhya Pradesh and Chhattisgarh had moved up in the Pen’s Parade between 2003 and 2013. The average net income from cultivation of farmers with less than one hectare of land in these two states improved more than those of farmers with similar landholdings in other states with similar positions in the parade in 2003. A possible explanation is that in Madhya Pradesh¹⁴ and Chhattisgarh, there were substantial investments in rural infrastructure (in particular, in

¹¹ The inequality calculations in this paper do not include the bottom end of the income distribution in rural India—that is, the population that has little or no income from agricultural activities; much of this is likely to be the landless population.

¹² Recognising that estimates of income from the NSSO and IHDS are not directly comparable, we undertook comparisons to the extent possible. For a sub-set of income components, we do find that the all-India patterns evident in the NSSO data are consistent with the patterns in the IHDS data. These calculations are available on request.

¹³ Our estimate of inequality in consumption expenditure in 2013 is comparable with that from the larger survey of consumption expenditure conducted by NSSO in 2011-12 from which the official estimates of poverty are generated. Depending on the recall period used for calculating consumption expenditure, the Lorenz Ratio for the distribution of MPCE was estimated to be between 0.283 and 0.307 in 2011-12 (Government of India 2014b, p. 40). Using unit level data from the 2011-12 survey of consumption expenditure, we estimate that the Lorenz Ratio for the distribution of MPCE in a comparable set of households to be 0.28. The estimate of consumption inequality from the 2013 survey data analysed in this paper is in the same ballpark as that from the detailed survey of consumption expenditure. Similarly, it has been established elsewhere that the estimates from the 2003 survey are comparable with the corresponding detailed survey of consumption expenditure (See Government of India 2005, p. 20, for a discussion). The fact that our consumption expenditure estimates from the agricultural household surveys are comparable to the estimates generated from the larger consumption expenditure surveys assures us about the quality and reliability of the estimates of consumption expenditure and hence also income from the 2003 and 2013 surveys.

¹⁴ Shah et al. (2016) have written about how the irrigation reforms undertaken by Madhya Pradesh can act as a model for other states. Singh and Singh (2013) have written about a relatively new organization form, the Producer Company, that enhances “the bargaining power, net incomes, and quality of life of small and marginal farmers/producers in India.” http://www.iimahd.ernet.in/users/webrequest/files/cmreports/14Producer_Company_Final.pdf

irrigation), agricultural output increased, and the respective governments ensured that the farmers got the minimum support price for their produce.

4.2 Contribution of Sources of Income to Income Inequality

Next we decompose total inequality in per-capita income in order to arrive at the contribution made by each of the four components of total income. Towards this, we use the decomposition rule proposed by Shorrocks (1982). The share of inequality contributed by each income factor (wages, and net receipts from cultivation, farming animals, and off-farm business) for 2013 and 2003 are reported in Table 6.¹⁵ Our four key findings are as follows:

First, income from cultivation is the most important factor in income inequality. This is consistent with what one would expect in a case like India, a land poor and labour rich country (Adams 2001). At the all India level in 2013, per capita net receipts from cultivation contributed 50 per cent of the per capita total income inequality of agricultural households. The contribution of the other sources of income to inequality was as follows: income from non-farm business (22%), income from farming of animals (16%), and income from wages (13%). In certain respects, this result is consistent with the findings by Davis et al (2010) who undertook a cross-country comparison of rural income generating activities.¹⁶ It should be noted, however, that at the level of Indian states, the importance of net receipts from cultivation varies considerably as the driver of income inequality. In some states (like West Bengal and Jharkhand, where the net income from cultivation is the lowest in the country) the contribution of cultivation income to inequality is very small (around 10%), whereas in other states (like Assam, Karnataka, Uttar Pradesh and Maharashtra) it is very large (over 70%).

Second, the contribution of cultivation income to inequality increased over the study period. The share of inequality accounted for by net income from cultivation increased from 39% in 2003 to 50% in 2013¹⁷ while that of net income from farming of animals more than doubled from 7% to 16%. The share of the contribution of wages halved from 25% in 2003 to

¹⁵ Estimates are computed using the `Ineqfac` command in STATA. Details are available in the Stata Technical Bulletin 48 (March 1999). Available: <http://www.stata-press.com/journals/stbcontents/stb48.pdf>. Accessed: May 5, 2016

¹⁶ They analysed data from 16 countries across four continents, viz. Asia, Africa, Eastern Europe, and Latin America and found that the key drivers of income inequality varied across countries. In 4 countries, the highest contributor to income inequality was income from crop cultivation, in 5 countries it was non-agricultural wage, and in 6 countries it was income from self-employment. India appears to be similar to a subset of 4 countries in their study, viz. Malawi, Madagascar, Tajikistan, and Nigeria, where income from cultivation is the largest contributor to income inequality. In their sample of countries, income from cultivation is the second highest contributor to inequality in Ghana, Pakistan and Ecuador.

¹⁷ In the Indian context, the only reliable estimate of how income inequality has evolved over time comes from a small sample longitudinal study of Palanpur village in the state of Uttar Pradesh (Himanshu et al. 2013). In Palanpur, income inequality as measured by the Gini Coefficient increased over the period 1957-58 to 2008-09. The contribution of agricultural income to inequality declined from 92 per cent to 28 per cent while the contribution of non-farm income increased from 8 per cent to 67 per cent during the 50-year period. Palanpur is a prosperous and in many ways atypical village, which may explain why our findings do not match theirs.

13% in 2013 and the share of the contribution of non-farm business income reduced from 29% in 2003 to 22% in 2013.

Third, income from farming of animals had ambiguous effects on inequality. The doubling of the contribution of income from farming of animals to total inequality in per-capita incomes in 2013 (as compared to 2003) can be understood from the large increase in the share of income from farming of animals in the average monthly income (see Table 2).¹⁸ It is to be noted that the inequality in the distribution of per-capita income from farming of animals itself has actually fallen between 2003 and 2013.¹⁹ But since income accruing to this category increased on average, its salience in explaining total inequality also increased.

Fourth, there are significant state-to-state variations in the other (non-cultivation) sources of income as drivers of inequality. Consider income from farming of animals, which was the source of the largest increase in average incomes between 2003 and 2013. In five of the eight states where this income more than doubled, the contribution of this source to total inequality increased sharply. But in Rajasthan and Uttar Pradesh, which are among those eight states, it is the share of inequality contributed by income from non-farm business that rose significantly between 2003 and 2013, whereas the share of inequality contributed by income from farming of animals fell during this period. Similarly, in Kerala, the contribution of income from non-farm business increased sharply from 10% in 2003 to 68% in 2013. These contrast with Maharashtra, where the contribution of non-farm income in explaining inequality reduced sharply from 71% in 2003 to 7% in 2013. The above discussion is consistent with Davis et al. (2010) who suggest that it is a purely empirical question on how growth in different components of income will affect inequality.

We undertook a detailed analysis of within and between group inequality for this project, which, to keep the exposition relatively short and simple, we have not reported here (detailed tables available on request). These analyses focused on paired comparisons based on social identity (Scheduled Caste, Scheduled Tribe, Other Backward Classes, and Upper Caste groups), religion (Hindu, Muslim, and other smaller groups), and type of agrarian economy (states in the “rice-wheat” system, recent strong performers in agriculture, etc.). In general, we find that at the all India level, income inequality between social groups is driven by cultivation income arising

¹⁸ It is to be noted that the figures given in Table 2 are for total incomes and the shares calculated in Table 6 are for per-capita incomes. We undertook the same calculation using per capita incomes and found similar magnitudes as those mentioned in Table 2. These tables are available on request.

¹⁹ Consistent with an overall decrease in income inequality at the all-India level between 2003 and 2013, the inequality in the distribution of each of the four components of incomes also decreased during this period. Among the four components, the largest decrease in inequality is observed in the income from farming of animals, which coincidentally also witnessed the largest increase in its share in average income during this period. Moreover, in six out of eight states where the share of income from farming of animals more than doubled, inequality in the distribution of this income component actually fell. Inequalities in the distribution of incomes from each factor are not provided here but are available on request.

from systematically lower landownership rates and/or access to irrigation for socially marginalized groups²⁰. There are significant variations across the states. In addition, there are distinguishable patterns in the share of the total inequality accounted for by the inequality between landownership groups across three clusters of Indian states. In the states which are part of the rice-wheat system and Chhattisgarh, Madhya Pradesh, and Odisha, the contribution of inequality between landownership groups in explaining inequality in per capita net income from cultivation has increased substantially²¹.

5. Concluding Comments

“How unequal is India?” Branko Milanovic (2016) asked. “The question is simple,” he wrote, “the answer is not.”²² Because, of the three main methods of conceptualizing inequality—by wealth, income, and consumption—there does not exist a single estimate for India from official sources for income. The findings in this paper, limited as they are to the agricultural sector, do not solve this problem of “ignorance.” But the gap we estimate between the inequalities of consumption (the “standard” measure of inequality in India) and income is so large that it is possible to make a case that the true level of income inequality in India may be among the highest in the world. Hence we underline our key finding that income inequality in rural India is very high, it is driven by income from cultivation, which in turn is driven by landownership.

There are significant state-level variations, which is not surprising given their varied histories of revenue extraction systems of zamindari, ryotwari, and mahalwari which have been shown to have persistent effects on present-day outcomes (Banerjee and Iyer 2005). In addition, there are variations in geographies (of agro-climatic and soil zones); landownership patterns (that go from average holding sizes of 0.2 to 4.0 hectares from Kerala to Punjab), politics (caste-driven in some states, religion-driven in others), and policies (the varying implementation of irrigation and agricultural support price schemes). As a result, the conditions of landownership and agricultural structure and income are diverging between states. There may be important policy lessons from well-performing states, but there are serious problems in states like Bihar,

²⁰ At the all-India level, in 2003, inequality in per capita cultivation incomes between landownership groups accounted for about 10% of the total inequality in per capita cultivation incomes. This proportion increased to 15% in 2013.

²¹ For the rice wheat system, the contribution of inequality between landownership groups to the total inequality in per capita net income from cultivation increased from 13% in 2003 to 26% in 2013. In Chhattisgarh, Madhya Pradesh, and Odisha too, the contribution of inequality between landownership groups to the total inequality in per capita net income from cultivation increased from 17% to 27%. It is only in the “other” group of states that we see that the share of inequality between landownership groups increased only marginally from 9% to 10%.

²² <http://tinyurl.com/j2vpr9z>. Accessed May 30, 2016

West Bengal, and Uttar Pradesh, where income levels are lower than consumption levels and/or there has been no growth in real incomes in the agricultural sector in the decade of 2003-13.

While we have focused on income inequality in the agricultural sector in this paper, the pressing policy questions on agriculture tend to be less about inequality and more about structural transformation. Analysts argue that a transformation of significant magnitude is not evident in rural India. In an article reviewing India's growth performance, Kotwal et al. (2011) point out that one distinct aspect of India's experience is the slow rate of decline in the share of the workforce employed in agriculture. In the inter-censal period 2001-2011, the share of workers engaged in the agriculture sector declined by 3.6% to 54.6%. Kotwal et al. argue that "an important component of growth—moving labor from low to high productivity activities—has been conspicuous by its absence in India. Also, as the labor to land ratio grows, it becomes that much more difficult to increase agricultural wages and reduce poverty" (p. 1195). One of the important reasons for it is found in Deininger et al. (2017) who show that the main impact of land fragmentation in India is to reduce the mean plot size below the threshold for mechanisation. Other analysts have written about the "stunted structural transformation" of the Indian economy (Binswanger-Mkhize 2013) given the lack of expansion in rural non-farm employment, declining farm sizes, and the large number of individuals that work part time as cultivators.

Our findings add to the gloomy conclusion that there has been little change—in structural or distributional terms—in India's agricultural economy. Despite the persistence of the deep inequalities we have shown in this paper, and the ongoing and seemingly irreversible fragmentation of the land into marginal and unsustainable sizes, the reallocation of labor to other work (waged or enterprise) simply does not appear to be taking place. The only significant change has been in the growth of income from farm animals (which is quite high in some states, like Odisha) which suggests that some labor reallocation is taking place in this subsector. But the bottom-line is this: cultivation income outgrew both wage income and income from non-farm business in 2003-13. This is not a sign of an agricultural economy undergoing transition.

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Table 1: Average monthly per capita income by sources and monthly per capita consumption expenditure (MPCE) per agricultural household, 2013

	Net Receipts from				Monthly Per Capita	
	Wages	Cultivation	Farming of Animals	Non-farm Business	Expenditure	Income
Punjab	1,034 (27)	2,311 (60)	389 (10)	137 (4)	2,743	3,872
Kerala	1,398 (41)	1,090 (32)	162 (5)	738 (22)	2,737	3,388
Haryana	692 (26)	1,404 (53)	480 (18)	85 (3)	1,951	2,662
Karnataka	580 (31)	1,052 (56)	125 (7)	121 (6)	1,295	1,878
Tamil Nadu	704 (38)	545 (30)	320 (17)	263 (14)	1,537	1,832
Telangana	383 (23)	1,149 (68)	98 (6)	54 (3)	1,261	1,683
Andhra Pradesh	680 (40)	580 (34)	266 (16)	156 (9)	1,622	1,681
Gujarat	536 (33)	621 (38)	399 (24)	74 (5)	1,566	1,630
Maharashtra	455 (29)	842 (54)	122 (8)	150 (10)	1,215	1,569
Rajasthan	484 (31)	701 (46)	204 (13)	152 (10)	1,493	1,540
Assam	275 (19)	921 (64)	179 (12)	62 (4)	1,237	1,437
Madhya Pradesh	265 (20)	883 (67)	133 (10)	40 (3)	1,062	1,321
Odisha	405 (34)	343 (29)	343 (29)	111 (9)	974	1,203
Chhattisgarh	376 (35)	707 (65)	-3 (0)	0 (0)	920	1,081
Jharkhand	367 (34)	341 (32)	306 (29)	54 (5)	952	1,068
West Bengal	533 (53)	250 (25)	64 (6)	160 (16)	1,468	1,007
Uttar Pradesh	215 (22)	589 (60)	101 (10)	73 (7)	1,200	979
Bihar	255 (35)	369 (50)	48 (7)	64 (9)	1,097	736
All India*	444 (31)	687 (49)	169 (12)	114 (8)	1,323	1,414

Figures in brackets are the state-level shares in average income

All figures in 2013 Rupees

* This is for all 36 States and Union Territories. We have not reported the numbers separately for 19 minor states and union territories. The states reported here cover about 95% of the national population.

Table 2: Ratio of average monthly income from different sources in 2013 to 2003

Major States	Income from Wages	Net Income from			Total Income
		Cultivation	Farming of Animals	Non-Farm Business	
Punjab	1.56	1.80	2.39	0.68	1.67
Haryana	1.20	1.85	--*	0.57	1.93
Rajasthan	1.36	1.60	3.99	1.63	1.63
Uttar Pradesh	1.00	1.38	3.76	0.99	1.31
Bihar	1.28	0.80	0.44	0.55	0.83
Assam	0.69	1.15	2.45	0.51	1.02
West Bengal	1.18	0.62	1.44	0.76	0.91
Jharkhand	1.09	0.78	5.88	0.56	1.13
Odisha	1.41	1.79	33.35	1.54	2.08
Chhattisgarh	1.25	2.05	1.58	--*	1.57
Madhya Pradesh	1.17	1.48	--*	0.59	1.75
Gujarat	1.34	1.18	1.84	1.30	1.36
Maharashtra	1.29	1.54	1.82	1.49	1.47
Andhra Pradesh	1.59	1.56	3.61	1.07	1.64
Karnataka	1.27	1.66	1.92	1.49	1.52
Kerala	1.21	1.43	1.58	1.62	1.36
Tamil Nadu	1.24	1.16	3.93	2.43	1.48
All India	1.22	1.32	3.21	1.00	1.34

Source: Authors computations from unit level data

Notes: For sake of comparability the 2003 income was adjusted to 2013 prices using CPI-AL. So the comparison is in real terms and not nominal terms

*We do not report this ratio since the average net income from this source is negative or zero in one or both the years.

Estimates for Andhra Pradesh in 2013 includes Telangana

Table 3: Quantity and share of average monthly income from different sources by size class of land owned, 2013 – All India

Size Class of Land Owned (hectares)	Income from Wages	Net Receipts from				Income	Consumption
		Cultivation	Farming of Animals	Non-Farm Business	A+B+C+D		
	A	B	C	D			
<0.01	3,019 (64%)	31 (1%)	1,223 (26%)	469 (10%)	4,742	5,139	
0.01-0.40	2,557 (58%)	712 (16%)	645 (15%)	482 (11%)	4,396	5,402	
0.41-1.00	2072 (39%)	2,177 (41%)	645 (12%)	477 (9%)	5,371	5,979	
1.01-2.00	1,744 (24%)	4,237 (57%)	825 (11%)	599 (8%)	7,405	6,430	
2.01-4.00	1,681 (15%)	7,433 (69%)	1,180 (11%)	556 (5%)	10,849	7,798	
4.01-10.00	2,067 (10%)	15,547 (78%)	1,501 (8%)	880 (4%)	19,995	10,115	
>10.00	1,311 (3%)	36,713 (86%)	2,616 (6%)	1,771 (4%)	41,412	14,445	
All Classes	2,146 (31%)	3,194 (49%)	784 (12%)	528 (8%)	6,653	6,229	

Source: Calculations from Unit Level Data of 2013 Survey

* This is for all states and union territories.

Table 4: Ratio of average monthly income from different sources in 2013 to the average monthly income from different sources in 2003 (major states only)

Size Class of Land Owned (hectares)	Income from Wages	Net Income from			Total Income
		Cultivation	Farming of Animals	Non-Farm Business	
<0.01	1.01	0.34	3.40	0.63	1.13
0.01-0.40	1.07	1.09	2.78	0.67	1.10
0.41-1.00	1.26	1.40	2.61	1.08	1.38
1.01-2.00	1.23	1.50	3.31	1.61	1.52
2.01-4.00	1.26	1.54	5.39	1.23	1.59
4.01-10.00	1.81	1.76	7.88	1.33	1.85
>10.00	1.23	2.06	3.58	1.32	2.02
All Classes	1.22	1.32	3.21	1.00	1.34

Source: Authors computations from unit level data

Notes: See Table 1

Table 5: Estimates of Inequality (Gini) in MPCE and Per Capita Income, 2013 and 2003

	Per Capita Income		MPCE	
	2013	2003	2013	2003
Punjab	0.53	0.63	0.29	0.25
Haryana	0.51	0.60	0.25	0.23
Rajasthan	0.50	0.65	0.27	0.25
Uttar Pradesh	0.58	0.65	0.28	0.26
Bihar	0.61	0.56	0.22	0.21
Assam	0.52	0.45	0.23	0.18
West Bengal	0.53	0.59	0.28	0.23
Jharkhand	0.52	0.52	0.24	0.20
Odisha	0.53	0.60	0.24	0.23
Chhattisgarh	0.43	0.56	0.22	0.20
Madhya Pradesh	0.49	0.82	0.25	0.22
Gujarat	0.43	0.53	0.23	0.28
Maharashtra	0.57	0.61	0.21	0.23
Andhra Pradesh*	0.60	0.61	0.27	0.26
Karnataka	0.58	0.56	0.23	0.22
Kerala	0.59	0.52	0.31	0.35
Tamil Nadu	0.59	0.67	0.28	0.28
All- India	0.58	0.63	0.28	0.27

Note: *For comparability with the 2003 data, the 2013 estimates for Andhra Pradesh were calculated by combining it with the state of Telangana.

Table 6: Share of Inequality in Per-capita Income by Income Source, 2003 and 2013

	Per Capita Net Receipts from							
	Per Capita Wages		Cultivation		Animals		Non-Farm Business	
	2003	2013	2003	2013	2003	2013	2003	2013
Punjab	6.4	12.1	84.0	63.6	8.7	18.3	0.9	6.0
Haryana	31.8	22.1	55.5	69.5	8.2	8.5	4.4	-0.2
Rajasthan	26.9	6.3	45.2	50.9	15.6	7.4	12.3	35.3
Uttar Pr.	13.9	12.8	74.5	72.7	7.6	3.4	4.0	10.7
Bihar	27.9	27.0	44.8	33.0	13.4	35.2	13.8	4.8
Assam	43.0	6.8	43.5	86.5	4.5	5.8	9.0	0.9
W. Bengal	52.6	44.6	4.9	9.4	3.8	22.7	38.7	21.3
Jharkhand	44.6	6.7	22.7	13.2	11.7	61.1	21.0	19.0
Odisha	54.3	16.1	12.2	32.7	4.1	42.5	29.4	8.6
Chhattisgarh	52.7	30.5	40.7	66.4	0.9	2.4	5.7	0.6
Madhya Pr.	8.4	2.9	59.5	51.4	30.8	3.2	1.4	42.6
Gujarat	23.5	36.6	63.4	47.2	11.4	11.9	1.8	4.2
Maharashtra	17.6	7.2	9.4	72.4	1.9	13.3	71.1	7.2
Andhra Pr.	9.9	2.7	67.8	43.3	7.4	49.8	14.8	4.2
Karnataka	18.5	8.1	54.7	77.8	14.6	9.2	12.2	4.9
Kerala	30.4	9.5	58.7	21.4	0.7	1.2	10.2	67.9
Tamil Nadu	17.3	6.4	39.5	23.2	1.8	35.3	41.3	35.2
Total	24.9	12.8	39.0	49.8	7.4	15.7	28.6	21.7

Note: The shares sum to 100 for each state for both years.

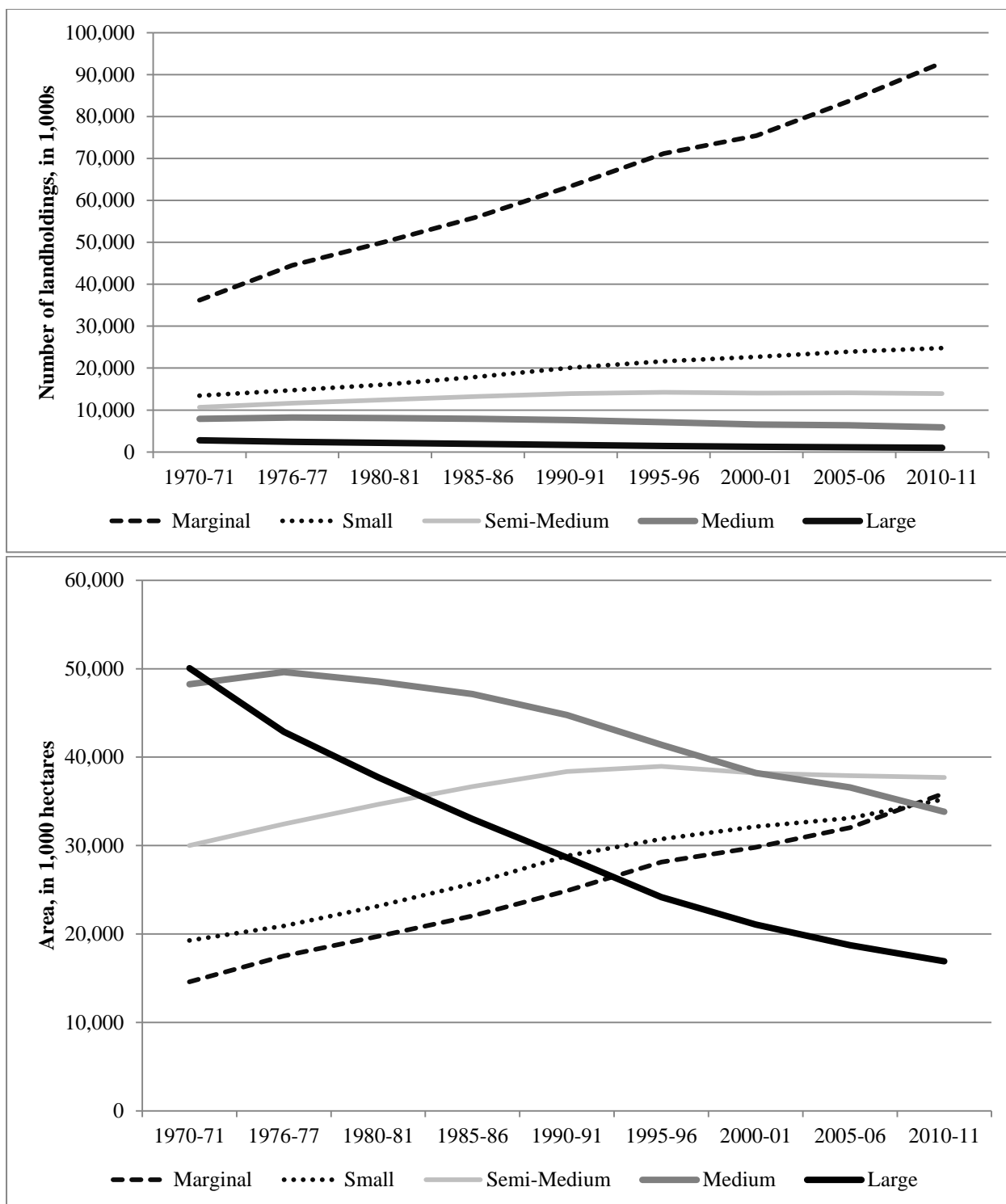
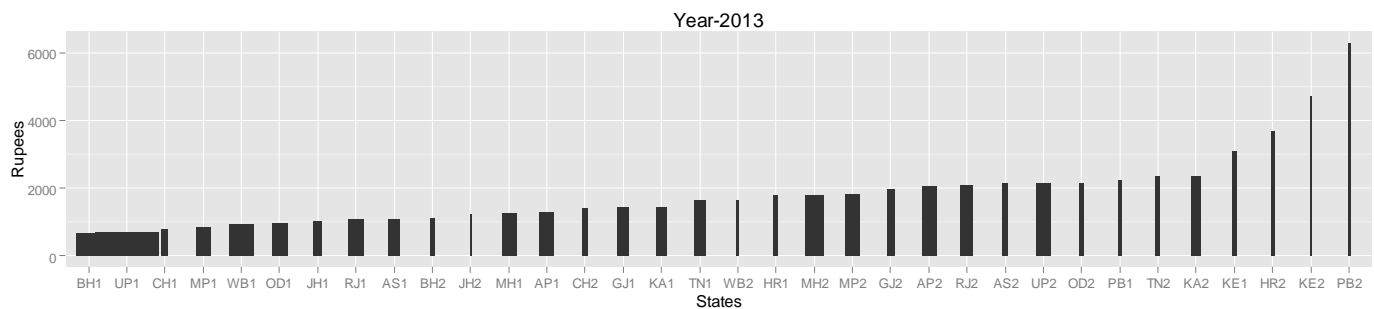
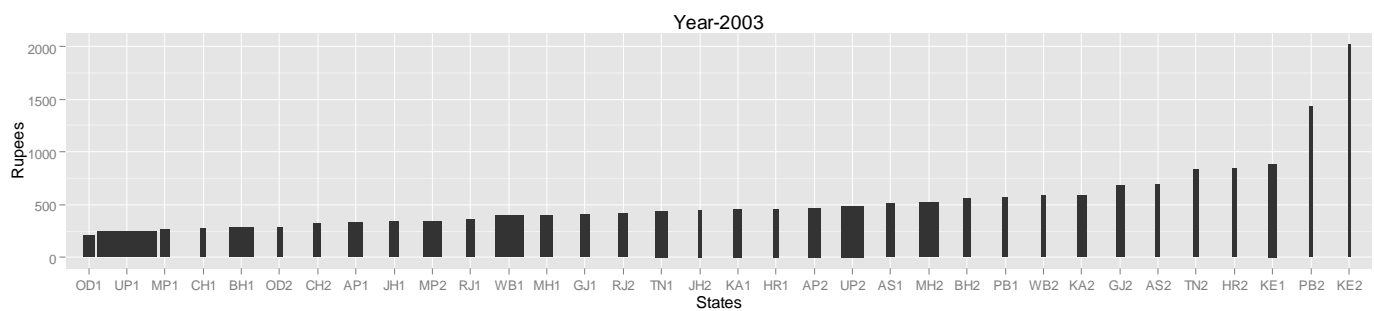


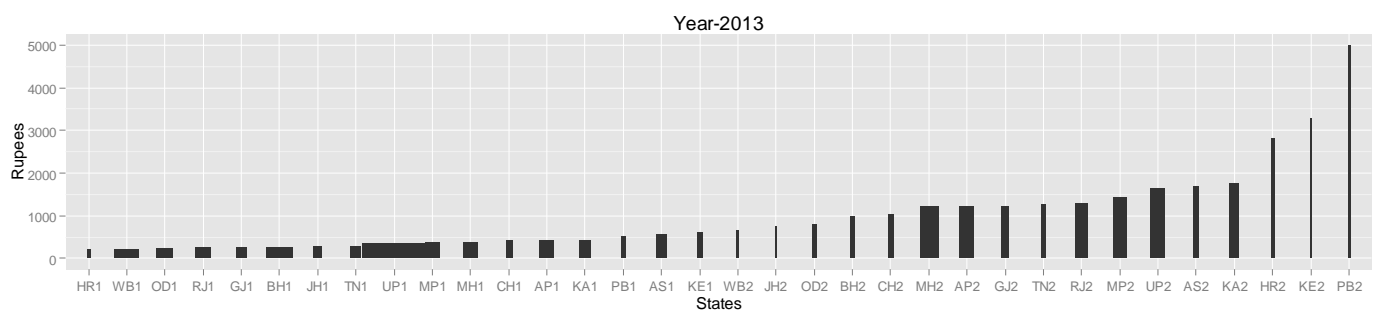
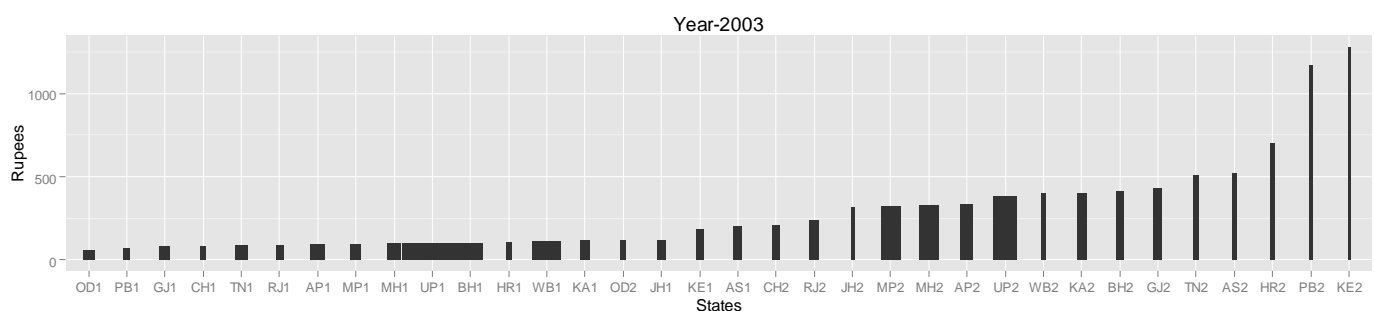
Figure 1. Distribution of Landholdings by Size, 1970-71 to 2010-11

Source: All India Report on Agriculture Census 2010-11, Government of India.

<http://agcensus.nic.in/document/ac1011/reports/air2010-11complete.pdf>



a. Mean per capita total income by size of land holding in major states



b. Mean per capita net income from cultivation by size of land holding in major states

Figure 2. Pen's Parade of Total and Cultivation Income by Size of Landholding, 2003 and 2013

Legend-- AP: Andhra Pradesh, AS: Assam, BH: Bihar, CH: Chhattisgarh, GJ: Gujarat, HR: Haryana, JH: Jharkhand, KA: Karnataka, KE: Kerala, MH: Maharashtra, MP: Madhya Pradesh, OD: Odisha, PB: Punjab, RJ: Rajasthan, TN: Tamil Nadu, UP: Uttar Pradesh, WB: West Bengal. The suffix 1 and 2 after each state corresponds to households with less than 1 hectare of land and more than 1 hectare of land.