Asia Research Institute
Working Paper Series No. 257

Linkages between Households' Agricultural Landholding and Child Nutritional Status in Rural India

Mohammad Zahid Siddiqui
Centre for the Study of Regional Development (CSRD)
Jawaharlal Nehru University (JNU), India
say2zahid.s@gmail.com; rehan9027@gmail.com

Srinivas Goli
Center for the Study of Regional Development (CSRD)
Jawaharlal Nehru University (JNU), India

Tamal Reja
International Center for Research on Women (ICRW), India

Shruti
Department of Economics, Banaras Hindu University (BHU), India

April 2017

The **ARI Working Paper Series** is published electronically by the Asia Research Institute of the National University of Singapore.

© Copyright is held by the author or authors of each Working Paper.
ARI Working Papers cannot be republished, reprinted, or reproduced in any format without the permission of the paper's author or authors.

Note: The views expressed in each paper are those of the author or authors of the paper. They do not necessarily represent or reflect the views of the Asia Research Institute, its Editorial Committee or of the National University of Singapore.

Citations of this electronic publication should be made in the following manner: Author, "Title," ARI Working Paper, No. #, Date, www.nus.ari.edu.sg/pub/wps.htm. For instance, Smith, John, "Ethnic Relations in Singapore," ARI Working Paper, No. 1, June 2003, www.ari.nus.edu.sg/pub/wps.htm.

Asia Research Institute Editorial Committee
Michelle Miller – Chair
Eric Kerr
Shekhar Krishnan
Creighton Paul Connolly
Valerie Yeo

Asia Research Institute
National University of Singapore
AS8, #07-01, 10 Kent Ridge Crescent,
Singapore 119260
Tel: (65) 6516 3810
Fax: (65) 6779 1428
Website: https://ari.nus.edu.sg
Email: arisec@nus.edu.sg

The Asia Research Institute (ARI) was established as a university-level institute in July 2001 as one of the strategic initiatives of the National University of Singapore (NUS). The mission of the Institute is to provide a world-class focus and resource for research on the Asian region, located at one of its communications hubs. ARI engages the social sciences broadly defined, and especially interdisciplinary frontiers between and beyond disciplines. Through frequent provision of short-term research appointments it seeks to be a place of encounters between the region and the world. Within NUS it works particularly with the Faculty of Arts and Social Sciences, Business, Law and Design, to support conferences, lectures, and graduate study at the highest level.

Linkages between Households' Agricultural Landholding and Child Nutritional Status in Rural India

Mohammad Zahid Siddiqui
Centre for the Study of Regional Development (CSRD)
Jawaharlal Nehru University (JNU), India
say2zahid.s@gmail.com; rehan9027@gmail.com

Srinivas Goli
Center for the Study of Regional Development (CSRD)
Jawaharlal Nehru University (JNU), India

Tamal Reja
International Center for Research on Women (ICRW), India

Shruti
Department of Economics, Banaras Hindu University (BHU), India

ABSTRACT

The aim of this study is to examine the linkages between ownership of households' agricultural landholding and child nutritional status in rural India. Agricultural landholding is a critical indicator of socioeconomic wellbeing in rural areas. More than 72 per cent of the working population in rural India is involved in agriculture as its main or marginal economic activity. Ownership of agricultural land and engagement in related activities not only makes access to food materials easy but also provides the crucial socioeconomic security that is essential to improve the nutritional status of the rural population in India. Our empirical analyses support theoretical arguments: bivariate analyses revealed that about 11 per cent more underweight children reside in households with no land or with marginal agricultural landholdings as compared to households with the larger size of agricultural landholdings. Similar differences are also observed in the case of child stunting and food security by the size of household agricultural landholding. Regression analyses also suggest that the size of a household agricultural landholding is a critical determinant of child nutritional status in rural India after controlling for other important socioeconomic factors that are known to affect the child nutritional status.

INTRODUCTION

What is the linkage between household's ownership of agricultural landholding and children nutritional status in rural areas of India? There is much interest, both among researchers and policy makers, in understanding this question because child malnutrition has been a long-standing public health and socioeconomic challenge in the country. The progress in reducing child malnutrition has been slow in this country. According to the latest available estimates, India is home to around 40 per cent of the world's malnourished children and about 35 per cent of the developing world's low-birth-weight babies. Each year, 2.5 million children die in India, accounting for one-fifth of all child deaths in the world. More than half of these deaths could be prevented if children were well-nourished. The prevalence of child malnutrition in India diverges more than expected from the country's per capita income compared to any other developing economies (von Braun et al., 2008; MoWCD and UNICEF, 2014).

On the other hand, secure land rights are critical but often an overlooked factor in achieving household food security and improved nutritional status in rural areas of developing countries (Mebrahtu et al., 1995). In India, the land is historically unevenly distributed such that a small proportion of the households own the bulk of the land, and certain social groups are traditionally deprived of land ownership. The average size of holdings has shown a steady decline over the successive census periods. In 1970-71, it stood at 2.28 hectares, which declined to 1.15 hectares in 2010-11. Around 40 per cent of the rural households do not own land whereas as much as 15 million acres is under ownership holdings of land size of more than 20 acres; this inequality in ownership has worsened post-1990. By contrast, over 72 per cent of the working population in the rural area is involved in agriculture as its main or marginal economic activity, which includes both cultivators and agricultural labourers (Rawal, 2008; GoI, 2014c; Goli et al., 2015). The reversal of land reforms, as recently witnessed in some states is a serious blow to equidistribution of land, especially in the light of the fact that the ceiling law has failed to make a dent in the country's agricultural land distribution. It has disempowered the landless households further in a circumstance where land ownership structures have remained skewed (Trivedi, 2013). In this context, this paper, both theoretically and empirically, investigates the question that "how far does the ownership of agricultural land have an effect on the nutritional status of children in the rural areas of India"?

Though prevailing assumption suggests that the role of land in rural livelihood is weakening due to an increase in migration to the cities as an alternative coping mechanism and the growth of the non-farm sector in the rural areas (choithani, 2016), land continues to be a critical determinant of the socioeconomic position of a family in the rural society of India. By virtue of this, it is still a critical determinant of food security and nutritional status of the households. However, the pathway through which the agricultural landholding of the households influences nutrition is complex. In this study, we make an effort to understand this complex relationship. In the following sections, we present the background of the research question in the context of global and Indian literature to build both a theoretical and a conceptual framework for studying the linkage between the size of household agricultural landholding and children nutritional status.

BACKGROUND

For decades, the global development programs have failed to draw attention to hunger and undernutrition. Recent years have seen more contemplation and actions around the world to eradicate undernutrition. The most attention-seeking countries regarding progress in child malnutrition are India, Brazil, China, Indonesia, and Mexico, which are positioned among the world's most populous countries and even ranked in the top 20 economies in terms of Gross Domestic

Product (GDP). Except for India, the other four countries have made remarkable progress in addressing undernutrition in the recent past. Between 1990 and 2014, hunger was reduced in Brazil by nearly two-thirds and in China and Indonesia by more than half. Child stunting improved considerably in China from 1990 to 2013 and in Brazil from 1989 to 2007, declining by almost two-thirds in both countries (FAO, 2014). Despite a decline in child malnutrition from 43.5 per cent to 30.7 per cent between 2005-06 and 2013-14, India continues to be home to the highest number of chronically malnourished under-five children, with nearly every second child being stunted and one in three being underweight (MoWCD and UNICEF, 2014). Also, the evidence shows that regional, gender, caste and economic inequalities in child malnutrition have widened in the recent past (IIPS and ORC Macro, 2007; Pathak and Singh, 2011; Goli and Arokiasamy, 2013).

In terms of food security, according to the evidence from the Global Hunger Index (GHI) constructed by the IFPRI in 2014, India stands at the 55th position out of 76 countries and has now moved from the 'alarming' category to the 'serious' category of hunger (Grebmer et al., 2014). Though India has moved above Bangladesh and Pakistan, it still lies behind Nepal and Sri Lanka. The study concluded that GHI scores are closely aligned with poverty, but there was a little association with state-level economic growth. High levels of hunger are seen even in the states that are performing well economically such as Gujarat and Karnataka. India is in a situation of dichotomy, where on the one hand we are self-sufficient regarding agricultural production and on the other, we are leading the world in terms of hungry people (Menon et al., 2009).

Worldwide, the evidence of the linkage between economic growth and nutrition shows that the economic growth has played a significant role in addressing malnutrition. The rate of decline in the occurrence of underweight children tends to be approximately half of the rate of growth of per capita GDP (Haddad et al., 2003). During the last decade and more, even though India has become the highest growing economy in the world after China, it has continued to outnumber Sub-Saharan Africa in terms of the absolute number of hungry people. The government of India claims a substantial reduction in the prevalence of poverty in the country, but evidence suggests a startling divergence between the real per capita expenditure and the per capita calorie intake, which underlies the divergence between the decline in poverty and hunger (Basu and Das, 2014). The data also points to a decline in the average calorie intake of cereals in spite of a rise in the real income and no long-term rise in the relative price of food (Deaton and Dreze, 2009). It has also been found that the cross-sectional relationships between the aggregate net state per capita income and health indicators of children are positive; yet, the association has been less steep in the recent times than in the past (Coffey et al., 2013). On the other hand, a more recent study by Himanshu (2015) reports that reform in Public Distribution Programme (PDS) in the country have contributed to the increase in daily per capita calorie intake. Even then, we need to see whether this increase in calorie intake has resulted in improvement in nutritional status which is a composite outcome of several other factors along with calorie intake.

A growing number of nutrition studies explain that malnutrition in India, as in other developing countries, results from a series of interrelated factors rooted in poverty, including lack of access to food, diversity in food intake, healthcare, safe drinking water, sanitation services, and appropriate child feeding and caring practices. These interrelated factors are in turn exacerbated by the lack of access to human, financial, social, natural, and physical capital for poor households and communities, combined with social discrimination, lack of education, and gender inequality (IIPS, 1995; IIPS and ORC Macro, 2000, 2007; Deaton and Dreze, 2009; Pathak and Singh, 2011; Spears, 2013; Coffey et al., 2013; Dreze and Sen, 2013).

Many of these factors are directly or indirectly, linked to the household's ownership of agricultural landholding. Yet, there are only a few studies which have theoretically and empirically argued for the possible association between agricultural landholding of households and their nutritional status. Therefore, in this study, we explore the relationship between agricultural landholding of households and the nutritional status of children in the rural areas in India. Before presenting our conceptual framework, in the following section, we have briefly discussed the previous literature on the linkage of household agricultural landholding and nutritional status.

PREVIOUS LITERATURE

Access to land and rural poverty is an established relationship, especially in Asia (Ali and Penia, 2003). In the past, few efforts have also been made to establish the link between access to land and undernutrition. In one of the areas of Punjab, Levinson (1974) found that 54 per cent of the children of landless labourers were moderately or severely malnourished, compared to less than 39 per cent of the children of landowners. FAO (1982) shows a rise in gross consumption, and calorie and protein intake with increasing farm size in Bangladesh. Similar patterns have been observed in the Philippines, Kenya, Haiti, and Peru. A study conducted in Nepal also reveals that land distribution (both quantity and quality) is a major factor responsible for maintaining the household food security (Maharajan and Chhetri, 2006). It revealed that the average landholding size of food-secure households was almost double to that of food-insecure households. Babatunde and Qaim (2010) also suggested that farm size positively contributes not only to food security but also to farm income, which in turn helps to improve the nutritional security. A similar association was observed by studies conducted in China, Ethiopia, and Uganda (Li et al., 1998; Deininger, 2003; Deininger et al., 2008; Kyomughisha, 2008)

In just two years span, the death of 200 children due to malnutrition among the tribal population of Attappady, Kerala may be stated for its relevance to the association between the access to land and the problem of undernutrition in India (Shaji, 2014; Manikandan, 2014). People ascribed the loss of their agricultural lands as the main reason for this massive undernutrition related deaths in their community. Rammohan and Pritchard (2014) consider land as an important source of income, especially in rural developing economies, and they provide existing evidence of a positive association between land size and agricultural income. They go to the extent of arguing that landless or near-landless households are unable to use the land to generate income or to cushion themselves against major shocks through asset sales. Their analysis indicates that landless and near-landless households are unable to meet their food and nutritional security and required dietary diversity needs.

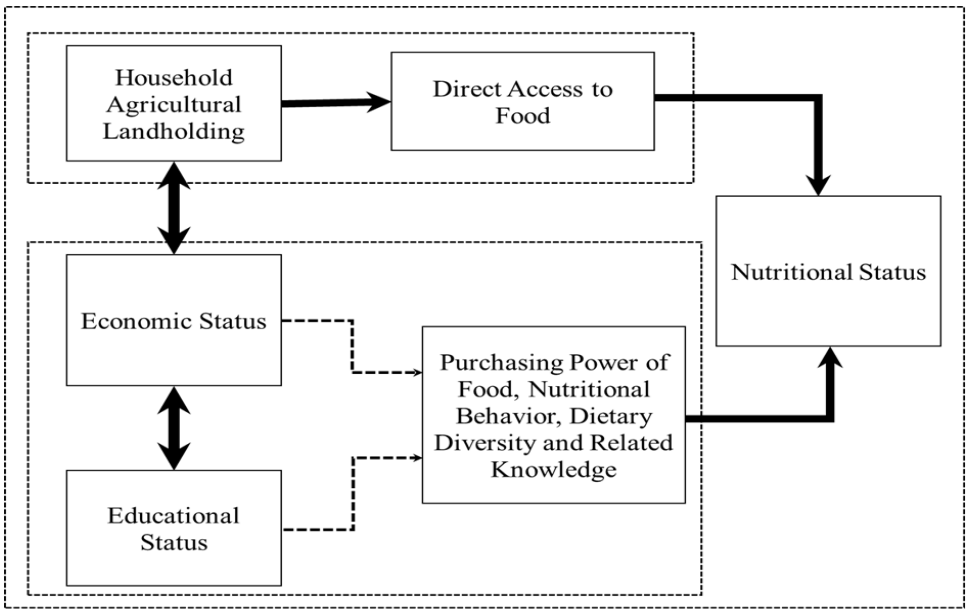
Santos et al. (2013) have argued that land rights have a direct link to the increasing food production and food security of the households. In a policy brief, Kadiyala et al., (2011) have accepted the agriculture landholding—nutrition linkage. They have argued that extending more land rights to women and increasing their participation in agriculture in rural areas is essential to India's nutritional security. Citing the example of Brazil and China's continuous investments and reforms in agriculture and improvement in nutritional status, Fan and his colleagues argued that targeting the safety nets by providing productive assets like land to them is important in the nutritional security of the households (Fan et al., 2012). Furthermore, it has been argued that land is a principally important asset for rural livelihoods and nutritional security because of its primacy in asset sequencing, which paves the way for the wellbeing of the households (Savath et al., 2014). Though there is a clear and widely accepted association between agriculture and nutrition (World Bank, 2007; Gillespie and Kadiyala, 2011; Kadiyala et al. 2011; Dev, 2012), India has lagged behind in explaining these links empirically in the recent times especially by using large-scale survey data.

PATHWAYS OF HOUSEHOLD LANDHOLDING AND NUTRITIONAL STATUS LINKAGE

In this section, we present the theoretical arguments and a conceptual framework illustrating the pathways of how agricultural landholding of a household is associated with child nutritional status. India produces enough food to meet the average calorie requirements of its population (FAO, 2014). Despite this, access to food is unevenly distributed in India. The skewed land distribution forms the basis for this skewed access to food. The rural Indian society is hierarchically organised, primarily by ownership and control of agricultural land. The distribution of social power, income, and food consumption closely approximates the distribution and control of land. Since control of resources and income is directly linked to landholding, it emerges as the most critical indicator of socioeconomic wellbeing in rural India. More than 50 per cent of the population in India lives in the rural areas and is involved in agriculture as its primary economic activity (GoI, 2014). Data from an empirical study on structural and chronic poverty show that rather than income or expenditure, it is the assets that play a central role in households' ability to exit poverty (Carter and Barrett, 2006). A study conducted by Santos et al. (2013) in West Bengal, India, finds that land-allocation has an impact on a range of outcomes that are expected to lead to future food security. Ownership of agricultural land and engagement in related activities makes access to food materials easy and ensures food security, which is strongly linked to nutritional outcomes; thus, it becomes an important determinant of nutrition as well.

There are several important determinants of malnutrition in India (IIPS, 1995; IIPS and ORC Macro, 2000, 2007; Deaton and Dreze, 2009; Pathak and Singh, 2011; Spears, 2013; Coffey et al., 2013; Dreze and Sen, 2013); however, given its primacy among assets, agricultural landholding is perhaps the single most important factor that influences the nutritional levels in rural India, as shown in figure 1. Household agricultural landholding affects the nutritional status both directly and indirectly, which means that it not only affects the direct access to food and diversity in food intake but also affects the economic and educational status. These last two factors strongly influence the purchasing power and the nutritional behaviour, which further affects the nutritional outcomes. Thus, there is a greater probability of undernutrition in the families of landless or small and marginal farmers (<2.1 hectares) that are not large enough to fully support food and nutritional security in the rural areas.

Pathways, Showing the Relationship between Households' Agricultural Landholding and Nutritional Status



DATA AND METHODS

The data from the third round of the National Family Health Survey (NFHS-3), 2005-06 has been used to assess the relationship between agricultural landholding and child nutritional status in rural India. The survey is a nationwide representative sample survey of 109,041 households, consisting of 1,24, 385 women, aged 15-49 years and 74,369 men, aged 15-54 years. We have restricted our sample to children in the age group of less than 5 years and residing in the rural areas of India. Our estimated sample contains information on 35,318 children, aged 0–5 years. The analysis is based on the questions asked in the women's questionnaire, which was administered to all women aged 15-49 years. The survey collected information on key socio-economic, demographic, and health characteristics, with representative samples from 29 states of India, comprising more than 99 per cent of the national population.

The survey adopted a two-stage sample design in the rural areas and a three-stage sample design in the urban areas. To make the estimates representative and to account for the multistage sampling design, appropriate weights have been used in the analysis (for more details on sampling and sampling weights, see International Institute for Population Sciences [IIPS] and ICF Macro International, 2007).

Although NFHS provides comprehensive information on nutrition, it does not have the information on food security of the households. Information on food security is very important to strengthen the argument which we are putting forward through this study. Therefore, we used information on food security and agricultural landholding of the household from our recent survey called 'Social and Educational Status of OBC and Dalit Muslims in Uttar Pradesh', conducted in 2014-15 at the Giri Institute of Development Studies (GIDS), Lucknow. The sampling design of this survey is similar to the design of NFHS. The survey was administered to 7,239 households spread across the 15 districts proportionately selected from all the four regions of the state (Kumar et al., 2015).

Description of the Variables

Outcome variables (Nutritional indicators): Height-for-age (Stunting), Weight-for-age (Underweight), and Weight-for-height (Wasting) are used as child nutritional measures for this study. We selected children because the adverse effects tend to be the most pronounced among them. NFHS-3 included anthropometric components in which all children less than 5 years of age were weighed and height measured. These indicators are measured in terms of standard deviation units (Z-scores) from the median of the reference population. The estimates are based on a new international reference population recommended by the World Health Organization (WHO) in April 2006 (WHO Multicenter Growth Reference Study Group, 2006). The indices provide information related to growth and body composition. Children whose height-for-age Z-score is below minus two standard deviations (–2SD) from the median of the reference population are considered to be stunted (short for age). Weight-for-age is a composite index of height-for-age and weight-for-height. It takes into account both acute and chronic malnutrition. Children whose weight-for-age is below –2SD from the median of the reference population are classified as underweight. Similarly, children whose weight-for-height is below –2SD from the median of the reference population are classified as wasted.

Food security is another important variable that is used in this study. It is constructed on the basis of the composite score of the households regarding their self-reported responses to three questions asked in a survey conducted in Uttar Pradesh. The questions are: 1) In the past 12 months, how often were you (refers to the respondent) or any household member not able to eat the kinds of food you preferred because of lack of enough resources? 2) In the past 12 months, how often were you (refers to the respondent) or any household member ate fewer meals in a day because of lack of

food? 3) In the past 12 months, how often were you (refers to the respondent) or any household member slept hungry at night because there was not enough food? The response categories for the questions are: i) Never ii) Rarely iii) Sometimes iv) Often (Kumar et al., 2015). If the households replied 'never' to all the three questions, they were considered to be secure in terms of food security. Otherwise, they were defined as households with food insecurity.

The explanatory variable is the own usable agricultural landholding. For the purpose of analysis, we have categorized land size into five groups according to the classification used in the agricultural Census by the Government of India: No land, Marginal (below 1 hectare [less than 2.25 acres]), Small (1 to 2 hectares [2.25 acres to 5 acres]), Medium (2.1 hectares to 4 hectares [5.1 acres to 10 acres)], and Large [above 4 hectares (above 10 acres)].

Control variables: The control variables in the logistic regression models are the age of the mother, sex of the child, religion and caste (social/ethnic groups), mother's education and father's education, mother's current work status, and household wealth quintile. These variables are categorical in nature. Wealth quintiles were based on 33 assets and housing characteristics, but the land was not included in it. Each household asset was assigned a weight (factor score) generated through the principal component analysis, and the resulting asset scores were standardised in relation to a normal distribution with a mean of zero and a standard deviation of one. The wealth quintile distribution was used to determine the poorest, poorer, middle, richer, and the richest households.

Table 1 presents the descriptive statistics of the variables under study in rural India. In 2005-06, 51 (±1) and 46 (±1) per cent of children in rural India are found stunted and underweight respectively, whereas 21 (±1) per cent children are found suffering from wasting. About 45.5 (±1.4) per cent households are landless or near landless, whereas 26.9 (±1.2) per cent,10.4 (±0.8) per cent and 17.1(±1) per cent households in India own marginal, small and medium to large usable agricultural landholdings respectively. Around 12 (±0.8) per cent households own large tracts of land, that is, land size of more than 10 hectares. Categorisation of mother's age reveals that 7.5 (±0.7), 67.8 (±1) and 24.6 (±1) per cent women in the group of 15-24 years, 25-34 years and above 35 years respectively. In rural India, 52 (±1) per cent of the children are male, whereas 48 (±0.9) per cent are female. The religion-wise distribution suggests that Hinduism is the most prevalent religion with 80.1 (±1) per cent, followed Islam (15±0.9 per cent), Christianity (1.7±0.2 per cent), and Sikhism (1.3±0.2 per cent). The caste-wise distribution suggests that 21.2 (±1) per cent households belong to the category of Scheduled Castes and 11.7 (±0. 7) per cent to that of Scheduled Tribes. Whereas, household belongs to other backward classes (OBCs) and Other categories constitute 40.9 (±1) per cent and 25.8 (±1) per cent respectively. Out of the total children's mothers interviewed, 57.4 (±1), 14.5 (±0. 9) and 28 (±1) per cent had no education, primary education and secondary and higher education respectively. Around 33.8 (±1) per cent fathers are found to have received no education while 16 (±0. 9) per cent and 50 (±1) per cent received primary, secondary and higher education respectively. Of the total mothers interviewed, 66.5 (±1) per cent are found as not working against 33.3 (±1) per cent of the working mothers. On categorising of the households on the basis of their wealth quintile, we find that 32.5 (±1) per cent of the households are in the poorest wealth category. As we move from the poorer to the richest, the percentage of households in each category reduces from 27.2 (±1) in the poorer category to 5.6 (±1) households in the richest category.

The results, based on a recent survey in Uttar Pradesh show a similar skewness in the distribution of own usable agricultural landholding. The results presented in Table 1 reveal that 38 (±2.5), 45 (±2.8) and (±1.8) per cent of households have no land, marginal land and medium to large agricultural land respectively. In terms of food security of the households, the results show that nearly one third (30 (±2.5) per cent) of the households in rural Uttar Pradesh had reported insecurity.

Statistical Analyses

Gini concentration index and Lorenz curve are used to measure the inequalities in household agricultural landholding distribution. Bivariate plots are drawn to assess the variation in child nutritional measures by the size of agricultural landholding among households. Its statistical significance is measured by using the Pearson Chi-Square test. Binary logistic regression models are used to assess the unadjusted and adjusted effects of households' agricultural landholding on child nutritional status after controlling for several confounding factors.

RESULTS

The Lorenz curve presented in figure 1 is below the line of equality and greatly skewed downwards, meaning that there is a high inequality in the distribution of agricultural land across the rural households. The measure of Gini coefficient (G=0.87) also reveals that there is a huge inequality in the distribution of agricultural land across the rural households. As said earlier, the land is a critical economic resource for a family. It affects not only their livelihood but also the food security and nutritional status of the households especially that of the vulnerable populations like children. With this perspective, we have estimated child nutritional status by the size of household agricultural landholding and presented it in figure 2. The results show a persistent and significant decline in child stunting as household agricultural landholding increases above 1 hectare. With reference to no land (53.8 per cent) or marginal agricultural land (52 per cent), there is a substantial difference in stunted children in the households with small (47.6 per cent), medium to large landholdings (43.3 per cent). The differences are statistically significant with the chi-square value of 196.18 and the p-value <0.01.

Figure 2 also shows the percentage of underweight children by the size of household agricultural landholding in rural India. The results are similar to those found in the case of stunting and size of usable agricultural landholding. The results reveal that there are substantial differences in the prevalence of children underweight among households with no land (47.9 per cent) as compared to households with medium to large agricultural landholding (38.5 per cent). Also, there is no substantial difference between the percentage of underweight children in the households with no landholding (47.9 per cent) and those with marginal landholding (46.5 per cent). Households with above marginal (that is, small) landholding (44.8 per cent) have slightly less underweight children in comparison to both with no land and marginal landholding households.

Furthermore, figure 2 shows the percentage of wasting children by the size of household agricultural landholding. However, the prevalence of Wasting among children didn't show much variation in households having no land (21 per cent) and marginal land (20.8 per cent) as compared to those who had medium to large landholdings (20.1 per cent). The results of chi-square test also confirmed that variation is not statistically significant. Nevertheless, in general, it has been found from the bivariate plots that except for wasting, other two indicators of child nutritional status, stunting and underweight show that children in households having medium to large agricultural land size are in an advantageous position in comparison to children in households with no land or marginal landholding.

To measure the unadjusted and adjusted effects of household's agricultural landholding on child nutritional status, binary logistic regression models have been employed, controlling for several confounding factors in the case of adjusted effects. We have estimated the logistic regression coefficients and Average Marginal Effects (AME) along with confidence interval for each of the child nutritional outcome indicators for both the models separately. Results are presented in the form of coefficients and AME with corresponding confidence intervals in Table 2, 3 & 4. The dependent

variable is dichotomized as no child malnutrition (0) and child malnutrition (1). Model 1 examines the significant predictors of child nutritional status without controlling the other confounding factors; whereas model 2 is to examine the net effect of household agricultural landholding on the child nutritional status by controlling for relevant confounding factors. The independent variables are the same for all the three dependent variables in model 2 in Table 2, 3 & 4.

The results of logistic regression show that size of landholding was negatively associated with child stunting. The results from both β coefficient and AME indicate that probability of being stunted decreased significantly for children with larger landholding households. For instance, the probability of stunting among children of household with marginal landholding (AME=-0.019, p<0.01), small landholding (AME=-0.065, p<0.01) and medium to large landholding (AME=-0.103, p<0.01) are significantly higher as compared to household with no agricultural landholding. Even after controlling for several known predictors, landholding still emerges as a significant factor of stunting among children. The probability of children stunting are significantly lower among the children of medium to large landholdings (AME=-0.032, p<0.01), small landholdings (AME=-0.023, p<0.05) and marginal landholding (AME=-0.014, p<0.05) as compared to children of household with no agricultural landholding. This postulates the strong relationship between children nutritional status (stunting) and household agricultural landholdings even after controlling for other background characteristics (Table 2).

Similarly, in the case of children underweight, the likelihood of being underweight differed significantly in children with households of different size of agricultural landholdings. Model-I from Table 2 shows that the probability of children being underweight is declining significantly as we move from children of marginal landholding (AME=-0.011, p<0.05), small landholding households (AME=-0.031, p<0.05) to medium to large agricultural landholding households (AME=-0.088, p<0.01). Model-II in Table 3 shows a strong negative relationship between agricultural landholding size and children underweight, even after controlling a number of relevant background characteristics. The probability of children underweight in households with medium to large landholdings (AME=-0.009, p<0.01) are significantly lower as compared to the household with marginal (AME=0.013, p<0.05) and no agricultural land holding.

On the contrary, the likelihood of children wasting and landholding size has shown non-conclusive association; a positive association for small and medium to large landholding and negative for marginal landholding after controlling for several confounding factors. The probability of being wasting increases among the children with small landholding households (AME=0.014, p<0.05) as compare to no land holding household. While, the probability of children wasting among the household with marginal landholding (AME=-0.004) is less as compared to household with no landholding. Thus findings suggest an inconsistent relationship between size of agricultural landholding and proportion of children wasted in rural India. Among other predictors of nutritional outcome indicators, as expected, mother's age, caste, mother's education, mother's current working status, and household wealth quintile emerged as statistically significant (Table 4).

As pointed-out previously, to support our findings based on NFHS of 2005-06, we have included the analyses of the relationship between food security and landholding from a recent survey in Uttar Pradesh (Kumar et al., 2014-15). This latest result strongly supports our NFHS findings. Food insecurity is nearly two and half times more prevalent in households with no land than in households with medium to large landholding. This finding assumes importance for two reasons: first, in the absence of food security information in large-scale household surveys (e.g. NFHS and National Sample Survey), this finding provides critical insights; second, it adds to the current debate on the food security mission in India because the finding is based on the latest survey from Uttar Pradesh

which is one of the poorest and most populous states of India which contributes to the maximum number of undernourished children in the country.

DISCUSSION

In view of its theoretical and empirical investigation of the linkage between agricultural landholding of households and children's nutritional status in the rural areas, this paper presents two intriguing findings and significant implications for socioeconomic and nutrition policies in India. First, it offers evidence of huge inequalities in the distribution of the agricultural land in rural India. Second, it suggests that agricultural landholding has a huge bearing on child nutritional status. Both bivariate and multivariate analyses suggest that children in households with larger agricultural landholding are in an advantageous position as compared to those in households with no landholding or marginal landholding. The proportion of children stunted, and underweight, decreased with an increase in the size of households' agricultural landholding. Therefore, it implies that household's access to usable agricultural land is one of the critical entitlements which pave the way for the children's access to food, diversity in food, and socioeconomic and nutritional security.

Comparative assessment of the findings of this study and arguments of some of the earlier studies on nutrition and food security facilitate a more critical understanding of predictors of child malnutrition and also advance the best viable socioeconomic and nutritional policy for the country. In the recent times, one such argument was that economic growth is most important to reduce poverty *vis-a-vis*, food and nutritional insecurity in the country (Panagariya, 2013). However, by now, the contradiction in terms of high economic growth accompanied by a much slower decline in undernutrition in India is well recognised (IIPS and MoHFW, 2017). Therefore, eliminating hunger and malnutrition in India will not be possible without a fresh approach to deal with it. This implies that along with ensuring that economic growth and poverty reduction policies concerning the poor, India need a comprehensive nutritional strategy in order to respond this issue more concisely. A review of the experiences of some of the most successful country by von Braun et al. (2008) suggests that the nutrition policies in many developing countries have followed complex and multisectoral strategies. India now has the prospect to move towards the innovative nutritional improvement based on the experiences of other countries. In this direction, findings from this study clearly suggest that granting access to usable agricultural land to the rural poor households in India is instrumental in assuring food security and improving the nutritional status of children. Our argument, as discussed above can be strengthened further through examining the historical food production and food security systems in India. For long, the enormous Indian population has fed itself by growing crops, tending to livestock, and catching, hunting and gathering food, especially in the tribal and remote areas of India. These practices have ensured that the fortunes of the rural poor have rested close to the soil and the natural environment of the country. Such 'own- production systems' have remained the food security anchor for a considerable fold of the Indian population. However, with increasing proliferation of the corporatization and commercialization, a new form of the agricultural system has evolved where the farmers with the large size of landholding grab small peasant's land, which was evident during the green revolution (Patnaik, 2007). In this process, landless rural poor and small farmers are the major victims, facing livelihood vulnerabilities, especially insecurity for basic need fulfilment like food. Furthermore, the Land Acquisition Act, 2013 and the proposed amendments to it will do more harm than good to marginal and small farmers as far as access to food, and nutritional security is concerned.

Another important argument in the great nutritional debate in India is that with the advent of modern agricultural systems, the production of crops has increased, making India food self-sufficient and yet food insecure because the majority of the food production is skewed towards a small

proportion of the population. Therefore, the ongoing food security mission in India is mostly dependent on the country's social safety programs. Right from its historic initiation in 1965, the Public Distribution System (PDS) continues to be the most far-reaching food safety net operations, along with the Integrated Child Development Services (ICDS) program. These served as important vehicles for the distribution of procured grains in the deficit regions at cheaper prices, and as such programmes continue to be major instruments towards ensuring food security and other daily needs of the poor populations in India (Dreze and Sen, 2013; Pritchard et al., 2013).

However, government food security and nutrition efforts are constrained by several challenges (e.g. insufficient funds, corruption, leakages, bogus beneficiaries, and mismanagement in execution), many of which are exclusive to India. Though the introduction of the universal PDS under the National Food Security Act, 2013 (also called Right to Food Act) is a major step in controlling the leakages and corruption in the PDS, from a regional perspective, there is a huge variation in the implementation of the policy. For instance, states like Tamil Nadu and Andhra Pradesh have been performing well, while others like Chhattisgarh and Bihar that were previously considered as underperforming states have improved with the PDS reforms. Other states, like Uttar Pradesh and Madhya Pradesh, are lagging in this effort basically, due to the lack of political will in the execution of bold reforms in PDS (Dreze and Khera, 2015). Furthermore, the system of cash transfers in place of grains is unlikely to be successful in a patriarchal set-up like India, where men have more power to decide how to spend money than women do, which means that in such a system the share of women and children is not guaranteed. Unlike access to agricultural land and PDS, cash transfers have lower resistance to price fluctuation. Also, there is the least guarantee that transferred cash will be spent only on purchasing food. Scientific literature has also questioned cash transfers. The scheme has faced opposition from some state governments and non-governmental organisation on the ground of lack of access to banks in the rural areas (Sinha, 2015). For instance, there are 1.16 lakh bank branches in the country, of which only 38.4% are in the rural areas (RBI, 2014). Puducherry, a Union Territory in southern India which had recently implemented cash transfers in place of PDS, has now withdrawn the scheme on account of its failure to reach the deserved households.

Going beyond the great nutritional debate, it is worth taking up the argument of Desai and Thorat (2013) that it is important to look at nutrition beyond food and to include disease conditions caused by inadequate and unclean water, poor sanitation, and insufficient public health measures. By taking their argument forward, we argue that provision of productive assets like agricultural land to the poor and landless households through land reforms will bring major benefits. First of all, if the households get land, they will produce their food; so, there will be no question of leakages and corruption. Further, it will make them economically and educationally empowered because land is a critical economic and productive resource in rural India as shown in our conceptual framework. Thus, access to agricultural land has a great impact not only on food security and nutrition, but also on access to safe drinking water, sanitation, and health care purchasing power of the household for their children as it empowers the households economically through the farming income. Some of the previous evidence also show that among the states where these measures have been strongly implemented, the results are positive (Banerjee et al., 2002).

Therefore, provision of land for the rural poor is critical for nutritional security in India. However, this is not a new demand. In fact, the Indian government was committed to land reforms and during the 1950s, laws were passed by all the state governments with the avowed aim of abolishing landlordism, distribution of land through the imposition of ceilings, protection of tenants, and consolidation of landholdings. However, land reforms were half-hearted with regard to the imposition of ceilings and security of tenants. Consequently, the skewness in land distribution was not reduced in any significant manner. Further, a very large number of tenants were actually evicted in the name of self-cultivation. Although the contribution of agriculture to gross domestic product

has declined significantly to around 14 per cent, its share in employment is still around 56 per cent (GoI, 2014). Therefore, access to land to a vast majority of the rural poor will have a great impact on their livelihood, food, and nutritional security in rural India. Finally, eliminating hunger and malnutrition around the globe cannot be achieved without a new approach to deal with the problem in countries like India as it contributes to the largest share of global malnourished children.

This study is significant for reasons that have far-reaching implications. It promotes land distribution and land rights for landless households and supports the safeguarding of landholdings of small and marginal farmers along with the ongoing nutritional safety programmes (e.g. Public Distribution Scheme [PDS], Integrated Child Development Scheme [ICDS], and Mahatma Gandhi National Rural Employment Guarantee Act [MGNREGA]) to ensure nutritional security in the country. Access to agricultural land should be seen as complementary rather than a substitute for an ongoing nutritional safety programme. Brazil, with a unique and practical approach, launched a number of public programmes and schemes to ensure zero hunger. These include direct procurement from small farmers, provision of highly subsidised meals through community canteens, school mid-day meals, and so on. The inclusion of the provision of productive assets like land in the ongoing nutritional safety and poverty alleviation programs will make our existing nutrition policy into a comprehensive nutritional strategy. Making agriculture profitable through increasing investment and by way of proactive policies in the agricultural sector is critical for food diversity and nutritional security in rural India. In a situation where rural to urban migration is reaching at a saturation point and urban areas are no more a pulling factor for dispossessed agricultural labourers from rural areas (Kundu, 2015), provision of access to land could form one of the critical social and economic safety nets for nutritional security among the landless households and the marginal landholding households. Nevertheless, we are not denying the importance of non-form sector in the rural economy and thereby ensuring food and nutritional security (Riggs, 2005). The policies concerning the food and nutrition security should support complementarities between farm and non-farm activities rather than exclusively depending on any one sector.

REFERENCES

Ali, I., & Penia, E.M. (2003). *Infrastructure and poverty reduction—what is the connection?* ERD Policy Brief No. 13. Manila, Philippines: Economics and Research Department, Asian Development Bank.

Babatunde, R.O., & Qaim M. (2010). Impact of Off-farm Income on Food Security and Nutrition in Nigeria. Paper presented at the Joint 3rd African Association of Agricultural Economists (AAAE) and 48th Agricultural Economists Association of South Africa (AEASA) Conference, Cape Town, South Africa, September 19-23.

Banerjee, A.V., Gertler, P.J., & Ghatak, M. (2002). Empowerment and efficiency: Tenancy reform in West Bengal. *Journal of Political Economy*, *110*, 239-280.

Basu, D., & Das, D. (2014). Poverty-hunger divergence in India. *Economic and Political Weekly*, *49*, 23-24.

Carter, M., & Barrett, C. (2006). The economics of poverty traps and persistent poverty: An asset-based approach. *The Journal of Development Studies*, *42*, 178–199.

Choithani, C. (2017). Understanding the linkages between migration and household food security in India. *Geographical Research, 2017*. doi:10.1111/1745-5871.12223.

Coffey. D., Deaton, A., Drèze, J., Spears, D., & Tarozzi, A. (2013). Stunting among children: Facts and implications. *Economic & Political Weekly, 45,* 68–70.

Deaton, A., and Dreze, J. (2009). Nutrition in India: facts and interpretation. *Economic and Political Weekly, 45,* 42-65.

Deininger, K. (2003). *Land Policies for Growth and Poverty Reduction*. Washington DC: World Bank.

Deininger, K., Ali, A.D., Holden S., & Zevenbergen, J. (2008). Rural land certification in Ethiopia: Process, initial impact and implications for older African countries. *World Development, 36*, 1786-1812.

Desai, S., & Thorat, A. (2013). Beyond the great Indian nutrition debate. *Economic & Political Weekly, 48*, 18-22.

Dev S. M. (2012). *Agriculture-nutrition linkages and policies in India. IGIDR working paper series.* Doi: http://www.igidr.ac.in/pdf/publication/WP-2012-006.pdf.

Drèze, J., & Khera, R. (2015). Understanding leakages in the public distribution system. *Economic & Political Weekly, 50,* 41-42.

Drèze, J., & Sen, A.K. (2013). *An Uncertain Glory, India and its Contradictions.* Penguin, New Delhi.

Fan S., & Pandya-Lorch R. (Eds.). (2012). *Reshaping Agriculture for Nutrition and Health: An IFPRI 2020 Book*. Washington, DC : IFPRI.

FAO (Food and Agriculture Organization). (1982). *The State of Food and Agriculture, 1981*. Rome : FAO.

FAO (Food and Agriculture Organization). (2014). *The State of Food Insecurity in the World 2014. Strengthening the Enabling Environment for Food Security and Nutrition*. Rome: FAO. http://www.fao.org/3/a-i4030e.pdf

Gillespie, S., & Kadiyala, S. (2011). Exploring the Agriculture-Nutrition Disconnect in India. 2020 Conference Brief 20. Prepared for the IFPRI 2020 International Conference Leveraging Agriculture for Improving Nutrition and Health, February 10–12, 2011, New Delhi, India.

GoI (Government of India). (2014a). *Status Paper on Computerisation of TPDS Operations.* New Delhi: Ministry of Consumer Affairs, Food and Public Distribution, Government of India.

— (2014b). *Food grain Bulletin June 2014*. New Delhi: Ministry of Consumer Affairs, Food and Public Distribution, Government of India.

— (2014c). Agriculture census 2010-11: All India report on number and area of operational holdings. Agriculture Census Division Department of Agriculture & Co-Operation. New Delhi: Ministry of Agriculture, Government of India.

— (2015). *Targeted Public Distribution*. New Delhi: Ministry of Consumer Affairs, Food and Public Distribution. Doi http://dfpd.nic.in/?q=node/101 assessed on 06 Jan, 2015.

Goli, S., & Arokiasamy, P. (2013). Trends in health and health inequalities among major states of India: Assessing progress through convergence models. *Health Economics, Policy, and Law, 26,* 1–26.

Goli, S., Maurya, N.K., & Sharma, M.K. (2015). Continuing caste inequalities in Uttar Pradesh. *International Journal of Sociology and Social Policy, 5/6,* 252-272.

Grebmer K. von, Saltzman A., Birol E., Wiesmann D., Prasai N., Yin S., Yohannes Y., Menon P., Thompson J., & Sonntag A. (2014). *Global Hunger Index: The Challenge of Hidden Hunger.* Bonn, Washington, D.C. & Dublin: Welthungerhilfe, International Food Policy Research Institute, and Concern Worldwide.

Haddad, L., Alderman H., Appleton, S., Song, L., & Yohannes, Y. (2003). Reducing child malnutrition: How far does income growth take us? *World Bank Economic Review, 17*, 107–31.

Himanshu. (2015). Why is calorie intake rising? Live mint. Assessed at: http://www.livemint.com/Home-Page/PmSPUOMjh0kSoPYNrE3FfM/Why-is-calorie-intake-rising.html.

IIPS (International Institute for Population Sciences), (1995). *National Family Health Survey (NFHS - 1), 1992-93: India. Vol. I*. Mumbai: IIPS.

IIPS (International Institute for Population Sciences) and ORC Macro (2000). *National Family Health Survey (NFHS - 2), 1998-99: India. Vol. I*. Mumbai: IIPS.

IIPS (International Institute for Population Sciences) and ORC Macro (2007). *National Family Health Survey (NFHS - 3), 2005-06: India. Vol. I*. Mumbai: IIPS.

Kadiyala, S., Joshi, P.K., Dev, S.M., Kumar, T.N., & Vyas, V. (2011). *Strengthening the Role of Agriculture for a Nutrition Secure India.* IFRI policy note.

Kundu, A. (2015). Interview. *It is no longer possible for a dispossessed agricultural labourer in India to migrate to urban areas.* Admin in Livelihood, posted: April 4, 2015. http://counterview.org/2015/04/04/it-is-no-longer-possible-for-a-dispossessed-agricultural-labourer-in-india-to-migrate-to-urban-areas/

Kumar, S., Fahimuddin, Trivedi, P., and Goli, S. (2015). Social and Educational Status of OBC and Dalit Muslin in Uttar Pradesh.

Kyomugisha, E. (2008). *Land Tenure and Agricultural Productivity in Uganda. IFPRI – USSP Brief No. 5.* Washington, DC: International Food Policy Research Institute.

Levinson, M. (1974). *An Economic Analysis of Malnutrition among Young Children in Rural India.* Cornell/MIT International Nutritional Policy Series.

Li, G., Rozelle, S., & Brandt, L. (1998). Tenure, land rights and farmer investment incentives in China. *Agricultural Economics, 19*, 63-71.

Maharjan K.L., & Khatri-Chhetri, A. (2006). Household Food Security in Rural Areas of Nepal: Relationship between Socioeconomic Characteristics and Food Security Status. Paper presented at the International Association of Agricultural Economics Conference, Gold Coast, Australia.

Manikandan, A.D. (2014). A tragedy unfolding: Tribal Children Dying in Attappady. *Economic and Political Weekly, 49*. http://www.epw.in/reports-states/tragedy-unfolding.html.

Mebrahtu, S., Pelletier, D., & Per Pinstrup, Andersen. (1995). Agriculture and Nutrition. In Per Pinstrup, A., Pelletier, D., & Alderman, H. (Eds.), *Child Growth and Nutrition in Developing Countries.* Ithaca, New York: Cornell University Press.

Menon, P., Deolalikar, A., & Bhaskar, A. (2009). *The India State Hunger Index: Comparisons of Hunger across States.* Washington, D.C., Bonn, and Riverside: International Food Policy Research Institute (IFRI), Welthungerhilfe, and University of California.

MoWCD (Ministry of Women and Child Development) and UNICEF, India. (2014). Rapid Survey on Children. Ministry of Women and Child Development, New Delhi, India.

Panagariya, A. (2013). Does India really suffer from worse child malnutrition than Sub-Saharan Africa? *Economic & Political Weekly, 48,* 98-110.

Pathak, P. K., & Singh, A. (2011). Trends in malnutrition among children in India: Growing inequalities across different economic groups. *Social Science & Medicine, 74*, 576-585.

Patnaik, U. (2007). *The Republic of Hunger and Other Essays*, *Three Essays.* New Delhi.

Prichard, B., Rammohan, A., Sekhar, M., Parasuraman, S., & Choithani, C. (2013). *Feeding India: Livelihoods, Entitlement and Capabilities.* London and New York: Routledge Taylor and Francis.

Rammohan, A., & Pritchard, B. (2014). The role of landholding as a determinant of food and nutrition insecurity in rural Myanmar. *World Development, 64,* 597-608.

Rawal, V. (2008). Ownership holdings of land in rural India: Putting the record straight. *Economic & Political Weekly, 8,* 43-47.

Riggs, J. (2005). Land, Framing, Livelihoods, and Poverty: Rethinking the Links in Rural South. *World Development*, 34, 180-202.

Santos, F., Fletschner, D., Savath, V. & Peterman, A. (2013). *Can Government-Allocated Land Contribute to Food Security? Intrahousehold Analysis of West Bengal's Microplot Allocation Program.* IFPRI Discussion Paper No. 01310. New Delhi: Poverty, Health and Nutrition Division, IFPRI.

Savath, V., Fletschner, D., Peterman, A., & Santos, F. (2014). *Land, Assets, and Livelihoods: Gendered analysis of evidence from Odisha state in India.* New Delhi: Poverty, Health and Nutrition Division, IFPRI.

Shaji, K. A. (2014). Not a lack of knowledge but loss of land behind malnutrition: How forced dependence on distribution system shatters self-sustained communities – Kerala. *The Hindu, Palakkad.* (June 15, 2014). Doi:http://www.indiantribalheritage.org/?p=11819.

Singh, I. (1979). *Small farmers and the landless in South Asia.* World Bank Staff Working Paper No. 320.

Sinha, D. (2015). Cash for Food—A Misplaced Idea. *Economic & Political Weekly, 50,* 17-20.

Spears, D. (2013). *How much International Variation in Child Height Can Sanitation Explain?* World Bank Policy Research Working Paper 6351. Washington DC: World Bank.

Trivedi, P.K. (2013). Reversal of land reforms: new revenue code of Uttar Pradesh. *Economic and Political Weekly, 48,* 26-28.

von Braun, J., Ruel, M., & Gulati, A. (2008). Accelerating progress towards reducing child malnutrition in India: A concept for action. International Food Policy Research Institute (IFPRI) Paper, 12. http://www.ifpri.org/publication/accelerating-progress-toward-reducing-child-malnutrition-india

World Bank. (2007). *From Agriculture to Nutrition: Pathways Synergies and Outcomes*. Washington, DC: World Bank.

Table 1: Descriptive Statistics of the Study Variables, (n=32,072)
Based on National Family Health Survey (NFHS), 2005-06

Background Characteristics		Percentage ±difference of 95% confidence upper and lower limit
Child Nutrition	Stunting	50.7 ±1
	Underweight	45.6 ±1
	Wasting	20.8 ±1
Own Useable Agricultural Land	No Land	45.5 ±1.4
	Marginal	26.9 ±1.2
	Small	10.4±0.8
	Medium to Large	17.1±1
Age of the Mother	15-24	7.5 ±0.7
	25-34	67.8 ±1
	35+	24.6 ±1
Sex of the Child	Male	52.1 ±1
	Female	47.9 ±0.9
Religion	Hindu	80.1 ±1
	Muslim	15.4 ±0.9
	Christian	1.7 ±0.2
	Sikh	1.3 ±0.2
	Other	1.2 ±0.2
Caste	Scheduled Caste	21.42 ±1
	Scheduled Tribe	11.7 ±0.7
	Other Backward Class	40.9 ±1
	Other	25.8 ±1
Mother's Education	No Education	57.4 ±1
	Primary Education	14.52 ±0.9
	Secondary & Higher Education	28.0 ±1
Father's Education	No Education	33.8 ±1
	Primary Education	16.0±0.9
	Secondary & Higher Education	50.0 ±1
Mother's Current Work Status	Not working	66.5±1
	Working	33.3±1
BPL card	No	64±0.6
	Yes	27±1
	Dejure resident	9±2.7
Household Wealth Quintiles	Poorest	32.5±1
	Poorer	27.2±1
	Middle	20.9±1
	Richer	13.8±0.8
	Richest	5.6±0.5
Own Useable Agricultural Land† (n=7239)	No Land	38.2±2.5
	Marginal	45. 5±2.8
	Small	11.4±1.8
	Medium to Large	4.9±1.8
Food security status† (n=7239)	Not secured	29.6±2.5
	Secured	70.4±2.5

† Source: estimated based on the information from survey of 'Social and Educational Status of OBC and Dalit Muslims in Uttar Pradesh'

Table 2: Logistic Regression Estimates: The Effect of Own Useable Agricultural Landholding on Child Nutritional Status, 2005-06 (n=32,072)

Stunting	Model 1				Model 2			
	Coefficient	AME	95% C.I		Coefficient	AME	95% C.I	
			Lower	Upper			Lower	Upper
Own Usable Agricultural Land								
No Land v/s Marginal	-0.075	-0.019***	-0.036	-0.001	-0.058	-0.014**	-0.031	0.003
No Land v/s Small	-0.262	-0.065***	-0.09	-0.04	-0.098	-0.023**	-0.049	0.002
No Land v/s Medium to Large	-0.413	-0.103***	-0.137	-0.069	-0.135	-0.032***	-0.067	0.003
Age of the Mother								
15-24 v/s 25-34	-	-	-	-	0.077	0.018*	-0.011	0.048
15-24 v/s 35+	-	-	-	-	0.149	0.035***	0.003	0.068
Sex of the Child								
Male v/s Female	-	-	-	-	-0.005	-0.001	-0.016	0.013
Religion								
Hindu v/s Muslim	-	-	-	-	0.088	0.021**	-0.002	0.044
Hindu v/s Christian	-	-	-	-	-0.064	-0.015	-0.059	0.028
Hindu v/s Sikh	-	-	-	-	-0.242	-0.058***	-0.105	-0.011
Hindu v/s others	-	-	-	-	0.157	0.037	-0.026	0.101
Social Groups								
SC v/s ST	-	-	-	-	-0.144	-0.034***	-0.061	-0.008
SC v/s OBC	-	-	-	-	-0.084	-0.02***	-0.04	0
SC v/Others	-	-	-	-	-0.231	-0.055***	-0.078	-0.032
Mother's Education								
No Education v/s Primary	-	-	-	-	-0.164	-0.039***	-0.061	-0.018
No Education v/s Secondary & Higher	-	-	-	-	-0.364	-0.087***	-0.107	-0.066
Father's Education								
No Education v/s Primary	-	-	-	-	-0.047	-0.011	-0.034	0.011
No Education v/s Secondary & Higher	-	-	-	-	-0.097	-0.023***	-0.043	-0.003
Mothers Current Works								
Not working v/s Working	-	-	-	-	0.051	0.012**	-0.004	0.028
Household has BPL Card								
No v/s Yes	-	-	-	-	0.025	0.006	-0.011	0.023
No v/s Not a Dejure Residents	-	-	-	-	-0.195	-0.047**	-0.094	0.001
Wealth Index								
Poorest v/s Poorer	-	-	-	-	-0.154	-0.037***	-0.057	-0.017
Poorest v/s Middle	-	-	-	-	-0.292	-0.07***	-0.091	-0.048
Poorest v/s Richer	-	-	-	-	-0.513	-0.122***	-0.149	-0.096
Poorest v/s Richest	-	-	-	-	-1.086	-0.259***	-0.297	-0.22
Constant	0.153***	-	0.104	0.202	0.501***	-	0.345	0.655
Chi-square				1364.78***				
Cox & Snell R Square				0.052				

Note: AME: Average Marginal Effects, C.I: Confidence Interval, SC: Schedule Caste, ST: Schedule Tribe, Level of significance: ** p < 0.1 ** p < 0.05 *** p < 0.01.*

Table 3: Logistic Regression Estimates: The Effect of Own Useable Agricultural Landholding on Child Nutritional Status, 2005-06 (n=32,072)

Underweight	Model 1				Model 2			
	Coefficient	AME	95% C.I		Coefficient	AME	95% C.I	
			Lower	Upper			Lower	Upper
Own Usable Agricultural Land								
No Land v/s Marginal	-0.044	-0.011**	-0.028	0.006	0.054	0.013**	-0.012	0.037
No Land v/s Small	-0.127	-0.031**	-0.057	-0.006	-0.038	-0.009	-0.043	0.026
No Land v/s Medium to Large	-0.356	-0.088***	-0.122	-0.054	-0.04	-0.009***	-0.051	0.032
Age of the Mother								
15-24 v/s 25-34	-	-	-	-	0.084	0.019	-0.017	0.055
15-24 v/s 35+	-	-	-	-	0.192	0.044***	0.005	0.084
Sex of the Child								
Male v/s Female	-	-	-	-	0.056	0.013	-0.005	0.031
Religion								
Hindu v/s Muslim	-	-	-	-	-0.059	-0.014	-0.044	0.016
Hindu v/s Christian	-	-	-	-	-0.377	-0.087***	-0.144	-0.031
Hindu v/s Sikh	-	-	-	-	-0.317	-0.073***	-0.147	0
Hindu v/s others	-	-	-	-	0.261	0.061	-0.014	0.135
Social Groups								
SC v/s ST	-	-	-	-	0.274	0.063***	0.03	0.097
SC v/s OBC	-	-	-	-	0.018	0.004**	-0.022	0.031
SC v/Others	-	-	-	-	-0.15	-0.035***	-0.066	-0.004
Mother's Education								
No Education v/s Primary	-	-	-	-	-0.144	-0.033***	-0.06	-0.006
No Education v/s Secondary & Higher	-	-	-	-	-0.31	-0.072***	-0.097	-0.047
Father's Education								
No Education v/s Primary	-	-	-	-	0.109	0.025	-0.003	0.054
No Education v/s Secondary & Higher	-	-	-	-	-0.124	-0.029**	-0.053	-0.004
Mothers Current Works								
Not working v/s Working	-	-	-	-	0.043	0.01**	-0.009	0.029
Household has BPL Card								
No v/s Yes	-	-	-	-	0.072	0.017***	-0.005	0.039
No v/s Not a Dejure Residents	-	-	-	-	-0.06	-0.014	-0.062	0.034
Wealth Index								
Poorest v/s Poorer	-	-	-	-	-0.159	-0.037***	-0.062	-0.012
Poorest v/s Middle	-	-	-	-	-0.384	-0.089***	-0.116	-0.061
Poorest v/s Richer	-	-	-	-	-0.572	-0.133***	-0.166	-0.1
Poorest v/s Richest	-	-	-	-	-1.263	-0.293***	-0.342	-0.243
Constant	-0.082***		-0.131	-0.032	0.082***	-	-0.118	0.283
Chi-square				2033***				
Cox & Snell R Square				0.059				

Note: AME: Average Marginal Effects, C.I: Confidence Interval, SC: Schedule Caste, ST: Schedule Tribe, Level of significance: ** p < 0.1 ** p < 0.05 *** p < 0.01.*

Table 4: Logistic Regression Estimates: The Effect of Own Useable Agricultural Landholding on Child Nutritional Status, 2005-06 (n=32,072)

Wasting	Model 1				Model 2			
	Coefficient	AME	95% C.I		Coefficient	AME	95% C.I	
			Lower	Upper			Lower	Upper
Own Usable Agricultural Land								
No Land v/s Marginal	0.013	0.002*	-0.009	0.013	-0.027	-0.004	-0.019	0.011
No Land v/s Small	0.003	0.000**	-0.016	0.017	0.085	0.014**	-0.007	0.035
No Land v/s Medium to Large	-0.070	-0.011**	-0.034	0.012	0.073	0.012*	-0.017	0.041
Age of the Mother								
15-24 v/s 25-34	-	-	-	-	-0.156	-0.025***	-0.049	-0.002
15-24 v/s 35+	-	-	-	-	-0.146	-0.024***	-0.05	0.002
Sex of the Child								
Male v/s Female	-	-	-	-	-0.092	-0.015*	-0.027	-0.003
Religion								
Hindu v/s Muslim	-	-	-	-	-0.147	-0.024***	-0.044	-0.004
Hindu v/s Christian	-	-	-	-	-0.211	-0.034*	-0.072	0.003
Hindu v/s Sikh	-	-	-	-	-0.424	-0.069***	-0.113	-0.024
Hindu v/s others	-	-	-	-	0.303	0.049***	0.003	0.095
Social Groups								
SC v/s ST	-	-	-	-	0.342	0.055***	0.035	0.076
SC v/s OBC	-	-	-	-	0.019	0.003	-0.014	0.02
SC v/Others	-	-	-	-	-0.077	-0.013*	-0.032	0.007
Mother's Education								
No Education v/s Primary	-	-	-	-	-0.076	-0.012*	-0.03	0.006
No Education v/s Secondary & Higher	-	-	-	-	-0.166	-0.027***	-0.045	-0.009
Father's Education								
No Education v/s Primary	-	-	-	-	-0.019	-0.003	-0.022	0.015
No Education v/s Secondary & Higher	-	-	-	-	-0.043	-0.007	-0.023	0.009
Mothers Current Works								
Not working v/s Working	-	-	-	-	-0.131	-0.021***	-0.035	-0.008
Household has BPL Card								
No v/s Yes	-	-	-	-	0	0.001	-0.014	0.014
No v/s Not a Dejure Residents	-	-	-	-	0.224	0.036**	-0.004	0.077
Wealth Index								
Poorest v/s Poorer	-	-	-	-	-0.08	-0.013**	-0.029	0.003
Poorest v/s Middle	-	-	-	-	-0.23	-0.037***	-0.055	-0.019
Poorest v/s Richer	-	-	-	-	-0.398	-0.064***	-0.088	-0.041
Poorest v/s Richest	-	-	-	-	-0.71	-0.115***	-0.149	-0.081
Constant	-1.416***	-	-1.466	-1.365	-0.890***	-	-1.074	-0.706
Chi-square	442.0**							
Cox & Snell R Square	0.017							

Note: AME: Average Marginal Effects, C.I: Confidence Interval, SC: Schedule Caste, ST: Schedule Tribe, Level of significance: ** p < 0.1 ** p < 0.05 *** p < 0.01.*

Fig. 1: Lorenz Curve: Inequalities in the Distribution of Agricultural Land in Rural India.

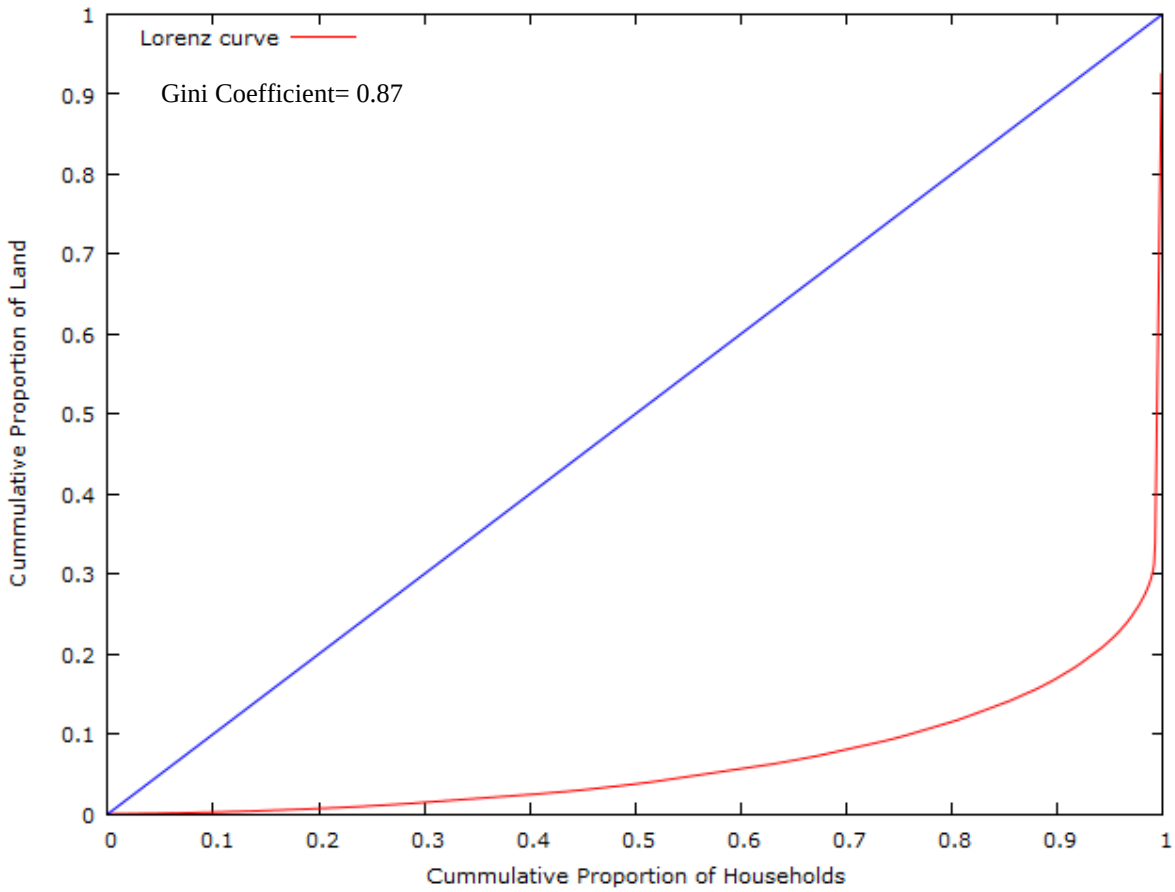
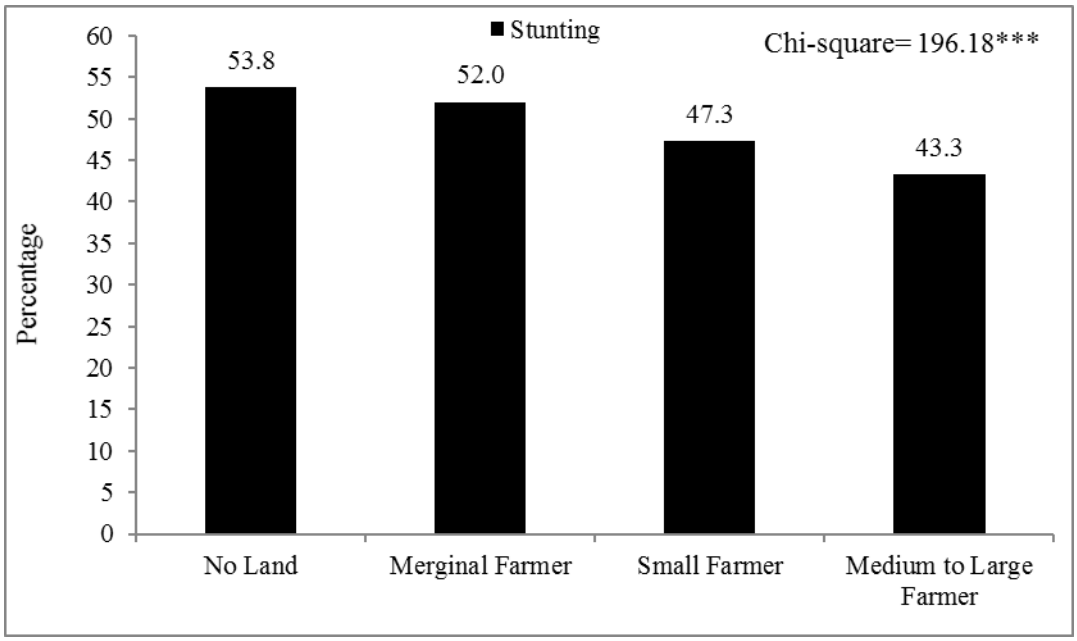
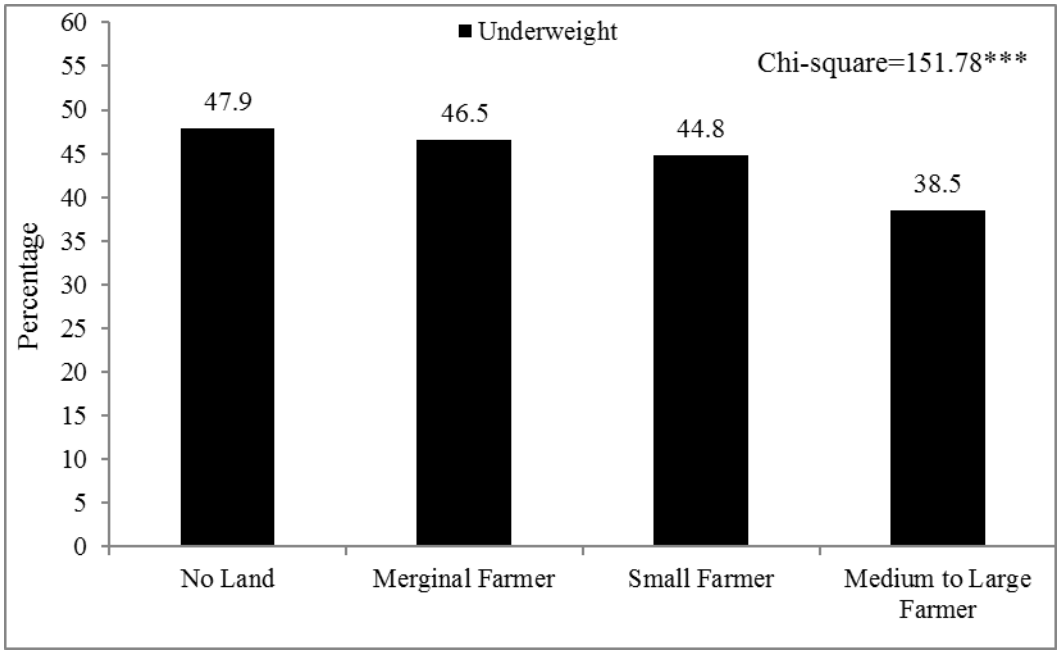


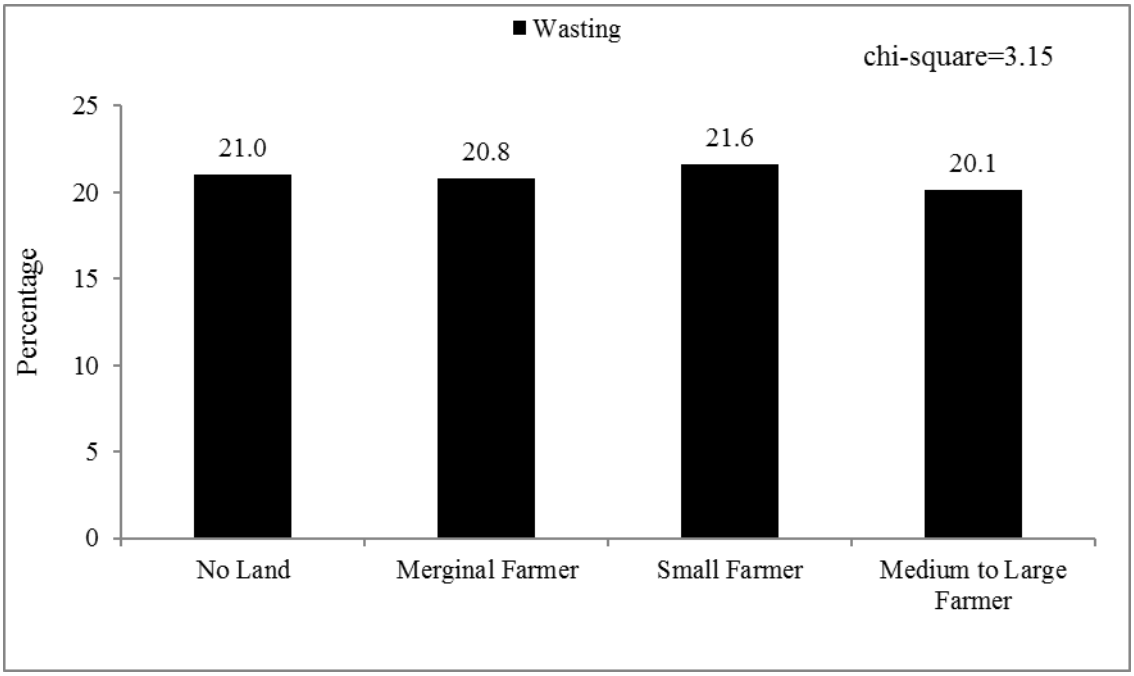
Figure. 2: Nutritional Status of Children by Size of Own Useable Agricultural Landholding in Rural India, 2005-06



Source: Estimated based on the information from NFHS-III

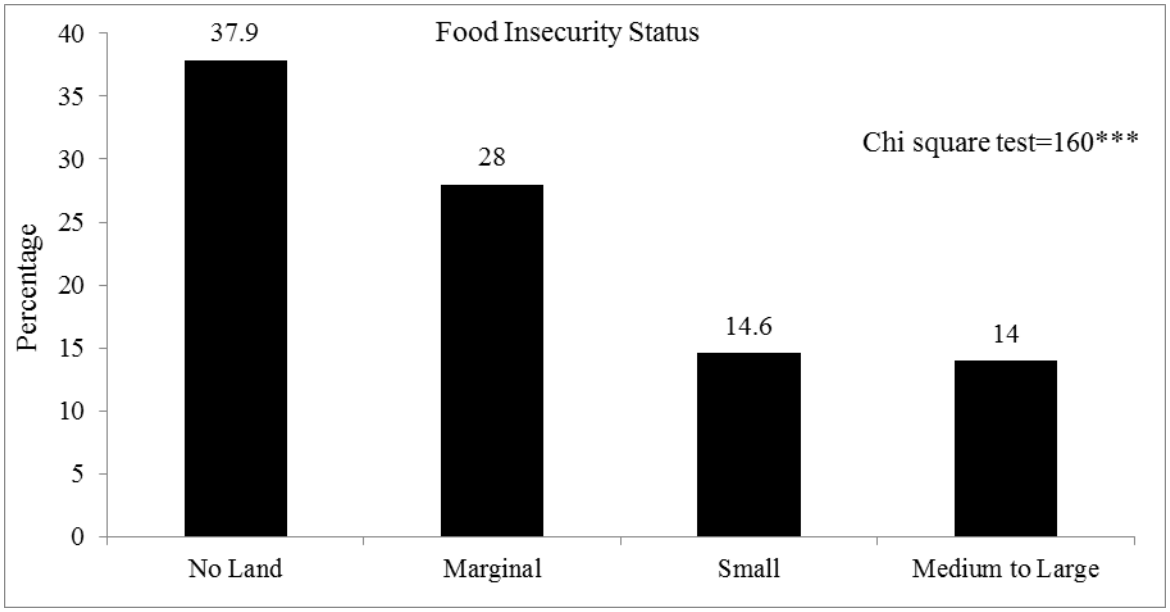


Source: Estimated based on the information from NFHS-III



Source: Estimated based on the information from NFHS-III

Figure. 3: Food Insecurity Status of the Households by Size of Own Useable Agricultural Landholding in Uttar Pradesh, 2014-15. †



† Source: Estimated based on the information from survey of 'Social and Educational Status of OBC and Dalit Muslims in Uttar Pradesh' (Kumar et al., 2015)