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Dr. Ruchira Bhattacharya
Dr. N. V. Madhuri
Dr. Sudeshna Maitra
Mr. Mohammed Sajid

Centre for Gender Studies and Development
National Institute of Rural Development and Panchayati Raj
Ministry of Rural Development, Government of India
Rajendranagar, Hyderabad - 500 030,India

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nirdpr.org.in

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Authors: Dr. Ruchira Bhattacharya[1], Dr. N. V. Madhuri[2], Dr. Sudeshna Maitra[3] &
Mr. Mohammed Sajid[4]

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[1] Corresponding Author, Assistant Professor, NIRDPR (ruchirab.nird@gov.in),
[2] Associate Professor, Head, CGSD, NIRDPR
[3] Research Associate, NIRDPR
[4] Research Assistant, NIRDPR

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ABBREVIATIONS

5DE	5 Domain Disempowerment Index
AOR	Adjusted Odds Ratio
ASHA	Accredited Social Health Activist
BMI	Body Mass Index
CED	Chronic Energy Deficiency
CI	Concentration Index
FAO	Food and Agriculture Organisation
FGD	Focus Group Discussion
FIES	Food Insecurity Experience Scale
GP	Gram Panchayat
GPI	Gender Parity Index
ICDS	Integrated Child Development Services
MDM	Mid-Day Meal
NFHS	National Family Health Survey
NRHM	National Rural Health Mission
NRLM	National Rural Livelihoods Mission
OBC	Other Backward Caste
PDS	Public Distribution System
PRA	Participatory Rural Appraisal
SC	Scheduled Caste
SHG	Self-Help Group
ST	Scheduled Tribe

GLOSSARY OF TERMS

WEAI	Women Empowerment in Agriculture Index is a multi-dimensional index combining the status of women individually and compared to men within households in indicators relating to 5 dimensions, viz. Production, Resources, Income, Leadership, and Time (workload and leisure).
Ad-hoc WEAI	Women Empowerment in Agriculture Index created by the authors using indicators customised for the studied geography and society but within the 5 dimensions, viz. Production, Resources, Income, Leadership, and Time (workload and leisure).
5DE	5DE is the term used for one of the two sub-indexes that constitute WEAI. This sub-index analyses women and men's 'adequacy' in achieving indicators relating to the five domains of Production, Resources, Income, Leadership, and Time.
GPI	The second sub-index of WEAI, GPI or Gender Parity Index measures the difference in empowerment (in terms of 5DE score) between a primary adult man and female in a dual-adult household. This index can only be constituted if both men and women's 5DE are available for the same household.
Dual Household	Household where both primary adult man and female are engaged in agriculture.
Empowered	In the context of this study, 'empowered' refers to an individual who has achieved 'adequacy' in 80 per cent or more of the weighted indicators relating to the five domains.
Disempowered	In the context of this study, 'disempowered' refers to an individual who has achieved 'adequacy' in less than 80 per cent of the weighted indicators relating to the five domains.

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POLICY BRIEF

Context

Evidence across the world has time and again established a link between gender-based discrimination and underdevelopment indicators such as malnourishment. India too has faced a massive challenge of widespread malnourishment and undernutrition, especially among its women and children with anaemia in near 50 per cent of women, and stunting and wasting in almost 33 per cent of children (Kant, 2017). The interventions targeted towards reducing malnourishment are mostly social protection programmes. A vital question is whether the social protection is enough when the access to food and livelihood is highly segregated by gender. This research tried to analyse the linkages between the gender gap in nutritional outcomes and equity in access to food production in terms of resources and decision-making processes and, in turn, identify the exact dimension of women-empowerment which can be instrumental in reducing malnourishment.

Objectives & Methodology

Broadly, the research aspired to find out the linkages between different dimensions of women empowerment and nutritional outcomes such as chronic energy deficiency, incidence of disease and low dietary diversity. The major objectives of this study were:

- To explore the levels of women empowerment and nutritional scenarios of the study area in terms of nutritional intake and outcome of population.
- To decompose women's access to farming decisions by its constituent factors to observe the most important contributor to empowerment.
- Explore the linkages between women's empowerment within the farming system – its contributory indicators and nutritional outcome and the gender gap in nutrition within households.

Daily dietary consumption data was collected from the individuals to construct an Individual level Dietary Diversity Index. Other than this, the height and weight of adult members were collected to identify persons <18.5 BMI in the households. Finally, data on morbidity was collected to construct the frequency of disease of individuals.

A multi-stage, probability proportionate random sampling procedure was used for collecting the data. The primary data of 578 agricultural dual households was collected from March to May 2019 funded by the National Institute of Rural Development and Panchayati Raj, Ministry of Rural Development, Govt. of India, Hyderabad, India. A composite index of women empowerment was

constructed combining women's status on five dimensions of decision-making in comparison to the men in the households. The index ranged from 0 to 1 (*higher the value lesser the empowerment level*) This index was the key predictor and occurrence of low BMI adults, frequent disease or morbidity and low dietary diversity index score at the individual level and an abbreviated Food Insecurity Experience Scale at household level were constructed as outcome indicators. Concentration Index and Multivariable logistic regression were conducted to analyse the linkages between women empowerment levels and nutritional outcome.

Major Findings

- The index for the sampled four States of India was 0.738, meaning that only 37.45 per cent of women were empowered.
- Further disaggregation of the index revealed that 56.95 per cent of women had gender parity in decision making with the primary man members in their households.
- The domains that contributed the most to women's disempowerment were lack of leadership in the community (29.42 per cent), low leisure time (21.95 per cent) and less input in productive decisions (20.92 per cent).
- The results showed a variation in the distribution of "power" and that it had a negative relation with asset-levels of households. The surveyed women in Tamil Nadu had the highest levels of empowerment, followed by Telangana, Madhya Pradesh and lastly, women surveyed in Punjab showed the lowest levels of empowerment.
- Analysis of the nutrition outcomes revealed that the surveyed women in Telangana had 0 inequality in malnutrition. However, in other States, malnutrition was highly concentrated amongst the poorer women. Women of MP and Tamil Nadu, respectively, showed the highest and the lowest inequality.
- Logistic regression revealed that the households with no-gender-parity had lesser probability of a gender equality in nutrition as compared to households with gender parity. At the same time, the odds of a household facing *Food Insecurity* above moderate-level was lower if it was a household with *low gender parity* and *the medium and high asset classes* compared to low asset households reflecting a *non-linear relation* between women empowerment, gender parity and wealth.

Policy Recommendation

A few important policy recommendations came out of the results.

Firstly, the study emphasises a need to re-energise the SHG-based programmes for an immediate upliftment of women in the States where poverty is not a primary cause of malnutrition

such as Punjab and MP. The dimensions of empowerment that affect nutrition most were control on income and decision-making among adult women in the village – both of which can be addressed through SHGs.

Secondly, the study shows that malnutrition gap that existed within household men and women can be reduced by a huge percentage if gender parity in household decision-making around the production system can be improved.

Thirdly, as per the results, gender parity in farming system decision-making will also ensure better dietary diversity. Since inadequacy in the leadership domain was the major contributing factor in disempowering women, the study strongly recommends investment in women's education, skill, livelihood and an overhaul of the community development and mobilisation programmes to address women's participation and access to resources in the studied areas.

CHAPTER I
INTRODUCTION

Evidence across the world has time again hinted at a link between gender-based discrimination and underdevelopment indicators such as malnourishment. However, a direct empirical link has been difficult to establish. India has faced a massive challenge of widespread malnourishment and undernutrition, especially among its women and children. Large datasets such as the National Family Health Survey reveal an inter-generational cycle of undernutrition manifested by anaemia in nearly 50 per cent of the women in India and stunting and wasting in almost 33 per cent of the children (Kant, 2017). The interventions targeted towards reducing malnourishment are mostly social protection programmes such as ICDS or PDS providing food or nutrition supplement to a targeted population. A vital question is whether the social protection is enough when the access to food and livelihood is highly segregated by gender. This research tried to analyse the linkages between gender gap in nutritional outcomes and equity in access to food production in terms of resources and decision-making processes and, in turn, identify the dimension of women-empowerment which can be instrumental in reducing malnourishment.

The pathways through which undernutrition may be impacted by differential gender roles have been brought up time and again. Ramalingaswami (1996) pointed to the low status of women in Indian households as a major reason behind the poor health and nutritional outcomes among women and children. In fact, access to both the immediate determinants of nutrition such as dietary intake and morbidity and underlying determinants such as availability of good quantity and quality of food, safe water, sanitation, etc., largely vary from men to women and are affected by the roles and positions of women in society (Smith and Haddad, 2014). Although the predictors and trends of gender differences in nutrition and health are widely studied, the pathways to achieving gender-just nutritional security remain an important subject to explore. Recent studies have brought out that nutritional security is influenced by women through three roles: as the producer of food (through control on land and productive resources), as the consumer of food (through control on income, employment or other resources) and through women's own nutritional performance (through lack of time for caregiving or insufficient feeding) (Rao, 2017). Since the role of women in influencing the nutritional outcome is complex, the pathways to achieve nutritional security should be studied in relation to women's access to nutrition and entitlements.

Women's access to food and nutritional security also gets influenced by her access to productive assets through her fallback position. This is more evident in the case of a limited resource to be distributed intra-household such as in times of lean season or drought or more extremely

famine (Aggarwal, 1986). Although both men and women suffer in case of lower resources, when it comes to the question of intra-household distribution of resource such as food, the burden is more on the women and their bargaining power is often less (Sen, 1989; Agarwal, 1994). The major factors affecting the bargaining power of women in acquiring household resources can be measured by their access to or inheritance of land titles, access to other livelihoods and means of income, their access to common property resources and finally, the social support from families and kinships (Agarwal, 1988). Evidence suggests that women have been in disadvantageous positions in all four of these factors. Land titles are rarely in the names of women even when it is a constitutionally guaranteed right (Chowdhry, 2009). From the primary and secondary evidence, women's access to employment has been observed to be at lower wage (Ramachandran, Rawal, and Swaminathan, 2010) and often as a distress response (Himanshu, 2011). Even the common resources have gone down over the decades. The burden on women has increased and their access to diversified sources of livelihood and food such as common property resources – open grazing grounds for livestock and firewood – have steadily declined (Jodha, 1986). The reasons are many, such as land privatization (Jodha, 1986) and systematic push towards input-intensive market-oriented crops (Pingali et al. 2017) but the effect has been more or less similar, i.e. decline in diversity of sources of food grain. Social support too has been declining with the disintegration of families. Also, in the despotic family structures acting on patriarchal interests, women's welfare is the last priority of the households (Ramalingaswami, 1996).

Research in low- and middle-income countries (LMIC) have generally shown a strong relation between land-holding size and household food security (Rammohan and Pritchard, 2014). Gender acts as an added disadvantage to the differences in entitlements and assets. Women from landless backgrounds have been observed to fare worse both in terms of BMI and overall food intake as compared to women in landed households (Bamji and Thimayamma, 2000). Women in the LMICs generally own jewels or cattle as assets. Land is usually owned by married man members and inherited in patrilineal lines making intra-household asset inequity perpetuate through generations (Quisumbing and Briere, Paper 86). Gender biases in investment in children have been observed to create unequal human capital and resultant differences in fortune between the man and female child of the same household (Behrman, 1997; Cox, 2003). Lack of access to land leaves women with other options to acquire food, such as livelihood, social protection, or family support.

The relation of women's nutrition and other development indicators is also not linear. Livelihood, for example, shows a mixed effect on women's nutrition, added burden of reproduction, care-work and household chores resulting in chronic energy deficiency in women and sometimes children. Lowering of breastfeeding due to work and resultant thinness among young children has

been noted in several studies before (Bamji and Thimayamma, 2000; Engle and Pederson, 1989).

Despite these challenges, employment in the regular sector may come as a gain for women's nutritional status and overall household's nutritional status. Women's dietary intake improves if they have gainful employment (Bisgrove and Popkin, 1996; Vijayalakshmi, 1991). Also, women's agency and control on the money has been favourable to mitigate intra-household resource distribution bias (Sen, 1999). The role of women is essential since the burden of food production on women has been observed to adversely affect the nutritional status of children (Kumar and Hotchkiss, 1988). The access to productive resources such as land or part of production is also adversely against women farmers in India due to patriarchal nature of resource and asset transfer (FAO, 2011; Agarwal 2003, 2012). Due to lack of access to income or land, women's access to institutional credit is also observed to be low. This coupled with the lesser share in household income and resources perpetuate the problem of lower nutritional security of women.

In the context of widespread gender gap in nutritional intake and outcome, the importance of women's access to productive assets and production-related decisions has been highlighted. Multiple studies, such as the one in Northern Ghana, have found a positive influence of Women's Empowerment in Agriculture (WEAI) on their levels of nutritional intake in terms of calorie, protein and fat (Tsiboe et al., 2017). Yet, most of the literature on nutrition and food security is centred on social protection schemes. This research proposes to analyse the underlying link between women's nutritional security and their access to productive entitlements. The analysis also tries to explore the pathways for achieving sustainable nutritional security for women in particular, and households in general.

Research Question

Broadly, the research aspires to find out the linkages between women's decision-making power within farming systems and nutritional outcomes such as chronic energy deficiency, incidence of disease and low dietary diversity. Particularly, it looks at the question of whether the relation between the access of women to productive decision-making and the gender gap in nutritional outcome within households vary if the type of production system, caste/religion and other attributes of the households are controlled.

Objectives

- To explore the levels of women empowerment and nutritional scenarios of the study area in terms of nutritional intake and outcome of population.
- To decompose women's access to farming decisions by its constituent factors to observe the most important contributor to empowerment.

- Explore the linkages between women's empowerment within the farming system – its contributory indicators and nutritional outcome, and the gender gap in nutrition within households.

Analytical Framework

Both quantitative and qualitative analyses were used for the study. The details are discussed in the empirical framework chapter. The following sets of indicators were collected through the questionnaire:

1. Indicators of Household Characteristics – socio-economic attributes, demographic composition, and geographical characteristics.

2. All Household Members – age, sex, education, height, weight, occupation, duration of stay in the village, access to social protection schemes.

To capture nutritional intake other than the height and weight of cooperating participants, we also use a simplified version of the standard consumption intake module of India Human Development Survey and run it at the individual level of the household. We collected information on other socio-economic characteristics as controls for quantitative analysis.

3. Asked only to Women- Indicators of autonomy and empowerment in agriculture (following the indicators in Women Empowerment in Agriculture Index); item-wise consumption of food last 24 hours.

To capture women's access to productive resources, information was collected to create an adhoc Women Empowerment in Agriculture Index (WEAI) using Alkire Method (Hazel et al., 2015).

Key Outcome Indicators

Daily dietary consumption data was collected for each individual to construct an Individual level Dietary Diversity Index. Other than this, the height and weight of members were collected to identify persons <18.5 BMI in the households. Finally, data on morbidity was collected to construct the frequency of disease of individuals.

Key Predictors

The index of women empowerment was a key predictor along with the geography or agro-ecological location of the household.

Study Area

Both primary and secondary data sources were used for this study. The study was based on a multi-stage, systematic random sampling procedure. The sampling was based on secondary sources

of NSSO Employment Unemployment Survey 2011-12 (68th Round) and NFHS IV (2015-16) which provide detailed data on women's autonomy, participation in agriculture and nutritional outcome at the district level.

Since different farming systems have different degree of access to food security at the agricultural household level, we wanted to generalize our results for a set of agricultural regions. Therefore, agricultural regions were our first stage units of the sample. We selected two major agrarian regions – one which is producing staple food such as the rice-wheat producing "Sub-humid" regions (coastal excluded) and the other which conducting dry farming or producing non-food crops, i.e. "Semi-arid" Regions (arid excluded). These agro-ecological regions – sub-humid and semi-arid regions – were identified using Meso-data base of ICRISAT. The purpose of selecting agro-ecological zones as the primary unit was to identify two sets of households – one which had some access to own production of food, and the second set which did not have much staple food crop and therefore, depended mostly on market for foodgrains. There is evidence of differences in vulnerabilities and social problems between different agrarian systems. The engagement and value of labour, therefore, the value of women also vary between agro-regions (Goli et al. 2014). Within these two sets of households, we wanted to observe the linkages between the gender gap in nutritional outcome and women's empowerment in agriculture. We assumed that within the agro-ecological zones, all external constraints and characteristics of agricultural households will be homogeneous. Collecting information on households' characteristics then will be enough to control the household-level variations in the opportunity of producing food.

After identifying the first stage units, we moved on to identify the second stage units, i.e. the States for drawing the samples for this study. Although political State boundaries do not conform to ecological boundaries, we selected States as they have homogeneity regarding language, food and cultural practices which are roughly similar within state boundaries. There is also some administrative convenience and most of the socio-economic data is available at the State level. Since there was no estimate of WEAI at State/sub-State level, we used information on the percentage of women in farming (rural) using NSS EUS (68th Round) 2011 data (NIC 2008 codes 01 to 03) and the percentage of women who rank above 0.6 in Average Index of Autonomy (rural) from NFHS Data 2015 to identify the States. The index was constructed collapsing responses of women in the 15-49 age group in the autonomy section. We ranked women in the sum of these two indicators (per cent in farm sector and per cent with autonomy score above .6) by States within each Agro-ecological region.

From the NFHS data, we also worked out the percentage of women who have Chronic Energy Deficiency (BMI<18.5) as a proxy of our outcome indicator.

Within the two meso regions, two States each were selected based on the following criteria:

State 1: Min ∑ (% of Women in farming sector + % women with Autonomy Score >0.6)

State 2: Max ∑ (% of Women in farming sector + % women with Autonomy Score >0.6)

Within these primary selections of States, a further selection of third stage units, i.e. the districts were identified using the same set of criteria. The States, although conforming broadly to the agro-ecological meso-regions, had micro-agro-ecological regions. To capture the micro-regions, while ranking districts, the combination of districts in these two criteria was followed:

a) Districts that fell either on sub-humid or semi-arid ecological zones.

b) Districts ranking high and low on the following indicators:

District 1: Min ∑ (% of Women in farming sector + % women with Autonomy Score >0.6)

District 2: Max ∑ (% of Women in farming sector + % women with Autonomy Score >0.6)

First Sampling Unit	Agro-Ecological Meso Region							
Agro-ecological Meso Region		Semi-Arid Region				Sub-humid Region		
Second Sampling Unit	States							
Ranking in Women participation and Autonomy	High		Low			High		Low
Third Sampling Unit	Districts grouped by Inter-State Micro Agro-Ecological conditions							
Criteria 1: Agro-ecological Conditions	Semi-Arid	Sub-humid	Semi-Arid	Sub-humid		Semi-Arid	Sub-humid	Semi-Arid	Sub-humid
Criteria 2: Ranking in Women participation and Autonomy	High	Low	High	Low		High	Low	High	Low
Last Sampling Unit	>>Random Selection of Blocks/Gram Panchayats >>Purposive selection of Agricultural Dual Households							

Figure 1: Structure of Sampling

The district selection is listed in Table 1.

Table 1: District Micro-Region and Women-Autonomy Rank Combination

Agro Region	State	Districts	Inter-State micro-region	Women autonomy rank
Semi-arid	Telangana	Vikarabad	Semi-arid	Low
		Karimnagar	Sub-humid	High
	Tamil Nadu	Virudhunagar	Sub-humid	Low
		Erode	Semi-arid	High
Sub-humid	Madhya Pradesh	Sidhi	Semi-arid	Low
		Hoshangabad	Sub-humid	High
	Punjab	SBS Nagar	Sub-humid	Low
		Mansa	Semi-arid	High

Source: By the author.

After selecting the districts, at the final stage, within each district (one high ranking district and one low ranking in each State: total 4 x 2 = 8 districts), we randomly selected the blocks. Within the blocks, Gram Panchayats were randomly selected.

After identifying the blocks, the local administration (Panchayat Secretary and Block Development Officers) was contacted to provide contacts of agricultural dual households. A random sampling of households was done out of the list of households. If a household did not cooperate or did not indulge in agriculture in the last season (Rabi: November 2018 to March 2019), the household was dropped. The enumerators moved to the next closest agricultural household in the village. In some cases, more than one village had to be surveyed to complete the sample size.

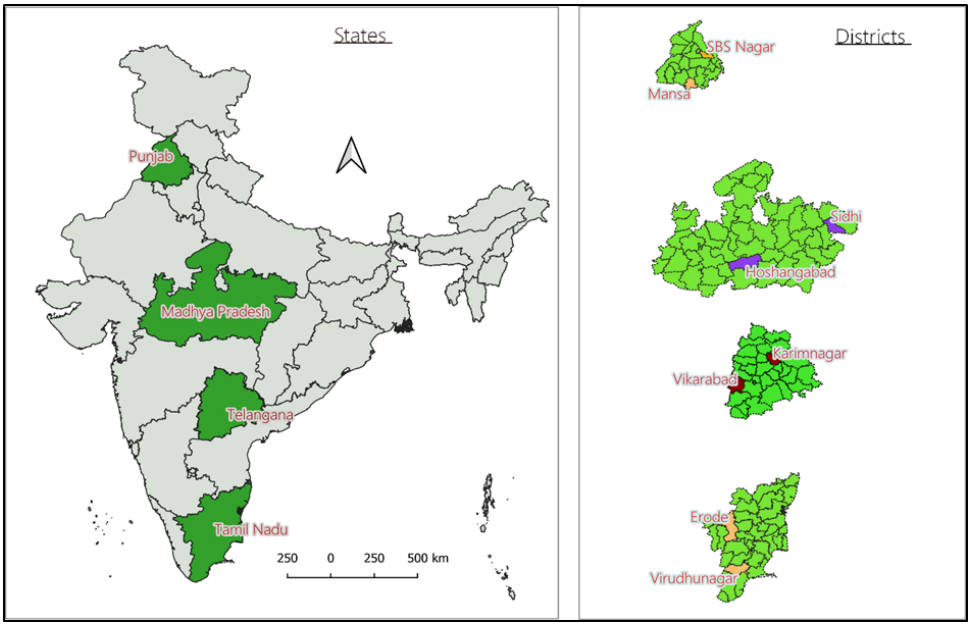

Figure 2: Study Area

Source: By authors.

Sample Size

The sample size was determined based on the assumptions about - (a) the current level of key indicator (BMI gap between men and women) that should change due to the key predictor, i.e. women empowerment in agriculture, (b) the extent of quantifiable change in the selected key indicator which is expected from accessing the key predictor (empowerment level), and (c) the statistical significance level – α and (d) power (1-β) of the statistical test.

This study tries to test the hypothesis that the increase in the levels of women's empowerment will decrease their malnutrition levels.

Table 2: Sample Size Calculation

	Analytical Groups	Rank of State in the Sum of (% Participation + % Autonomy Score >0.6)	
Outcome		**Highest (p1)**	**Lowest (p2)**
Female Adult malnourishment (BMI < 18.5)	Semi-Arid	0.290	0.185
	Sub-Humid	0.318	0.135

Source: By authors using data from NFHS 4.

$$n = [2 X \{(Z_\alpha + Z_\beta)^2 X ((p1+p2)/2) X q\}] /(p_2 - p_1)^2$$

Where p1 and p2 refer to the percentage gap of women and men with Body Mass Index<18.5 between the states with maximum score (p2) and minimum score (p1) in the index of autonomy which was computed from NFHS IV.

α = 0.05 refers to the probability of committing a type I error (`level of statistical significance');

β = 0.20 refers to the probability of making a type II error. β at 80 per cent power referred to the probability of correctly rejecting the null hypothesis in the sample if the actual effect in the population is equal to or greater than the effect size.

$Z\alpha \approx 1.96$ and $Z\beta \approx 0.84$ are the normal curve values associated with the assumed level of α and β.

At a rough calculation of the all-India level using NSSO and NFHS data, we get 424 individuals (adult women) in two regions. This increased to 531 individuals after a design effect of 1.25 and assumed a non-response rate of 1.25. In the sub-humid region, we estimated 402 individuals and in the non-staple producing dry region, we estimated 128 individuals.

Since the survey had to be of "dual households" for computation of Empowerment Index and intra-household power gap, the sample size, which is based on individuals, also conform to the number of households that were surveyed. Corresponding to each sampled woman, the responses of the primary adult man member and information on other members of the household have also been collected.

Adjusting for design and non-response effect, a total of 585 dual-households were sampled. In the final data, seven households had to be dropped due to data quality issues. Four households did not have responses in all the domains of the questionnaire; therefore, they were also dropped. Finally, 574 households were kept in the sample. The adult primary women and men were interviewed using a structured questionnaire like the one used for Women Empowerment in Agriculture Index. Socio-economic characteristics and consumption to measure the difference in nutrition between men and women of the same households were also collected to analyse the pathways of equitable nutritional intake.

Organisation of the Report

The report is organised into five sections. The first chapter deals with the introduction to the study and sampling structure. In the second chapter, the existing methodologies of Women Empowerment in Agriculture Index and secondary evidence of its linkage with social outcomes are in discussed in detail. The third chapter discusses the detailed empirical framework and methodologies used for this study and the fourth chapter presents the results. In the fifth chapter, the results are summarised and concluded. The field diaries and questionnaires are provided in the Appendix.

CHAPTER II
REVIEW OF EXISTING EVIDENCE ON MEASURING EMPOWERMENT AND ITS LINKAGES WITH NUTRITION

The definition of 'empowerment' and the measurement thereof is one of the most complicated tasks of academics. 'Empowerment' in a very literal sense means moving from a position of powerlessness or helplessness to a position of power where one can take control of all aspects of their lives. But it is not simple to theorise that in what sense or when a person is powerless, and what constructs a position of power or when one becomes powerful. A person holds many identities in society all through his/her lifecycle such as their race, ethnicity, class, caste, gender, age, biological features, education, occupation and geography. Each identity is situated in a different location in the scale of power and, therefore, the same person ends up being "differently powerful" in different contexts. An illiterate man from a "Dalit"[1] community, for example, is virtually powerless and has nothing to bargain for his wage or working conditions. But in his own household, compared to his wife or children, he has the highest power to make all decisions. Geography is one such identity that makes designing a common definition of 'empowerment' a difficult task.

Theoretically defining empowerment is one task, to empirically measure it is another. Measuring the level of empowerment of women is one of the ways of fostering policies inclusive for all genders and removing the invisibility of women in the socio-economic discourse. This study defined and measured the 'empowerment' of women in agricultural systems in India by different geographies in which the women operate. The study used a primary database collected with the funding from the National Institute of Rural Development and Panchayati Raj, Hyderabad, India.

The task of measuring "empowerment" as a single empirical index is relevant for designing, monitoring, and evaluating policies informed by gender. This falls more in the area of advocacy than academic research. A statistical approximation of a concept so complex also has its limitation of overlooking several paradoxes of empowerment and has the risk of over-simplifying a complicated social phenomenon (Kabeer, 1999). Yet, the empirical measurement of "empowerment" has the potential of continuous modifications to adjust itself to the ever-expanding concept of power and thus, contributing to the academic discussion around what constitutes power and how it affects other social outcomes in a nuanced manner.

In the context of India, where there is a wide gender gap in social and human development outcomes, the measurement of women's access to decision-making is extremely relevant. In an

[1]Communities which are termed Scheduled Castes or Tribes by the Constitution of India. These are typically the landless, victims of untouchability, or tribal marginalized sections historically excluded from development process through discrimination and violence.

agrarian economy of low-technology and small fragmented land, women's role in agriculture has a strong link with the natural resources and ecological conditions in which they work.

Women's Empowerment in Agriculture Index (WEAI)

Women's Empowerment in Agriculture Index developed by the International Food Policy Research Institute (IFPRI), Oxford Policy and Human Development Initiative (OPHI) and the United States Agency for International Development (USAID) tracks the impact of an intervention called Feed the Future on the change in empowerment level of women. This multidimensional index measures the empowerment of women in the agricultural context. WEAI comprises two sub-indexes: the first sub-index analyses women's empowerment in the household and the society across five domains known as 5DE; the second sub-index is Gender Parity Index (GPI) which measures the difference in empowerment between a primary adult man and female in a dual-adult household. The weights associated with the sub-indexes are 90 per cent and 10 per cent, respectively (Alkire et al., 2013). The weight suggests that the emphasis of WEAI is mainly on the women's five domains of empowerment (5DE).

To calculate the original WEAI (Alkire et al., 2013), each domain of 5DE included the following indicators: 1) Production; 2) Resources; 3) Income; 4) Leadership; 5) Time. The first domain is based on two questions followed from the definition of empowerment by Kabeer (2001) and Alsop, Bertelsen and Holland (2006). First, whether an individual had a joint or sole decision on food cropping, cash cropping, livestock raising and fish culture. Second, decision-making and practicing choice on agricultural production, on agricultural inputs, types of crop to grow, when and who takes the crop to market, whether to involve in livestock raising. The second domain is based on the autonomy or ownership of resources. The indicator consists of the ownership of land and assets, the decision-making ability on sell and buy or transfer of land and assets and decision and access to credits. The third domain measures the control over generated income from food crops, cash crops, livestock production, fish culture or other non-farm production, and wage or salary work. It also includes her decision-making power on her individual wage and salary employment or household expenditures. The fourth domain measures an individual's leadership quality as a proxy for empowerment (Narayan, 2002) which comprises the following indicators: whether a member of any economic or social group; and whether an individual is comfortable speaking in public. The last domain measures the amount of time allocated by an individual for the productive and domestic task and the time allocated for leisure and whether the individual is satisfied with the available leisure time. Each of the indicators is associated with a cut-off which tells if the individual is adequate or inadequate. Consequently, adequacy indicators are coded such that its value is 1 if an individual is

inadequate. A sum of these weighted inadequacies gives an inadequacy score of each individual (M_0), termed as disempowerment index, which lies between 0 and 1. The women's empowerment score, 5DE, is then calculated as (1-M_0) (Alkire and Foster, 2011). Table 1, thus, presents each of the domains and respective indicators along with their adequacy threshold and weights as designed in the original WEAI (Alkire et al., 2013). Note, Ryan and Deci's (2000, 2011) *Relative Autonomy Indicator* (RAI) is computed, which is a weighted sum of multiple decision-making questions under one indicator; for instance, here it has been computed for autonomy in production.

Table 3: Domain-wise Indicators and Weights of WEAI

Domain	Indicator	Survey Question	Cut-off	Weights
Production	Input in productive decisions	How much input did you have in making decisions about food crop farming, cash crop farming, livestock raising, and fish culture? To what extent do you feel you can make your personal decisions regarding these aspects of household life if you want(ed) to: agriculture production, which inputs to buy, which types of crops to grow for agricultural production, when to take or who should take crops to market, and livestock raising?	Inadequate if the individual participates but does not have at least some input in decisions; or does not make the decisions nor feels s/he could make own decision at least to a medium extent in at least two domain	1/10
	Autonomy in production	My actions in [getting inputs for agricultural production, the types of crops to grow for agricultural production, taking crops to the market (or not) or livestock raising] are partly because I will get in trouble with someone if I act differently. Regarding [getting inputs for agricultural production, the types of crops to grow for agricultural production, taking crops to the market (or not) or livestock raising] I do what I do so others don't think poorly of me. Regarding [getting inputs for agricultural production, the types of crops to grow for agricultural production, taking crops to the market (or not) or livestock raising] I do what I do because I think it is the right thing to do.	Inadequate if Relative Autonomy Indicator is less than 1 RAI is a weighted sum of the three survey questions on Autonomy in production for each domain.	1/10

Domain	Indicator	Survey Question	Cut-off	Weights
Resources	Ownership of assets	Who would you say can use the [item] most of the time? Item: Agricultural land; large livestock; small livestock; Chickens, Ducks, Turkeys, Pigeons; fish pond/ fishing equipment; farm equipment (non-mechanised); farm equipment (mechanised); nonfarm business equipment; house; large consumer durables; small consumer durables; cell phone; non-agricultural land (any); means of transport.	Inadequate if the household owns the type of asset but she or he does not own at least one asset solely or jointly (excluding one small asset such as chickens, non-mechanized equipment and small consumer durables)	1/15
	Purchase, sale or transfer of asset	Who would you say can decide whether to sell, give away, rent/mortgage [item] most of the time? Who contributes most to decisions regarding a new purchase of [item]? Item: Agricultural land; large livestock; small livestock; Chickens, Ducks, Turkeys, Pigeons; fish pond/ fishing equipment; farm equipment (non-mechanized); farm equipment (mechanized)	Inadequate if the household owns the type of asset but he or she does not participate in any decision solely or jointly over at least one type of asset (excluding one small asset such as chickens, non-mechanised equipment and small consumer durables)	1/15
	Access to and decision about credit	Who made the decision to borrow/what to do with money/item borrowed from non-governmental organisation; informal lender; formal lender (bank); friends or relatives; Group based micro-finance or lending including VSLAs/SACCOs/merry -go-rounds?	Inadequate if household used a source of credit but she or he did not participate in any decisions on at least one	1/15
Income	Control over the use of income	How much input did you have in decisions about the use of income generated from food crop farming, cash crop farming, livestock raising, non-farm economic activities, Wage and salary employment or fishing or fishpond culture? To what extent do you feel you can make your personal decisions regarding [your wage or salary employment; Major household expenditures; Minor household expenditures] if you want(ed) to?	Inadequate if the individual participates in activity but has no input or little input in decisions about the income generated in at least one activity (except minor household expenditures)	1/5

Domain	Indicator	Survey Question	Cut-off	Weights
Leadership	Economic/ Social group member	Are you a member of any [Group]? Group: agricultural/livestock/fisheries producer/market group; water users' group; forest users' group; credit, or microfinance group; mutual help or insurance group (including burial societies); trade and business association; civic/charitable group; local government; religious group; other women's group; other groups	Inadequate if not part of at least one group	1/10
	Speak in public	Do you feel comfortable speaking up in public?	Inadequate if not comfortable speaking in public in at least one of [situations]	1/10
Time	Work	Worked more than 10.5 hours in the previous 24 hours.	Inadequate if individual works more than 11 hours per day	1/10
	Leisure	How would you rate your satisfaction with your time available for leisure activities such as visiting neighbours, watching TV, listening to the radio, seeing movies, or doing sports?	Inadequate if not satisfied (<5)	1/10

Source: Collated by authors from various sources.

The second sub-index, GPI, measures the difference in 5DE score of an adult man and woman within a household. GPI takes a value between -1 to 0. Zero value of GPI denotes either the 5DE score of the man and woman adult member is the same or if the female 5DE score is greater than that of his counterpart. Households with no primary adult man are excluded from the GPI measure. In that case, the overall WEAI is calculated using the mean GPI value from dual adult households (Alkire et al., 2013). The WEAI, 5DE, GPI and the decomposed domains of 5DE were computed for the initial three countries under the Feed the Future zones which are South-western Bangladesh, Western Highlands of Guatemala and Uganda. The value of WEAI is 0.762 in South-western Bangladesh, 0.702 in the Western Highlands of Guatemala and 0.800 in Uganda. The 5DE score states that 39 per cent of women in Bangladesh pilot areas, 28.7 per cent in Guatemala regions and 43.3 per cent in Uganda are empowered. In Bangladesh, the main contributors to women's disempowerment are weak leadership and lack of control over resources. In Guatemala, the main reasons are again lack of group membership and less control over the income. Time burden and lack of control over resources contribute to Uganda's women's disempowerment. Alkire et al. (2013) highlights that in Bangladesh, even empowered men are lower in number, about 40 per cent which is not the same for Guatemala and Uganda with 60.9 per cent and 63 per cent of empowered men, respectively. Notably, in

Guatemala and Uganda men are more empowered than women in all domains, but in Bangladesh, men's disempowerment domains are quite different to women's disempowerment domains.

After the baseline survey under the Feed the Future initiative, the WEAI team updated the original questionnaire to clarify few questions. The updated WEAI, also known as WEAI 1.1, had the same 10 indicators and same questions except for the questions on *autonomy in production* which were changed to short hypothetical questions, as the feedback pointed these questions to be problematic. Few other minor changes such as change in instruction, options and formatting were made in the updated version. However, due to the intensive format of the original WEAI questionnaire, both in terms of time and cost, an abbreviated WEAI (A-WEAI) was developed (Malapit, Kovarik, et al. 2015). Out of the 10 indicators from the original WEAI, the A-WEAI includes only six, i.e. 1) Input in productive decisions, 2) Ownership of assets, 3) Access to and decisions on credit, 4) Control over the use of income, 5) Group membership, and 6) Workload with no change in questions or inputs or the cut-offs. Each of the domains in A-WEAI was assigned a weight of 1/5. Malapit et al. (2015) tested the A-WEAI questionnaire on Bangladesh and Uganda which were also part of the original WEAI in the feed the future initiative. A-WEAI score was found to be 0.837 and 0.836 for Bangladesh and Uganda, respectively. The 5DE score suggests that about 53.6 per cent of women in Bangladesh and 59.7 per cent of women in Uganda are empowered. The contributing domains of disempowerment among women in Bangladesh are lack of leadership, poor access to productive resources and time burden. For Uganda women, the contributing domains are time burden, less control over the use of income, and poor decision-making in production.

A modified version of WEAI, called the Project level WEAI (Pro-WEAI), was constructed later to specially evaluate the impact of agriculture development projects on women's empowerment (Malapit, Quisumbing, et al. 2019). This Index used 12 indicators under three domains: intrinsic agency (power within), instrumental agency (power to), and collective agency (power with). Similar to the original WEAI, Pro-WEAI is also built on Kabeer's (1999, 2005) framework. The indicators under the first domain, intrinsic agency, are 1) Autonomy in income (focuses exclusively on the use of income generated from agricultural and non-agricultural activities and uses a new vignette-based survey instrument); 2) Self-efficacy; 3) Attitudes about intimate partner violence against women; and 4) Respect among household members. The second domain, instrumental agency, consists of 5) Input in productive decisions (with stricter adequacy cut-off than WEAI); 6) Ownership of land and other assets (with stricter adequacy cut-off than WEAI); 7) Access to and decisions on financial services (includes access to financial accounts along with credits); 8) Control over the use of income (with stricter adequacy cut-off than WEAI); 9) Work balance (same but secondary activities includes single activity i.e., childcare); and 10) Visiting important locations. Finally, the last domain, collective

agency, comprises 11) Group membership and 12) Membership in influential groups. So, the Pro-WEAI has two sub-indexes - 3DE and GPI - with 90 per cent and 10 per cent weightage, respectively. To have a better understanding of the effect of agriculture project interventions, the index was developed based on both qualitative and quantitative surveys. The Pro-WEAI is still under development and being analysed through the baseline survey from the GAAP2 project in Burkina Faso (Kieran, Crookston, Gash, and Gray, 2018) and Bangladesh (Ahmed, Malapit, Pereira, Quisumbing and Rubin, 2018) to develop a healthier and nutrition-focused index and has been discussed briefly subsequently.

Another version called the Pro-WEAI was constructed for International Food Policy Research Institute (IFPRI) funded project titled *Building the Resilience of Vulnerable Communities in Burkina Faso (BRB)* as part of the Gender, Agriculture and Assets Project, Phase Two (GAAP2) (Kieran, et al. 2018). The Pro-WEAI used in this project initially started with the A-WEAI indicators but then added few more indicators based on the project requirement. So, the Pro-WEAI (Keiran et al., 2018) has 16 indicators: 1) Input in productive decisions, 2) Access to information important for making productive decisions, 3) Autonomy in production decisions, 4) Ownership of land, 5) Decision-making over land, what to plant, 6) Access to and decisions on credit, 7) Access to financial account, 8) Control over the use of agricultural income, 9) Control over the use of non-agricultural income, 10) Input in household spending decisions, 11) Autonomy in income, 12) Group membership, 13) Workload, 14) Mobility, i.e. ability to move, 15) Respect among intra-household members, and 16) Attitudes about domestic violence. Comparing results from both A-WEAI and Pro-WEAI, they point that both men and women are active group members, and hence, A-WEAI shows high empowerment among both sexes. However, if the question on man and female members' influence on group decisions is considered, then there is a difference in empowerment. Additionally, Pro-WEAI measures women's mobility which is often severely restricted. A-WEAI includes only primary work as workload, suggesting both men and women have equal workload. But, Pro-WEAI includes childcare as a secondary activity by measuring workload as:

Total Workload = Primary activity + 1/2 (time spent o childcare)

and hence, highlighting the time burden on women.

Women's Empowerment in Agriculture for Value Chain (WEAI4VC) was another modified version of WEAI and evolved after the feedback from the piloting surveys of Project level WEAI of GAAP2 (Ahmed et al. 2018). The objective of WEAI4VC was to involve women in agriculture wage employment and entrepreneurship along with women in production. Additional indicators included in the WEAI4VC are intra-household relationships, attitudes about domestic violence, physical mobility to important locations, attitude towards the *purdah* system, awareness on key messages such as food security and assets brought to the marriage by the women respondents.

Evidence Relating the WEAI Score to Food Security Outcomes

The original concept of Women's Empowerment in Agriculture Index (WEAI) (Alkire et al., 2013) was found to be linked with food security in rural Bangladesh using the data from the Bangladesh Integrated Household Survey (BIHS), 2012 data (Sraboni, Malapit, et al. 2014). Per capita calorie availability, household dietary diversity, and adult Body Mass Index (BMI) were the three measures of food security included in the paper. Women's empowerment in agriculture was measured using six indicators:1) the empowerment scores i.e., 5DE; four indicators from the decomposed 5DE which included 2) the *number of active group membership*, 3) *Number of decisions taken concerning credit*, 4) the *number of asset owned solely or jointly*, 5) *number of sole or joint decisions taken concerning transfer/sale/purchase of asset* and finally the last one is 6) Gender Parity Gap. They found that better empowerment scores of women were associated with higher calorie availability and dietary diversity but was not significantly associated with adult BMI.

A study on the feed the future initiative's 2012 baseline household survey in Ghana, found an association of women's empowerment in agriculture to the nutritional status of women and children (Malapit and Quisimbing, 2015). The dependent variables comprise infant and young child feeding practices such as exclusive breastfeeding practice, dietary diversity score, minimum diet diversity and their minimum acceptable diet defined according to the recommendations of WHO; child's anthropometric measures such as height-for-age, weight-for-height and weight-for-age; and women's dietary diversity score and her Body Mass Index. As a measure of women's empowerment in agriculture, they used the WEAI (Alkire et al., 2013). So, as an empowerment measure, the key independent variables included the women's individual 5DE empowerment score and the gender parity gap for households were at least one primary adult man and one woman were present. Further, decomposing 5DE, the key domains of disempowerment among women in Ghana were figured to be their access to decisions about credit and their input into productive decisions and hence were added into the list of key independent variables. Using an ordinary least square estimation they found a significant association of women's agriculture empowerment to infant and young child's feeding practices and weak association with child's nutritional status. Decision making in credit is positively related to girl's weight-for-height z-scores and the women's dietary diversity although have no association with women's BMI. Greater gender parity gap between adult men and women of the household is associated with better weight-for-age and height-for-age scores of the boys although insignificant for the girls. Better production diversity was observed to improve both maternal and child health outcomes and dietary diversity. Indicators of women's empowerment such as engagement in the community, control over income, reduced workload and overall empowerment score are associated with better maternal nutrition. Women's empowerment eases the ill effects of

household's low production diversity on women and child's dietary diversity and also child's weight-for-height score (Malapit, Kadiyala et al. 2015). The study added the production diversity index along with the women's empowerment measure, WEAI (Alkire et al., 2013) to examine how women's empowerment in agriculture modifies the effect of production diversity (index on the number of food groups produced in the household out of the 9 food groups in the maternal dietary diversity) on nutritional status of children and women in rural Nepal using data from 2012 household survey.

CHAPTER III

EMPIRICAL FRAMEWORK: METHOD AND METRICS

In this study, an empirical approximation of "empowerment" by different systems of agriculture was constructed in the form of an ad hoc WEAI. Its linkages with household's nutritional performance in terms of levels of undernutrition, dietary adequacy, hunger and health were examined controlling for agro-ecological conditions that may have an influence on women's role in farming and all household nutritional parameters.

The existing indices of empowerment such as the Women's Empowerment in Agriculture Index (WEAI) have taken the approach of measuring the level or status of power of women in society. It measures 'empowerment' by constructing sub-indexes of women's empowerment and a Gender Parity Index (GPI) between a primary adult man and female in a dual-adult household aggregating them with 90 and 10 per cent weights, respectively (Alkire et al., 2013).

Data

This study used primary data of 578 agricultural dual-households collected from March 2019 to April 2019. A multi-stage, probability proportionate random sampling procedure has been used for collecting the data (sampling details are given in Chapter 1; see annexure for questionnaire and field diaries).

Methodology

The main objective was to reconstruct a multi-dimensional index of empowerment in the agrarian system. Indicators of the original 5 dimensions of WEAI, i.e. production, resources, income, leadership, and time spent in leisure were collected from sampled households. Other than these, indicators of women's detailed work on the farm, and their exposure to outdoor knowledge have been captured. The indicators were crop-wise information of individuals primarily operating the plot, individual-level type of farm activity, risks of farming, participation in collectives and producer organisations, and exposure to agricultural extension work.

There were a few changes to the index constructed by this study. The input indicators were aggregated out of granularly disaggregated activity level questions within the farming systems.

The second objective was to find the association between this index of empowerment and nutritional outcome controlling for socio-economic correlates. The details of indicators are provided below.

Indicators for Analysis

The effect of women's decision-making was tested on several outcome indicators of household health and nutrition. These were:

Malnourishment outcomes: Individual and Household levels

The anthropometric data collected for all available individuals was converted into Body Mass Index values and coded into 0 (>= than 18.5) and 1 (< than 18.5).

Households, where the number of malnourished man members was lower than the number of malnourished female members, were coded as 1; otherwise, households were coded as 0.

Dietary Diversity Scores

The Individual Dietary Diversity Score was constructed adding consumption of 16 food groups in the last 24 hours for every member. Those with a score greater than 4 were coded 1 (adequate) otherwise they were coded 0 (inadequate).

Household Food Insecurity Index

Following FAO FIES index was constructed from 6 questions pertaining to food security and hunger at the household level. Households with mild to severe insecurity were coded 1; otherwise 0.

Morbidity of Individuals

Short-term and long-term morbidity data were collected from everyone. Short-term morbidity was categorised into 0 as none, up to 2 reported cases and more than 2 cases.

Key Predictor Indicator

An ad-hoc version of the Women Empowerment in Agriculture Index was constructed as a major predictor. Two of its components – weighted deprivation score and gender parity index were separately used as predictors of outcome indicators.

Table 4: WEAI Definitions and Indicator-wise Weights Used

Sub-indicator	Sub-indicator weight	Domain Weight
Input in productive decisions: *Individual has **some input** in productive decisions in **at least two activities** (Food crop/ Commercial crop/ Livestock or fishing)*	1/5	1/5 (Production)
Ownership of assets: *Individual **self or jointly** owns **at least one large asset or two small assets***	1/15	1/5 (Resources)
Decision-making about purchase/sell/transfer of productive assets: *Individual **self/jointly** have **at least one right** over **one agricultural asset,** conditional on ownership*	1/15	
Access to and decisions about credit/savings: *Individual **self/jointly** makes **at least one decision** regarding **at least one credit/savings source**, conditioned on usage*	1/15	
Control over the use of Income *Individual has **some input** in income decisions in **at least one domain** (Food crop/ Commercial crop/ Livestock or fishing/ Non-farm activity/ Salaried employment/ Major household spending)*	1/5	1/5 (Income)
Group membership: *Individual is a member of **at least one group** present in the community*	1/10	1/5 (Leadership)
Speaking in Public: *Individuals speak up in public for **any circumstance***	1/10	
Leisure: *Individual had **more than or equal to 10 hours** of leisure in last 24 hours*	1/5	1/5 (Time)

Source: Created by authors

Control Variables

Several socio-demographic indicators such as gender of the member, age group, occupation, education level, agro-ecological region, access to clean water, electricity, clean fuel, pukka household, asset class, landholding class, access to social transfer and financial security and PDS were added to the multi-nominal logistic regression as controls.

Analysis of Linkages with Nutrition

Bivariate tables and multivariate analyses were used to analyse the linkages with the nutritional outcome. To analyse the contributing factors to nutrition inequity, a concentration index was constructed. To analyse the elasticity of nutritional outcomes, logistic regressions were conducted for different outcomes of nutrition.

Concentration Index

To estimate the inequality in malnutrition, *Normalised Wagstaff Concentration* (Wagstaff et al., 2003) *Index* (*CI*) was calculated by asset-ownership status. The concentration index is an estimation inequality in an outcome variable by an underlying economic indicator. The index is related to the concentration curve and measures the degree of socio-economic inequality in a health variable (O'Donnel et al., 2008). Several health inequality-analyses have used the index, for e.g. inequality in child mortality (Wagstaff, 2000), child immunization (Gwatkin et al., 2003), child malnutrition (Wagstaff et al., 2003), health subsidies (O'Donnell et al., 2007), and immunisation and malnourishment (Arokiasamy et al., 2013). Compared to the Gini Coefficient that estimates the inequality of an outcome, the Concentration Index estimates the inequities, i.e. the concentration of the outcome by socio-economic status or living standards.

The CI is essentially computed using the formula suggested by Kakwani (1980). Covariance between the health outcome variable and the fractional rank in the living standards distribution are divided by mean outcome to get the concentration index.

$$C = \frac{2}{\mu} Cov(h,r)$$

Where μ refers to the mean value of the outcome variable; h is the health outcome variable (RI in our case) and r is the fractional rank of the individual by wealth or underlying economic status by which the inequality is computed. In Wagstaff (2005) measure, the outcome variable is dichotomised and finally, the *CI* is normalised through dividing by $(1-\mu)$.

$$CI = \frac{C}{(1-\mu)}$$

Where C is the non-normalised concentration index and μ is the mean of the health outcome variable.

A positive value of CI means the outcome is concentrated among the richer households and a negative value of CI means the outcome is more concentrated among the poorer households. A value of 0 (zero) means there is no concentration in the outcome, and it is equally distributed among all wealth classes.

Decomposition Analysis

Table 5: Indicators for Decomposition Analysis

Type	Indicator	Yes== 1 |No ==0
Outcome Indicator	Combined Malnutrition	Underweight (BMI<18.5) or Frequent Morbidity (infections more than once in last 15 days) or Low Dietary Diversity (IDDS<4)
Key Predictors	Input in Decision on Production	Low
	Control over Income	Low
	Ownership of Assets	Low
	Access to any Credit/Savings	None
	Membership of SHG/FPO/CBO	None
	Public Speaking Skills	Low
	Time for Leisure	Low
Socio-demographic Covariates	Gender	Female
	Caste	SC/ST/OBC
	Place of Residence	Semi-arid districts
	Literacy	Illiterate
	Standard of Living	Low
	NREGA	Not participated
	PDS	Not taken
	Financial Security	Low
	Social Security	Low
	Food Security	Low

Source: By authors.

The key predictors were individual indicators that went into the 5DE index. Other than the key predictors, variables chosen for the study were socio-economic and geographical factors. Literature suggests that measurement of inequality can be based on predictors that show systematic association with the health status of the population (Gakidou et al., 2000; Wagstaff, 2002b; O'Donnell et al., 2008). For measuring the contribution of socio-economic predictors on overall levels of CI, the analysis used predictor variables that were dichotomised with a hostile social status hostile to nutrition coded as 1 and favourable status for nutrition coded as 0. The first group of predictors comprised determinants that played out in determining malnutrition at an individual level. These were (i) sex (female as 1 and man as 0) and (ii) education (Illiterate as 1) (iii) access to NREGA/other financial security/other social security (no access as 1). The next set of predictors was at the household level. These were (iv) caste order (SC/ST/OBC coded as 1; General as 0) (v) Place of residence (semi-arid as 1 and sub-humid as 0) (vi) Standard of living score (access to clean water, toilet, pucca house, kitchen garden and toilet in premises) (lowest tertile as 1, otherwise 0), (vii) access to the PDS (No access as 1).

Decomposing contribution of predictive variables

After the CI was calculated, calculation of residual and decomposition was done using methods explained by O'Donnel et al. (2008) and Arokiasamy et al. (2013) using STATA version 13.0.

- The individual contribution of each predictor was computed by multiplying the elasticity of RI to each predictor (marginal effect calculated through linear regression) with their individual Concentration Index Values (non-normalised).
- The individual contributions were summed up to arrive at the *total explained contribution*.
- Percentage contributions of predictors were derived by calculating the proportion of individual contribution to *total explained contribution*.
- The residual of the contributions was calculated by deducting the sum of all contributions from the non-normalised overall concentration index.

The analysis was done for the entire sample together and by agro-ecological regions, since vulnerabilities of women varied by the regions.

Logistic Regression

Different outcomes of nutrition were regressed on a dummy variable CI_gap which took the value of 1 if women had a greater disempowerment score than men in the same household. A set of socio-demographic controls were added to the equation to observe the partial effect of CI_gap.

CHAPTER IV
RESULTS

In the survey spanning from March 2019 to May 2019, data was collected from 574 households in four States of India, namely Telangana, Tamil Nadu, Madhya Pradesh and Punjab. Telangana and Tamil Nadu have a higher share of sample, about 36 per cent and 35 per cent, respectively, whereas Madhya Pradesh and Punjab have a lower share, about 14 per cent each.

The survey was conducted in one or two blocks from two districts of each State. Mominpet and Nawabpet blocks of Vikarabad district and Huzurabad and Ramadugu of Karimnagar in Telangana were surveyed. Similarly, Arrupokotai block of Virudhunagar district and Kodumudi block of Erode district in Tamil Nadu, Rampur Naikin of Sidhi district and Sohagpur in Hoshangabad district of Madhya Pradesh and finally, Saroya block of SBS Nagar and Sardulgarh block of Mansa in Punjab were chosen. The results are stated for the sampled individuals only and it will be unadvisable to make State-level generalisations from these tables. Yet, they offer significant insights on a complex household process of how "empowerment" in agriculture translates to "nutrition" within households of different agro-ecological settings.

Description of the Studied Sample

Data was collected from 574 agricultural dual households across four States. Since the WEAI uses households that have responses in all five domains from men and women, around 20 per cent of the sample had to be dropped during WEAI computation. The drop was the highest in Madhya Pradesh and the lowest in Telangana.

Table 6: Sample Size (Frequency) by State/District (Block)/Village

State	Districts	Blocks	Total		Dropping No-response		% of data used	
			Women	Men	Women	Men	Women	Men
Total			574	574	462	464	80.49	80.84
Telangana			**207**	**207**	**198**	**199**	**95.65**	**96.14**
	Vikarabad	Vikarabad	102	102	96	98	94.12	96.08
	Karimnagar	Ibrahimpatnam Mallapur Mahadevpatnam	105	105	102	101	97.14	96.19
Tamil Nadu			**201**	**201**	**149**	**149**	**74.13**	**74.13**
	Virudhunagar	Arupukottai Tiruchulli	101	101	74	74	73.27	73.27
	Erode	Kodumudi Nambiyur	100	100	75	75	75.00	75.00

State	Districts	Blocks	Total		Dropping No-response		% of data used	
Madhya Pradesh			**84**	**84**	**38**	**39**	**45.24**	**46.43**
	Sidhi	RampurNaikin	42	42	22	23	52.38	54.76
	Hoshangabad	SohagpurBankhedi	42	42	16	16	38.10	38.10
Punjab			**82**	**82**	**77**	**77**	**93.90**	**93.90**
	SBS Nagar	Saroya	39	39	37	37	94.87	94.87
	Mansa	Sardulgarh	43	43	40	40	93.02	93.02

Source: By authors using primary data.

As the sample was purposively agricultural households, the land-size distribution was heavier towards landed households of marginal and small category. Around 40 per cent of the households belonged to the marginal land-size class followed by 35 per cent in the small land-size class category.

Table 7: Land-Size Class Distribution

State	N	Near Landless	Marginal	Small	Semi-medium	Medium	Large
Total	563	2.1	40	35.9	12.8	3.7	5.5
Telangana	203	1.5	37.4	44.3	10.8	2.5	3.4
Tamil Nadu	196	1	42.3	33.2	13.3	2	8.2
Madhya Pradesh	82	7.3	51.2	19.5	11	6.1	4.9
Punjab	82	1.2	29.3	37.8	18.3	8.5	4.9

Source: By authors using primary data.

The proportion of marginal farmers was highest in Madhya Pradesh followed by Tamil Nadu. Within Madhya Pradesh, Sidhi district had the highest proportion of small/marginal farmer households. The sampled households of Punjab showed more equitable distribution across land-size class than any other States.

State	District	N	Near Landless	Marginal	Small	Semi-medium	Medium	Large
Telangana	Vikarabad	100	1	35	49	11	2	2
	Karimnagar	103	1.9	39.8	39.8	10.7	2.9	4.9
Tamil Nadu	Virudhunagar	101	0	32.7	38.6	19.8	2	6.9
	Erode	95	2.1	52.6	27.4	6.3	2.1	9.5
Madhya Pradesh	Sidhi	40	2.5	75.0	10.0	5.0	2.5	5
	Hoshangabad	42	11.9	28.6	28.6	16.7	9.5	4.8
Punjab	SBS Nagar	39	0	33.3	35.9	25.6	5.1	0
	Mansa	43	2.3	25.6	39.5	11.6	11.6	9.3
Total	Total	563	2.1	40	35.9	12.8	3.7	5.5

Source: By authors using primary data.

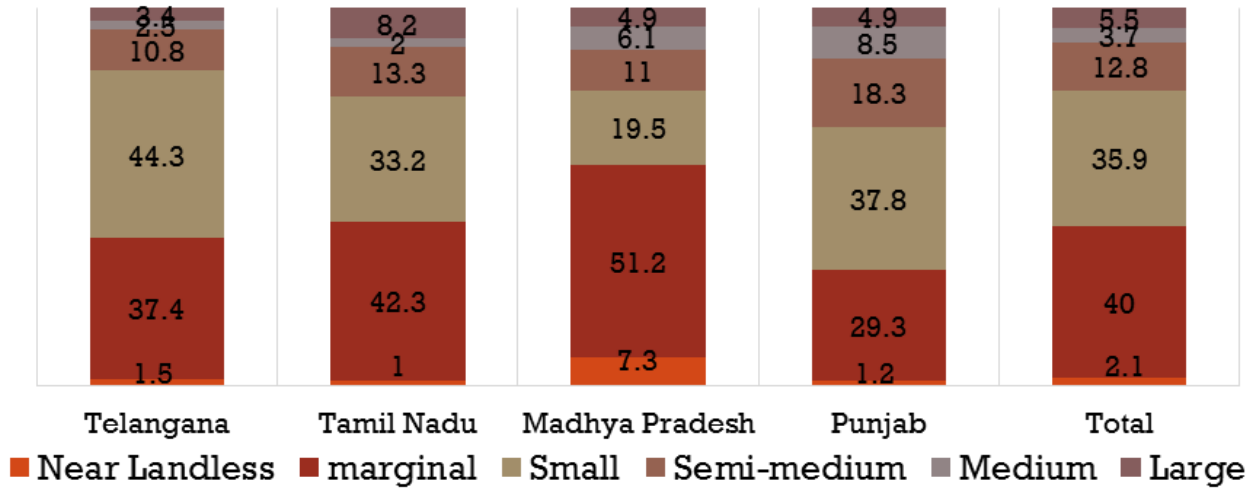

Figure 3: Land-Size Distribution of Sampled Households

Source: By authors using primary data.

Table 8: Caste-Religion Distribution

State	District	N	ST	SC	OBC	Others
Telangana		207	0	19.81	45.41	34.78
Tamil Nadu		201	0.5	2.49	94.03	2.99
Madhya Pradesh		84	14.29	1.19	83.33	1.19
Punjab		82	0	23.17	6.1	70.73
Total		574	2.26	11.5	62.37	23.87
Telangana	Vikarabad	102	0	17.65	40.2	42.16
	Karimnagar	105	0	21.9	50.48	27.62
Tamil Nadu	Virudhunagar	101	0.99	4.95	94.06	0
	Erode	100	0	0	94.0	6
Madhya Pradesh	Sidhi	42	26.19	0	71.43	2.38
	Hoshangabad	42	2.38	2.38	95.24	0
Punjab	SBS Nagar	39	0	0	0	100
	Mansa	43	0	44.19	11.63	44.19
Total		574	2.26	11.5	62.37	23.87
State	N	Hinduism	Islam	Christian	Sikhism	Others
Telangana	207	96.14	1.45	2.42	0	0
Tamil Nadu	201	100	0	0	0	0
Madhya Pradesh	84	97.62	1.19	1.19	0	0
Punjab	82	12.2	0	0	85.37	2.44
Total	574	85.71	0.7	1.05	12.2	0.35

Source: By authors using primary data.

Majority of households in Telangana belonged to the OBC category, followed by general castes. In Tamil Nadu and Madhya Pradesh, almost the entire sample is from the OBC category. In Punjab, around one-fourth of the households belonged to the SC community and around three-fourth belonged to the general caste category.

The sample also did not capture much variation in religion with more than four-fifth (85 per cent) of the households belonging to Hindu religion, except for in Punjab where most households were Sikh.

Table 9: Description of the Primary Member

Relation to Head	Men	Women	Total
Head	91.0	9.0	532
Spouse of Head	5.6	94.4	503
Married Child	95.5	4.6	22
Spouse of Married Child	0.0	100.0	14
Unmarried Child	76.0	24.0	25
Other	29.7	70.3	37

Source: By authors using primary data.

Out of the total sample which comprised 2,223 individuals, with 51.4 per cent man (1,142) and 48.6 per cent female (1081) – 563 adult men and 570 adult women were the primary members in agriculture. Out of this, 9 per cent of women were reportedly head of the households. Mostly, the wife of the heads or the daughters-in-law were engaged in family agriculture.

Only about 4.8 per cent were children (0-5 age group) and 10.3 per cent were adolescents (6-14 age group). 68.6 per cent of the surveyed individuals were aged between 15 and 60, followed by the 61 and above age group, comprising 16.3 per cent of the sample. The child sex ratio of the surveyed households was slightly skewed with 56 man and 50 females in the <5 age group and 124 male and 105 females in the adolescent age group. The 15-60 age group had a marginally higher share of woman than the male with 49.5 per cent male and 50.5 per cent woman. Lastly, the 60 and above age group had 207 men and 155 women.

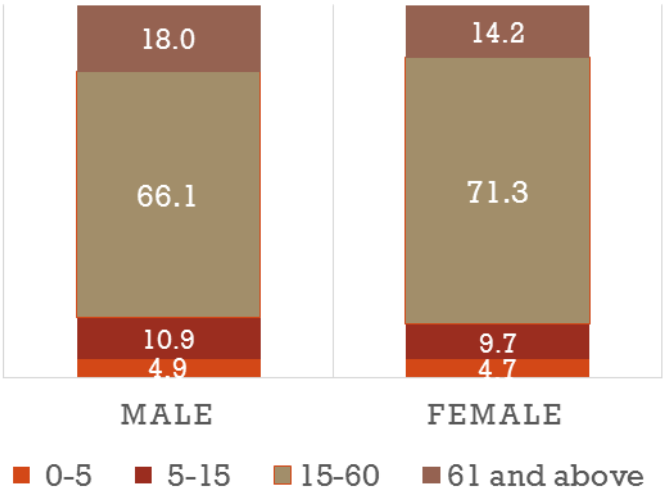

Figure 4: Age Distribution of All Individuals

Source: By authors using primary data.

Among the 1133 adult primary members, two-fifth were in the age group of 46-60, followed by 31-45 years, and around one-fifth was in the age group of 61 and above. A small proportion of (7 per cent) was in the younger 16-30 age group.

Table 10: Age-Sex Distribution of the Primary Members

Age Group	All sampled individuals			
	Male	Female	Total	
16-30	6.22	9.31	7.6	
31-45	28.24	35.85	32.1	
46-60	38.9	39.72	39.43	
61 and above	26.64	15.11	20.87	
Total N	563	570	1,131	
State-wise	**Telangana**	**Tamil Nadu**	**Madhya Pradesh**	**Punjab**
Men				
16-30	8.91	1.52	7.41	7.5
31-45	32.67	16.16	41.98	33.75
46-60	41.09	35.86	35.8	45.0
61 and above	17.33	46.46	14.81	13.75
Total N	203	198	82	80
Women				
16-30	14.15	2.02	14.29	9.76
31-45	41.46	27.27	46.43	31.71
46-60	36.59	42.42	32.14	48.78
61 and above	7.8	28.28	7.14	9.76
Total N	205	198	84	82

Source: By authors using primary data.

The age distribution of the surveyed primary members does not change much when disaggregated by the States. The proportion of middle/old-aged farmers is slightly higher in Tamil Nadu followed by Punjab.

Among the primary members, majority of surveyed farmers (around three-fifths) reported that they were at least educated till primary level. In fact, the percentage of women with primary education was higher than men by almost 4 per cent. However, the same can also be the result of clubbing "read" and "read and write without formal schooling" and "completed primary school" in the same category. The education level of women of Tamil Nadu, especially Virudhunagar district, was highest. Madhya Pradesh women had the lowest levels of education.

Table 11: Education-Sex Distribution

State	Education	Male	Female	Total
All States	Illiterate	26.29	41.05	33.72
	Primary	31.97	35.61	33.8
	Middle	35.88	20.7	28.24
	Secondary and Above	5.86	2.63	4.24
	Total N	563	570	1,133
Telangana	Illiterate	30.54	50.49	40.59
	Primary	32.02	28.16	30.07
	Middle	31.03	19.42	25.18
	Secondary and Above	6.4	1.94	4.16
	Total N	203	206	409
Tamil Nadu	Illiterate	12.63	19.19	15.91
	Primary	34.85	46.97	40.91
	Middle	45.45	29.29	37.37
	Secondary and Above	7.07	4.55	5.81
	Total N	198	198	306
Madhya Pradesh	Illiterate	56.1	79.76	68.07
	Primary	24.39	17.86	21.08
	Middle	15.85	2.38	9.04
	Secondary and Above	3.66	0	1.81
	Total N	82	84	166
Punjab	Illiterate	18.75	30.49	24.69
	Primary	32.5	45.12	38.89
	Middle	45	21.95	33.33
	Secondary and Above	3.75	2.44	3.09
	Total N	80	82	162

District	Illiterate	Primary	Middle	Secondary and Above	Total N
Male					
Vikarabad	20.27	20.56	14.36	9.09	99
Karimnagar	21.62	15.56	16.83	30.3	104
Virudhunagar	6.08	24.44	22.28	9.09	101
Erode	10.81	13.89	22.28	33.33	97
Sidhi	16.89	3.33	3.96	3.03	40
Hoshangabad	14.19	7.78	2.48	6.06	42
SBS Nagar	4.05	7.22	9.41	0	38
Mansa	6.08	7.22	8.42	9.09	42
Female					
Vikarabad	21.37	15.27	16.1	13.33	102
Karimnagar	23.08	13.3	17.8	13.33	103
Virudhunagar	5.56	27.09	21.19	53.33	101
Erode	10.68	18.72	27.97	6.67	97
Sidhi	15.81	1.48	1.69	0	42
Hoshangabad	12.82	5.91	0	0	42
SBS Nagar	3.42	9.85	8.47	6.67	39
Mansa	7.26	8.37	6.78	6.67	43

Source: By authors using primary data.

The average age at marriage within the primary respondents was 18.36 years for women and 23.7 years for men. This age was lowest in women of Madhya Pradesh followed by Telangana.

Table 12: Average Age at Marriage

States	Men	N	Women	N
All States				
16 to 30	22.65	35	18.28	53
30+ to 45	23.62	159	18.17	204
45+ to 60	22.87	219	18.36	227
Above 60	25.13	150	18.82	86
All	23.7	563	18.36	570
Telangana				
16 to 30	22.3	19	18.2	29
30+ to 45	23.2	66	16.8	85
45+ to 60	21.0	83	16.1	76
Above 60	21.2	35	15.7	16
Total	21.8	203	16.7	206

States	Men	N	Women	N
Madhya Pradesh				
16 to 30	21.0	7	15.5	12
30+ to 45	21.1	34	15.9	39
45+ to 60	20.5	29	16.4	27
Above 60	18.5	12	18.7	6
Total	20.5	82	16.3	84
Punjab				
16 to 30	24.4	6	20.6	8
30+ to 45	23.0	27	20.6	26
45+ to 60	23.2	36	20.8	40
Above 60	23.6	11	22.0	8
Total	23.3	80	20.9	82

Source: By authors using primary data.

Table 13: Sex-Occupation Distribution

Occupation Category	Male	Female	Total
Usual Principal			
Agriculture	92.73	63.96	78.61
Business/self-employed	0.73	0.38	0.56
Regular	0.91	0.57	0.74
Casual labour	2.91	3.96	3.43
Not employed	2	30.75	16.11
others	0.73	0.38	0.56
Total N	550	530	1080
Usual Secondary			
Agriculture	14.41	9.21	11.24
Business/Self-employed	0.85	1.36	1.16
Regular	2.54	1.36	1.82
Casual labour	63.14	42.01	50.25
Not employed	13.56	44.72	32.56
Others	5.51	1.36	2.98
Total N	236	369	605
Usual Principal + Secondary			
Agriculture	90.76	60.7	75.64
Business/Self-employed	0.89	0.53	0.71
Regular	0.89	0.53	0.71
Casual labour	3.02	12.28	7.68
Not employed	1.78	18.77	10.33
Others	0.71	0.35	0.53
No response	1.95	6.84	4.41
Total N	563	570	1,133

Source: By authors using primary data.

Combining both categories of occupations, around 90 per cent of primary male members and 60 per cent of women were in agriculture. Around 18.7 per cent of women responded that they are not employed (domestic work) and 12.2 per cent of women were casual labourers. The proportion of women responding "not employed" status was highest in Punjab. A higher percentage of women reported casual labour as their occupation when Principal and Secondary status were combined.

Table 14: Occupation Category by Sex

State	Occupation Category	Male	Female	Total
Telangana	Agriculture	95.57	80.49	87.99
	Business/Self-employed	0.49	0	0.25
	Regular	0	0.49	0.25
	Casual labour	1.48	7.8	4.66
	Not employed	1.97	10.24	6.13
	Others	0.49	0.98	0.74
	Total N	203	205	408
Tamil Nadu	Agriculture	95.45	67.68	81.57
	Regular	2.53	1.01	1.77
	Casual labour	1.01	21.21	11.11
	Not employed	0	6.57	3.28
	No response	1.01	3.54	2.27
	Total N	198	198	396
Madhya Pradesh	Agriculture	64.63	19.05	41.57
	Business/Self-employed	3.66	2.38	3.01
	Casual labour	9.76	9.52	9.64
	Not employed	7.32	35.71	21.69
	Others	3.66	0	1.81
	No response	10.98	33.33	22.29
	Total N	82	84	166
Punjab	Agriculture	93.75	36.59	64.81
	Business/Self-employed	1.25	1.22	1.23
	Casual labour	5	4.88	4.94
	Not employed	0	52.44	26.54
	No response	0	4.88	2.47
	Total N	80	82	162

Source: By authors using primary data.

Participation in NREGA was highest in Tamil Nadu and lowest in Punjab. The proportion of women participating in NREGA was higher than men in Telangana and Tamil Nadu whereas, in Madhya Pradesh and Punjab, it was the opposite.

Table 15: Participation in NREGA

State	Male	N	Female	N
Telangana	51.0%	198	54.4%	204
Tamil Nadu	37.3%	142	79.7%	158
Madhya Pradesh	21.6%	74	20.5%	73
Punjab	16.7%	78	12.8%	78
All States	37.2%	492	51.1%	513

Source: By authors using primary data.

Among the surveyed primary adults, more than half of the men reported accessing more than three schemes – either financial or social security. Women mostly reported accessing up to three schemes. Overall, the proportion of individuals accessing no scheme was the lowest.

Table 16: Number of Schemes Availed by Gender

States	Schemes Availed	Male	Female	All
All States	None	2.3%	4%	3%
	Up to 3	44.6%	72%	58%
	> than 3	53.1%	24%	38%
	Total N	563	570	1,133
Telangana	None	0.99	0.49	0.73
	Up to 3	21.18	66.5	44.01
	> than 3	77.83	33.01	55.26
	Total N	203	206	409
Tamil Nadu	None	2.02	0.51	1.26
	Up to 3	60.1	79.8	69.95
	> than 3	37.88	19.7	28.79
	Total N	198	198	396
Madhya Pradesh	None	8.54	26.19	17.47
	Up to 3	47.56	58.33	53.01
	> than 3	43.9	15.48	29.52
	Total N	82	84	166
Punjab	None			
	Up to 3	62.5	79.27	70.99
	> than 3	37.5	20.73	29.01
	Total N	80	82	162

Source: By authors using primary data.

The durable assets were clubbed and categorised as up to 4 (low), 5-6 (medium), 7 and more assets (high) to create a proxy of household wealth. Around 17.6 per cent of households reported a low asset level with Telangana and Madhya Pradesh reporting the highest proportion of low asset

households. Punjab reported the highest proportion of high asset households. Telangana had a very low proportion of households in the high asset category.

Table 17: Asset Level

State	Low	Medium	High	Total N
Telangana	31.40	63.77	4.83	207
Tamil Nadu	4.98	42.79	52.24	201
Madhya Pradesh	29.76	39.29	30.95	84
Punjab	1.22	18.29	80.49	82
Total	17.6	46.34	36.06	574

Source: By authors using primary data.

A modified FIES Index was constructed with selected questions out of the FAO module of FIES. The proportion of no-food insecurity was highest in Punjab. Almost 76 per cent of households reported mild food insecurity irrespective of asset level. Madhya Pradesh had the highest proportion of moderate levels of food insecurity compared to any other State. Severe food insecurity was highest in Telangana, especially Vikarabad. Out of the surveyed households, Tamil Nadu and Punjab did not have any household in the severe category.

Table 18: Food Insecurity Experience Score (Modified) Distribution

State	District	None	Mild	Moderate	Severe	N
Telangana		2.9	86.5	4.8	5.8	207
	Vikarabad	1.0	90.2	1.0	7.8	102
	Karimnagar	4.8	82.9	8.6	3.8	105
Tamil Nadu		0.5	97.0	2.5	0.0	201
	Virudhunagar	0.0	95.1	5.0	0.0	101
	Erode	1.0	99.0	0.0	0.0	100
Madhya Pradesh		14.3	48.8	32.1	4.8	84
	Sidhi	11.9	54.8	26.2	7.1	42
	Hoshangabad	16.7	42.9	38.1	2.4	42
Punjab		69.5	30.5	0.0	0.0	82
	SBS Nagar	97.4	2.6	0.0	0.0	39
	Mansa	44.2	55.8	0.0	0.0	43
All-State		13.2	76.7	7.3	2.8	574

Source: By authors using primary data.

Consumption from the PDS was highest in the households reporting medium levels of asset-ownership. In Tamil Nadu and Telangana, the highest proportion of households reporting consumption from the PDS was in the high asset category. Madhya Pradesh had the most pro-poor PDS with 38 per cent of households of low asset class consuming from the PDS. Punjab showed the worst performance with no household of low asset class consuming from the PDS.

Table 19: PDS by Asset Level

Asset class	All	Telangana	Tamil Nadu	Madhya Pradesh	Punjab
Low	20.08	32.02	5.05	38.18	0
Medium	50.21	63.05	42.42	38.18	31.82
High	29.71	4.93	52.53	23.64	68.18
Total n	478	203	198	55	22

Source: By authors using primary data.

All members were asked about food consumed in the last 24 hours which were clubbed into food groups to construct IDDS (>4 category). Height and weight were collected from the individuals to construct BMI and individuals were also asked about short- and long-term morbidity. Women showed marginally lower consumption of more than four food groups. The percentage of adult underweight was highest in Madhya Pradesh and lowest in Punjab. Men reported lower proportions of underweight primary member than women. Morbidity was slightly higher in men with Punjab reporting the highest medium morbidity and Telangana reporting the highest severe morbidity.

Table 20: Health/Nutrition Outcomes of the Primary Members

State	IDDS > 4	% Underweight	Morbidity Medium	Morbidity Severe	N
Male					
Telangana	95.6	13.3	25.62	11.82	203
Tamil Nadu	70.7	5.56	6.57	0.51	198
Madhya Pradesh	53.7	23.17	18.29	8.54	82
Punjab	36.3	0.0	37.5	5.0	80
All Male	72.3	10.12	19.54	6.39	563
Female					
Telangana	94.6	11.71	21.46	9.76	205
Tamil Nadu	69.2	9.09	8.59	1.01	198
Madhya Pradesh	52.4	22.62	15.48	7.14	84
Punjab	35.4	2.44	39.02	2.44	82
All Female	71.0	11.07	18.63	5.27	569

Source: By authors using primary data.

In the full sample, Madhya Pradesh showed the highest undernutrition and Tamil Nadu showed the lowest. The results were not too far from NFHS 4 data and, therefore, were validated. However, in the surveyed individuals, adult women had higher undernutrition than adult men.

Table 21: Undernutrition in Adults (Full Sample)

Gender	Telangana	Tamil Nadu	Madhya Pradesh	Punjab
Male	21.3	11.6	36.7	19.5
(NFHS 4)	**24.6**	**14.3**	**31.8**	**12.3**
Female	19.2	16.5	35.5	19
(NFHS 4)	**29**	**18.5**	**31.1**	**13.5**

Source: By authors using primary data.

Table 22: Livestock Owned by the Land-Size Class

Land-size class	Telangana	Tamil Nadu	Madhya Pradesh	Punjab	All States
Near Landless	0.0	100.0	66.7	100.0	58.3
Marginal	10.5	29.4	72.7	79.2	36.7
Small	22.6	34.9	81.3	90.3	41.3
Semi-medium	8.7	25.9	100.0	93.3	43.2
Medium	20.0	60.0	80.0	57.1	54.6
Large	14.3	43.8	50.0	50.0	38.7
All Households	15.9	33.3	76.2	82.9	40.4

Source: By authors using primary data.

The (Ad Hoc) WEAI Levels

The WEAI index and its sub-indices, the 5DE and the GPI were computed for all the surveyed individuals and separately for the samples of the four surveyed states of Telangana, Tamil Nadu, Madhya Pradesh and Punjab. The overall women's disempowerment index (M_0), was decomposed by domain and indicator so that the key contributing factors to women's disempowerment could be identified (M_0). The decomposition for the sample of men from each State is also presented to compare the findings with that of the women.

The WEAI for the sampled four States of India was 0.738. It is a weighted average of the 5DE sub-index value of 0.725 and the GPI sub-index value of 0.861. The 5DE for the surveyed areas of India depicted that only 37.45 per cent of women were empowered. The 62.55 per cent of women

who were not empowered had, on an average, inadequate achievements in 43.99 per cent of domains. Thus, women's disempowerment index (M_0) was 62.55 per cent × 43.99 per cent = 0.275 and 5DE was 1 - 0.275 = 37.45 per cent + (62.55 per cent × [1- 43.99 per cent]) = 0.725. Among the men in the four surveyed states, 38.58 per cent were not empowered. The average inadequacy score among these men was 38.25. Thus, men's M_0 was 38.58 per cent × 38.25 per cent = 0.148 and 5DE value was 1 - 0.148 = 0.852. The GPI revealed that 56.95 per cent of women had gender parity with the primary men in their households. Among the 43.05 per cent women with less empowerment than their men counterparts, the empowerment-gap between them and the men in their households was 32.28 per cent. The overall GPI was (1- [43.05 per cent × 32.28 per cent]) = 0.861.

Decomposing the 5DE of the overall surveyed areas of India showed that the domains that contribute the most to women's disempowerment were lack of leadership in the community (29.42 per cent), low leisure time (21.95 per cent) and less input in productive decisions (20.92 per cent). More than half of the women were not members of any group and about 30 per cent of women did not have sufficient leisure time, 29 per cent were not comfortable speaking in public, 28.8 per cent lacked sole or joint decision-making power in productive decisions. The most contributing domains to men's disempowerment were similar to that of women, but men were uniformly more empowered than women in all the indicators. About 36 per cent of men were not a member of any group and 21 per cent of them had insufficient leisure time.

Table 23: Dimension-wise Disempowerment of Men and Women

States	Dimension	Indicators	Women			Men		
			Censored Head count	% Contri-bution	By Dimen-sion	Censored Head count	% Contri-bution	By Dimen-sion
All States	Production	Input in productive decisions	28.8%	20.9	20.9	12.9%	17.5	17.5
	Income	Control over use of income	16.2%	11.8	11.8	6.9%	9.3	9.3
	Resources	Ownership of Assets	19.7%	4.8		4.5%	2.0	
		Purchase, sale, or transfer of assets	19.9%	4.8	15.0	2.8%	1.3	9.4
		Access to and decisions on credit	22.5%	5.5		13.6%	6.1	
	Leadership	Speaking in public	29.0%	10.5	29.4	14.4%	9.8	34.8
		Group Member	51.9%	18.9		36.9%	25.0	
	Time	Leisure	31.4%	22.8	22.0	21.3%	28.9	28.9
	N		464			462		

States	Dimension	Indicators	Women			Men		
			Censored Head count	% Contri-bution	By Dimen-sion	Censored Head count	% Contri-bution	By Dimen-sion
Telangana	Production	Input in productive decisions	37.9%	34.5	34.5	23.1%	33.5	33.5
	Income	Control over use of income	11.6%	10.6	10.6	6.0%	8.7	8.7
	Resources	Ownership of Assets	5.1%	1.5		1.0%	0.5	
		Purchase, sale, or transfer of assets	16.2%	4.9	9.8	5.0%	2.4	5.8
		Access to and decisions on credit	11.1%	3.4		6.0%	2.9	
	Leadership	Speaking in public	39.4%	17.9	31.7	21.1%	15.3	37.5
		Group Member	30.3%	13.8		30.7%	22.2	
	Time	Leisure	14.6%	13.3	13.3	10.1%	14.5	14.5
	N		198			199		
Tamil Nadu	Production	Input in productive decisions	10.7%	10.5	10.5	0.1	10.9	10.9
	Income	Control over use of income	4.0%	3.9	3.9	2.0%	2.5	2.5
	Resources	Ownership of Assets	5.4%	1.8		6.7%	2.8	
		Purchase, sale, or transfer of assets	6.7%	2.2	5.9	0.7%	0.3	12.3
		Access to and decisions on credit	6.0%	2.0		22.1%	9.2	
	Leadership	Speaking in public	6.0%	3.0	30.1	6.0%	3.8	30.1
		Group Member	54.4%	26.6		42.3%	26.3	
	Time	Leisure	51.0%	50.0	50.0	35.6%	44.3	44.3
	N		149			149		
Madhya Pradesh	Production	Input in productive decisions	31.6%	15.8	15.8	2.6%	2.2	2.2
	Income	Control over use of income	39.5%	19.8	19.8	43.6%	37.9	37.9
	Resources	Ownership of Assets	42.1%	7.0		20.5%	5.9	
		Purchase, sale, or transfer of assets	34.2%	5.7	20.2	2.6%	0.7	14.1
		Access to and decisions on credit	44.7%	7.5		25.6%	7.4	

States	Dimension	Indicators	Women			Men		
			Censored Head count	% Contri-bution	By Dimen-sion	Censored Head count	% Contri-bution	By Dimen-sion
Madhya Pradesh	Leadership	Speaking in public	60.5%	15.2	33.6	28.2%	12.3	36.8
		Group Member	73.7%	18.5		56.4%	24.5	
	Time	Leisure	21.1%	10.5	10.5	10.3%	8.9	8.9
	N		38			39		
Punjab	Production	Input in productive decisions	39.0%	15.7	15.7	0.0%	0.0	0.0
	Income	Control over use of income	40.3%	16.3	16.3	0.0%	0.0	0.0
	Resources	Ownership of Assets	74.0%	10.0		1.3%	0.8	
		Purchase, sale, or transfer of assets	48.1%	6.5	26.2	1.3%	0.8	8.3
		Access to and decisions on credit	72.7%	9.8		10.4%	6.6	
	Leadership	Speaking in public	31.2%	6.3	24.9	6.5%	6.2	37.2
		Group Member	92.2%	18.6		32.5%	31.0	
	Time	Leisure	41.6%	16.8	16.8	28.6%	54.5	54.5
	N		77			77		

Source: By authors using primary data.

Among the four States, WEAI was relatively higher in the sample of two semi-arid regions. The WEAI in Tamil Nadu was 0.810 and that of Telangana was 0.793. In Tamil Nadu, sub-index value of 5DE was 0.796 and the GPI was 0.938. In Telangana, 5DE value was 0.780 and the GPI was 0.907. Among the two semi-humid regions, the WEAI for the sampled areas in Madhya Pradesh was 0.618 and that of in Punjab was 0.519. In Madhya Pradesh, 5DE sub-index value was 0.601 and the GPI was 0.769, whereas in Punjab, 5DE value was 0.505 and the GPI value was 0.519.

In Tamil Nadu, about 57.05 per cent of women were not empowered with an inadequacy score of 35.76 per cent. So, women's M_0 in Tamil Nadu was 57.05 per cent × 35.76 per cent = 0.204 and 5DE was 1 -0.204 = 0.796. Subsequently, 57.72 per cent of men in Tamil Nadu were not empowered with an inadequacy score of 37.99. Men's M_0 in Tamil Nadu was 42.28 per cent × 37.99 per cent = 0.161 and 5 DE was 1 - 0.161 = 0.839. In Tamil Nadu, only 27.40 per cent of women were less empowered than the men in their household, with an empowerment gap of 22.59 per cent. This was the lowest among all the surveyed States. Hence, the GPI in the surveyed areas of Tamil Nadu was the most favorable at 0.938.

The domains that contributed the most to Tamil Nadu women's disempowerment were lack of leadership (30.15 per cent) and low leisure time (50 per cent). Half of the women in Tamil Nadu had no membership in any group and have insufficient leisure time. The configuration of men's empowerment was same as women's in the surveyed regions of Tamil Nadu, with the only difference that women in Tamil Nadu had better decision-making power around household resources than men. About 42 per cent of men had no membership to any community, 35 per cent did not enjoy sufficient leisure time and 22 per cent lacked access and decision-making power on credits.

In Telangana, 52.02 per cent of women were not empowered, and these women had inadequate achievements in 42.20 per cent of the dimensions. Women's disempowerment index in Telangana was 52.02 per cent × 42.20 per cent = 0.220 and 5DE was 1 - 0.220 = 0.780. Among men, 34.67 per cent in Telangana were not empowered with the inadequacy score of 39.86. The disempowerment index of men was also low, at 0.138 (34.67 per cent × 39.86 per cent) and 5DE was 1 – 0.138 = 0.862. 34.90 per cent of the women in the surveyed areas of Telangana were less empowered than the men in their households. The empowerment gap between the disempowered women and the men in their households was 26.65 per cent. Thus, the overall GPI in Telangana was 0.907.

Table 24: AWEAI: 5DE Results by State

Indicators>>	Number of disempowered individual		Disempowered Headcount Ratio (H)		Average Inadequacy Score (A)		Disempowerment Index (MO)		5DE Index		% data used	
Gender >>	W	M	W	M	W	M	W	M	W	M	W	M
All States	289	179	62.55	38.58	43.99	38.25	0.275	0.148	0.725	0.852	80.49	80.84
Telangana	103	69	52.02	34.67	42.20	39.86	0.220	0.138	0.780	0.862	95.65	96.14
Tamil Nadu	85	63	57.05	42.28	35.76	37.99	0.204	0.161	0.796	0.839	74.13	74.13
Madhya Pradesh	29	22	76.32	56.41	52.30	40.76	0.399	0.230	0.601	0.770	45.24	46.43
Punjab	72	25	93.51	32.47	52.92	32.27	0.495	0.105	0.505	0.895	93.90	93.90
Vikarabad	62	33	64.58	33.67	41.24	40.51	0.266	0.136	0.734	0.864	94.12	96.08
Karimnagar	41	36	40.20	35.64	43.66	39.26	0.175	0.140	0.825	0.860	97.14	96.19
Virudhunagar	31	5	41.89	6.76	39.25	38.67	0.164	0.026	0.836	0.974	73.27	73.27
Erode	54	58	72.00	77.33	33.77	37.93	0.243	0.293	0.757	0.707	75.00	75.00
Sidhi	15	18	68.18	78.26	44.00	42.59	0.300	0.333	0.700	0.667	52.38	54.76
Hoshangabad	14	4	87.50	25.00	61.19	32.50	0.535	0.081	0.465	0.919	38.10	38.10
SBS Nagar	33	7	89.19	18.92	48.99	34.29	0.437	0.065	0.563	0.935	94.87	94.87
Mansa	39	18	97.50	45.00	56.24	31.48	0.548	0.142	0.452	0.858	93.02	93.02

Source: By authors using primary data.

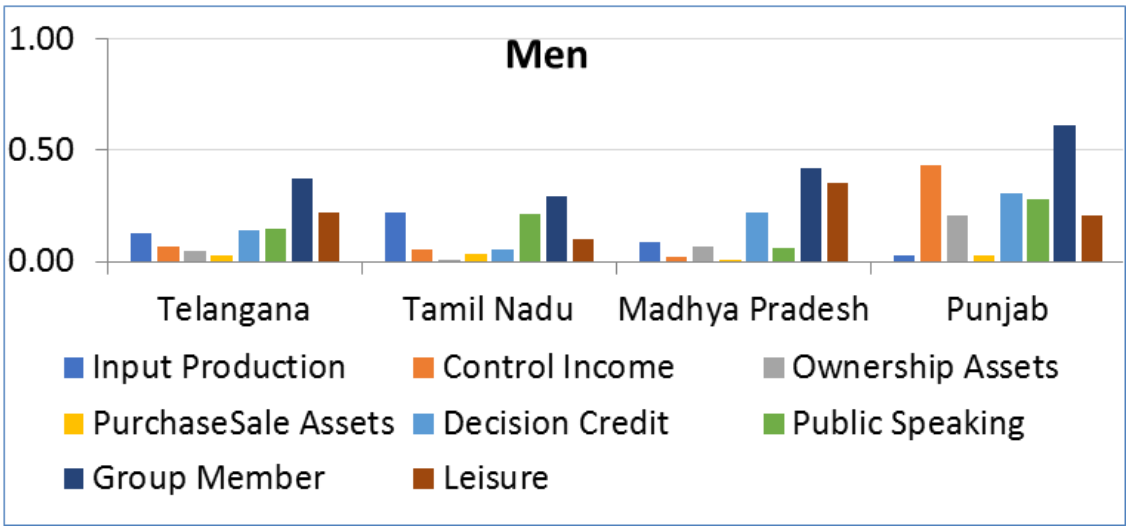

Figure 5: Censored Head Count by Indicators - Men

Source: By authors.

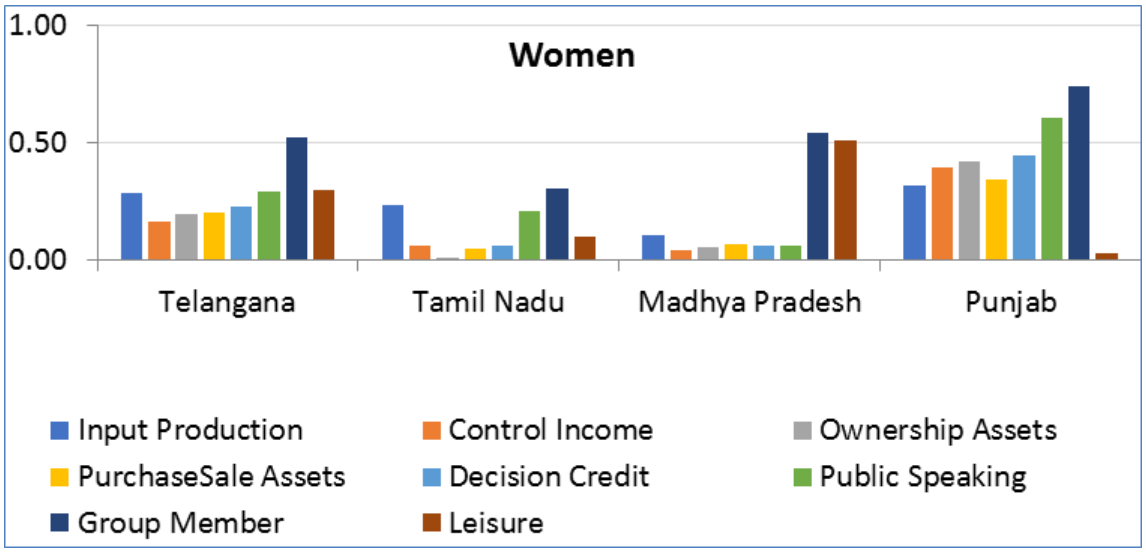

Figure 6: Censored Head Count by Indicators - Women

Source: By authors.

Domain-wise decomposition of 5DE of women sampled in Telangana revealed that the most contributing domains of disempowerment were lack of decision-making power in production (34.5 per cent) and lack of leadership in the community (31.75 per cent). About 40 per cent of women were not comfortable speaking in public and 30 per cent were not a member of any group. Around 37 per cent of women did not solely or jointly make any decision regarding productive inputs. The configuration of men's empowerment was analogous to that of women's in the surveyed regions of Telangana, but men were uniformly more empowered than women in all indicators.

The 5DE of Madhya Pradesh depicted that the disempowered headcount ratio among women was 76.32 per cent and among men, it was 56.41 per cent. The disempowered women had inadequate achievements in 52.30 per cent of the dimensions and the disempowered men had

inadequate achievements in 40.76 per cent of the dimensions. Thus, women's M_0 in Madhya Pradesh was 76.32 per cent × 52.30 per cent = 0.399, whereas that of men was 56.41 per cent × 40.76 per cent = 0.230 and 5DE was 0.601 and 0.770 for the women and the men, respectively. The GPI portrayed that 57.89 per cent of women in Madhya Pradesh were less empowered than the men in their households. These disempowered women had an empowerment gap of 39.85 per cent with that of the men in the households. Thus, the GPI in Madhya Pradesh was low at (1- [57.89 per cent × 39.85 per cent]) 0.769.

In the surveyed areas of Madhya Pradesh, the most contributing domains in the disempowerment of women were lack of leadership in the community (33.63 per cent), lack of decision-making power in household resources (20.2 per cent) and lack of decision-making power in the use of income. The configuration of men's empowerment was slightly different to that of women. The most contributing domain for men's disempowerment was lack of decision-making power in the use of income (37.91 per cent) and then lack of leadership in the community (36.80 per cent). Men were uniformly more empowered than the women in all indicators except for control over the use of income, where over 43 per cent of men had no sole or joint decision-making power on the use of income compared to 39 per cent of women.

In Punjab, 93.51 per cent of sampled women were not empowered and had inadequate achievements in 52.92 per cent of the dimensions, whereas only 32.47 per cent of men were not empowered with inadequate achievements in 32.27 per cent of the dimensions. Women's disempowerment index in the surveyed areas of Punjab was (93.51 per cent × 52.92 per cent) = 0.495 and that of the men's was (32.47 per cent × 32.27 per cent) = 0.105. Hence, the 5DE's for the men and women of Punjab were 0.505 (1-0.495) and 0.895 (1- 0.105), respectively. Punjab was the worst-performing States among all the surveyed States in terms of gender parity. In Punjab, 85.71 per cent of women of surveyed area were less empowered than the men in their households and the disempowered women had an empowerment gap of 41.33 per cent with that of the men in their households. The GPI was thus the lowest in Punjab among all the surveyed States, at (1 – [85.71 per cent × 41.33 per cent]) 0.646.

In Punjab, all the domains had an equal share in the *disempowerment*-score of women, with a marginally higher share of contribution by domains such as of lack of decision-making power in household resources (26.24 per cent) and lack of leadership quality in the community (24.93 per cent). More than 90 per cent of women were not a member of any group and more than 70 per cent of them did not own any major assets or had access to or could make decisions regarding credits. The configuration of men's 'empowerment' was completely different to that of women's in Punjab, with the most contributing domain for 'disempowerment' of men being lack of leisure time (54.54 per

cent) and lack of leadership in the community (37.19 per cent). In fact, men reported lower '*disempowerment*' in all the indicators compared to women so much so that none of the men in Punjab was '*disempowered*' in terms of decision-making power in productive decisions and control over income.

Table 25: AWEAI: GPI Results by State

Indicators>>	N HH inadequate in gender parity	% W with no Gender Parity	Average Empowerment Gap	GPI	No. of dual households
All States	195	43.05	32.28	0.861	453
Telangana	67	34.90	26.65	0.907	192
Tamil Nadu	40	27.40	22.59	0.938	146
Madhya Pradesh	22	57.89	39.85	0.769	38
Punjab	66	85.71	41.33	0.646	77
Vikarabad	41	44.09	29.02	0.872	93
Karimnagar	26	26.26	22.91	0.940	99
Virudhunagar	28	37.84	25.30	0.904	74
Erode	12	16.67	16.27	0.973	72
Sidhi	8	36.36	24.84	0.910	22
Hoshangabad	14	87.50	48.43	0.576	16
SBS Nagar	31	83.78	36.02	0.698	37
Mansa	35	87.50	46.04	0.597	40

Source: By authors using primary data.

The gender parity index showed that about 43 per cent of households had a gap in empowerment score. This was highest in Punjab where almost four-fifths of the households reported not having gender parity and the lowest in Tamil Nadu where less than two-fourths reported not having gender parity. Sampled dual-adult households Tamil Nadu and Telangana were better off, in general, than Madhya Pradesh and Punjab in terms of gender parity.

The empowerment index score (AWEAI) was, as expected, lowest in Punjab and highest in Tamil Nadu. In terms of all the districts, Mansa in Punjab showed the worst empowerment score whereas Virudhunagar in Tamil Nadu showed the highest empowerment score.

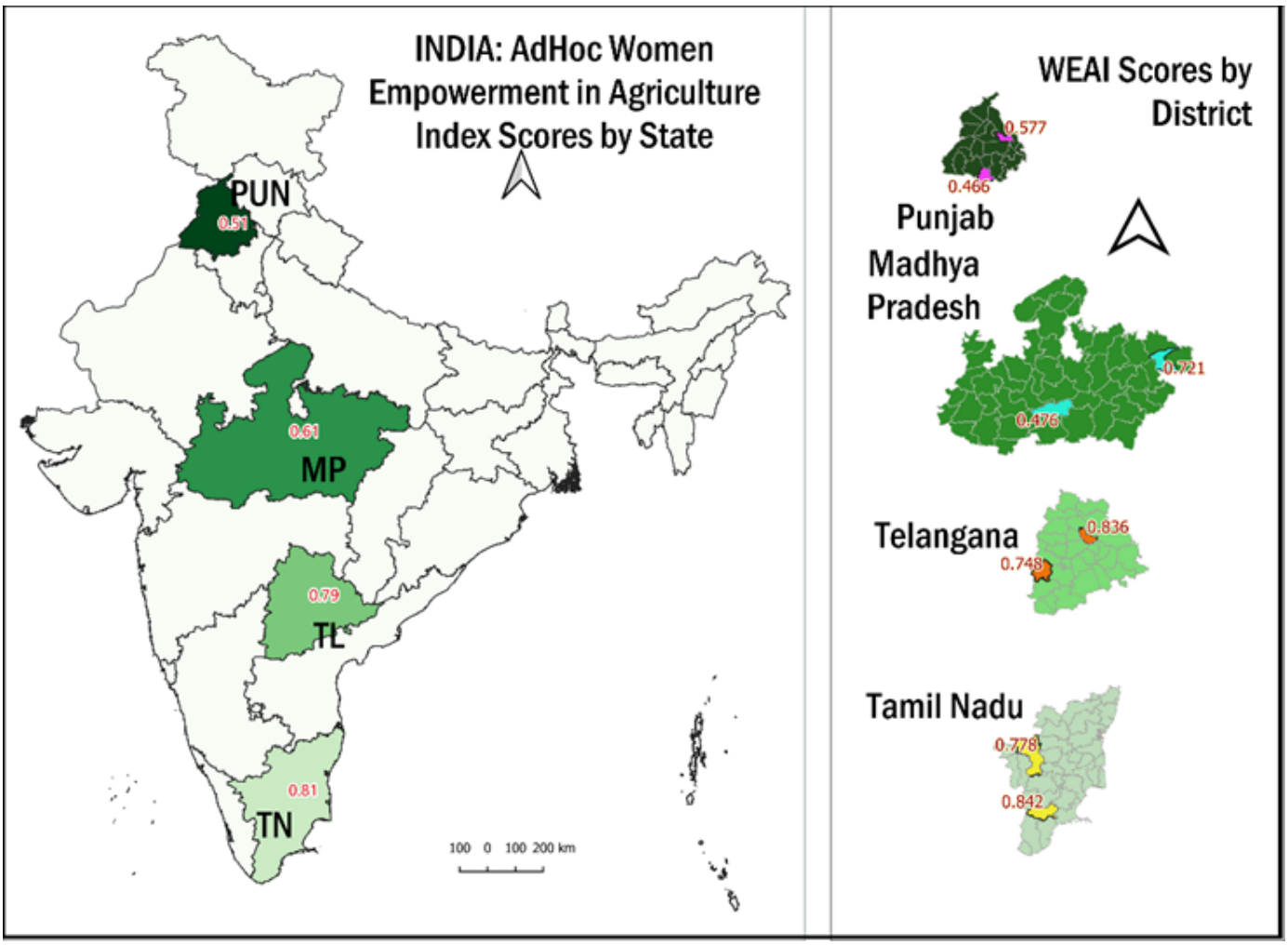

Figure 7: AWEAI in Study Area

Source: By authors.

Table 26: AWEAI by State/District

State	District	WEAI Score
All States		0.738
Telangana		0.793
	Vikarabad	0.748
	Karimnagar	0.836
Tamil Nadu		0.810
	Virudhunagar	0.842
	Erode	0.778
Madhya Pradesh		0.618
	Sidhi	0.721
	Hoshangabad	0.476
Punjab		0.519
	SBS Nagar	0.577
	Mansa	0.466

Source: By authors using primary data.

Table 27: Summary of WEAI (Ad Hoc) Results

Indicators	Strict		Flexible	
	Women	Men	Women	Men
5DE	0.52	0.61	0.73	0.85
Disempowerment score (1 - 5DE)	0.48	0.39	0.27	0.15
N (number of observations)	574	463	574	463
% not achieving empowerment (H)	0.91	0.89	0.63	0.39
GPI score (1 - HGPI x IGPI)		0.82		0.87
N (number of dual-adult households)	463			
A-WEAI score (0.9*5DE+0.1*GPI)	**0.55**	**0.63**	**0.74**	**0.85**

Source: By authors using primary data.

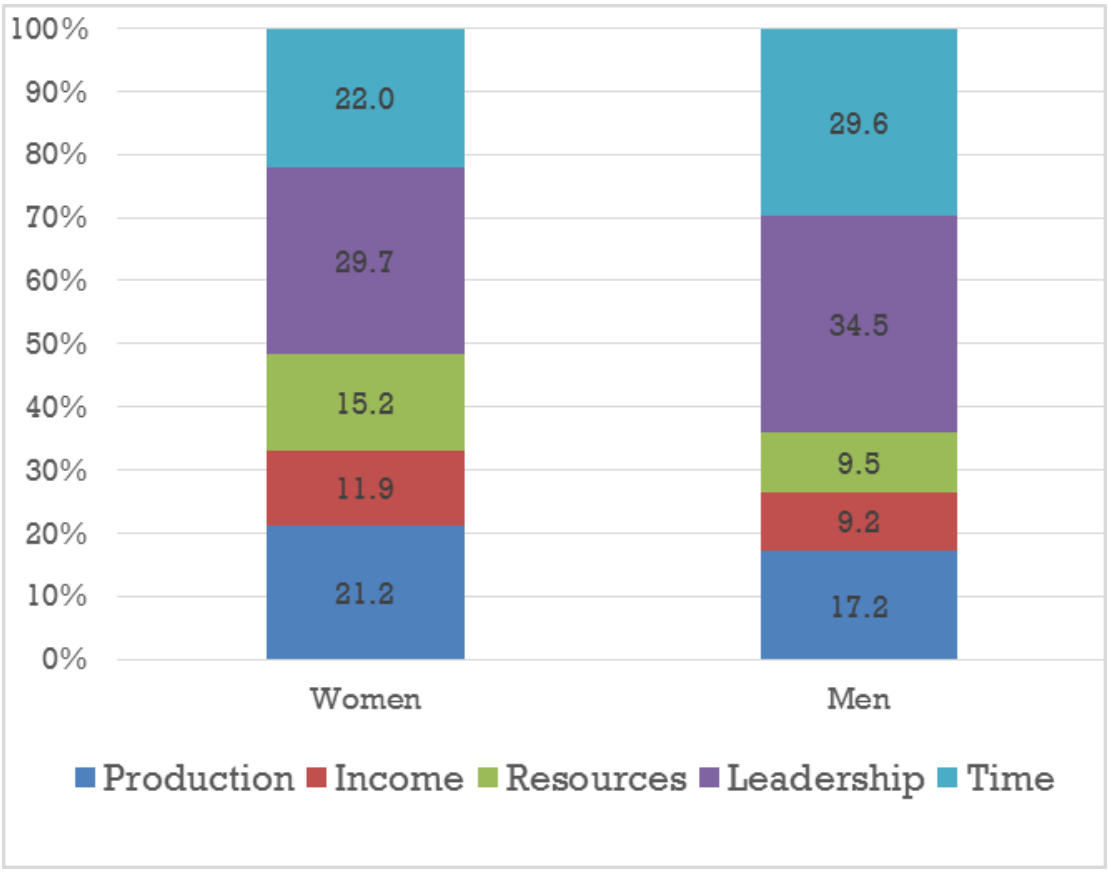

Figure 8: Contribution of Domains to Overall Inequality

Source: By authors using primary data.

The overall *disempowerment headcount ratio* was 62.5 per cent for women and 38.58 per cent for men. Punjab recorded a high disempowerment ratio despite relatively better asset/land levels. Mansa district showed the highest disempowerment headcount in Punjab. Telangana, despite lower asset levels, showed a lower disempowerment headcount. Within Telangana, Vikarabad showed a higher disempowerment. The 5DE score was high for men and lower for women in all States and districts except for Erode district of Tamil Nadu and Sidhi district of Madhya Pradesh where the 5DE score was marginally lower for men by about 0.050 points. However, in Sidhi, many samples could not be used due to non-response in one or two categories.

The decomposition of WEAI index shows that the domain of leadership is the highest contributor of disempowerment of women followed by the domain of time and decision-making in production. For men, the leadership domain is followed by the leisure domain. In terms of indicators, leisure and input in production decisions are the two largest contributors to disempowerment in women. For men, leadership and leisure are the major contributors.

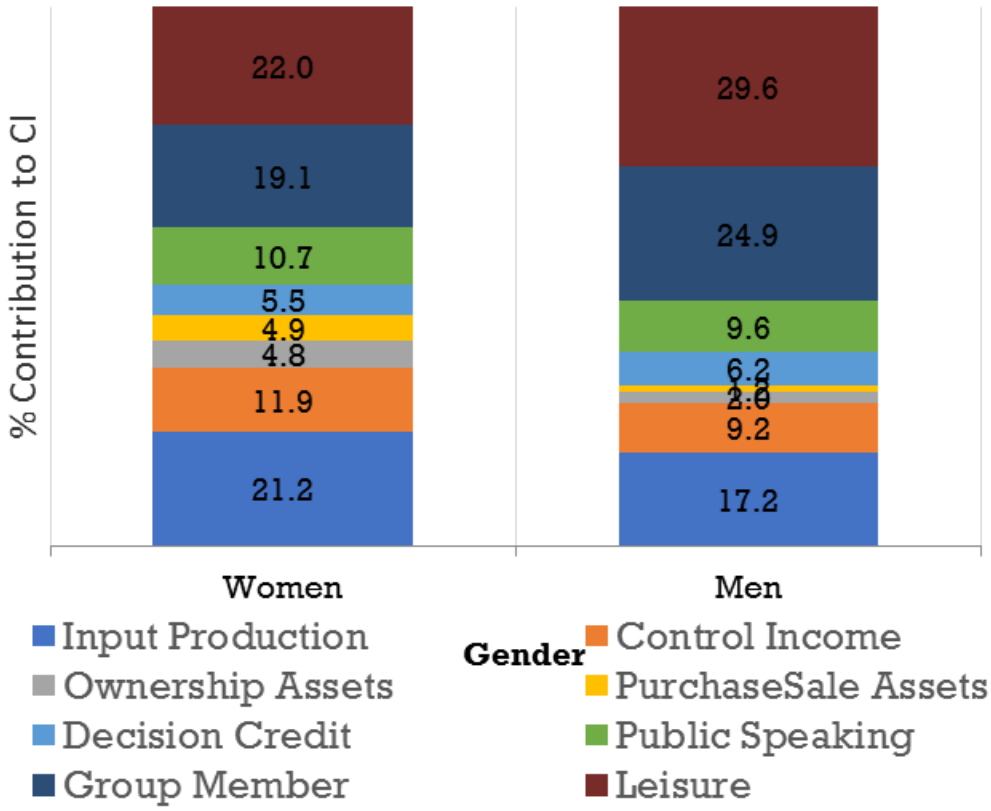

Figure 9: Contribution of Indicators to Overall 'Disempowerment'

Source: By authors.

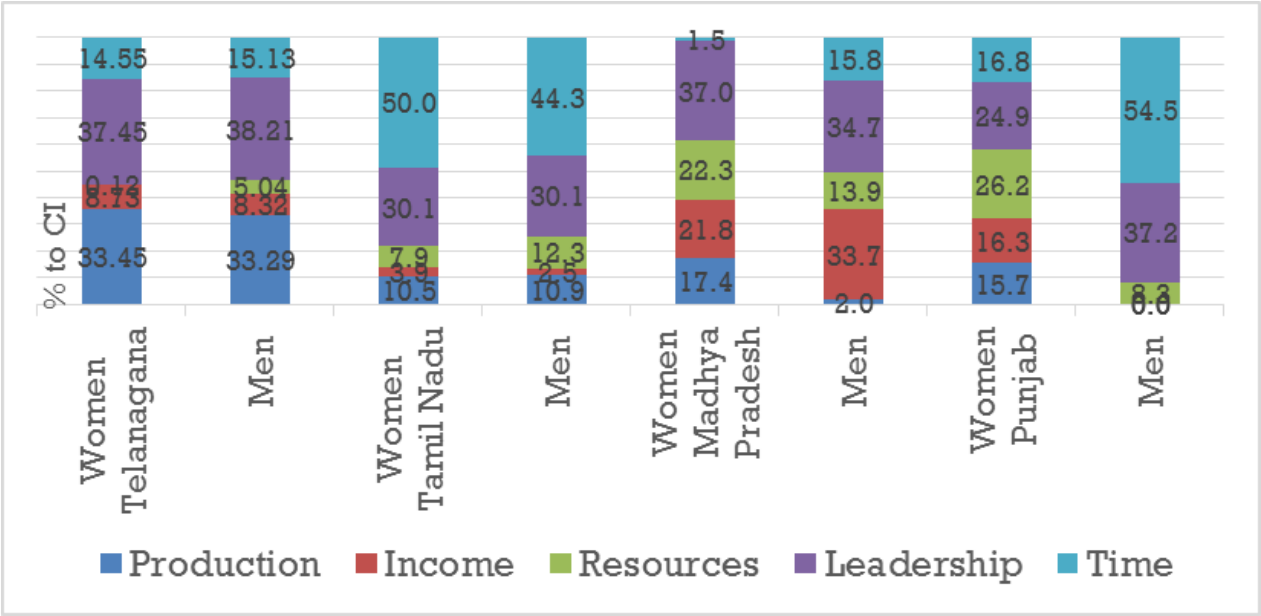

Figure 10: Contribution of Domains by State

Source: By authors.

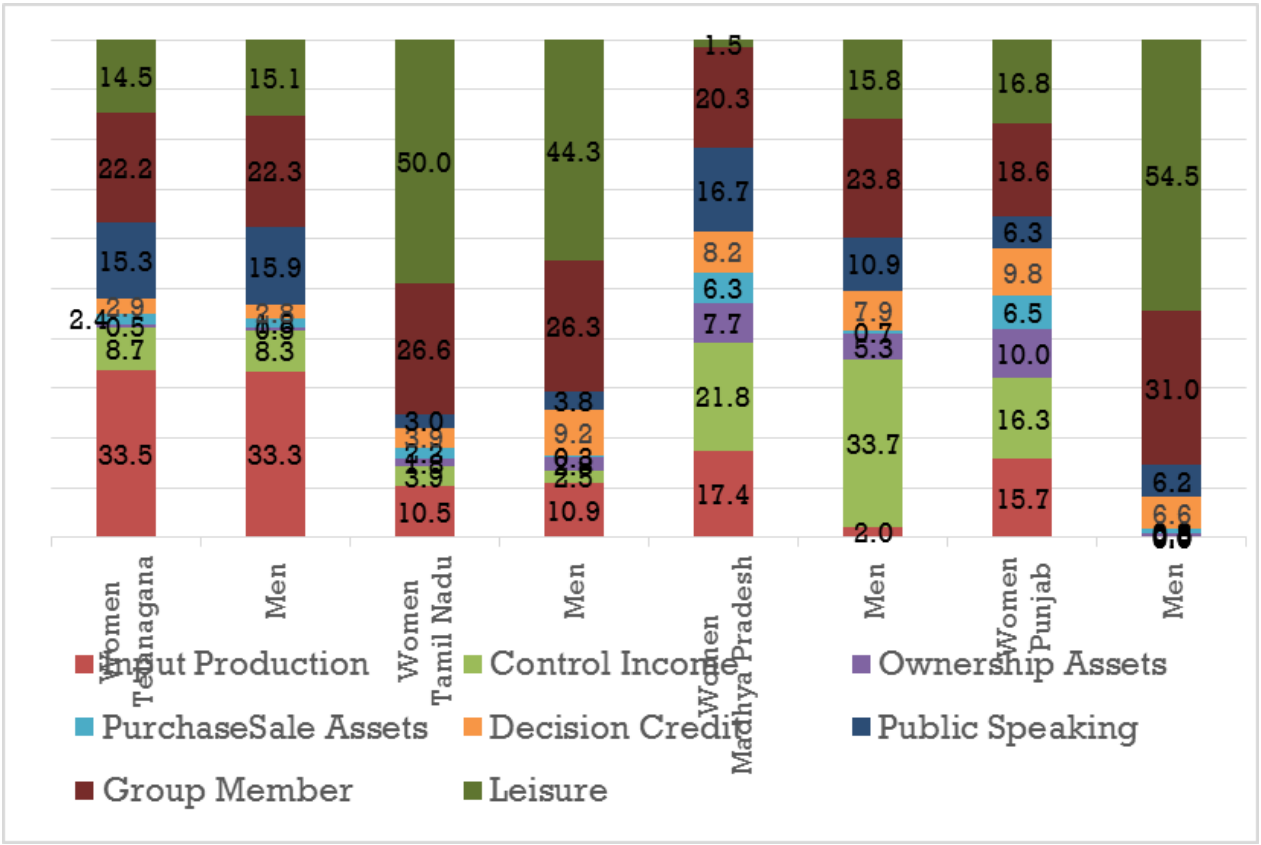

Figure 11: Contribution of Indicators by State

Source: By authors.

There are wide State-level variations with the samples in Telangana and Tamil Nadu showing deprivation in all the domains to be similar for men and women, whereas, for Madhya Pradesh and Punjab, the deprivation of women is driven by more number of domains than in men. In Punjab, no man reported deprivation in input decision and income-related decision. In Madhya Pradesh, men showed a higher deprivation in income-related control.

The disempowerment headcount ratios show that for women, the highest deprivation is in the group membership indicator, followed by leisure and input in productive decisions. There is a visible gender gap as the deprivation headcount of men is much lower, i.e. almost half of that of women in any dimension or indicator. Punjab showed maximum deprivation of women in any indicator.

Linking Variation in Nutrition Outcome to the Empowerment of Women

Table 28: Key Outcomes by AWEAI Status: Individual with Adequate IDDS and Empowerment

Inadequacy Score cut-off 20%	Men	Chi2	Women	Chi2
Empowered (<=20%)	77.76	0.418	86.71	18.0480***
Not Empowered (> 20%)	75.00		68.86	
Total	76.52		76.54	

Source: Computed by authors from data.

Individuals above 20 per cent of inadequacy score were coded as "not empowered." It was observed that empowered men did not show a statistically significant difference in the per centage with adequate dietary diversity from disempowered men. But for women, empowerment meant an increased proportion of women with dietary diversity by about 18 percentage points. The disempowerment indicator does not show a statistically significant relation with other outcomes of health and nutrition.

Nutritional Equity and levels of empowerment

The overall Wagstaff Concentration Index of Low-IDDS by disempowerment rankings was estimated to be 0.181 (Table 26) with a confidence level of more than 99 per cent. The overall results show that low dietary diversity in the studied sample was more concentrated among the disempowered individuals.

The estimation was done separately for groups. Out of the inter-group differences, a statistically significant difference (assuming equal variance) is observed between genders. Men

showed a statistically insignificant and lower CI (0.057) whereas women showed a positive significant CI (0.306). The difference was also significant (p<0.005) Similar counterintuitive results are observed when CI is computed by regions but the difference were not statistically significant.

Table 29: Concentration Index (CI) by Region and Selected Predictors

Unit of Estimation	Observation	Total Concentration Index	se	p-value	F	p-value
Total Sample	926	0.181***	0.044	0.000		
Men	464	0.057	0.062	0.364	8.216**	0.004
Women	462	0.306***	0.061	0.000		
Sub-Humid Regions	457	0.194***	0.069	0.005	0.723	0.396
Semi-Arid Regions	469	0.117	0.058	0.043		
Poor	164	0.210	0.117	0.074	0.592	0.553
Middle	426	0.128	0.075	0.090		
Rich	336	0.237***	0.064	0.000		
Poor Men	82	0.298	0.166	0.077	1.996	0.077
Middle Men	214	-0.056	0.105	0.592		
Rich Men	168	0.170	0.090	0.062		
Poor Women	82	0.134	0.165	0.418		
Middle Women	212	0.318***	0.107	0.003		
Rich Women	168	0.303***	0.089	0.001		

Source: By authors using primary data; ***p<0.001; **p<0.005.

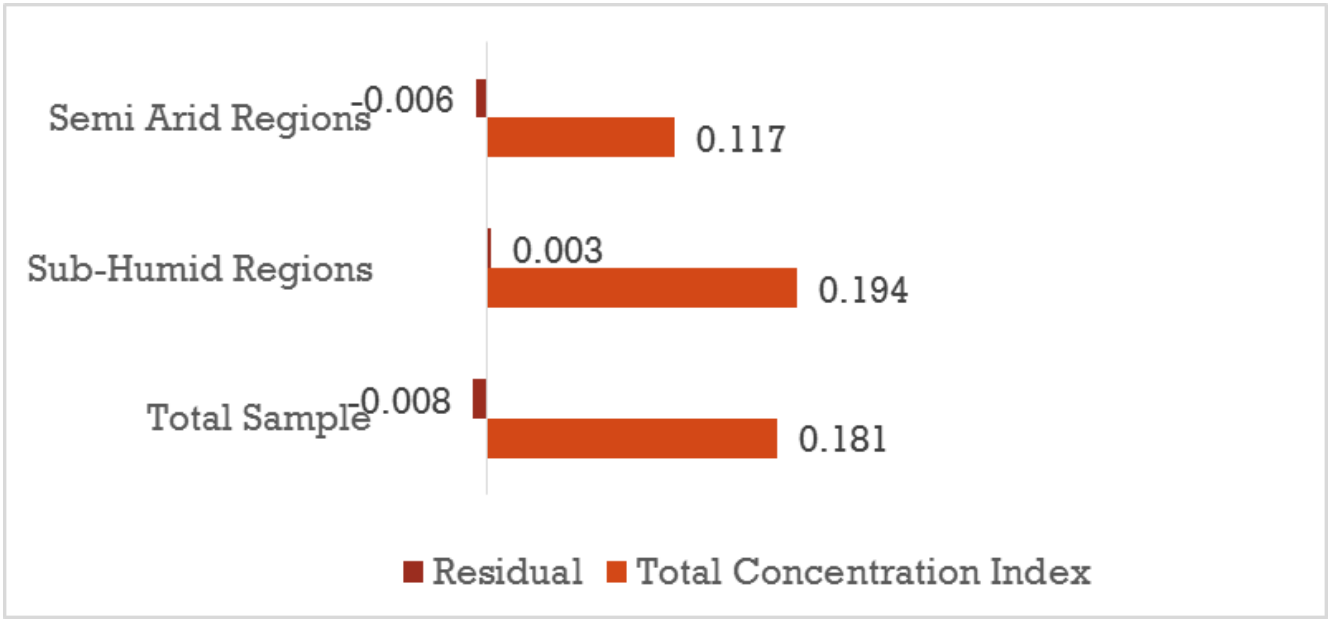

Figure 12: Concentration Index Values and Residuals

Source: By authors using Primary data

If the Wagstaff Concentration Index of malnourishment (combined) levels was created by asset categories, it was estimated to be 0.115 (Table 30). Using the traditional CI, overall results show a pro-poor inequality in malnourishment as the outcome was more concentrated among the asset-owning households. But, when the estimation was done separately for four States, namely Telangana, Tamil Nadu, MP and Punjab, in every state, except for Telangana, the malnutrition index was negative pointing to inequity against the poor in the three States (Figure 13). This contradiction between empowerment and asset ranked CI is reported to validate those immediate indicators of nutrition, i.e. IDDS does not show a similar response to empowerment levels and wealth. Women may face disempowerment-driven malnutrition within wealthy households.

Table 30: Concentration Index (CI) by States and Selected Predictors

Unit of Estimation	Observation	Total CI	se	p-value	F	p-value
Overall CI	928	0.115	0.038	0.003		
Telangana	397	0.003	0.063	0.962	1.380	0.2473
Tamil Nadu	300	-0.130	0.067	0.054		
Madhya Pradesh	77	-0.217	0.132	0.103		
Punjab	154	-0.167	0.097	0.087		

Source: By authors using primary data.

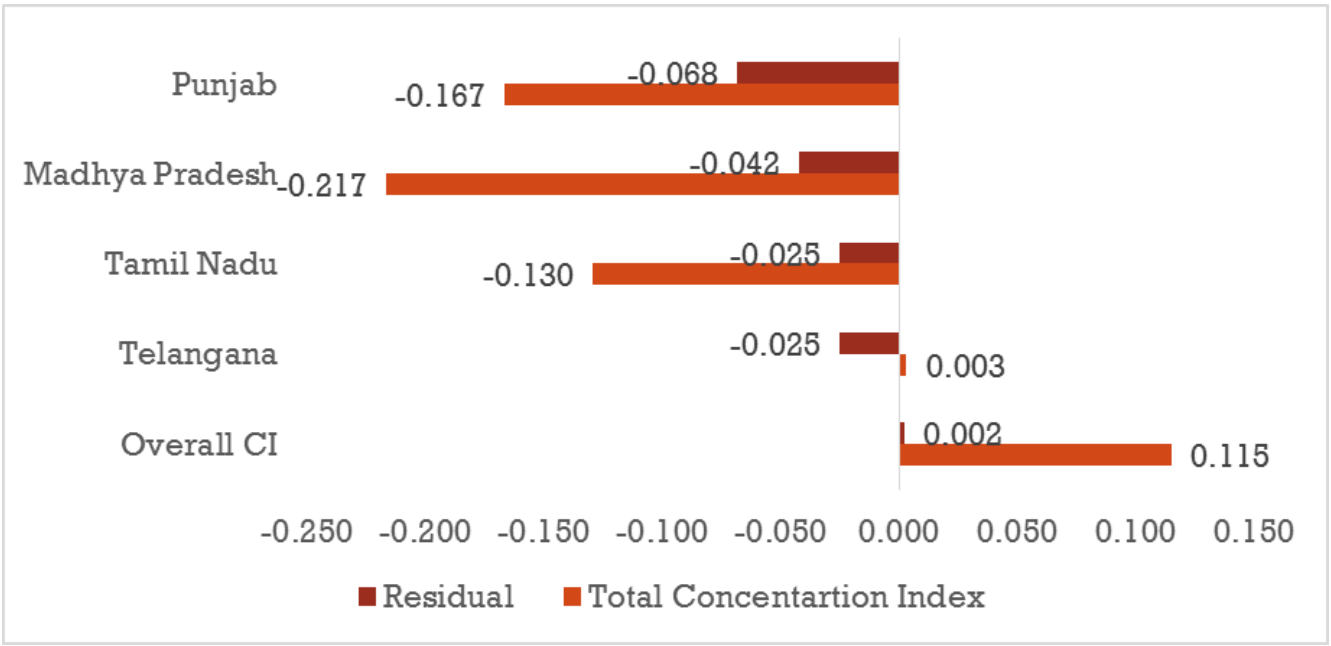

Figure 13: Concentration Index Values and Residuals

Source: By authors using primary data.

Table 31: Percentage of CI Explained by Predictors

Indicators	Overall	Sub-Humid	Semi-Arid
Inadequate Input in Production Decision	-22.090	-25.358	-50.15024
Inadequate Control on Income	-5.021	1.849	-14.888
Inadequate Asset ownership	22.738	6.984	79.532
Inadequate credit/ savings	19.864	13.792	34.327
Inadequate group membership	7.760	1.014	5.725
Inadequate public speaking	-6.588	7.018	-21.428
Less than 10 Hours Leisure	45.829	59.783	49.948
Gender = women	-0.002	-8.838	3.952
Illiterate	-1.309	-1.406	0.259
No Financial Security	-0.253	-0.795	2.075
No Social Protection	7.942	4.718	20.002
Semi-arid Region	12.803		
SC/ST/OBC	0.221	3.830	-1.816
Low Standard of Living	6.125	0.032	19.972
No PDS	9.774	18.880	8.884
No NREGA	8.538	6.142	8.500

Source: By authors using primary data.

Repeating the decomposition separately for each of the geographies revealed differences in the contribution of empowerment indicators in overall CI. In sub-humid regions, inadequacy in leisure was the largest contributor, whereas in the semi-arid regions, inadequate control on asset was the largest contributor followed by inadequate leisure and credit/savings.

Among the other factors, gender contributed to around 4 per cent in the semi-arid regions, but not in sub-humid regions. Caste on the other hand contributed 4 per cent in sub-humid regions, and not semi-arid regions. Lack of access to PDS was a major contributor but the contribution was higher in the sub-humid regions. Low standards of living and lack of social protection contributed a very high proportion to overall concentration in semi-arid areas.

Elasticity of Nutrition Outcomes to Indicator of Gender Parity

Table 32: Adjusted Odds Ratios of Malnutrition, Nutrition Insecurity and Food Insecurity at Household

Indicator	Category	% to N	AOR£	AORα	AORβ	AOR€
Chronic Energy Deficiency Gap	No Gap	81.4			Reference	
	Male < Female	18.6			1.260	.916
> 20% average Deprivation Score	Not Deprived	49.2	Reference			
	Deprived	50.8	1.041	0.934	0.882	--
Gender Parity	Yes	57.0	Reference			
	No	43.0	**2.068*** **	1.642	1.313	**0.523 ***
Gender	Men	50.0	Reference			
	Women	50.0	0.909	0.805	0.797	
Literacy	Literate	61.4	Reference			
	Illiterate	38.6	0.759	0.810	**1.593** **	
Employment	Unemployed	24.7	Reference	Reference		
	Employed	75.3	0.620	**0.533***	0.976	
Financial Protection	No	75.6	Reference	Reference		
	Yes	24.4	1.039	0.985	0.791	
Social Protection	No	80.7	Reference			
	Yes	19.3	0.564	**0.396** **	0.908	
Caste	SC	2.3	Reference			
	OBC	11.5	0.623	0.808	**0.502** **	.521
	General	62.4	0.783	1.122	0.680	.324
Region	Sub-humid	23.9	Reference			
	Semi-arid	50.0	**2.522*** **	**2.277** **	**1.888*** **	**.514***
Standard of Living	Low	50.0	Reference			
	High	26.0	**0.543*** **	**0.431*** **	0.701	0.628
PDS	No PDS	74.0	Reference			
	Has PDS	16.7	**0.484*** **	0.516	**0.263*** **	0.531
Asset Ownership level	Low	83.3	Reference			
	Medium	17.6	0.933	0.973	1.064	**.291***
	High	46.3	**2.098*** **	**2.316** **	1.095	**.071***
Land Ownership level	Marginal to small	36.1	Reference			
	Semi-medium to medium	77.9	1.156	1.134	0.952	.536
	Large	16.7	2.147	1.701	1.122	1.422
Constant			0.641	0.850	**4.893*** **	2.161

Source: By authors using primary data.

Note: £ Adjusted Odds Ratio of IDDS <4 of members.

α Adjusted Odds Ratio of Malnourishment (either IDDS <4 or Female Malnourished member in the Household more than man malnourished members)

β Adjusted Odds Ratio of Combined Malnourishment (either IDDS <4 or BMI <18.5 or Frequency of infectious disease == more than once last 15 days)

€ Adjusted Odds Ratio of Food Insecurity Experience scale (0 = low, 1 = high)

A significant relation was observed between IDDS coded and gender-parity within the household. Individuals living in households with gender-parity had twice the chance of eating balanced food (IDDS>4) than those not living in households with gender parity. The adjusted odds revealed that lack of gender parity increased the odds of combined malnourishment (low IDDS or low BMI) by 64 per cent. Those living in semi-arid regions had double the odds of malnourishment (low IDDS and low BMI) than those in sub-humid regions. At the same time, access to PDS and a good standard of living (safe water, clean fuel, indoor safe toilet and kitchen garden) almost halved the odds of low IDDS. There was a higher chance of low dietary diversity in the high asset class.

The odds of having any malnutrition (low IDDS or low BMI or disease) were 88 per cent higher for individuals residing in semi-arid regions than those residing in sub-humid regions and more than twice for semi-arid regions and high asset households. However, good standard of living, employment and social protection significantly reduced the odds.

Contrary to expectations, the odds of food insecurity were lower in households without gender parity and residing in semi-arid areas. However, the households at higher asset level had lower odds of food insecurity.

CHAPTER V
DISCUSSION

Despite the existing evidence on women empowerment and malnutrition across the world, malnutrition policies rarely consider gendered access to sources of nutrition. Most social protection policies targeting malnourishment prioritise households that are poor and overlook the intra-household dynamic of access to food. There is little evidence in India as to how empowerment in agriculture and nutrition are linked, but numerous studies in other developing countries such as Ghana have found a statistical link between the two (Malapit and Quisimbing, 2015). This research study tried to fill this gap by linking women's participation in decision making and malnutrition within Indian households. It analysed how women empowerment in agriculture associates with food insecurity, malnutrition, disease and dietary diversity in different farming/production systems.

Geography and Empowerment of Women

In terms of levels of disempowerment or distribution of power, the sampled individuals in neither of the two agro-ecological regions or States showed a result in favour of women. The average WEAI score was 0.738 – which means only about 30 per cent of women had enough power in the agricultural system. Although WEAI has not been computed for the overall country by any study, our results are not too far from other small studies such as Pingali et al. (2017) who found a WEAI of 0.77 in Maharashtra. The aggregate score of all domains (5DE) for men was 0.83 and women was 0.73, showing a gender gap of 0.10 points.

A major point to note while reading the results of this study is that within each State, the studied sample was homogenous in many attributes – all the individuals were from largely agricultural households, where majority of the primary members in agriculture were the adult couple in the household. In some households, the daughter-in-law is engaged in agriculture, but rarely the son or the daughter of the household head. The younger generation seems to have shifted to non-farm related occupations with the older generation and the daughter-in-law in the village taking care of farming. Even with this increasingly feminised activity, decision-making, access to resources, income and leisure of women are lower than men.

Although the study found a clear State-wise divide in the level of empowerment with women sampled in the Semi-arid South reporting better WEAI than the Sub-humid North, there is more to this pattern than a simple difference. The surveyed women in Tamil Nadu reported the highest levels of ad hoc WEAI scores, followed by Telangana, Madhya Pradesh and lastly Punjab even though Punjab was the richest in terms of asset ownership. This contradiction between wealth and gender

equity is not unheard of in developing countries. A study by Goli et al. (2014) observed how women's autonomy decreased in India with the increasing size of household landholding. Patriarchy seems to become stronger where the value of women's labour is less—such as the mechanised richer farm households of Punjab. On the contrary, in States such as Telangana or Tamil Nadu, where farming was dominated by small machines and low-level technologies, the demand for women's labour seemed to be higher – thus increasing their level of participation. This is corroborated in the indicator-wise decomposition of inadequacy-head-count ratios. It is observed that in Punjab ***leisure-inadequacy,*** i.e. reporting inadequate time for non-work activities has very little contribution to women's disempowerment score. In Tamil Nadu, on the other hand, it is very high. It is possible, by adding time-domain in overall empowerment, the drudgery of women is also captured and added to the score. Women with lesser participation in farm-related work, as a result, may come across as more empowered as they reported adequate leisure. These contradictions between power, leisure and women's participation in farm decisions need more in-depth analysis to explore the extent and nature of these inter-domain relations between constituents of power.

Although the scenario of power in India was skewed against women, the outcome indicators such as chronic energy deficiency, dietary diversity and disease showed a different pattern than power in the sampled households. In any of the health-nutrition outcome indicators, MP stood out to be the worst State, followed by Telangana. However, in FIES and CED (BMI<18.5), the sample of Punjab showed no negative outcome. In terms of dietary diversity and disease occurrence, Punjab showed a higher level of negative outcome than the Tamil Nadu sample.

Within the States, the performance of districts that had dry, drought-prone farming systems and low rainfall was worse than the humid and irrigated districts – either in empowerment levels or health, except for Sidhi district in MP which had a relatively better result for WEAI than Hoshangabad. Sidhi was also the only district with a significant proportion of tribal households which may have shot up the empowerment figures due to a more egalitarian production system of the tribal communities.

Access to Power More Important in Wealthy Households for Nutritional Intake of Women

Power Ranked Concentration Index Scores of nutritional intake confirm that poor dietary diversity has a higher concentration among the disempowered. The results are supported by the evidence from other studies in developing countries. Better empowerment scores of women were observed to be associated with higher calorie availability and dietary diversity (Sraboni, Malapit, Quisumbing and Ahmed, 2014).

De-constructing the index by individual attributes of gender and asset class revealed a

complex relation between power and wealth. The CI was statistically significant only for the middle-asset class and high asset-class women. The result reflects that the cost of disempowerment is higher for richer households, especially women, in terms of nutritional intake. The reason why rich women, women in otherwise agriculturally prosperous and richer sub-humid geographies lose more when disempowered may also be found in the distribution of wealth and nature of society.

Decomposing the CI by individual components of empowerment and a set of socio-demographic factors, it was observed that the inadequacy in leisure is the largest contributor among empowerment indicators followed by ownership of assets and leadership. There were differences between the two geographies. Despite the women in sub-humid areas reporting less inadequacy in leisure, they were losing more nutrition to overall disempowerment through leisure-poverty followed by inadequate credit savings. In the semi-arid areas, inadequate assets were the largest contributors of nutrition-loss followed by leisure and leadership. It seems that in the sub-humid districts, leisure-poverty or drudgery is faced by the extremely vulnerable, and therefore, drives low dietary diversity among the disempowered. Whereas in the semi-arid districts, leisure poverty being more common, the main pathways through which disempowerment affects low dietary diversity in women is inadequate control on wealth.

Among the other factors, the sub-humid regions show caste and lack of access to the PDS as major pathways, whereas, in semi-arid districts, lack of other social protection and low standard of living were major pathways. This result is expected as the semi-arid regions are agriculturally poor, and therefore, dependent on PDS. The sub-humid districts with abundant cultivation of food crops do not have properly functioning PDS. The disadvantage of gender is also higher in semi-arid regions but in sub-humid regions, a caste-based disadvantage is observed.

Gender-Parity in empowerment levels reduces odds of individual malnourishment but not household food insecurity

The results of odds suggest a strong association between gender-parity in sampled households and IDDS but could not find a significant association with the malnutrition indicators (BMI<18.5, the gender gap in underweight and/or disease frequency). The results corroborate findings from other countries. Women empowerment has been observed to ease the ill effects of household's low production diversity on women and child's dietary diversity and anthropometric performance (Malapit, Kadiyala, Quisumbing, Cunningham and Tyagi, 2015). Our study could not link anthropometric outcome to gender parity in empowerment, but similar results have been observed in Bangladesh where WEAI associated with dietary diversity but not BMI (Sraboni, Malapit, Quisumbing and Ahmed, 2014).

We, however, found that the odds of a household facing FIES above moderate was lower if it was a household with no gender parity compared to the households with gender parity. Food insecurity seems to be driven more by wealth as the odds of moderate to high food insecurity was lower in the medium and high asset classes compared to low asset households. This again reflects a non-linear relation between women empowerment and wealth and hunger and hidden hunger. The richer households, although secure in terms of food, perform worse in terms of gender inequality and quality of dietary intake. Since the relation between gender parity and nutrition/food insecurity is statistically significant, the implication of the result needs to be carefully thought.

An in-depth study of these issues is required to understand these counter-intuitive results. A possible hypothesis could be the very way WEAI is constructed – in which it does not include any of the proven determinants of nutrition and health such as women's education, skill and even their reproductive health indicators. This exclusion of certain dimensions is probably necessary as the WEAI has a very specific goal of measuring empowerment within agriculture, but it surely shows that a stand-alone WEAI index may not be the best predictor of nutritional and health outcomes in households.

That apart, the current study did establish that the gender-parity in average levels of decision-making within households may help bring down the gender gap in malnutrition within households and increase dietary diversity score.

Conclusion

There are a few limitations to this study. Firstly, due to the limitations of resources, the survey was done for a limited sample, and, therefore, the results could not be generalised for the entire State or region. Secondly, due to difficulties in reaching every member of the family, anthropometric data for several household members could not be collected, and the relation between household-level nutritional outcome and empowerment had to be limited to dietary diversity. Also, the homogenous profile within the State and different cast profiles between States would have exerted influence on the results which is not dealt with in this report in depth. Since this report is based on the initial analysis, more work is needed to incorporate the structure of interrelations between the outcomes and predictor indicators in the analytical framework. Despite these limitations, the study brought out the relation between access to nutrition, gender and empowerment in agriculture and showed that these relations tend to vary in different systems of production and by different nature of households.

A few important policy recommendations come out of the results. Since poor nutritional intake tends to concentrate among the disempowered and lack of gender parity increases the odds of

poor diet, the solutions to increasing or improving nutritional intake are also linked with empowering women. A major disempowering factor in the sample was the abject absence of any Community Based Organisation – be it a self-help group or FPO or NGO. The leadership-poverty headcount ratio was higher than any other indicator, which, in turn, could have had an upward impact on other inadequacy indicators such as control on income or access to savings and credit – both of which are again programmatically addressed through SHGs or FPOs.

In the pattern exhibited by our sampled individuals in terms of main contributors of disempowerment, Punjab seems to need to concentrate on SHG-mobilisation so that control on income and access to input decisions can also be improved. Madhya Pradesh required to focus on almost all domains, especially the leadership domain and control on income domain. Telangana needed to improve both leadership and input over production decisions. For Tamil Nadu, it was lack of leisure or in other words, time-burden, driving a major part of disempowerment. The solution to this could be a better care facility, sensitisation of men to share reproductive burden and provision of time-saving technologies for these households.

The complexity of the relation between nutrition and 'empowerment' aside, the results of this study in general point to the need for an overhaul of the community development and mobilisation programmes to address women's participation and access to resources in the studied areas. There is a need to re-energise their SHG-based programmes for an immediate improvement of women's participation in decision-making. Other than illiteracy, poor quality of life, lack of financial and social protection, poverty, inadequacies in the control on income and decision-making among adult women in the village have significant contributions to overall nutrition inequity. This can be addressed through SHGs. Secondly, the geographical and wealth-based variations of the disempowerments should also be considered. For instance, in the Semi-arid regions, inadequacy in leisure is greater in terms of incidence, but its contribution to overall inequity was higher in Sub-humid regions. Leisure poverty may be addressed by technological solutions that will ease the burden of women. A rethinking should be done for identifying the indicators for WEAI to capture these geography-specific differences in a comparable form. Lastly, the study shows that the malnutrition gap that exists within household between men and women can be reduced by a huge percentage if gender parity in household decision-making around the production system can be improved. A long-term commitment to improving gender equality through all policy and development channels is needed in that direction.

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APPENDIX

Village Profiles and Observations from Field: Excerpts from the Field Diaries of Coordinators

Telangana: Vikarabad

We started our field survey in Vikarabad, Telangana on 12th March, 2019. The survey was part of the ongoing study by the Centre for Gender Studies and Development, NIRDPR titled 'Understanding Gender Differences in Nutrition in Relation to Women's Access to Food Production in Rural India' that tries to examine the degree of women empowerment in agriculture and their access to nutrition. The team travelled daily from Hyderabad to collect data from 100 households from five villages of Vikarabad, namely Mubarakpur, Keshavpally, Nawabpet, Syedalipur and Yethrajpally. Out of the five villages, four are in Nawabpet block except for Syedalipur which is in Mominpet block. The survey started with Mubarakpur village, and further moved on to Keshavpally, Nawabpet, Syedalipur and Yethrajpally villagesNawabpet village was found more developed than the other five probably due to the proximity to the Nawabpet block. Syedalipur was the remotest and also the least developed village amongst others with mostly semi-pucca houses, subsistence living and little agricultural output. Most commonly cultivated crops all over in Vikarabad villages are cotton or vegetables that require least irrigation. All the villages faced the common problem, i.e. water scarcity, dry bore wells and crop damage due to the intense dry summers.

A dual household in Vikarabad, Telangana

The VOAs of all villages were so cooperative and helpful to the extent that all three groups of field investigators were accompanied and introduced to each household. It may be noted that all VOAs were, in fact, women (except in Mubarakpur) which portrayed their high degree of participation in social life. In most of the villages, people were cooperative with the women of the households easily available to communicate with. The households were mostly old with young adults who had migrated to the closest town for other works. The scorching heat in Telangana in the middle of March was not at all a very pleasing experience. Amidst all the constraints, we successfully completed the survey in Vikarabad.

Telangana: Karimnagar

The Karimnagar team started the study on the second week of March with two field coordinators and a Research Assistant at Ramadugu block in Laxmipur village. As far as agriculture is concerned, Laxmipur village was one of the best and major among the rest in Karimnagar with 450 households. The VOA (Village Office Assistant), Ideal Former and CC (Centre Coordinator) extended the team a warm welcome. The team visited the Laxmipur Panchayati office where the Gram Sabha was in progress and announced that the purpose of the visit was to hold an agriculture household survey. Saritha Prabhakar, the Sarpanch, welcomed us to do the survey.

A woman farmer of Karimnagar, Telangana

Women making organic pesticide in Telangana

During the survey, we observed a large number of residents were engaged in dairy work and they deliver milk to the milk centre (Karimnagar diary) located near the Panchayat office. The main crops cultivated were paddy, cotton and maize whereas two farmers cultivated vegetable crops. In Laxmipur, 95 per cent of the households are doing agriculture. The remaining five5 per cent are engaged in daily wage labour and a few are working abroad (Dubai). In most of the households, male and female members were found jointly participating in cultivation. The village consisted of a total of 45 SHGs. The major problems faced by the village were lack of water resources, too little rain and a regular, well-functioning MGNREGA! The MGNREGA was reported as a problem by the farmers as they were facing difficulty in getting farm labourers.

The daily wage of agriculture works for paddy was Rs.150-200 and for cotton, it was Rs.200 and according to season, it would change. The people were working for NREGA from 7 AM to 10 AM and were getting Rs.110. Accordingly, they were not willing to do work in farms for a remuneration of Rs.150 for the whole day. One of the farmers said that the NREGA work was a waste of time and money and it also affected agriculture. In Laxmipur, many people lost their lands as the Pranahitha Chevella Project canal was passing through their lands. They had demanded a short canal (conduit) to get the water for their agriculture irrigation and added that they had approached the Collector and political leaders with the request but didn't get any proper response.

Madhya Pradesh: Hoshangabad and Sidhi Districts

The MP survey started in April from Hoshangabad district. On the 5th of April, we started the household survey with a team of two field coordinators and a Research Assistant in Sohagpur block – Baokhedi Kalan village and Bhiladia. We visited the Panchayati office at the Baokhedi village where we had a discussion with the Panchayat Secretary, Village Assistant, Sarpanch and four formers of the village on the agricultural and development of the village. There are a total of 150 households, of which 95 per cent are engaged in cultivation. The main crops raised in this village are wheat (90 per cent) and vegetables (10 per cent). The irrigation system in this village was well organised and every agricultural household was getting water from the Tawa river through a canal.

An agricultural household in Madhya Pradesh

A dual household of Sidhi, Madhya Pradesh

The women rarely participate in any activity. The widows only did the agriculture of their own, otherwise, all cultivation works were done mostly by men. Coming from Telangana, the team found the whole scenario largely contrasting. There was the Parda system followed throughout the village and women would not speak in front of men. Hence, we had to hire more female data-collection coordinators to run the questionnaires. An anganwadi teacher Ms. Jyothi Malviya told the team that the situation reflects the respect exist between men and women, adding that it has nothing to do with the domination of men over women. The women of the village often told us that there was no need for them to work as men are doing the labour. There were no SHGs in this village. The people belonging to Patel caste did experimental maize farming in the previous year (2018) and they had succeeded. There was no water pipeline system in this village and they depended only on bore water.

A kitchen garden in Hoshangabad

A water tank having about 40,000 litres capacity was built but it has been remaining dysfunctional for the last six years. Majority of the villagers were illiterates. No transportation system to this village was available and everyone used their own vehicle. The daily wage of agriculture workers was Rs. 200.

The village has a tradition of consumed tobacco and we found this an unhealthiest thing in practice. They villagers used to offer tobacco as refreshment for the guests and their teeth has turned brownish due to the excessive usage of tobacco. In the last 10 years, four cancer deaths occurred in this village and one has been admitted to a hospital in Bhopal during the survey period. The Gujjar caste women never came outside. Compared to Bhiladia village, women were visible outside in slightly more numbers in Baokhedi village.

The team further moved to Sidhi district where Sidhi District Officer Mr. Sanjay Chaurasiya received us. The survey was started in the second week of April from the Rampur Naikin block and related village Pikiniyan, Kuwan Panchayati. As per the details provided by the block office, this village consisted of 100 households; 95 per cent of people are engaged in cultivation and 5 per cent are into agriculture and other labours. Only a few people had pucca houses and the rest of all had kutcha houses. Ninety-nine per cent of the village population belonged to OBC (Patel) category.

This village was popular for supplying vegetables to Sidhi district. They mostly cultivated ladies finger, bottle guard, tomato, beans, brinjal along with chickpea, red lentil, wheat, rice, etc. All the five SHGs functioned in the village were closed due to non-repayment of the debt. The Sarpanch of the

An agricultural land with low soil moisture in Sidhi

village and other officers said that the total village is a defaulter in bank repayments that was the main reason for the closing of the SHGs. In agriculture, both men and women participated actively without any gender division of labour. There were no houses in this building which built under the PMAY scheme. The MGNREGA workers did not credit their money from the last four months stating lack of funds.

Compared to Sohagpur block, tobacco consumption was way low here. There was a general lack of awareness about programmes like SHG, etc., and possibly this was the key reason for the villegrs becoming defaulters. The agricultural officer visited the village 3-4 times in a month. The village has *domat mitti* (black in colour, loam) and another variety of sand soil. The farmers were getting Rs.1860 per quintal of wheat plus government bonus of Rs.160 at mandi. They needed to go to the Rampur Naikin and Churahat about 12 km from Pikiniyan, 30 minutes journey for selling wheat, etc.

In this village, Patel caste was more empowered to do the new crop cultivation. Overall, it is observed that the literacy level in both districts in Madhya Pradesh was very low. The districts neither had basic transportation system nor development in SHG-based empowerment.

Punjab: Mansa and Saroya Districts

The survey in Punjab started in the first week of April at Sardulgarh block in Mansa district and later at Saroya in SBS Nagar district. Sardulewala, Alhupur and Khairakalan villages in Sardulgarh and Sahungra and Sujawalpur in Saroya were surveyed. Although, Mansa district was stated to be less developed than the SBS Nagar district by the government officers and the residents, the villages had no sign of being less developed. All the three villages had good roads, pucca houses, primary schools, primary health centres, markets at a distance of 7 km and banks at a distance of maximum 2 km. In fact, many agricultural houses even owned a car. The only difference, according to them, was that almost all houses in SBS Nagar had one person who had sometime or the other worked in a foreign country which was not so frequent in Mansa. The villages in Saroya block definitely had bigger houses, more farm equipment owning houses and a large number of houses had cars.

A dual household at Mansa, Punjab

However, in Saroya the inequality was found greater than Sardulgarh. Almost every house in the villages of Sardulgarh owned some plot of land for cultivation and irrespective of the caste, they were involved in MNREGA work. In Saroya block, the Panchayats mentioned that lands were owned by the general category and hence, they were primarily into cultivation. The SC and BC categories own no land and mostly do MNREGA work or work as hired labourers in others' fields. Notably, in Alhupur village of Sardulgarh, the SC houses mentioned that they have not received payments for MNREGA for months which was not the narrative in general category houses.

A field that is ready for harvest in Mansa, Punjab

The commercial crops grown in Punjab in the rabi season were mainly wheat along with cotton and sugarcane and vegetables were grown only as a food crop. In the kharif season, they cultivate paddy, maize and vegetables. Almost 80 per cent of the people were into cultivation and almost all owned a piece of land. Punjab Government provides eight hours of free electricity for irrigation purpose which have reduced their irrigation costs. Similar to Telangana's patta passbook, Punjab also has a limit card using which people can lend according to the size of their land.

Women's participation in agriculture, both physically and in making decisions, is really low, especially among the Sikh women. Women went to the field only to bring food to their husbands and rarely to help their husbands in sorting the harvested crop. However, women from Rai Sikh and Bagri communities, who are SCs and BCs respectively, have higher participation. Khairakalan village in Sardulgarh block had the best women participation just because the village is dominated by the Rai Sikhs and the Bagris.

A pumpset in agricultural land at Sardul e walah, Punjab

Due to our visit close to the 2019 Lok Sabha elections, and their active participation in politics, we had to face a lot of hindrance, both by the village residents and the local government. In Alhupur village, the team faced resistance from the Panchayat members who stopped the team from going to the sampled houses – probably because we were visiting houses where MNREGA work has not been paid. Punjab was the only State where we had to ask for DM and BDO's intervention to continue the survey, and the local facilitators put curfew timings on women surveyors stating security issues. Finding upper caste women to answer the questions was also a huge challenge.

A dual household in Punjab

A lot of residents, especially those who had huge houses, would just shun the team, not giving consent for the survey. A few of them gave consent but answered every question reluctantly, fearing it is some "government verification" on their income. Almost everyone understated their revenue from crop and livestock, and said that they have not received any scheme from the government. After investigation, we did find some houses which had received PM Kisan Yojana.

Tamil Nadu: Virudhunagar

The Virudhunagar field survey started in the last week of April 2019 at the Aruppukottai block in Tamil Nadu. The survey was conducted in four villages of Aruppukottai block, namely Chithaparapuram, Valangi, Kovilangulam and Gopalapuram. Chithaparapuram has just one community, i.e. the Reddy community and most of them were relatives. The other villages consisted of Reddy, Naidu, Nadar and the SC communities where mostly cultivation was done by the first three communities.

A dual household of Virudhnagar, Tamil Nadu

The common thing about all the villages was that they were mostly rainfall dependent cultivators since it was a highly dry region with very low groundwater level. Hardly 1-2 houses in each village have a pumpset for irrigation. So, the households cultivated crop only in the monsoon season of the year and they sustained the next six months by MNREGA works or other labour works. The main crops grown in these villages are cotton, maize and banana. Additionally, they also cultivate coriander, black dal (urad dal) and green dal (moong dal), especially in Chithaparapuram and Valangi villages. The villages also agreed on the fact that over the years, the rainfall situation has gotten worse and hence, the groundwater level has reduced to a critical level, which they claim to be the reason for the reduction in agricultural land. In Gopalapuram, a very old farmer said that about

20 years back, the village had 1000 acres of agricultural land, which has now reduced to only 500 acres because of the shortage of rain. However, he also agreed that due to more agricultural extension work in the village, the soil quality has improved in the last 10 years. Earlier, people used to put only natural fertiliser but now with chemical fertiliser, the soil quality has improved and hence, cotton and maize are produced. The team got a chance to meet an agricultural extension officer in Kovilangulam village. She informed that soil test practices have become very common in the past three years which have improved the fertility of the soil. However, another reason for concern for the villagers is pest attack in maize which frequently destroy the whole field. There are specific pesticides as treatments but they work only in the early stage of infestation.

The villages have hardly gone through any change in the past 10 years, be it in terms of crop pattern or the village infrastructure except for the four-lane road constructed close to the villages. All the villages had their own PHCs, anganwadi centres, banks and primary schools. In fact, Valangi and Gopalapuram villages also have high school. To note, Kovilangulam village has an agricultural regional research station established under the Tamil Nadu Agricultural University.

The women in most of the villages, especially in Chithaparapuram and Kovilangulam, have high decision-making power in agriculture. About 40 per cent of houses of these two villages are female-headed households, where mostly all household and even agricultural decisions are taken by women. The women in most houses had complete knowledge of the field and responded promptly. The other two villages - Valangi and Kovilangulam - had 30 per cent female-headed households. The women in these two villages do participate in decision-making regarding household chores but had less decision-making power and even knowledge of agriculture.

Tamil Nadu: Erode District

The survey started in the first week in Kodumudi block. In this block, six villages Solarpatti, Nagamanacempalayam, Muruganpalayam, Pannapalayam, Valanthankottai, Icchipalayam were surveyed. Overall, we collected 100 household agricultural samples. Every village consisted of 100 to 150 households and 95 per cent of the villagers performed farming. The main crops in these villages were turmeric, banana, paddy, gingelly, groundnuts, sugarcane, sorghum (*cholam/jowar*), ladies finger, brinjal, bottle guard, drum sticks, etc. The village has Blacklite soil. The irrigation system in these villages was well-organised except for Nagamanacempalayam and everybody was getting canal water from Lower Bhavani Project. In this block, women were well empowered and all cultivation works were done mostly by both men and women. There are 5-6 SHGs in each village and roads were well developed. All Central government schemes, including MGNREGS, were fully operational.

People used the community centre, a system launched by the villagers 15 years back, mainly for women. The water pipeline system in this block was well developed and they use the open well also for drinking water. The transportation system was well organised in each and every corner of the village. The daily wage of agriculture labour work was Rs. 200 -550 according to the crop.

In Icchipalayam village, 4-5 residents were diagnosed with cancer.

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