Divecha Centre for Climate Change
Indian Institute of Science, Bengaluru

Policy Brief
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Drought and Vulnerability Among Indian Agricultural Households

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Highlights:

1. 87 percent of districts and 93 percent of the Indian population are moderate to highly vulnerable to droughts.
2. Farming, a major source of employment and income in rural India, is under great stress due to severe and consequent droughts.
3. Crop loss, distress sale of agriculture produce, and the resulting income loss force the households to employ reactive coping strategies.
4. Vulnerable to market forces, farmers are compelled to settle for lower returns.
5. In this study we examine two coping strategies-occupational diversification and sale of assets like livestock.
6. The percentage of labour force moving out of the farm sector between the agricultural seasons is proportional to the extent of crop loss.
7. Agriculture households, post drought, are forced to expend educated workforce to readily available, locally obtainable, low-paying casual labour.
8. When faced with drought, households sell away their livestock for 50 percent lesser price than those that did not.
9. One of the ways to make the rural economy resilient to climate variability is to strengthen crop insurance schemes.
10. Another is to train educated youth and generate employment opportunities that are compatible with local growth and developmental requirements.

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I. Introduction

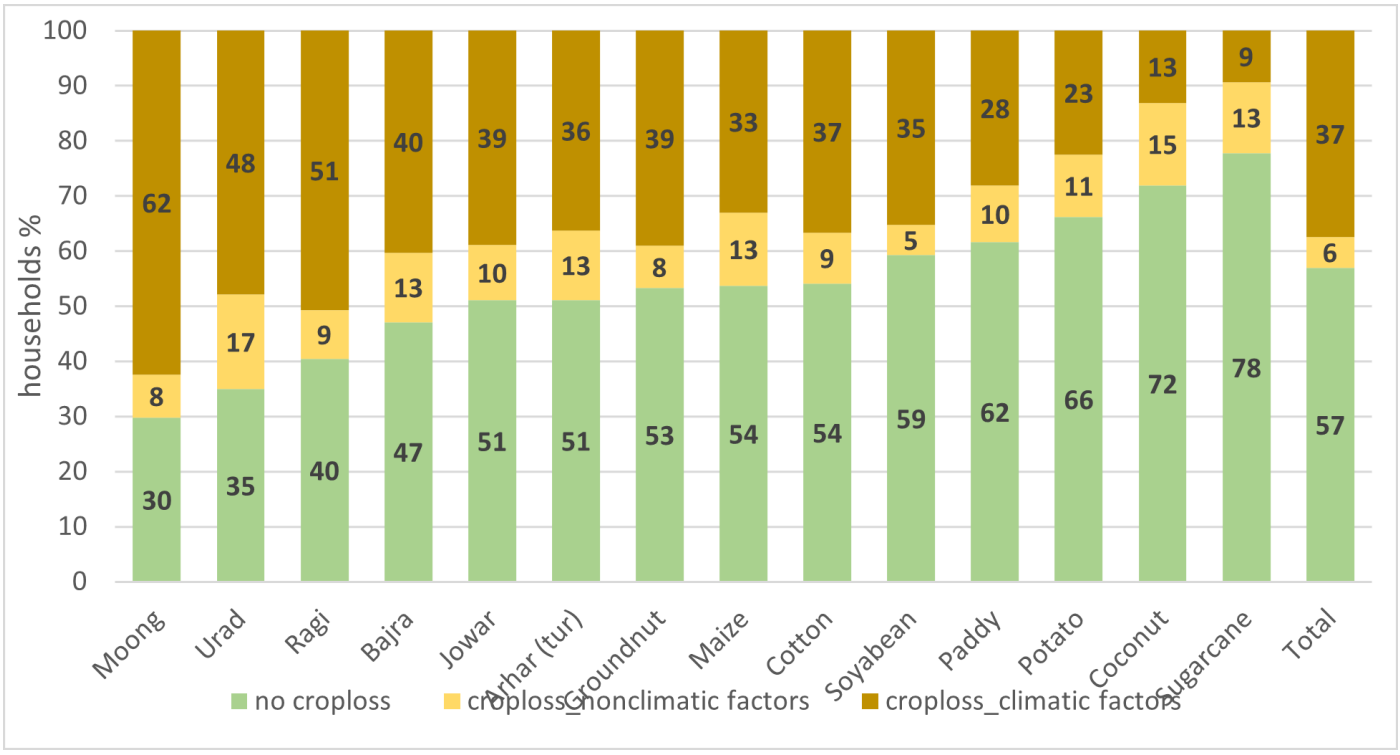
In the recently published Hazards and Vulnerability Atlas, Indian Meteorological Department (**Hazard Atlas of India 2023**) presented the enormity and the urgency with which India needs to tackle climate change. According to the atlas, 87% of the districts and 93% of the population are moderate to very highly vulnerable to drought. Agriculture is one of the sectors in which the effects of climate change are direct and prominent. Mild to extreme droughts, floods and cyclones have a significant effect on agriculture. According to the information tabled before Lok Sabha, between 2019-2023, 23.2 million hectares of cropped area had been affected due to hydrometeorological calamities (**GoI 2022**) (**GoI 2023**). Mongabay India, reports that 35 million hectares of cropped area (where crop loss is more than 33%) was damaged due to drought between 2016 and 2022 (**Pandey 2022**). Agriculture continues to engage large section of India's rural work force. According to the recent labour force survey (**MoSPI 2023**), 59% of labour force is engaged in agriculture and for 47% of the households farming is the major source of income (**MoSPI 2023**). Therefore, climate variability and consequent agricultural losses effects the livelihoods and welfare of a vast majority of rural India.

In the Kharif season of 2018, 43% of the households reported crop loss of which 37% was due to drought, flood and other natural factors (**MoSPI 2021**). **Figure 1** shows the extent of crop loss (i.e., percentage of households that reported crop loss) of fourteen major crops and nearly half of them are small and marginal land holding farming households.

More than three-fourth of the farming households dispose their produce to private agents like local mandis, input dealers, and private processors. Poor quality of crop due to drought, transaction costs and the urgency to compensate for the loss, compel the farmers to sell their produce for much lower prices.

Lack of strict regulations and no obligation to procure the crop for Minimum Support Price, private agents exploit the situation by under valuing the crop. As a result, it is sold for significantly lesser price. See **Figure 2** for the average rate (**sale value per kg[2] of crop**) at which the top ten crops are sold to the private sellers by drought hit households vis-à-vis others.

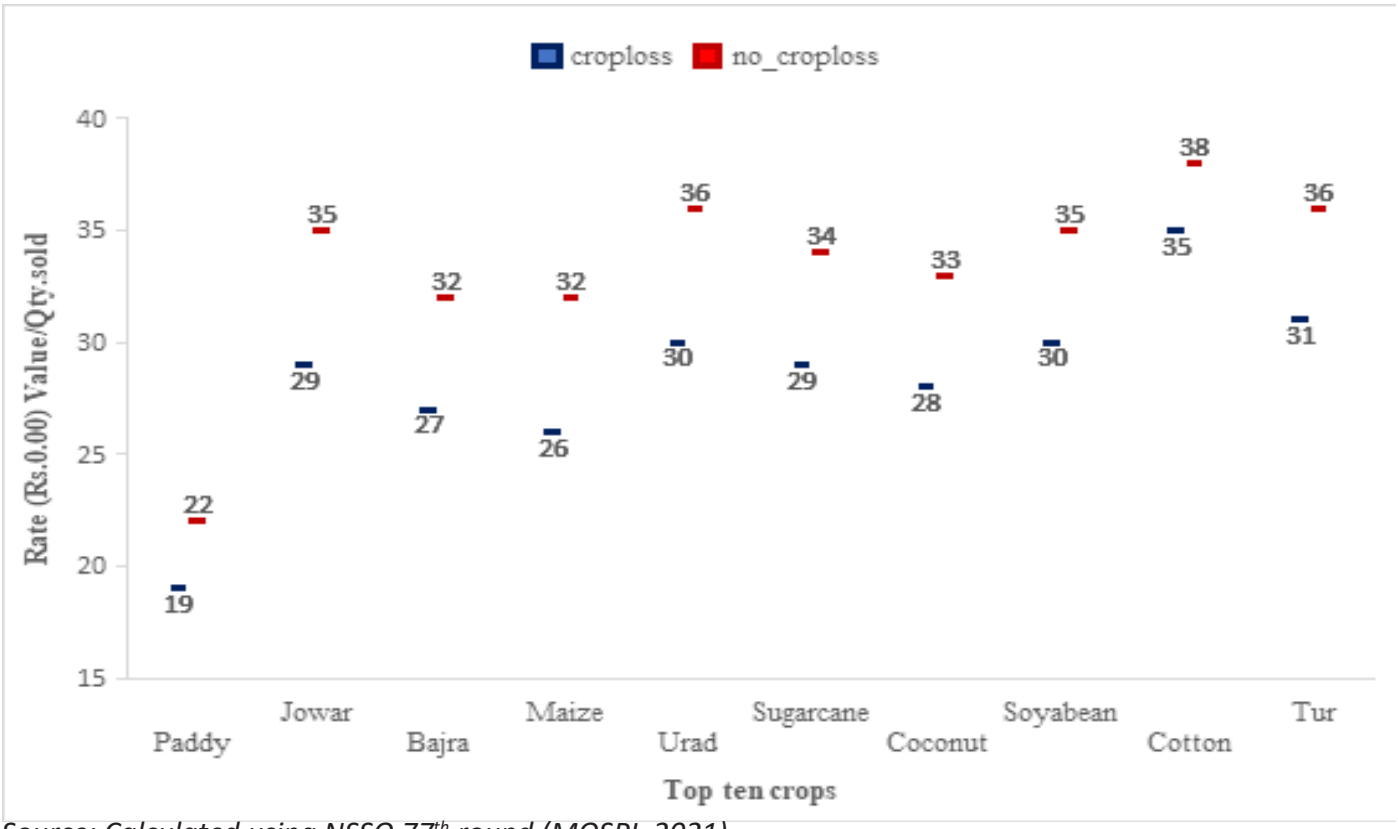
Consequently, the farmers experience income loss. See **Figure 3** for per-capita income differences in drought and non-drought households. Subsequently, households respond to losses by



Source: NSSO 77th round (MoSPI 2021)

Figure 1: Extent of crop loss of major crops (Kharif 2018).

[2] **In case of coconut, rate at which they are sold is measured by sale value per piece.**



Source: Calculated using NSSO 77th round (MOSPI, 2021)
Note: The above figure denotes sale of crop to private agents only.

Figure 2: Drought and Distress Crop Sale: Top Ten Crops.

adopting one or more of the following strategies- taking a loan, reducing consumption, migration, occupational diversification and sale of productive assets. Weather-related risks and absence of credit and insurance markets force the farming households to adapt through precautionary and reactive actions protecting their welfare but at the cost of lower returns (**Skoufias, Bandyopadhyay, and Olivieri 2017**).

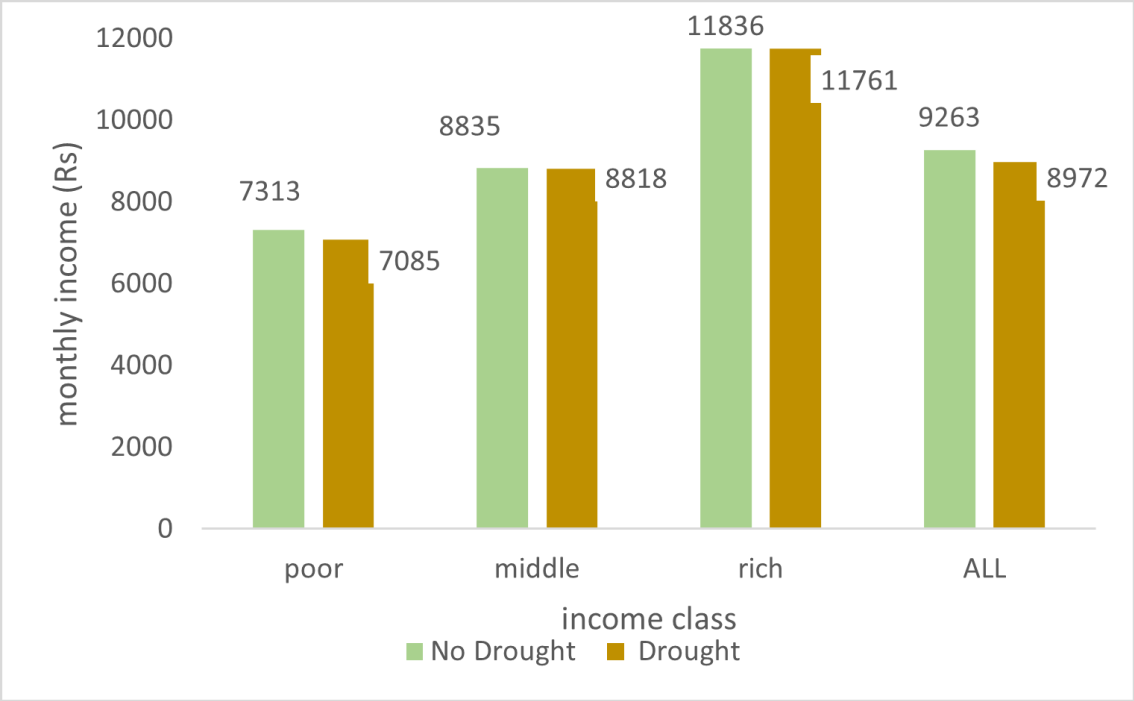
In this policy brief, we explore two strategies- occupational diversification and sale of productive assets. We demonstrate that these reactive actions leave Indian agriculture households vulnerable in the market there by forcing them to settle for lower returns.

II.1. Occupational Diversification

Occupational diversification is one of the primary coping strategies agriculture households adopt in response to crop loss (**Ito and Kurosaki 2009**). In general, agricultural households devote lesser workforce during Rabi season (*January to June*) than in the Kharif season (*July-October*). According to the estimates of the 77th round of the NSS (**2021**), 12% of the workforce diversified out of agriculture between Kharif and Rabi seasons. In general, in order to deal with income dips or during agricultural lean seasons, rural households engage in casual labour. However, the degree of diversification away from farming activities depends on the success of the crop in the previous season. We observe that as more households in a state declare crop loss during Kharif season, the percentage of the workforce that move out of agriculture in the following season increases (**Figure 4**). Among the other reasons, the success of the previous agriculture season determines the occupational choice household members make in the short term.

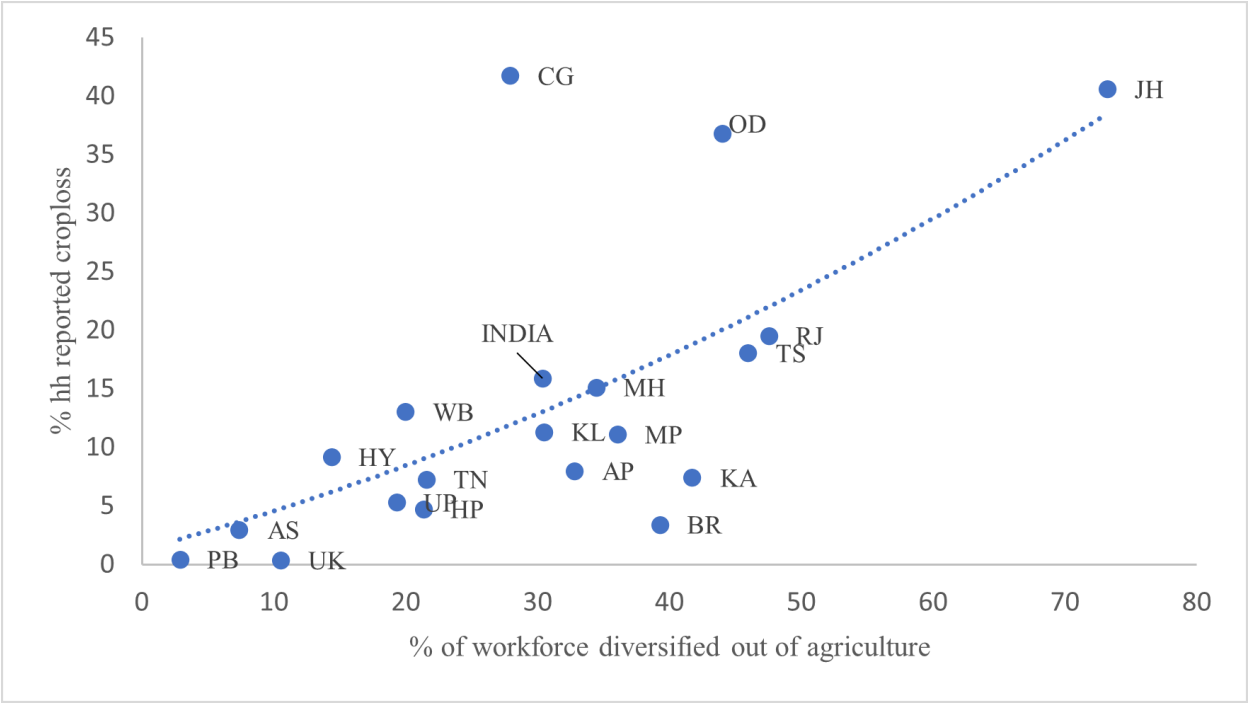
About 44 % of the agriculture workforce has upper primary and higher levels of education. When this workforce moves out of agriculture between cropping seasons, when faced with crop loss, they are compelled to opt for readily available, locally obtainable, low paying casual labor.

We found that 72% of the educated work force, post crop loss, engage in daily wage labour. It is particularly disturbing to note that 62% of the workforce with tertiary education (*graduation and above*) settle for casual labour post crop loss. Under normal circumstances, however, only 37%



Source: Calculated using MOSPI, 2021
Note: the income gap varies depending on the extent of crop loss

Figure 3: Average monthly per capita income: Drought vs Non-Drought Households.



Source: 77th round of the NSS (MoSPI 2021)

Figure 4: Crop loss and occupational diversification away from agriculture.

of the graduate workforce opt for casual labour. Alternatively, a larger percentage of work force opt for regular salaried/wage employment that pays 63% higher than casual labour.

This phenomenon could also be tracked by looking at the composition of sectors in which the educated workforce is engaged (**Figure 5**). When not facing drought induced crop loss, 10% of the workforce diversifies into manufacturing and 8% into the service sector between Rabi and Kharif seasons. On the other hand, under duress, only little over 5% of the workforce diversifies into the service sector, and none are engaged in the manufacturing sector. Instead, majority of the work force is crowded in low paid construction and public works. Clearly, this

Table 1. Employment status and wages of educated workforce in response to Drought in rural India

	No Drought		Drought	
I. Employment Status (%)	Upper primary to higher secondary	Graduate and above	Upper primary to higher secondary	Graduate and above
Own and operate farm/non-farm enterprises	17.04	19.58	15.77	19.66
Unpaid family worker	4.12	6.28	3.3	2.12
Worked as regular salaried/wage employee	20.29	37.1	8.42	15.58
Worked as casual wage labour	58.55	37.04	72.51	62.64
II. Median Wages (Rs. per capita) 2 @				
Primary to higher secondary	22,000		17,600	
Graduate and above	36,000		22,000	

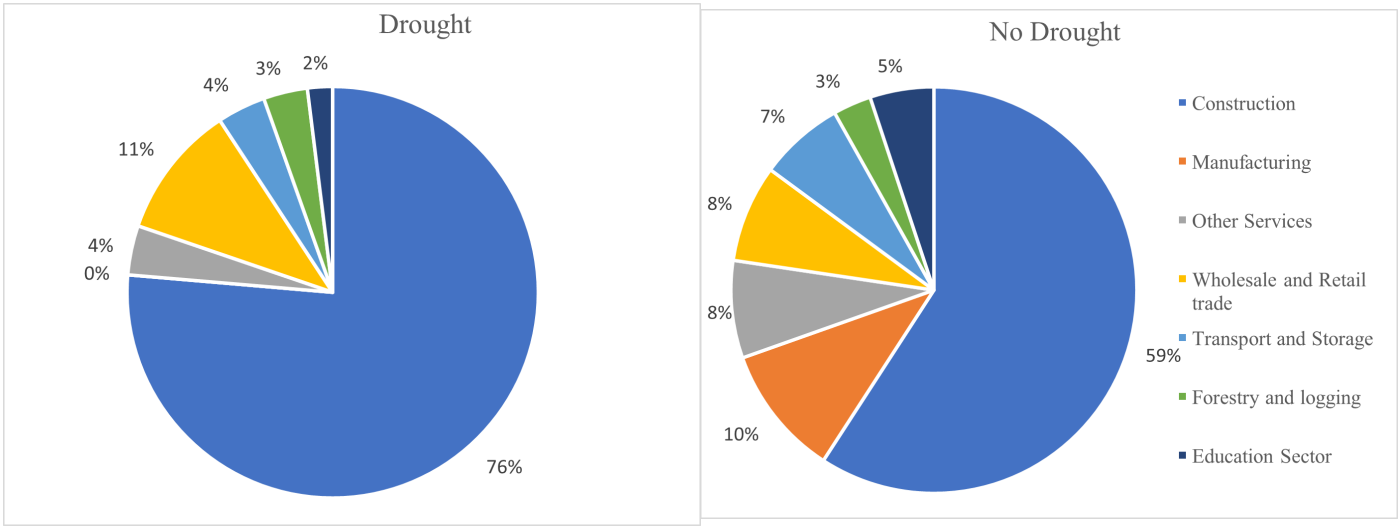
Notes: i) 90% of the total educated workforce that diverted from agriculture between the two seasons are employed in these 7 sectors.
ii): Aggregated for six months.
@: A Mann-Whitney U-test was conducted to examine if difference in the earnings of the educated work force in both the contexts (drought or no drought) is statistically significant. We find that 57-63 out of 100 times the wages earned through distress employment is significantly lesser than wages earned under normal circumstances.

is reflected in the wages earned (**see section III in Table 1**).

Not withstanding a network of socioeconomic factors including local policies, sectoral growth, labour market dynamics, migration, and cropping patterns that determine occupational choices, these observations hint at distress employment among agricultural households in the case of drought led income loss. As droughts occur more frequently and for longer, excess labour will concentrate in unskilled, low wage sectors.

II. Sale of livestock

Another strategy often adopted by agricultural households in case of income dips is sale of assets, primarily livestock. Usually, in case of relatively

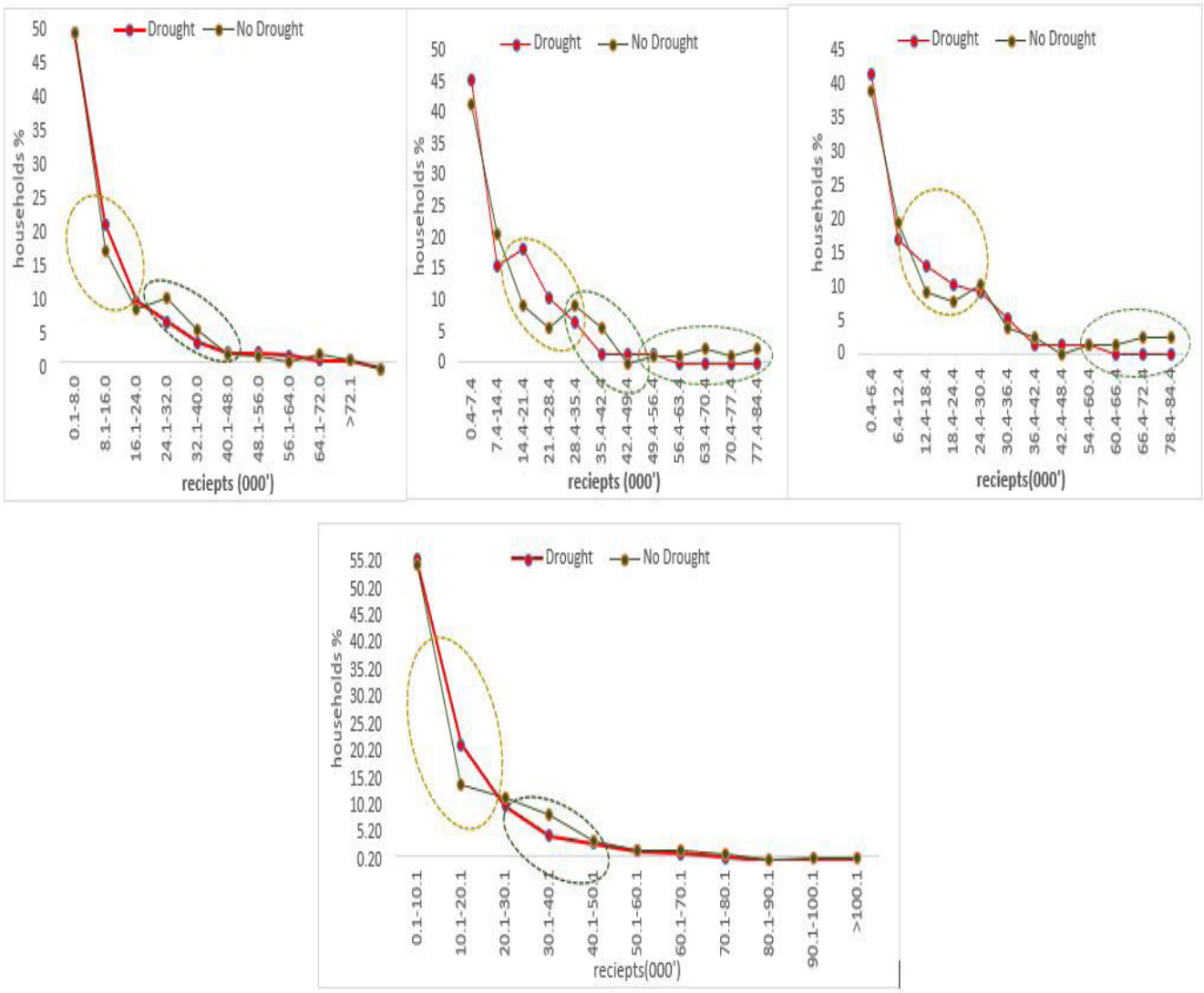


Source: 77th round of the NSS (MoSPI 2021)

Figure 5: Occupational Diversification and Sectoral Composition of Employment: Rural India.

small income shocks, the households rely on stocks of grains and preserve livestock (**Acosta, Nicolli, and Karfakis 2021**). However, when the losses are larger, households tend to sell livestock. Fodder shortage and water scarcity during drought is another compelling reason to sell livestock.

Figure 6 presents the percentage of households against a range of sale value of the livestock. We examine the sale value of the livestock across land size classes – marginal and small, semi-medium and medium, and large. We observe that, at the lowest end of sale value (*far left on the horizontal axis*), percentage of households that experienced crop loss is more than the percentage of households that did not. As the sale value increases (towards the right of the horizontal axis), percentage of households that did not experience drought exceeds the percentage of households that did. This suggests that a greater number of households in the face of droughts (than those that did not) are compelled to sell their livestock at lower prices. The median receipt value



Source: 77th round of the NSS (MoSPI 2021)

Figure 6: Value of sale of livestock: Drought vs No Drought Households.

Note: Figures a, b, and c represents the frequency distribution of livestock receipts of small and marginal, semi-medium and medium, and large agricultural households, respectively. Figure d is for all agriculture households. The yellow dotted circle highlights that at the lowest end of receipts, the percentage of households that experienced crop loss (red line) is more than the percentage of households that did not (green line). green dotted line highlights that as the sale value increases, households in case of crop loss fall behind.

Mann-Whitney U-test shows that 57 out of 100 times the average receipts on sale of livestock (per hectare of land) are significantly lower when sold in distress compared to the sales that are made in normal circumstances.

(per hectare of land) against sale of livestock post drought is Rs. 3,337 vis-à-vis Rs. 5,000 lower than when livestock is sold under normal circumstances.

Implications for Policy

India's agriculture sector is under great stress due to increasing climate variability. Already struggling with lower farm incomes, rural households are exposed to more uncertainty with every passing agricultural season. Short run ex post coping strategies are a rather desperate bid to counteract drought led income loss. The disadvantageous outcome of these strategies highlights the vulnerability of the households and absence of system that cushions the blow.

High percentage of educated rural work force take up casual labour under duress and earn significantly less wages. Distress sale of livestock for significantly lower prices indicate the desperation of the households to stay afloat. Preliminary observations though they are, the empirical evidence of vulnerability presented here warrants a call to make rural economy, not just agriculture, resilient to climate variability.

One crucial step towards building such system is to strengthen India's crop insurance schemes. According to the recent farmer assessment survey, only 10 percent of the total farm households reported to have insured their crops (**MoSPI 2021**). Across the land classes more than 50 % of the households that did not insure are "not aware about crop insurance" or "not aware about availability of the facility".

Secondly, creating alternative employment opportunities is key to making rural economy resilient to climate shocks. Training rural educated youth with skills that are compatible with local growth and developmental requirements and expanding rural employment guarantee schemes to accommodate this group is one way to achieve it. The debate on climate change and employment, so far, is focused on emission reduction in energy sector and jobs created (renewable energy) or lost (coal). As farming becomes an unreliable source of income, short term and long-term movement of labour out of agriculture becomes increasingly common with escalating climate variability. The resulting consequences and measures to tackle it ought to garner similar policy and academic attention.

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