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Income risk and management strategies of rural households: evidence from distressed regions of Maharashtra

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Abstract Vulnerability to production and market risks is a dominant feature of agriculture in the developing countries. This happens due to household's limited capacity for *ex post* risk coping. *Ex ante* risk reduction and mitigation strategies may enhance their ability to build-up asset base to enable them to escape poverty. This paper delineates the extent of incidence of events that lead to occurrence of environmental, health and economic risks in two high risk prone regions viz. Vidarbha and Marathwada in Maharashtra. An analysis of various strategies that rural households adopt to avoid consumption shortfalls due to income shocks has been carried out empirically using the logit model. The results based on a primary survey of 200 rural households in the region indicate that irregular rainfall along with pest and disease outbreaks before crop harvest are the main sources of environmental risks. The landless, marginal and small farmers are more susceptible to the sources of economic risks compared to the farmers having larger size landholdings. The use of risk management strategies was conditioned by the socio-economic status of households with poorer households resorting to sell their assets and borrowing to informal sources. The study concludes that in the distressed regions, effective social risk management strategies are imperative to improve the socio-economic status of rural households.

Keywords Vulnerability, Risk, Risk management

JEL classification D81, H12, I38, Q18

1 Introduction

Households in the developing countries encounter various risks and shocks due to climatic conditions, economic factors, macroeconomic changes and individual specific factors. Volatility in households' welfare, usually measured based on their income and consumption is the result of intensity of risk exposure. Thus, poverty becomes a stochastic phenomenon as ups and downs in households' welfare bring about temporary movements in and out of poverty (Murakami 2017). The concerns for eradication of extreme poverty have been voiced at the international platform and are now part of the United Nations development agenda. The Millennium Project commissioned by the United

Nations in 2002 (UN Millennium Project 2005), set eradication of extreme hunger and poverty as the first Millennium Development Goal (MDG). Building on the success of MDGs, a universal call for action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity has been given under the UN development programme in the form of Sustainable Development Goals (SDGs). The SDGs came into effect in January 2016.

Social risk management (SRM) as a part of social protection provides a useful framework in the rural context for classifying the range of idiosyncratic and covariate risks that households and communities face, and identifying the informal and formal risk management strategies in three categories. These include risk reduction (*ex ante* actions to raise income

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or reduce income variability), risk mitigation (*ex ante* actions to reduce income variability when a shock occurs), and risk coping (*ex post* actions to alleviate the impact of shocks).

In this regard, it is crucial to know the perception (reflected through incidence of risk events) and attitude (reflected through risk management mechanisms) of households towards various risks. This paper provides empirical support towards formulation of social protection strategies by the rural households. Accordingly, the first objective is to study the incidence of occurrence of various events and situations that lead to environmental, health and economic risks. In the light of such shocks and risks, the second objective is to identify the determinants of risk management strategy preferred by the rural households. As risk realization and its outcome are the function of how households respond to it and the influence of their socio-economic background on adoption of various risk management strategies, it is hypothesized that access to risk management options is not equitable among different household groups.

The study was purposively carried out in Vidarbha and Marathwada, the two high risk prone regions of Maharashtra. Literature validates that frequent occurrence of droughts, inadequate irrigation facilities, high dependence on monsoons, persistent decline in land productivity and negative returns from cultivation of traditional crops (such as, cotton, soybean, tur and sorghum) in these regions have pushed farmers into distress which is manifested through high rates of suicides (Mohanty 2005; Kulkarni & Deshpande 2005; Dandekar et al. 2005; Deshpande 2005; Mishra 2006; Behare & Behare 2008; Talule 2013; Shrivastav 2015).

2 Data and methodology

The sample of farm households was drawn from randomly selected two districts -Yavatmal in Vidarbha and Latur in Marathwada. Out of total 16 tehsils in Yavatmal and 10 tehsils in Latur, two tehsils from each district (Ghtanji and Kalamb from Yavatmal; and Udgir and Jalkot from Latur) were selected randomly. Further, a random selection of two villages from each tehsil was made for eliciting information from farmers. A complete enumeration of the households in selected villages was carried out to gather information on landholding and herd size of milch animals. In all, there were 1157 households in eight sample villages.

Households owning different size of landholdings were categorized into 5 groups based on the standard classification; landless, marginal (<1 hectare), small (1-2 hectares), medium (4-10 hectares) and large (>10 hectares). A predetermined sample of 200 farmers as per various groups was selected randomly from the sample villages with probability proportional to the number of households in each village and land size class. Primary data from farm households were collected for the year 2012-13 through conventional survey method on a well-structured and pre-tested schedule.

2.1 Sources of risk

We have considered the following types of risks in the study (a) environmental risk encompassing drought, irregular rainfall, heat waves, deforestation and soil erosion, pest and disease outbreak on crops and livestock, (b) health risk covering illness of household head and his family and; (c) economic risks due to lack of finance/ capital and access to inputs, increase in input prices, decrease in output prices, lack of demand or inability to sell, unemployment and harvest failure.

The respondents were queried about the incidence of occurrence of each of these events or conditions in the last 5 years as perceived or faced. The households were asked to classify in three categories of occurrence according to the number of times events or conditions affected them viz. low (≤ 2 times), medium (3 times) and high (≥ 4 times).

2.2 Access and utilization of risk management strategies

Based on the focused group discussions with the villagers, extension personals, government and non-government development functionaries in the area, 11 risk management strategies were identified. These strategies covered various aspects of risk management viz. risk reduction, mitigation and coping as follows:

1. Risk reduction: production of less risky crops, adoption of new technology, permanent migration to other place and personal insurance.
2. Risk mitigation: investment in various assets and multiple jobs
3. Risk coping: seasonal (temporary) migration, sale of assets, making children work and borrowing from formal and informal sources.

It is possible that even after availability of risk management strategies, some households might not utilize them because of lack of assets, and socio-economic backwardness. In this regard, it was worthwhile to study household specific characteristics that influence utilization of particular risk management strategy.

2.3 Method of estimation

Binary logit regressions were run on pooled sample from two regions for 11 different risk management strategies. By interacting various risk management options with fixed household characteristics, it was determined whether different types of households were more or less likely to use a given risk management mechanism. The logit model estimated was specified as below:

$$\log \left[\frac{P_n}{1-P_n} \right] = R_{ih} = \beta_0 + \beta_1 \text{OPRLHLD} + \beta_2 \text{HERD} + \beta_3 \text{PCME} + \beta_4 \text{AGE} + \beta_5 \text{HHSZ} + \beta_6 \text{EDU} + \beta_7 \text{GENDER} + \beta_8 \text{CASTE} + \beta_9 \text{OCCUP1} + \beta_{10} \text{OCCUP2} + \beta_{11} \text{OCCUP3} + \varepsilon_h$$

Where, P_n is the probability that a household used a particular risk management strategy, and $1-P_n$ is the probability that a household did not use it. R_{ih} is binary response variable for i^{th} risk management mechanism used by h^{th} household (yes= 1, No= 0). The set of explanatory variables contain: OPRLHLD- operational size of landholding (acres), HERD – herd size of milch animals (numbers), PCME – household's per capita monthly consumption expenditure (Rs), AGE - age of the household head (no.of years), HHSZ - household size (numbers), EDU - educational status of household head (1 for literate, 0 otherwise), GENDER - gender of household head (1 for male, 0 otherwise), CASTE - social group status (1 for ST/SC, 0 for Non-SC/ST), OCCUP1, OCCUP2 and OCCUP3 are dummy variables to depict the occupational status (base self-employed in cultivation) as self-employed in non-agricultural, salaried professions and agricultural & other labour, respectively. β_k and ε_h are coefficients and random disturbances, respectively. The marginal effects were worked out to predict the effect of change in an explanatory variable on the probability of a favorable attitude towards risk management strategy.

3 Results and discussion

3.1 Socio-economic profile of sample households

As shown in table 1, 69% of farmers were self-employed in agriculture in the study area. The average size of land holding was 2.49 ha, slightly higher than average farm size at district level in Yavatmal (2.21ha) and Latur (1.65 ha) (GOI 2011). Average herd size in the study area was nearly 3 animals. Average age of household head was 45 years with number of members to be four. Around 89% households had male member as the bread-earner. The average monthly per capita consumption expenditure which is generally taken as a proxy to gauge the economic status of household and hence has direct connection with realization of loss due to adverse events was around Rs 980. The per capita consumption expenditure in the study area was

Table 1. Selected socio-economic characteristics of households

Characteristics	Number
Sample households (No.)	200
Average land holding (ha.)	2.49
Average herd size (No.)	3.36
Average age of household head (years)	45.57
Gender of households (%)	
Male	88.50
Female	11.50
Average household size (No.)	4.24
Average monthly per capita consumption expenditure (Rs.)	976.62
Social group of households (%)	
Scheduled tribes	7.50
Scheduled caste	14
Other backward class	43
General	35.50
Household type (%)	
Self-employed in agriculture	69
Self-employed in non-agriculture	6.50
Permanent salaried professionals	10.50
Daily wage workers	14
Household head educational status (%)	
Primary education (1-5)	30.50
Higher education (>5)	54
Not literate	15.50

Source: Field survey.

slightly lower than that of Maharashtra (Rs. 1188) (GOI 2011). Sometimes there may be existence of social exclusion in market and non-market transactions. For this reason, households' social status matters to understand the discriminatory access to various risk management strategies. It was found that 7.50% households belong to scheduled tribes while 14% and 43% belong to scheduled caste and other backward class, respectively.

Households socio-economic status is related to their occupation which provides them assurance in an adverse situation. Around 69% households had agriculture as prime source of income and hence directly exposed to environmental risks whereas only 6.50% of households were engaged in non-agricultural activities with livestock as a subsidiary business. Further, 14% and 11% households were daily wage workers and permanent salaried professionals having primary income source, respectively. It was found that around 85% of households were literate and capable to make proper decisions.

3.2 Incidence of events and conditions causing risks: households' perceptions

Numerous studies have been carried out on different aspects of a drought like situation which prevails in the regions (Vedeld et al. 2014; Kale et al. 2016; Thakare & Thakare 2016). Almost every twenty years, a severe drought has hit the regions while small droughts keep occurring intermittently. Around 20% households in Marathwada region and 18% in Vidharbha felt that frequency of severe drought was 3 years out of 5 years preceding the survey. Majority of sample households (77% in Marathwada and 81% in

Vidarbha) perceived realization of severe drought like situations in less than three years out of last five years (table 2). For them the irregular rainfall was a more recurrent phenomenon rather than severe drought. In all five years, the weather condition was found to be unfavorable for crop cultivation.

Marathwada region, which has been suffering from crippling drought for the last two consecutive years 2012 and 2013, and in 2017 had excess rainfall which posed as threat to crops. However, during the time of data collection, no such situation prevailed in both the regions.

Vidarbha and Marathwada regions are always in news in every summer for sizzling temperature. Households fall victims to the heat waves condition. It also reduces the capacity to do work which may be reflected in less earning during that particular time period. Almost half of the total households perceived high incidence of heat waves.

In last three decades, forest area in the Marathwada and Eastern Vidarbha regions has declined gradually while in some other districts it has remained constant. The outcome of deforestation hits badly. In early periods, the availability of ground water was within six meters depth, but over time even 244 meters deep bore wells have gone dry. Deforestation affected farmers badly as 45% in Marathwada and 54% in Vidarbha perceived its high incidence. Most of the landless farmers use common pastures to graze animals which has got highly degraded and encroached due to drought and deforestation.

Besides deepening of water level, deforestation has adverse impact on soil. According to 17% farmers in

Table 2. Incidence of occurrence of environmental risks based on HH perceptions (% of households)

Region Risks	Marathwada			Vidarbha		
	Low	Medium	High	Low	Medium	High
Severe drought	77.29	20.2	2.5	81.65	18.34	-
Irregular rainfall	21.87	30.41	47.71	20.08	31.85	48.06
Heat waves	39.37	12.5	48.13	49.39	10.79	39.82
Deforestation	52.5	2.5	45	30.33	17.56	53.89
Soil erosion	67.5	15.83	16.66	55.31	28.38	16.29
Pests or diseases that affected crops before harvest	5.25	22.58	47.16	6.03	22.92	46.03
Pests or diseases that affected livestock	73.95	8.54	17.5	92.42	7.57	-

Source: Field survey.

Table 3. Incidence of occurrence of health risks (% of households)

Incidence	Illness of household head	Illness of household head's wife	Illness of children
Low	80.39	90.76	83.66
Medium	17.65	9.23	12.99
High	1.95	-	3.33

Source: Field survey.

Marathwada and 16% in Vidarbha, soil erosion occurs with high incidence. More than half of households perceived its lower incidence in both the regions. Most of the farming households did not know the invisible losses of soil erosion.

Prevalence of pest and disease before harvesting of crop that is conditioned by weather conditions was high in both the regions. In Marathwada, 47% of farmers realized its high incidence while in Vidarbha, incidence was found by 46% farmers. Pest and disease outbreak was a major concern as it reduces yield and quality of produce which may contribute in lesser earnings to the farmers. Further, pest and disease that affect livestock was not found prevalent in both regions as 74% households in Marathwada and 92% in Vidarbha reported its low incidence.

As regards health risk, it is considered to be the most common and important reason for descent of households into poverty in the developing countries (Krishna 2007)¹. Such shocks have direct and indirect impact on their economy and welfare. Direct impact is in the form of expenditure incurred during medical care like hospitalization and outpatient treatment. Indirect impact refers to loss of productive labour time and thus earning of patients and care givers. We tried to know the frequency of realization of health shocks among sample households. As shown in table 3, most of the households reported low occurrence of the event and hence less adverse impact on their economy.

Due to environmental and health risks, an attempt was made to know the impact of prevalence of various adverse economic situations in the form of incidence of occurrence perceived by the respondents. The size of operational land holding signifies the socio-economic status of farmer household. Larger holding

size indicates strong asset position and better economic and social status of the household. Social connections always have positive effect on reducing strong psychological beliefs and are significantly associated with reduction in suicidal attempt (Milner et al. 2015). Seven major sources of economic risks were identified to know their realization in the last five years among different household groups. It can be seen that, 48% of landless, 79% of marginal & small farmers and 41% of semi-medium and medium farmers frequently face lack of financing/capital (table 4), while for the large farmers the incidence of this problem is low. Sometimes, in the event of scarcity or unavailability of inputs with the dealers, the smaller farmers are at a disadvantaged situation *vis-à-vis* their larger counterparts. This is reflected in the differences in the incidence of lack of access to inputs to the farmers belonging to various farm size categories.

Increase in input prices over the period of time with unchanged or less than proportionate increase in the value of agricultural output pushes the agrarian community into distress. It was found that landless, marginal & small farmers have realized this more frequently as compared to the rest of farmers. 95% of semi-medium and medium farmers also consider it as a major risk reporting its high incidence of occurrence. Further, 29% large farmers too realized high frequency of increase in input prices. On the contrary, very few farmers reported that output prices decreased over the last five years. Almost all the farm categories suggest lower frequency of decrease in output prices, but there was disproportionately a lower increase in the output prices as compared to increase in the input prices.

Occurrence of regular employment throughout the year was always an issue among landless, marginal & small

¹ Though health shocks affect individuals, the unit of analysis was 'household'. This is because decisions regarding medical expenditure and coping strategies are based on negotiation within the household and the burden of medical costs fall on the household budget (Khan 2010; Russell 2004)

Table 4. Incidence of occurrence of economic risks (% of households)

Household type	Incidence	Lack of financing/ capital	Lack of access to inputs	Increase in input prices	Decrease in output prices	Lack of demand or inability to sell agricultural products	Unemployment	Harvest failure
Landless	Low	19.05	4.76	9.52	90.48	66.67	66.67	-
	Medium	33.33	42.86	28.57	9.52	33.33	28.57	-
	High	47.62	52.38	61.90	-	-	-	-
Marginal + Small	Low	12.98	1.53	-	96.95	67.94	79.39	79.39
	Medium	7.63	30.53	9.92	3.05	17.56	21.37	18.32
Semi-medium + Medium	High	79.39	67.94	90.08	-	15.27	6.87	2.29
	Low	54.55	9.09	-	86.36	72.73	95.45	81.82
	Medium	4.55	31.82	4.55	13.64	27.27	4.55	18.18
Large	High	40.91	59.09	95.45	-	-	-	-
	Low	100.00	85.71	28.57	100.00	85.71	100.00	100.00
	Medium	-	14.29	42.86	-	14.29	-	-
	High	-	-	28.57	-	-	-	-

Source: Field survey.

farmers. It was found that these two farm categories moderately faced problem of unemployment in the last five years whereas, medium and large farmers had employment throughout the year as they perceived low incidence of the event. Failure to get expected production has its roots back to adverse environmental conditions. Surprisingly, around 80% of small and medium farmers realized it with lower frequency while for large farmers, harvest failure was not a big issue. Around 18% and 3% of marginal and small farmers mentioned about its medium and high frequency. Thus, high incidence of economic risk prevails among the poor farmers in comparison to the rich farmers.

3.3 Utilization of risk management strategies

After obtaining pertinent information on risk and households likely to be exposed to various risks, the next question is which strategies household opt to manage such risks. By taking utilization of a particular risk management strategy as binary dependent variable and household's socio-economic characters as independent variables, we run a logit regression. Out of total 200 farm households, usable information regarding risk management strategies was available from 181 farmers.

In all, four major risk reduction strategies were identified to reduce exposure. Table 5 presents the

behavior of utilization of various risk reduction strategies by households of different socio-economic status. The results indicate that, self-employment of rural farm households in agricultural enterprises, literacy of household head and female headed households have significant positive association with decision to produce less risky crops. The probability of adopting new technology for risk reduction increased with the size of land holding and was also higher among female headed households. The cultivator households adopted new technologies to reduce risk rather than changing the cropping pattern towards less risky crops. The ST/SC households had significantly lower chances of adopting new technology than non-SC/STs households suggesting that they have been having either poorer access due to their socially and economically disadvantaged situation.

The ownership of larger livestock herd and self-employment in agricultural enterprise prevented permanent migration of rural households to reduce risks faced by them. Households that were self-employed in non-agricultural enterprises had 44% higher probability of migrating permanently to other places for risk reduction. Similarly, addition of an animal in herd size reduces the probability of permanent migration by 5%, thus, reiterating the fact that the households engaged primarily in agriculture have fewer chances to migrate.

Table 5. Utilization of risk reduction and risk mitigation strategies

Utilization	Risk reduction strategies						Risk mitigation strategies					
	Production of less risky crops		Adoption of new technology		Permanent migration to other places		Personal Insurance		Investment in assets		Multiple jobs	
	Coefficient	ME	Coefficient	ME	Coefficient	ME	Coefficient	ME	Coefficient	ME	Coefficient	ME
OPRLHD	-0.02	0.00	0.32***	0.08	-0.07	-0.02	0.07	0.01	0.13*	0.02	-0.04	-0.01
HERD	0.03	0.01	0.10	0.02	-0.22**	-0.05	-0.02	-0.005	0.01	0.002	0.01	0.002
AGE	-0.01	-0.002	0.04	0.01	-0.01	-0.002	0.01	0.002	0.07***	0.01	0.01	0.002
GENDER	-1.05*	-0.24	-1.76**	-0.40	-0.60	-0.14	1.43*	0.22	0.88	0.13	-1.23**	-0.29
HHSZ	0.22	0.06	0.27	0.07	0.06	0.01	0.04	0.01	0.32	0.06	0.03	0.01
PCME	-0.00004	-0.00001	0.001	0.0001	0.0002	0.00004	0.001*	0.0002	0.002***	0.0003	-0.0002	0.0001
CASTE	-0.49	-0.12	-1.11**	-0.25	-0.08	-0.02	-0.42	-0.08	-0.03	-0.005	-0.52	-0.13
OCCUP1	-2.62**	-0.47	2.89***	0.54	1.88**	0.44	-0.53	-0.10	2.25**	0.51	0.79	0.19
OCCUP2	-0.74	-0.18	-0.58	-0.13	0.68	0.16	0.69	0.16	0.49	0.10	2.12***	0.44
OCCUP3	-0.80	-0.20	-1.14	-0.24	0.54	0.12	-0.77	-0.14	0.81	0.17	0.98*	0.24
EDU	0.77**	0.19	1.39	0.32	-0.33	-0.07	0.20	0.04	-0.65	-0.12	-0.65	-0.16
Constant	0.62		-6.37		1.27		-4.22		-8.85		1.24	
No. of observations						181						
LR chi ²	26.76		106.28		32.07		31.70		78.25		28.09	
Pseudo R ²	0.11***		0.43***		0.13***		0.13***		0.35***		0.12***	

***, **, * significant at 1, 5 and 10% level respectively.

ME = Marginal effects.

Source: Estimated by authors.

Table 6. Utilization of risk coping strategies

Utilization	Risk coping strategies											
	Selling of assets		Seasonal of temporary migration		Sending children to work		Borrowing from money lenders		Borrowing from formal sources			
	Coefficient	ME	Coefficient	ME	Coefficient	ME	Coefficient	ME	Coefficient	ME	Coefficient	ME
OPRLHD	-0.08*	-0.02	-0.03	-0.01	-0.18**	-0.04	0.02	0.00	0.14**	0.03		
HERD	-0.03	-0.01	-0.04	-0.01	-0.13	-0.03	-0.01	0.00	0.08	0.02		
AGE	-0.02	0.00	-0.01	0.00	-0.01	-0.002	0.05**	0.01	-0.06	0.02		
GENDER	-0.67	-0.16	-0.48	-0.12	-0.66	-0.15	0.08	0.02	-0.30	-0.07		
HHSZ	0.35**	0.08	0.13	0.03	0.03	0.01	-0.15	-0.04	-0.27	-0.06		
PCME	0.0004	0.0001	0.001***	0.0003	0.0003	0.0001	-0.001**	-0.0003	0.001**	0.0002		
CASTE	-0.57*	-0.13	0.03	0.01	0.03	0.01	0.23	0.06	-0.08	-0.02		
OCCUP1	0.99	0.24	1.14	0.28	0.79	0.19	-0.49	-0.12	-0.18	-0.04		
OCCUP2	0.21	0.05	-0.15	-0.03	0.04	0.01	1.64**	0.35	-1.31**	-0.26		
OCCUP3	0.16	0.04	1.13**	0.28	0.01	0.003	-0.57	-0.14	0.25	0.06		
EDU	0.82**	0.18	-0.32	-0.07	0.09	0.02	0.61	0.15	2.90***	0.58		
Constant	-0.66		-0.92		1.42		-1.08		-5.65			
No. of observations					181							
LR chi ²	22.99		16.09		34.95		32.27		62.94			
Pseudo R ²	0.23***		0.07*		0.13***		0.12***		0.25***			

***, **, * significant at 1, 5 and 10% level respectively.

ME = Marginal effects.

Source: Estimated by authors.

As expected, in case of use of personal insurance as risk reduction strategy, higher monthly consumption expenditure which is mostly taken as proxy for household income has positive association with personal insurance. The male headed households had 22% higher probability of taking personal insurance cover.

The risk mitigation strategies denote the *ex ante* actions to provide compensation in case of losses generated through risk. The two major mitigation strategies considered were investment in assets and multiple jobs (table 5). Variables like operational land holding, age of household head, monthly consumption expenditure and self-employment in non-agriculture have positive association towards investment in assets. Higher operational land holding generates additional income which can be invested in real assets. The same notion is applicable for higher monthly consumption expenditure, a proxy for income. Higher the income more is the scope for investment. With growing age of household, there is possibility of accumulated money which is sufficient balance to invest thus, showing positive association between them. Further, as compared to households self-employed in agriculture, self-employed in non-agriculture tend to invest more in asset indicating a constant flow of income with latter households irrespective of the prevailing risk events. Marginal effects for investment in assets show that 51% probability increases with self-employment status of household in non-agricultural enterprises against that of agricultural enterprises.

With respect to multiple jobs, it was observed that the dummy variables - salaried employees and agricultural and other labour household have positive association while male headed households have negative association with it. Cultivator households usually remain tied to their land rather than seeking multiple jobs. In case of female headed households, the males usually migrate and take up jobs while the females continue to work on the farm.

Risk coping strategies are *ex post* in nature and include responses that are taken after a risk has been realized. Table 6 shows five major risk coping strategies that have been identified and their utilization. Variables such as households' occupational status as agricultural & other labour and monthly consumption expenditure have positive association with the use of seasonal

temporary migration as risk coping strategy. Size of operational land holding and caste dummy have negative effect on the sale of asset as a coping mechanism. It implies that small landholders and hence poor resort more to sale of assets owned in order to cope up with risks. The asset base of SC/ST households is weaker than that of non-SC/ST and hence, this option is not frequently used by them.

The source of borrowings may be formal or informal depending upon the emergency and access. It is found that older household heads tend to borrow more from informal lenders, whereas household having large operational land holding, higher monthly per capita expenditure and better educational attainment preferred borrowings from formal sources i.e. banks, and co-operatives.

Thus, it is evident that utilization of risk management strategies (risk reduction, risk mitigation and risk coping) were conditioned by the socio-economic characteristics of households. There were varied risk responses to manage the adverse situations. In general, economically disadvantaged groups with smaller land holding sold assets, sent children to work, borrowed from informal sources while the socially disadvantaged groups use better management options like adoption of new technologies. This situation may force them to remain poor or vulnerable.

4 Conclusions

High incidence of environmental risks due to irregular rainfall and pest and disease outbreak before harvest of crops in both Marathwada and Vidarbha regions calls for research and development in new technologies to enhance the resilience of farmers. The incidence of economic risk prevails more among the landless, marginal and small farmers compared to farmers who owned large size land holdings. Inclusive policy should be adopted to reduce and mitigate the adverse influence of economic risks on marginal and small farmers. The findings further show large disparities among the households in using various risk management strategies. The risk reduction and coping strategies are linked to their socio-economic characteristics. We find that the socially and economically deprived households in general had lower utilization of various risk management strategies and remain vulnerable. It is important that policies that ensure social protection

should be designed and implemented considering equity parameter of the households. It further posits that the government should take up alternative savings or insurance-based schemes for rural households to reduce starvation, sale of assets and borrowings to manage the impact of sudden shocks. The government should promote development of credit market, safety nets and skill development for jobs and income earning activities. Finally, social protection policies should be targeted for selected households keeping in view their social and economic status and borrowing from formal or informal sources.

Acknowledgements

Authors acknowledge the Department of Science and Technology, Government of India and ICAR - NDRI for funding the research.

References

- Behere, P. B., & Behere, A. P. (2008). Farmers' suicide in Vidarbha region of Maharashtra state: a myth or reality? *Indian Journal of Psychiatry*, 50(2), 124–127.
- Dandekar, A., Narawade, S., Rathod, R., Ingle, R., Kulkarni, V., & Sateppa, Y. (2005). Causes of Farmer Suicides in Maharashtra: An Enquiry. Final Report Submitted to the Mumbai High Court, Tata Institute of Social Sciences, Rural Campus, Tuljapur.
- GOI (Government of India). 2011. Agricultural census 2010-11. New Delhi.
- GOI (Government of India). 2011. Situation Assessment Survey of Agricultural Households. National Sample Survey, Central Statistical Organisation, Ministry of Statistics and Programme Implementation, New Delhi.
- Kale, S., & Gond, J. (2016). Drought in Marathwada: water scarcity worsening situation in Marathwada. *International Journal of Innovative Research in Science, Engineering and Technology*, 5(5).
- Khan, F. U. (2010). Economic consequences of health shocks and coping strategies: Evidence from urban poor households in Bangladesh. Doctoral thesis. International Institute of Social Studies, The Hague, Netherlands.
- Khapre, S. (2016). Farmer suicides down 25% in parts of Vidarbha, Marathwada. *The Indian Express news letter*, May, 12.
- Krishna, A. (2007). Poverty and Health: Defeating poverty by going to the roots. Development, Palgrave Macmillan, Society for International Development, 50(2), 63-69.
- Kulkarni, A. P., & Deshpande, V. S. (2005). Agrarian Scenario in Yavatmal, Washim and Wardha Districts. Suicide of Farmers in Maharashtra Background Papers. Indira Gandhi Institute of Development Research, Mumbai.
- Milner, A., Page, A., Morrell, S., Hobbs, C., Carter, G., Dudley, M., Duflo, J., & Taylor, R. (2015). Social connections and suicidal behaviour in young Australian adults: Evidence from a case-control study of persons aged 18–34 years in NSW, Australia. *SSM -Population Health*, vol. 1, 1–7.
- Mishra, S. (2006). Farmers' Suicides in Maharashtra. *Economic and Political Weekly*, 41(16), 1538-1545.
- Mohanty, B. B. (2005). We are Like the Living Dead: Farmer Suicide in Maharashtra, Western India. *Journal of Peasant Studies*, 32 (2), 243-76.
- Murakami, E. (2017). Household consumption risk and coping strategies in Tajikistan: evidence from household surveys. Working paper No. 738, Asian Development Bank Institute, Manila, Philippines.
- Russell, S. (2004). The economic burden of illness for households in developing countries: a review of studies focusing on malaria, tuberculosis, and human immunodeficiency virus/acquired immunodeficiency syndrome. *American Journal of Tropical Medicine and Hygiene*, 71(2), 147-155.
- Shrivastav, K. S. (2015). Why Marathwada is becoming graveyard for farmers? Down to Earth online archive.
- Talule, D. (2013). Political economy of agricultural distress and farmers suicides in Maharashtra. *International Journal of Social Science & Interdisciplinary Research*, 2(2), 95-124.
- Thakare, R. M., & Thakare, K. R. (2016). Agriculture practices sustainability in Vidarbha. *IOSR Journal of Agriculture and Veterinary Science*, 9(7-1), 05-10.
- UN Millennium Project. (2005). Investing in Development: A Practical Plan to Achieve the Millennium Development Goals. New York.
- Vedeld, T., Aandahl, G., Barkved, L., Kelkar, U., Bruin, K., & Lanjekar, P. (2014). Drought in Jalna community-based adaptation to extreme climate events in Maharashtra. The Energy and Resources Institute (TERI) and Norwegian Institute for Urban and Regional Research (NIBR).