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Drudgery and Coping Strategies of Women Farmer to Droughts in Northeastern India

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Abstract

The occurrence of drought has been increasing over the years hence, making the farmers and farming more vulnerable. Indian Agriculture is highly dependent on the climate. Farmers are most concerned with the occurrence of drought when available water supplies are not able to meet crop water demands especially in a country like India, where 80 per cent of the farmers are small and marginal landholders. At household level, it is witnessed and observed that women folks are active participators and have vigorous contributions in agriculture and agricultural related activities, just like their men counterparts. When the whole farming household is affected due to drought, women tend to get affected of consequences. In North-eastern India, on an average farmer have small land holding (1.17 hectare) low productivity of 1.13 Mt ha⁻¹. The study revealed that most of the women spend extra time in agriculture related activities as well as at the household chores during the low rainfall or drought years. Most of this extra time is engaged in fetching drinking water. During drought, the women also reported that they have to work extra hours in their fields by almost 2.5 hours to perform agricultural operations. Time spent by women in preparing the land for cultivation also increased during drought since it is the women who help in cleaning the bunds, removing weed residues, etc. Therefore, the additional time spent to carry out this task minimizes the time available to engage in other income generating activities, making women more vulnerable.

Keywords

Drudgery, vulnerable, coping, strategy, NER

Introduction

Indian Agriculture is highly dependent on the climate; a favorable southwest summer monsoon is critical to securing water for irrigating crops. In parts of India, failure of the monsoons causes water shortages, resulting in below-average crop yields. Droughts has a long history and pose remarkable challenges on the socio-economic aspects of a large population in the country and has lasting impacts on water resources, agriculture, gross domestic product, and rural livelihood (Bhalme and Mooley, 1980, Mishra and Singh, 2010, Mooley and Parthasarathy, 1983). The country has history of droughts causing famines resulting in millions of deaths (Mishra et al., 2019). The recent drought of 2015 affected crop production and water availability in the Indo-Gangetic Plain and Maharashtra region (Mishra et al., 2016). Around 330 million people in ten states were affected by the 2015–2016 drought (UNICEF, 2016). Furthermore, the 2015–16 drought caused a significant depletion in groundwater in the Indo-Gangetic Plain and southern states of India (UNICEF, 2016). The occurrence of drought has been increasing over the years (IPCC, 2007); hence, making the farmers and farming more vulnerable. Farmers are most concerned with the occurrence of drought when available water supplies are not able to meet crop water demands especially in a country like ours where 80 per cent of the farmers were small

and marginal landholders. The *Kharif* production declines significantly, if the rainfall is lower between June to September (Webster *et al.*, 1998; Selvaraju, 2003; Kumar *et al.*, 2004). Cereal growers are affected the most due to the occurrence of drought; thus leads to food insecurities and greatly affect the vulnerable group of people *i.e.*, the poor. It has been also observed that at farm level, in India during bad monsoon days the price of food grains increase by 10 per cent and income became unstable (Mooley *et al.*, 1981). Thus, the impact of climate change and its consequences are not confined to food production only but also likely to affect the food system including availability of food, access to food, utilization of food and stability of food *etc.* (Joshi, 2015) which overall affects the farm families.

At household level, it is witnessed and observed that women folks are active participators and have vigorous contributions in agriculture and agricultural related activities, just like their men counterparts. Observably, the females apart from household chores also earn their livelihood that adds to the income of the family. In their rice fields and in the whole process of rice production, they do take active role and are responsible for seedling, nursing, harvesting, rice storing, seed preservation, straw drying, weeding, thinning, cleaning, boiling of grain, threshing, drying, husking *etc.*, (Rahman *et al.*, 2016) which are manual in nature. When any natural calamity which are unwanted happen resulting in the decrease household food supply and a little or no crop surplus for sale, the male migration increases embedding an extra work load on the women in their own villages. Drought depletes pastures and reduce livestock counts thus left the women folks in tilling the fields by hand to feed the livestock (Tichagwa, 1994).

The North-Eastern Region (NER) of India, comprising the states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura, lies between 21.5° N to 29.5° N latitude and 85.5° E to 97.5° E longitude. It has a total cropped area of 5.3 million hectares and a population of around 39 million. Majority of the population, predominantly tribal, is dependent on agriculture and land-based activities. Meghalaya is predominantly an agrarian state. Nearly two-thirds of the total workforce in Meghalaya is engaged in agriculture and allied activities and it is rainfed in nature (GoM, 2017). The state however is matrilineal in nature where, the women handle the title and ancestral properties. The women take decisions along with their male counterparts in relation to the household and farm activities except societal participation where the males hold the highest spree. They acquired to accomplish the work both at home and in their fields. This dual work causes fatigue and drudgery among the tribal women (Singh *et al.*, 2012). When it comes to preserving indigenous seeds and traditional practices it is observed that women are repositories of both seeds and indigenous knowledge systems. Thus, unlike other societies, the woman has the same role and has a share in the process of chores and farms too. So, when there is a change in the climate, irrelevant monsoon *etc.*, or other hurdles, that would hamper the whole system. Also, when the whole farming household is affected due to drought, women tend to get affected of consequences. Severe drought episodes had a dire impact on the socio-economic sector and the environment and leading to massive famines and migration, natural resource degradation, and weak economic performance (IPCC, 2018). Drought also exacerbates social tensions and fuel up civil unrest. The males may migrate to nearby villages for labour and wage, whereas, the women had to look after their families and perform other livelihood activities. Therefore, a survey was conducted to understand and document the drudgery of women farmers in changing climatic condition especially drought and how they are coping to these changes.

Material and Method

Sampling Regions

Meghalaya, one of the hilly regions among the North- Eastern states has a total geographical area of 22,429 sq.km, population of 23 lakh with a density of 103 persons per square km. The state is hilly stripped situated in the NER part of India and located about 300 km long (east to west) and 100 km wide. It is located between 24°45' and 26°15' North latitudes and 89°45' and 93° East longitudes. More than 80 per cent of the inhabitants earn their livelihood from agriculture, directly or indirectly whereby, two thirds of its total work force is engaged in agriculture and allied sectors (GoM, 2018). For the current survey West Garo hills district with its headquarter at Tura was selected purposively as it is highly drought vulnerable region (Venkateswarlu *et al.*, 2012). The district located at the western part of Meghalaya (Fig. 1). The district experiences a fairly high temperature, as its altitude is relatively low. The district covers an area of 3714 sq.km with a population of 515,813 (Census, 2011). The major crop in the district is rice and covers an area of 30621 hectare and a total production of 103,515 MT, which is the highest in the state (GoM, 2018). The other agricultural and horticultural crops cultivated are maize, cotton, pineapple, arecanut, cashewnut, citrus, tapioca and potato. Among the 6 blocks located in West Garo Hills district namely Rongram, Dadenggre, Dalu, Salsella, Tikrikilla and Gambegre

districts, the first two mentioned *i.e.*, Rongram and Dadenggre were selected for the study. The total population at Rongram and Dadenggre were 58,745 and 41,595, respectively. The women population was reported to be 28,943 and 20,753 at the selected blocks, respectively. The literacy rate of women across each blocks were 75 and 58 per cent respectively (Census, 2011). Asanang and Didanggre village were selected for the study and from each village, 25 female rice farmers were selected randomly and personal interview was done.

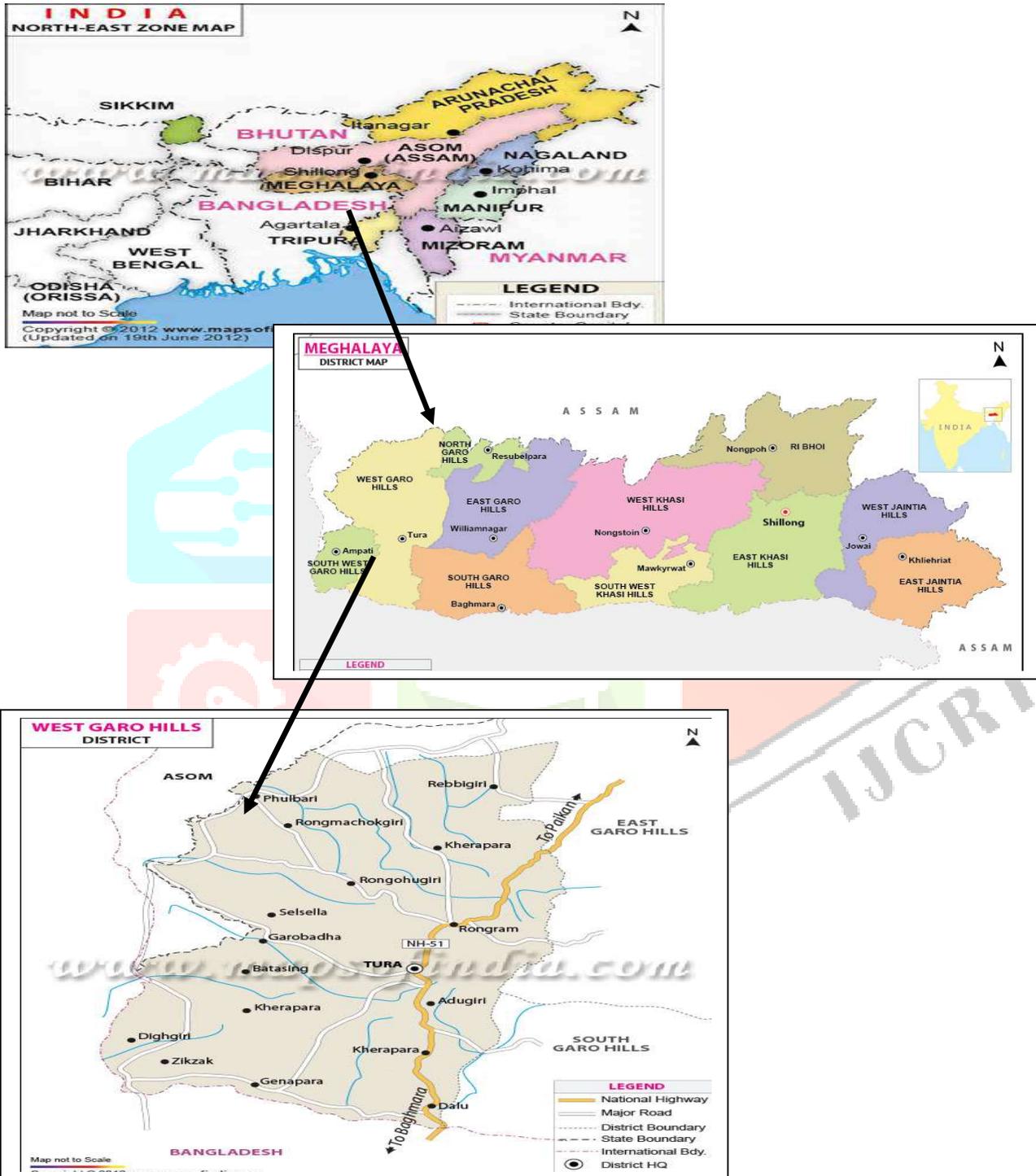


Figure 1: Sampling region map including Northeast, Meghalaya and West Garo Hills district

Data Collection

For the current study primary and secondary data was collected and collated to understand the drudgery and coping strategies by the women farmers in the region. Structured surveys of households were conducted to collect the primary data. The structured questionnaires of the survey mainly focused on rice-based women farmers. The questionnaires included general information about the households, their assets, cropping pattern, change in crop area, yield of rice, water and fuel availability, farming experience *etc.* The published literature from the Government sources and other reliable sources was collated to compile the secondary data on area, production and yield of rice *etc.*

Data Analytics

Drudgery of women during drought

A total of 50 women rice farmers were interviewed on their daily chores and encounters at households level like average food availability per household during drought, fuel availability situation, extra hours to fetch water, extra hours of works in the field and the distance from market. These variables were considered as the main expectations to induce drudgery among women. Tabular analysis was done for logical analysis of the data (Marwah *et al.* 2020).

Binary logit model: Coping Strategies to drought

Binary logit model was used to estimate the factors that determine coping and adaptation to drought among women folks in Garo Hills Meghalaya. It is a probability model where the independent variable was dummy for undertaking any adaptation strategy (Y_i has two possible values, 1 and 0, for adopters and non-adopters, respectively). It has been used to identify the factors determining farmer's decision to adapt to the changing climate. Same has been used by Abid *et al.*, (2015) Laitonjam (2019) for analyzing the decision for adaptation to climate change.

$$Y_i = \alpha X_i + \varepsilon_i$$

It was assumed that probability of coping any adaptation strategy ($Y_i=1$) depends on independent variables (X_i), unknown parameter (α) and stochastic term (ε_i) (Gujarati *et al.*, 2012). The probability of observing farmer to undertake any adaptation strategy is a function of age, farming experience, educational status, and household dependency ratio, extension contact, migration, and farmer to farmer contact, access to climatic information, irrigation and employment generation schemes.

Assuming the cumulative distribution of ε_i is logistic, the probability that a farmer adapt to climate change was estimated using the logistic probability model (Woodridge, 2001).

$$P(Y = \frac{1}{X}) = \hat{\alpha}^{X'} = \frac{e^{X'\alpha}}{1 + e^{X'\alpha}}$$

Where, $\hat{\alpha}$ = logistic cumulative distribution function

The model indicates diminishing marginal effects for the independent variables and the sign of coefficients indicates marginal effect of each of the independent variables on the probability of farmers undertaking any adoption strategy to climate change. The log likelihood function for probability is

$$\ln L = \sum_{i=1}^N li \ln [\hat{\alpha}(X_i'\alpha)] + (1 - li) \ln [1 - \hat{\alpha}(X_i'\alpha)]$$

Where 'li' indicated dummy indicator (0 and 1, for adopters and non-adopters respectively). The estimators of maximum likelihood parameters were obtained through maximization of the log likelihood function stated above. .

Independent or exogenous variables uses in the model

Age and farming experience are interrelated to each other, the more the age the more will be the farming experience. Other researchers also reported that age and rate of coping through improved technologies have positive relationship (Kebede *et al.*, 1990). It was assumed that educational status/level and access use of technology or information are directly linked to higher productivity (Norris and Batie, 1987). Age also has been reported to have a positive influence on the adaptation of the farmers to climate change (Maddison 2007, and Deressa *et al.*, 2008). Dependency ratio indicates the age-population ratio of persons in a household who are not in the labour force, the more the dependency ratio, indicate that the family have more non labour farmer force thus adaptation strategy was accounted to have a negative relationship

(Laitonjam, 2019). The other variables like extension contact, farmer to farmer contact, irrigation and employment generation schemes are assumed to have a positive relationship to the adaptation strategies of the farmers (Marwah et al 2020).

Results and Discussion

General characteristics of the women farmers in study region

The average age of the respondents in the district was 52.2 years and most of them completed middle school and secondary school (Table 2). About 24 per cent of the respondents were literate without any formal schooling. They earned their education through personal interactions with their educated children and neighborhood. On an average, the household consists of 5 family members. The respondents reported that their primary occupation is mainly farming wherein rice is the main crop. It has been encountered that most of the respondents (46 per cent) own *kaccha* houses and 38 per cent of them own semi-pucca houses whereas 16 per cent of them own *pucca* houses.

Table 2. Basic information of the respondents

Particulars		Unit of measurement		
Average age in years		Years	52.2	
Educational qualification	Illiterate	Percentage		
	Literate without formal schooling			24
	Literate but below primary			4
	Primary			6
	Middle			18
	Secondary			16
	Higher and secondary			24
	Graduate	6		
Family size		Numbers	5	
Primary Occupation			100	
5. Household Structure	<i>a</i> ¹	Percentage	46	
	<i>b</i> ²		16	
	<i>c</i> ^{pucca}		38	

Among the respondents, the average rice area was 1.17 hectare with an average productivity of 1.13 Mt ha⁻¹ (Figure 2).

Most of the varieties grown in the region were local including *Miongma*, *Ranjit*, *Bahadur*, whereas in Rongram block, local cultivated varieties were *mibelat*, *mimagisi*, and *Ranga kishor*.

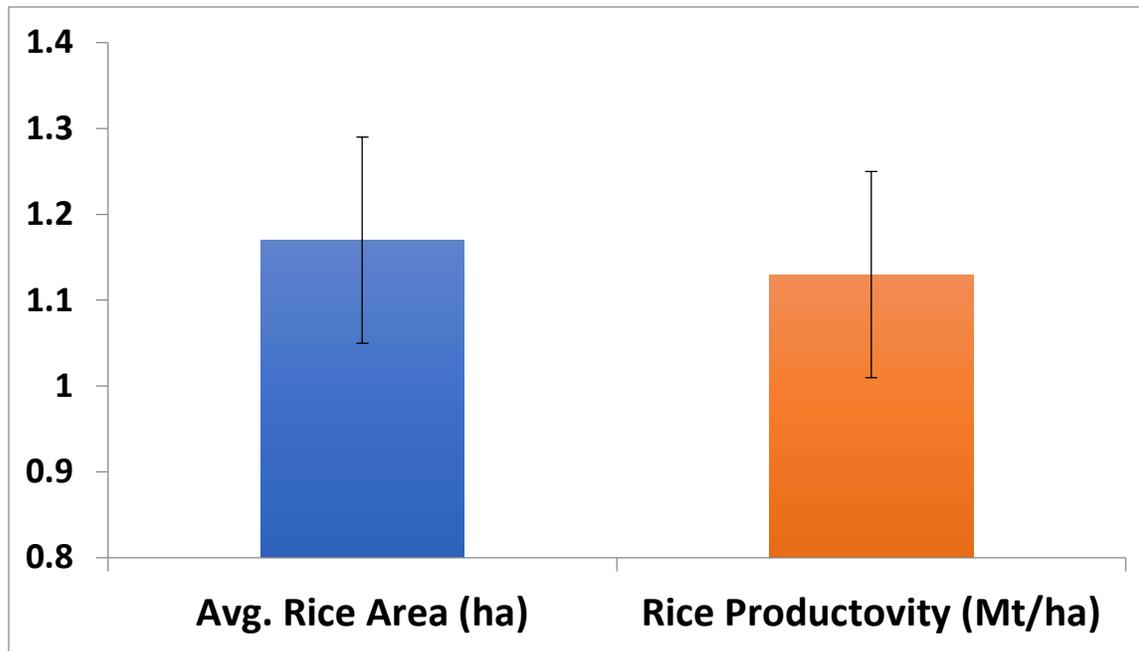


Figure 2: Average rice sown area and productivity in the districts sampled

The sample survey revealed that the average income was Rs. 26191.67 annually and they owned own livestock like cattle, poultry and pigs etc. On an average, livestock contributed Rs. 22075.04 to the farmer's annual income (Figure 3). On an average, a household earned a total annual income of Rs.125292 annually from different on-farm and off-farm sources. (Singh *et al.* 2013) conducted their study in Meghalaya and reported during drought; farmers tend to sell livestock not only for income but also due to the scarcity of green fodder. The husbands are the sole decision makers when it comes to selling female buffaloes and ducks. For other livestock, husband and wife make decisions jointly. However, wives dominate in decision making related to marketing of goats, pigs and chickens during drought years. The women's access to and control over livestock made them less vulnerable to the negative consequences of drought and, to a small degree, helps families to survive in bad years.

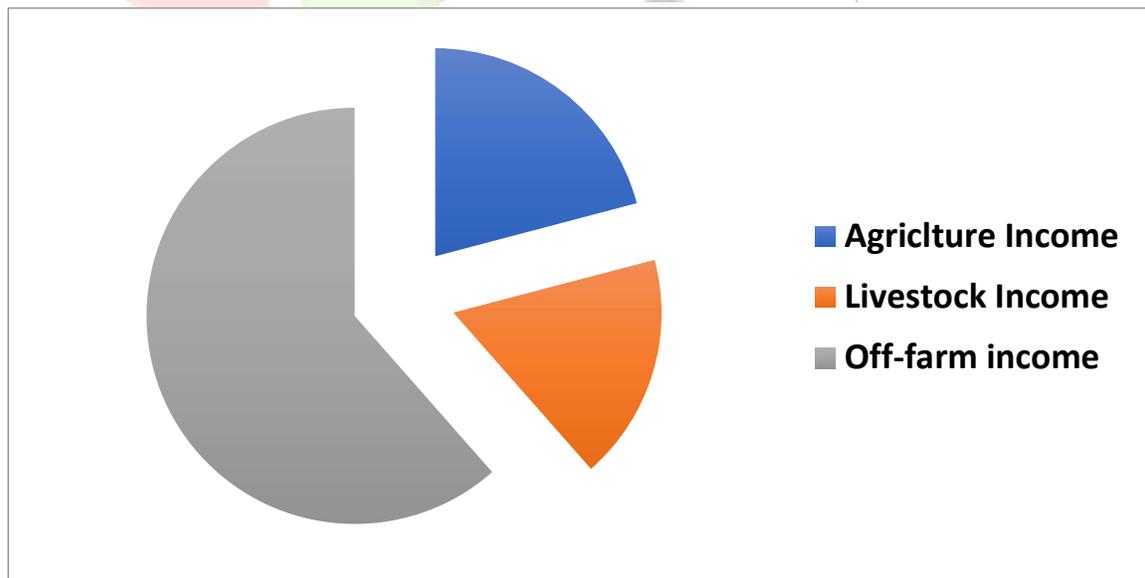


Figure 3 : Annual household income sources in the sampled region

Drought Frequency in the Region

UNICEF (2016) in their study in India reported that drought has affected more than 330 million people in more than 2.5 lakh villages of 266 districts from 11 states. The sample survey revealed that year 2012 was the most affected drought year in the recent past. Nongbri *et al.*, (2016) also reported that there was a severe drought during 2012 in Nagaland. It has affected people's lives particularly women and children as it has affected the water availability, agriculture, food production and food security. Women and children have been mostly affected as the water, fuel and food has to be procured by them. They have to walk farther and spend more of their regular timings. Girls dropped out schools to ensure helps to their mothers. This has a continuing poverty and inequity coupled with health problems and loaded works to them. In 2012, there was much problem in the rice-farming system of the region. Farmers with irrigation facilities were able to have a harvest from their fields. The sample area people agreed that drought and rainfall significantly reduced their rice produce but they were not much aware of the changing climatic scenarios.

Drudgery of women during drought

The data analysis revealed that in rice cultivation most of the operations are conducted by women in addition to the household chores conducted by them on daily basis. Crow and McPike (2009) concluded that during drought in the slim areas, the women lives and livelihood are shaped by inadequate access to water and it was common for them to queue for long periods and compete with numerous others from dawn. This limits the employment opportunities they can undertake and imposes a whole range of disadvantage to their households. Das and Lahiri (2013) also reported that more than eighty per cent of the rural women engaged in different agricultural, animal husbandry and other allied activities. In terms of rice availability for family consumption it was reported that during drought years, there was a deficit in rice for the households during that particular year. The households could hardly make up-to 9 months of rice self-sufficiency due to drought. This resulted in extra burden to the households by making up the deficit through market accessibility by undergone wage works and by borrowing from their neighbors.

Coping Strategy to Drought by Women

The study revealed that most of the women spend extra time in agriculture related activities as well as at the household chores during the low rainfall or drought years. Most of this extra time is engaged in fetching drinking water. As per data analysis it revealed that this extra time for fetching water varies from 1 to 2 hours on daily basis. Singh *et al.* (2013) in their study in Meghalaya reported that women suffer considerable fatigue and drudgery and the physical strain on women in Garo Hills is very high, causing various health problems. More female respondents in comparison to men felt that health is adversely affected during droughts when rivers and streams dry up and water becomes a rare commodity for households. Women spend most of their time in water collection, as they have to travel 4–5 km to get water. Surprisingly, a slightly higher proportion of men expressed concern over the lower availability of water for drinking and household purposes during severe drought and the decrease in fuel wood, while women were more concerned with the low availability of irrigation water.

Those problems have been mostly felt during the month of February to July- August. During drought, the women also reported that they have to work extra hours in their fields by almost 2.5 hours to perform agricultural operations. Singh *et al.* (2013) also reported that women contribute significantly in almost all rice-growing operations. In rice cultivation, the time spent on various activities increased for both men and women in erratic climatic conditions. It has also been reported that the time spent on land and seed bed preparation, weeding, drying and seed selection for the next cropping season had increased. But the time spent on harvesting and threshing of rice decreased during drought due to lesser production than in the normal year. The increase in time spent on weeding was higher for female respondents than for males as it was mainly a female chore. Time spent by women in preparing the land for cultivation also increased during drought since it is the women who help in cleaning the bunds, removing weed residues, etc. Therefore, the additional time spent to carry out this task minimizes the time available to engage in other income generating activities, making women more vulnerable. Water scarcity has also huge consequences on women's health and hygiene. First, the distance and the physical effort of carrying a bucket of water on their head create joint and back pain, feet or posture problems. The study also suggests that women are more worried of food insecurity than men, as they are the primary caretaker of children and the entire family. Along with the stress created by the burden of fetching water to ensure water security for the household, drought can have major psychosocial impacts on women. Second, bathing and taking care of personal hygiene becomes difficult due to the scarcity of water.

Conclusion

In parts of India, failure of the monsoons causes water shortages, resulting in below-average crop yields. Droughts has a long history and pose remarkable challenges on the socio-economic aspects of a large population in the country and has lasting impacts on water resources, agriculture, gross domestic product, and rural livelihood. The study revealed that in rice cultivation, most of the operations are conducted by women in addition to the household chores. During drought years, the households could hardly make up-to 9 months of rice self-sufficiency resulting in extra burden to the households by making up the deficit through market accessibility by undergone wage works and by borrowing from their neighbors. The study revealed that most of the women spend extra time in agriculture related activities as well as at the household chores during the low rainfall or drought years. Most of this extra time is engaged in fetching drinking water. Time spent by women in preparing the land for cultivation also increased during drought since it is the women who help in cleaning the bunds, removing weed residues, etc. Therefore, the additional time spent to carry out this task minimizes the time available to engage in other income generating activities, making women more vulnerable. The study also suggests that women are more worried of food insecurity than men, as they are the primary caretaker of children and the entire family.

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