

**Economic Vulnerability of Women in
Rural Agriculture Sector:
Evidence from India's National
Sample Survey 2013**

Amrita Ghatak



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Abstract

Keeping the evidences of feminization in agriculture in mind, this paper explores the economic vulnerability among women in Indian rural agriculture sector. The two main objectives addressed in this paper are to: a) ascertain the economic vulnerability (EV henceforth) of women in agriculture with special focus on women-headed households in India; and b) link such vulnerability to the institutional factors such as minimum support prices, type of procurement agency, self-reported perception about agrarian market and usefulness of extension services in rural areas of India.

Using NSS unit level data collected in 2013, the paper shows that the women cultivators are more economically vulnerable compared to men and those who are member of male-headed households. The findings indicate toward probable feminization of distress or poverty in India's rural farm sector. It is important to note that female cultivators, when they are also head of the households responsible for making decisions, are able to ensure substantially high per-capita profit from farming even with smaller size of cultivable land in their possession compared to male cultivators. As expected, in this paper, women agricultural workers are found to be less-paid and engaged more in domestic duties including unpaid family works. The economic vulnerability is found to be in line with the effectiveness of institutional factors and satisfaction about agricultural institutions among the farmers. Despite having limited awareness about minimum support prices, the satisfaction with market and extension services is found to be more or less high. Evidently, cultivators, particularly female, are found to hardly depend on any government procurement agency.

Keywords : Women, Agriculture, Well-being, Economic Vulnerability, Agricultural workers, Cultivators

JEL Codes : D63, E24, I31, I32, J70

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Amrita Ghatak

1. Introduction

Despite women's active participation in the farm sector they have largely remained absent on official records as 'farmers', owing to the norms, cultural practices, command and control over resources such as land, water as well as access to skill-training, education and institutional credit. It is important to note that in a scenario when men prefer to opt out of the agriculture, increasing burden of farming activities on women, particularly with limited ownership, decision-making role and access to resources seem to make them more vulnerable than they used to be in past. While the absence of male family members may mean inflow or no-flow of remittances seasonally or permanently, it also seems to provide new opportunities for women in various farming activities including participation in commercial farming or farming of export oriented crop as contract farmers or wage employees (World Bank, 2016); but some studies suggest that the engagement of women in farming in absence of the male members seemed to be the coping strategy of households to deal with the economic or financial risks (Gartaula, et.al., 2010; Nazneen, et. al., 2011). The present trend of men opting out of rural farming activities therefore implies that the feminized agriculture may be an outcome of 'poverty-push' or 'demand-pull' factors (Garikipati, 2006) reinforcing the agrarian distress (Pattnaik, et. al, 2018). The risks of adverse effects of climate change, poor access to water, institutional credits and technology, storage facilities, ineffective minimum support prices and access to market further complicate the status of women in agriculture further. Given this context, this paper explores the status of economic vulnerability among women in Indian rural farm sector.

Although there are several studies, discussed the well-being of women in agriculture, they are undertaken mainly using data collected from a specific region with small sample size. Studies on economic vulnerability of women

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in rural farm sector using large sample data covering all States and UTs are scant in literature. There is also a dearth in understanding the economic vulnerability between women agricultural workers who head the households in comparison with those who are member of male-headed households. This paper makes an attempt to: a) ascertain of economic vulnerability (EV) of women in agriculture with special focus on women-headed households in India; and b) identifying the institutional factors such as awareness about minimum support prices, satisfaction in selling the produce to the market and usefulness of extension services in rural areas of India. Having recognized various alleyways through which economic vulnerability (EV) operates among women in the agriculture sector, this paper makes attempt mainly to identify the varying intensity of EV among various groups of women. Further, it develops an index of institutional factors in order to explore the links between EV of women and institutional environment in the context of rural farm sector.

The next section 2 briefly discusses the brief review of literature on the work-participation, wages, land rights and access to resources of women in rural areas in developing countries, followed by section 3 that discusses the conceptual context useful for the empirical analysis in this paper. Section 4 explains the methodology, followed by the description of data in section 5. The section 6 explores the status of women as indicated by their participation in agriculture, wages, land-holding size, access to institutional credit, awareness of agricultural institutions, so on and so forth as evident from National Sample Survey (NSS henceforth, 2013) unit level data on situation assessment survey of agricultural households in rural areas of India. The EV of women in rural agriculture sector in India and its linkages with the selected institutional factors are analyzed in section 7. The last section 8 sums up the paper to indicate the way forward.

2. Brief review of literature

There is a plethora of studies available on the well-being of women in agriculture and its links with developmental factors such as education, health, employment, and institutional factors such as agricultural extension programmes, agricultural produce market, Minimum Support Price (MSP), so on and so forth. Although this paper would not differ much from many of the earlier studies in indicating the status of women in agriculture in India, it takes a slightly different approach in conceptualizing the vulnerability

using the available large sample data provided by National Sample Survey in 2013 focusing on the situation of agricultural households in India. In that sense, having not confined to a specific region based on the primary data, it narrates the status of economic vulnerability of women in India using the large sample NSS (2013) data.

Various studies have found that gender inequalities affect rural and agricultural development in less developed countries (Agarwal, 2003; Lastarria-Cornhiel, 2003; 2008; Kelkar, Nathan and Walter, 2003). Since there are major differences in employment patterns within rural agricultural labour market driven by various factors such as child rearing and domestic responsibilities women take part mainly in part-time or informal arrangements that attract less remuneration and limited benefits, but provide more flexibility in working hours. Women in India are often found to be engaged in both household works and manual works in cultivation and processing (Chakravathy, 1977). The invisibility of women's work is part of a cultural system, in which men are considered to be primary bread earners. The cultural biases are also evident in official records including Census, due to (a) respondent bias and (b) conceptual bias (Agarwal, 1985a; Sen, 1993) While the respondent bias is mainly due to the fact that the enumerator and the respondent are usually male and the questions asked are also not gender sensitive, the conceptual biases are due to the fact that household-works, unlike wage-work and works in field, performed by women are not considered to be economic contribution (Agarwal, 1985b; Sen, 1993).

Some studies therefore use time-use approach to estimate women's work. Although time-use studies are often not nationally representative, they are useful in understanding the patterns and burden of tasks undertaken by men and women in rural areas (Shah, et.al, 2007). For instance, the time contribution of women in agriculture ranges from 32 percent in India to over 50 percent in China as reported by FAO in 2011. In line with countries such as Cameroon and China, India has also exhibited substantial variation in women's participation in agriculture from region to region. For instance, women's share of total time-use in agriculture ranges from 10 percent in West Bengal to over 40 percent in Rajasthan whereas the national average hovers around 32 percent (Singh and Sengupta, 2009). The time-use studies are also useful in providing the in-depth insights about female time-use in agricultural activities that varies depending on the type of crop, production cycle, age, ethnic/caste group, type of activities, location, management structure and technology (Jain, 1996; Thompson and Sanabria, 2010).

Previous studies (Duflo and Udry, 2001; Doss, 2010) indicate that despite having difficulties in quantifying the accuracy of women's contribution to agricultural production in the developing countries a direct comparison between male and female-headed households is possible even when female-headed households generally possess smaller farms and purchase fewer inputs. Needless to mention that women's contribution to agriculture is difficult to quantify owing to the methodological challenges in defining and measuring resources and agricultural production. Since the quantitative understanding of resources and production depends on the gender of the person who controls them, with limited command and control over resources women's contribution is ambiguous (often under-estimated) and lacking analytical rigor (Doss, 2010). Moreover, female-headed households are likely to represent those having lost their husbands, and with much limited scopes for making decisions.

Other than agricultural activities women are significantly heavily engaged in keeping livestock, as well. Around two-third of livestock keepers including poultry and dairy animals are found to be women (Thornton et.al. 2002; Kitalyi, 1998; Tung, 2005; Tangka, Jabbar and Shapiro, 2000). Although female-headed households tend to take care of smaller number of animals, they are found to be more successful in generating incomes from their animals compared to the male-headed households. Ownership of livestock is more dominant characteristic among women particularly in the societies that allow men to enjoy privilege in access to land over women (Bravo-Baumann, 2000). Some studies in India indicate that in absence of ownership rights on livestock cooperative model of production helps in women's well-being since they play critical role in care and management of livestock (Ramdas, 2005; Ramdas and Ashalata, 2007).

¹ Rural Income Generating Activities

Rural households in the developing world are involved in a variety of economic activities, as part of complex livelihood strategies. Agriculture, while remaining important, is not the sole nor, in some cases, necessarily the principal activity of the poor.

<http://www.fao.org/economic/riga/rural-income-generating-activities/en/>

The Wage Gap

The Rural Income Generating Activity i.e, RIGA¹ individual wage employment data set (RIGA-L) (which was collected from 14 developing countries within a period between 1995 and 2005), has clearly exhibited the gender differences in full-time and part-time wage employment. The wage gaps in rural labour market is substantial (Hertz et al., 2009), owing to significant discrimination against women labourers in agriculture (CSO, 2018). Some studies (Wang and Cai, 2006; MacPhail and Dong, 2007; Hirway, 2006) have shown that the major reason of the wage differentials between men and women in China and India is attributed to discrimination rather than other factors such as education, skill and capital differences. The wage-gap is evident in rural non-agricultural activities, too (Hertz et. al., 2009).

Wage-gaps are mainly due to contractual agreements that differ for men and women and a system of paying women lower wages for the same work. Inequality in wages are explained not only by the asset endowment including level of education, age, years of experience, so on and so forth; but also, to a large extent by discrimination against women workers, particularly in fast developing Asian countries like China and India (Hertz et. al., 2009; Wang and Cai, 2006; MacPhail and Dong, 2006; Hirway, 2006). Female agricultural wages are found to be close to the minimum subsistence wages, which cannot be reduced further and therefore remain at the bottom of rural wage hierarchy (Chatterji, 1984). Even with the adoption of new technology the female wages are not improved.

It is important to note that, while, wage-gap in agriculture has not reduced much in India, it has reduced substantially in Bangladesh during the period from 1984-85 to 2000. The improvement in female agricultural wages is explained by policy initiatives for promoting micro-finance institutions and the migration of over a million women to work in the urban garment industry (Kelkar, 2009). Although women are often found to hand their wages over to their husbands (Saradamoni, 1987) even with long working hours and lower wages employment adds value to their identity (Kelkar, 2009).

Access to Resources

Access to and command over resources, particularly land and institutional credit, has always been a concern for women in developing countries, due to social norm, cultural practices that stand against women along with their elimination and discrimination under law. For instance, in Latin America daughters are much less likely to inherit land compared to sons. The allocation of land, in terms of both quantity and quality, favours men over women in Sub-Saharan Africa. Although many countries in the developing regions have undertaken legal reforms strengthening women's, particularly married women's land rights, FAO (2011) has indicted that the land-titling efforts do not ensure the inclusion of both husband' and wives' names. The male-headed households are observed to possess larger cultivable land holdings compared to female-headed households in all developing countries. However, the inequality in access to land is much severe in Latin America, Africa and South Asia (Deere and Leün, 2003; FAO, 1997, 2011).

Denial of women's right to various productive resources is also evident in their struggle in accessing institutional credit, training and extension facilities. Lack of command over resources develops not only a sense of lack of protection or intensified insecurity among women but it also reduces their bargaining power in other economic aspects including increasing reservation wages (Kelkar, 2009), gaining equal opportunities in accessing institutional credit, farming equipment, technology and land ownership (FAO, 2011). It is estimated that women farmers are able to increase the yield by 30 percent per household if they are entitled to have equal access to land ownership, institutional credit, farming equipment and new technologies (FAO, 2011). Let us recognize that devoid of ownership or even the use-rights to land women are less likely to be able to access institutional credit (Lahoti, et al, 2016) and invest in land or farming despite being necessarily skilled and trained (Kelkar, 2009). Therefore, the issue of farmers' productivity is further complicated and farming seems to be more challenging for women-headed households. While some studies have observed women-headed agricultural households to produce lower yields (Quisumbing, 1995; World Bank, 2009), women have been found to be with equal or greater productive capacity as that of men in several other studies (Rozelle, et.al., 2006; Krishi Vigyan Kendra, 2003-04).

3. Conceptual context

The previous studies indicate that access to resources such as land and institutional credit, education or knowledge about farming through formal and informal channels, access to market through procurement systems and awareness of minimum support price (MSP henceforth) along with wages determine the economic status of women in rural agricultural sector in developing countries like India. Irrespective of their economic contribution and social status, as discussed in Article 25 of the United Nations' Universal Declaration of Human Rights on 10 December 1948 (General Assembly resolution 217 A) women's right to well-being includes their right to security in various unfortunate events, which reinforces the concern for right to equal wages and access to productive resource such as land particularly in the context of rural farm sector.

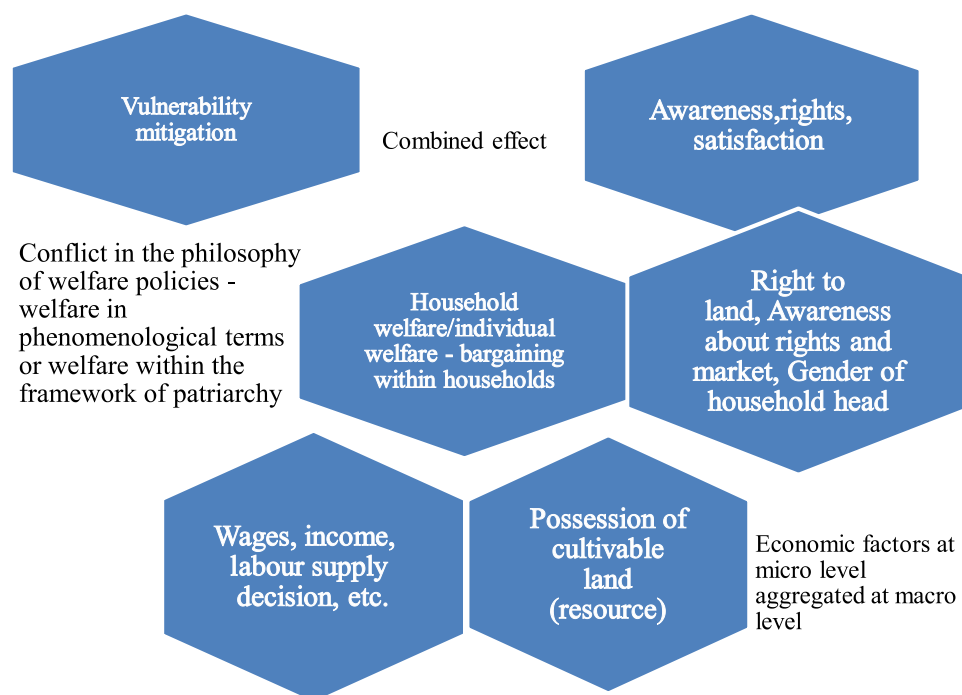
Osberg (2010)'s idea of economic vulnerability is followed in this paper to address the concern of security that helps women face future uncertainty and economic risks. Contrary to the concepts of well-being vulnerability discourse, typically concerns only those individuals with a risk of poverty or destitution (Osberg, 2010). In a developing economy like India this is understood as a risk *of poverty* and not as a hazard that is faced by all. Poverty and destitution are usually measured by individual's total expenditure or consumption, aggregated across commodities. Although freedom from vulnerability is not interpreted as a basic human right, there is considerable discussion of the loss in utility produced by uninsured (and possibly uninsurable) risks (Osberg, 2010). Although vulnerability and well-being are mental states they depend heavily on economic factors. Vulnerability stemming from the risk of future adverse outcomes and the anxieties which that risk now produces are important for both as predictive of personal and social behaviour and as a part of the measurement of well-being.

One of the key factors that influence the status of women in agriculture during recent years is education. Improvement in education is often reflected in awareness, changing norms and socio-economic aspirations. The awareness of various agricultural policies, schemes and programmes combined with satisfaction regarding yield procurement process and market are linked with the economic gains of farmers. In addition to formal education, the experience gained over time and knowledge inherited over the generation help older women to be more aware and active participants in the rural

farming, whereas reproductive and domestic responsibilities often restrict younger women from taking part in active economic activities in rural areas (Pattnaik and Lahiri-Dutt, 2018). Education, training and knowledge about technologies of women farmers are often found to be socially and economically rewarding (Kelkar, 2009).

Figure 1 exhibits the linkages between economic and institutional factors that play at individual and policy levels and have impact on mitigation of economic vulnerability of women in the present context. The wages/income and participation in labour force operate directly at the household or individual (micro) level. The aggregated outcomes of wages and labour supply behavior combined with the institutional arrangements and environments as indicated by possession of cultivable land, awareness of labour and farmers' rights and access to market lead to mitigating the magnitude and intensity of economic vulnerabilities among women farmers and agricultural labourers in India.

Figure 1: Conceptual framework: Vulnerability mitigation of women engaged in agricultural practices



4. Methodology

Using data on wages, profit from farming and burden of loan an index of economic vulnerability (EV henceforth) has been created. In order to understand the impacts of various factors on EV a non-parametric quantile regression model is followed, particularly with the aim of understanding the impacts of various factors at each decile of the EV. Thus, it helps in identifying the roles of various explanatory variables in determining the extents of vulnerability of women farmers without having restricted the variables by any assumption.

While one may question the ‘a theoretical’ character of nonparametric regression, as it does not specify the form of the regression function $f(x_1, x_2)$, one can also argue that the non-specificity of the form of regression function in social sciences leads to possibilities of exploring reality more accurately, as theories in social sciences are often able to tell that y depends on x_1 and x_2 , but they are unlikely to confirm if the relationship is linear. The paper derives the model from unrestricted nonparametric multiple regression as the conditional average value of y as a general, smooth function of several x 's, $E(y|x_1, x_2, \dots, x_k) = f(x_1, x_2, \dots, x_k)$ (Belloni and Chernozhukov, 2011; Charlier, et. al., 2015).

The model may be posited as follows:

Let's suppose Y is an outcome variable of interest (EV in the present context), and X is a vector of observable covariates (Table 1 in section 5). The covariate vector is partitioned as $X = (P, K)$, where P is the vector of key covariate, and K is a possibly with the vector of rest of the covariates that usually play the role of control variables. The t -quantile of Y conditional on $X = x$ using the partially linear quantile model will be:

$$R_{Y|X}(\tau|x) = g(\tau, p) + l\gamma(\tau), \tau \in [0, 1].$$

The nonparametric series quantile regression (QR henceforth) approximation is developed as:

$$R_{Y|X}(\tau|x) \approx Z(x)' \beta(\tau), \beta(\tau) = (\alpha(\tau)', \gamma(\tau)')', Z(x) = (Z(p)', k')$$

where the unknown function $g(\tau, p)$ is approximated by a linear combination of series terms $Z(p)' \alpha(\tau)$

The vector $Z(p)$ includes transformations of p . The function $\tau \rightarrow \alpha(\tau)$ contains quantile-specific coefficients (Belloni and Chernozhukov, 2011). The ‘qreg’

package in STATA implements estimation and inference method for the conditional quantile function based on the series QR approximation, which includes the conditional quantile function: $(\tau, x) \rightarrow R_{\tau|x}(\tau|x) \approx Z(x)' \beta(\tau)$

5. Source of data

The entire analysis of economic vulnerability in this paper is carried out with the help of NSS 70th round (Schedule no. 33 on situation assessment survey of agricultural households, 2013) unit level data for the rural areas in India. The NSS 2013 data were collected during the period from January to December, 2013 and were made available for use in 2014. The data were collected in two visits from the same set of sample households with an objective to collect information separately for the two major agricultural seasons in a year. While the first visit was made during January to July 2013, the second was made during August to December 2013. The survey was conducted in rural areas only. The total number of villages surveyed under the survey is 4529, whereas the total number of households interviewed was 35200.

In order to identify women farmers the households that have reported cultivation as main source of income are classified into two categories: male-headed and female-headed. Women farmer or farm labourers as head of the households vis-à-vis family members of male-headed agricultural households are compared. In the events of seasonal migration, women's taking care of farms is often a household's survival strategy in absence of male members. The NSS 70th round data set is limited in capturing the true nature of feminization in agriculture: whether it is an opportunity for women to expand their roles in the gainful aspects of rural farm sector, or, it implies the feminization of poverty, which is argued as an outcome of 'demand-pull' factors (Garikipati, 2009). Although the data set doesn't provide any direct information on permanent and seasonal male out-migration, one can identify the households that are reported to be male-headed and dependent on cultivation as main source of income throughout the year prior to the date of survey vis-à-vis the households that are female-headed and also dependent on cultivation as main source of income during the same period. However, a study designed for the purpose of understanding feminization in rural farm sector would be more appropriate to overcome the limitation of the present NSS data set in order to control the aspects of migration and understand the true nature of feminization in rural farm sector. Women

farmers and workers in male-headed vs women-headed households in the rural farm sector experience different set of agonies and insecurities that influence their well-being. As expected, the women-headed farm-households are reported small in number. While there are 43044 male respondents who are head of the farm-households number of women in the same category is reported to be 3820.

Depending on the availability of data, two sets of variables at individual as well as household levels are explored: one is the economic factors including usual activity status, main source of income, size of land possessed, profit out of farming of crops and animals, wages/salary and burden of outstanding loan amount to the households; the other one is the institutional factors such as awareness of minimum support price, reasons for not selling agricultural produce to the government agencies that follow the mandate of minimum support price and the usefulness of advices received from various extension nodes.

While there are many versions of vulnerability index developed specifically for different contexts such as economic, environmental, gender-related and livelihood concerned, The Economic vulnerability for an individual may generally be defined as the likelihood that an individual's economic development process is hindered by the occurrence of exogenous unforeseen events, often called external shocks (Guillaumont, 2009). Exposure to the shocks, adaptive capacity and sensitivity are generally considered to be the three contributing factors to economic vulnerability. Given the information available with NSS 70th round unit level data collected from survey on situation of agricultural households in India, the exposure to the shocks, adaptive capacity and sensitivity of a woman farmer/agricultural labourer are perceived to be dependent on her income/wages, source of income other than agriculture, experience as proxied by age, caste marital status, education and access to cultivable land. Education is also linked with the institutional factors such as awareness of minimum support prices for agricultural products, access to the market and/or satisfaction in selling the agricultural produces and access to institutional credit. The variables, available with NSS 70th round (2013) data on situation of agricultural households in India, included in the analysis in section 6 and 7, are described in table 1.

Table 1: Description of variables

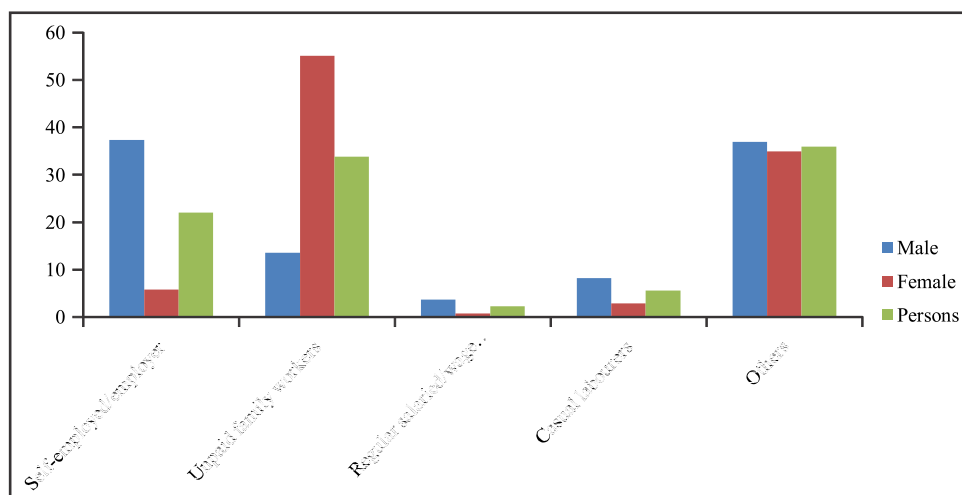
SI No	Variables	Description
1	EVI	Using data on wages, profit from farming and burden of loan an index of economic vulnerability has been created. Higher value of EVI implies lesser economic vulnerability (table 5)
2	Age	A continuous variable. Older women are supposed to be more experienced in agricultural practices. However, at old age, the productivity is reasonably assumed to be declining with a declining physical strength required for manual labour.
3	Caste	Categorical variable – Schedule Tribe, Schedule Caste, Other Backward Caste and Others – with ‘Others’ being reference category depending on the distribution in the sample.
4	IEI	Institutional effectiveness index – continuous variable – the higher value of IEI implies better is functioning of institutional factors. The components of IEI are mentioned in table 5.
5	Wages/income	Continuous variable. Higher wages/income protects individuals from being vulnerable economically
6	Possession of cultivable land	Categorical variable: whether possess/own any cultivable land. It indicates women to be more self-reliant in agriculture compared to those without any/small piece of cultivable land under possession.
7	Profit from farming	Continuous variable. Profit helps in reducing the possibility of being economically vulnerable
8	Indebtedness	Categorical variable: Whether having any out-standing loan. Having out-standing loan increases the possibility of being economically vulnerable, particularly when the loan is with private money-lender at a high rate of interest
9	Source of household income	Categorical variable: Whether the household has any major source of income other than agriculture and allied activities. Diversified sources of income reduce the possibility of being economically vulnerable
10	Education	Level of education, whether the respondent is literate and has completed at least primary education. It is a categorical variable.
11	Awareness about minimum support prices	Categorical variable: whether aware of market and MAP. Awareness about market and MSP are expected to help reducing the possibility of being economically vulnerable.
12	Satisfaction with the agricultural market	Categorical variable: whether satisfied with market. Satisfaction with the market in selling the agricultural produces indicates that the farmer is less likely to suffer from economic vulnerability.
13	Dependence on government procurement agency	Categorical variable: Whether selling farm yields to government procurement agencies. Selling farm-produces to the government procurement agencies indicate likely compliance of minimum support price and thus the possibility of economic vulnerability will be less likely.
14	Usefulness of agricultural extension programmes	Categorical variable: Whether the agricultural extension programme is felt to be useful. Technical and other advices received from agricultural extension offices through various programmes are expected to help in farming activity positively, so as to reduce the economic vulnerability of farmers.

6. Women in Agriculture in India: What do the data suggest?

According to Statistical profile of women labour 2012-13 by the Labour Bureau of Government of India, the work-force participation rate among women has increased to 71.77 percent while the same among men is only 41.8 Percent. Despite having long hours of engagement the nature of work undertaken by the female agricultural labourer or cultivator is limited to

less skilled jobs, such as sowing, transplanting, weeding and harvesting, in addition to unpaid subsistence labor. Participation in less skilled work and/or unpaid family work is also reflected in the lower wages of female workers as compared to their male counterparts. In 2013, over 55 percent of women workers are reported to be participating in unpaid family works (Figure 2).

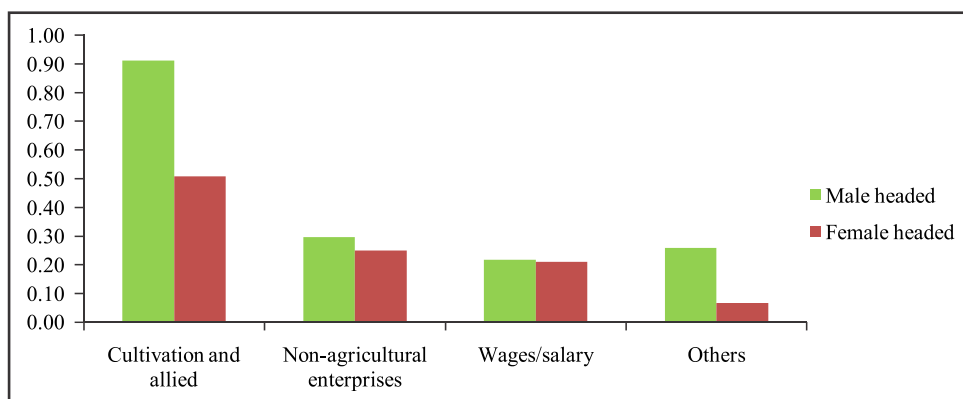
Figure 2: Percentage distribution of respondents engaged in major activities based on usual principal activity Status by state-groups, men and women in rural India 2013: A hint of invisible women workers



Note: Figures are computed by author based on NSS, 2013 unit level data on situation assessment survey of agricultural households in India. Figures are weighted according to NSS formulae.

Source: NSS, 2013

Figure 3: Average size of possessed cultivable land (in Acres) by male and female household heads engaged in major sources of income in rural India

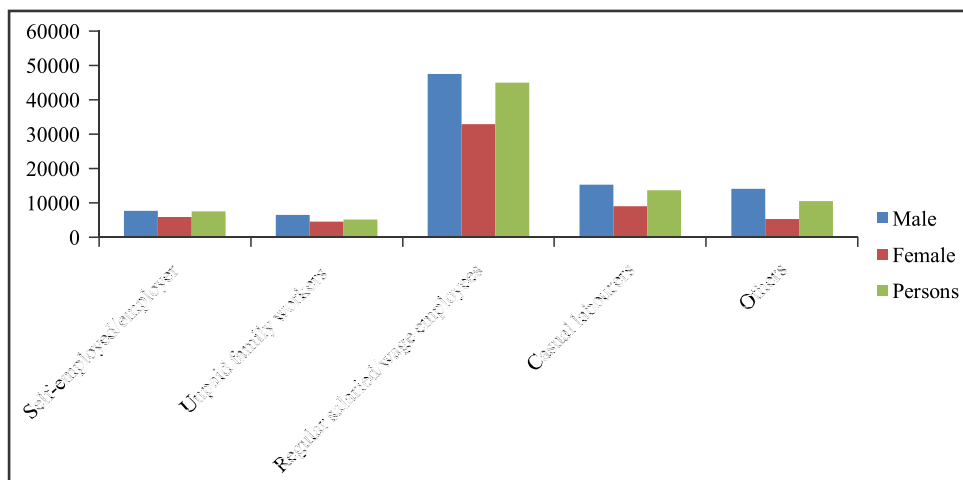


Note: Figures are computed by author based on NSS, 2013 unit level data on situation assessment survey of agricultural households in India. Figures are weighted according to NSS formulae.

Source: NSS, 2013

The Census 2011 figures indicate that only 32.8 per cent women formally take part in agriculture as primary workers, whereas this figure is 81.1 per cent for men. Notwithstanding the Census figures it is an undeniable fact that agricultural sector, which employs 80 to 100 million women, depends heavily on their labour from preparing the land, selecting seeds, preparing and sowing to transplanting the seedlings, applying manure/fertilisers/pesticides and then harvesting, winnowing and threshing. So, where do they go? Devoid of ownership (Figure 3) to the land and other resources, they largely work as wage labourers or invisible unpaid family labourers (Figure2) who are often less-paid or unpaid (Figure4). The average size of cultivable land-holding is much smaller among females in general, and further among female headed household heads, in particular (Figure3). As some studies have indicated (ILO, 2016; FAO, 2011; World Bank, 2016) these results are in line with the existing literature.

Figure 4: Average wages (in Rs.) received by sex across main occupation groups of the households

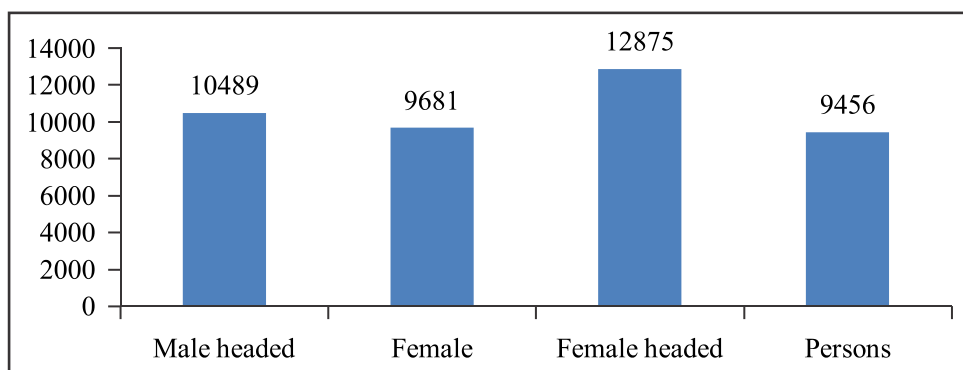


Figures are computed by author based on NSS, 2013 unit level data on situation assessment survey of agricultural households in India. Figures are weighted according to NSS formulae.

Source: NSS, 2013

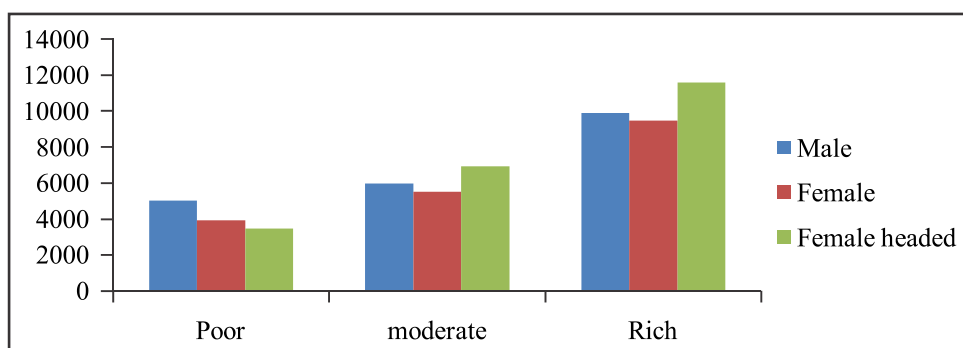
The results on output and profit earned by the women household heads indicate that women tend to be more efficient when they are the heads of the households (Figure 5). Further, an analysis by expenditure groups, using the data on monthly per-capita expenditure (MPCE) of each household, indicate that despite being able to generate substantially high profit from farming, women heads in the economically poor group lag in yielding high profit (Figure 6). While the results do not infer the productivity of women farmers directly, their engagement in a less remunerative sector especially in the economically backward households indicates that feminization of rural farming seems to be feminization of poverty.

Figure 5: Monthly Profit (average in Rs) per acre of land-size from farming of crops and animals by sex and sex of head of the households:



Source: NSS, 2013

Figure 6: Monthly Profit per land-holding size from farming of crops and animals (average in Rs) in each expenditure group (MPCE) by sex and sex of head of the households:



Source: NSS, 2013

This is noteworthy not only from productivity point but also from the point of social well-being as the women household heads in a patriarchal rural society are often single women who are either widows or divorced or separated/deserted and hence are subjected to the inferior social and psychological well-being. While women's ownership of land could result in higher and better quality production, it would also help them in having control over households' income that in turn would contribute to improve health, education, child's health, and would help in reducing the domestic

violence on them by strengthening their economic agency and position within households (Agarwal, 1994; Kelkar, 2009).

The profit from farming is also linked with various institutional factors such as awareness of MSP, satisfaction about market and procurement process by government agencies, usefulness of agriculture extension services, etc. While both male and female farmers are more or less highly satisfied with the extension services, they are not well-aware of MSP and mostly dissatisfied with the agrarian market and procurement process by the government agencies (Table 2). However, female heads are less aware of the MSP compared to their male counterparts. Although the male-headed households rely more on government agencies (around 24 percent) there are very few female-headed farming households (only 9 percent) that depend on government procurement agencies. It is important to note that despite relying more on private or other types of procurement agencies female household-heads are substantially more satisfied with the agriculture market compared to their male counterparts (Table 2).

Table 2: Market-satisfaction, whether output sold to government procurement agencies, awareness of MSP and usefulness of extension services as felt by farmers across male-headed and female-headed households:

Criteria	Market satisfaction (in %)		Output sold to: (in %)		Awareness of MSP (in %)	If extension services useful (in %)
	Partially satisfied	Dissatisfied	Govt agency	Others	Yes	Yes
Male headed	29.41	70.59	23.89	76.11	17.61	96.30
Female	27.69	72.31	24.33	75.67	17.33	95.42
Female headed	92.67	7.33	9.42	90.58	14.11	95.42

Source: NSS, 2013

7. Economic vulnerability of women in Agriculture

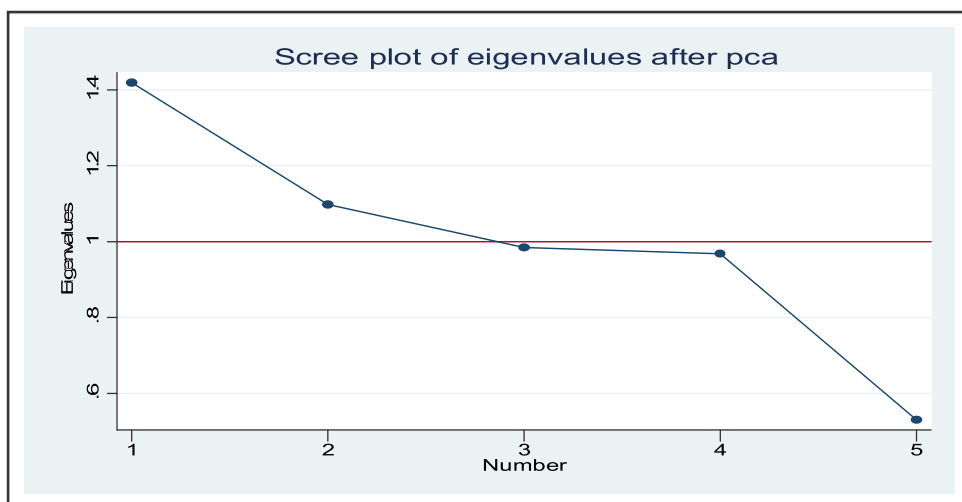
Literature on vulnerability index suggests that various economic, social, environmental, geographic and political components may be included in the construction of the index depending on the context of analyses (Briguglio and Galea, 2003; Rygel, et al., 2006; Briguglio, 2003; Sattar, et al., 2017; Guillaumont; 2007). In the context of present paper the economic vulnerability is reasonably assumed to depend on factors such as wages or

income, possession of cultivable land, profit from farming, indebtedness and sources of income other than agriculture. The effectiveness of institutional factors is indicated by the level of education, awareness about minimum support prices, satisfaction about government procurement processes and the market. While some studies (Patel, 2012; Shunmugasundaram, et. al., 2014; George and Ugbomeh, 2001) suggest that education plays important role in empowering women farmers, a few studies has shown that age and experience also play important roles in empowering women by influencing their decision-making capabilities in rural farming (Pattnaik and Lahiri-Dutt, 2018). Thus, the economic vulnerability index (EVI) and index for effectiveness of institutional factors (IEI) are constructed. The major and sub-components of both the indices are summarized in table 3. The higher values of the indices implies lesser is the economic vulnerability and better is the functioning of institutional factors. A principal component analysis method is followed to construct the indices (Figure 7).

Table 3. Major and sub-components of EVI and IEI with the explanation

Major components	Sub-components	Explanation of sub-components
Economic	Wages/income	Higher wages/income protects individuals from being vulnerable economically
	Possession of cultivable land	It indicates women to be more self-reliant in agriculture compared to those without any/small piece of cultivable land under possession.
	Profit from farming	Profit helps in reducing the possibility of being economically vulnerable
	Indebtedness	Having out-standing loan increases the possibility of being economically vulnerable, particularly when the loan is with private money-lender at a high rate of interest.
	Source of household income	Diversified sources of income reduce the possibility of being economically vulnerable
Institutional and other	Education	Level of education(whether the respondent is literate and has completed at least primary education) is expected to raise the awareness about farming techniques, market and other institutional supports
	Awareness about minimum support prices	Awareness about market and minimum support prices are expected to help reducing the possibility of being economically vulnerable
	Satisfaction with the agricultural market	Satisfaction with the market in selling the agricultural produces indicates that the farmer is less likely to suffer from economic vulnerability.
	Dependence on government procurement agency	Selling farm-produces to the government procurement agencies indicate likely compliance of minimum support price and thus the possibility of economic vulnerability will be less likely.
	Usefulness of agricultural extension programmes	Technical and other advices received from agricultural extension offices through various programmes are expected to help in farming activity positively, so as to reduce the economic vulnerability of farmers.

Figure 7: Scree plot of eigen values after PCA



Evidently, women, whether head of the households or not, are more economically vulnerable compared to men in almost everywhere across the country (Table 4).

Table 4: Economic vulnerability index (EVI) by women household-head, women in general and persons in rural India

Region	EVI person	EVI women	EVI women household-head
India	0.13	-0.38	-0.24

Source: Author's calculation from NSS, 2013

The intra-women economic vulnerability –belonging to the male-headed households vis-à-vis those who are heads of the households themselves in similar types socio-economic status – is substantially wide. The benefit of productivity growth has not reached women in improving their economic vulnerabilities owing to various factors such as access to resources including institutional credit (Fletschner and Kenney, 2011) irrigation water (Zwarteveen, 1995; Bryan & Didi, 2019), effective voice in water users' association, (Dasthagir, 2009) so on and so forth. Despite the high share of value of output the female work force participation in official records is still limited compared to their male counterparts in those major States. The recognition of women as farmers on official records, or the recognition of women farmers with ownership/possession of cultivable land is so limited in official records that many of the States and UTs have not even provided

with adequate number of sample households for a robust statistical analysis at State level.

The discussion on feminization in agriculture therefore hovers around the debate in the patriarchal norms of ownership, access, decision-making and participation in work force. Although women-headed households are evidently less economically vulnerable, they exist mostly in regions wherein value of per-capita agrarian output is much less compared to the highly productive regions that still experience agriculture as a productive sector. With a much smaller landholding size women therefore are found to have full command over the cultivable land mainly in regions where agriculture is less rewarding, which supports the argument that the feminized agriculture in those regions may not necessarily be an outcome of the “demand pull” factors, but an outcome of “feminized poverty” (Garikipati, 2009).

The women-headed households are found to be better off with relatively smaller extent of economic vulnerabilities in a limited number of States including Uttar-Pradesh, Karnataka, West Bengal, Himachal Pradesh and Telangana (Table 5) owing to various factors such as timely availability and accessibility of irrigation water, cropping pattern and types of crops grown. Whereas it is widely known that tenancy reform and operation Barga have impact on egalitarian distribution of cultivable land in West Bengal, the distribution has been done on the basis of household undermining the importance of intra-household distribution of resources between men and women. As a consequence, size of cultivable land in possession of women farmers is small and limited even in this State. However, being a predominantly agrarian economy, farming as a primary occupation and a major source of livelihood is more valued among women farmers in West Bengal compared to those in Gujarat, which has been experiencing unprecedented agricultural growth during recent years (Pattnaik and Lahiri-Dutt, 2018).

Table 5: EVI for persons, women and women-heads

EVI persons			EVI women			EVI women head		
Lower range	Middle range	Higher range	Lower range	Middle range	Higher range	Lower range	Middle range	Higher range
-0.61 to -0.22	-0.13 to 0.31	0.34 to 1.76	-1.08 to -0.37	-0.33 to 0.23	0.25 to 1.82	-0.58 to -0.19	-0.08 to 0.89	1.05 to 1.82
Gujarat	Uttar Pradesh	Assam	Puducherry	Rajasthan	West Bengal	Meghalaya	Madhya Pradesh	Uttar Pradesh
Mizoram	Tamil Nadu	Sikkim	A&N Islands	Chhattisgarh	Haryana	Gujarat	Mizoram	Karnataka
Chhattisgarh	Telangana	Dadra & N Haveli	Gujarat	Manipur	Telangana	Maharashtra	Odisha	West Bengal
Madhya Pradesh	Jharkhand	Kerala	Maharashtra	Andhra Pradesh	Bihar	Tripura	Rajasthan	Himachal Pradesh
Tripura	West Bengal	Haryana	Madhya Pradesh	Tamil Nadu	Kerala	Tamil Nadu	Andhra Pradesh	Telangana
Meghalaya	Rajasthan	Bihar	Tripura	Assam	Punjab			
Odisha	Chandigarh	Delhi	Mizoram	Uttar Pradesh	Jammu & Kashmir			
Maharashtra	Uttaranchal	Punjab	Odisha	Karnataka	Himachal Pradesh			
A&N Islands	Karnataka	Puducherry	Meghalaya	Sikkim	Arunachal Pradesh			
Andhra Pradesh	Arunachal Pradesh	Himachal Pradesh						
Manipur	Jammu & Kashmir	Nagaland						

Marital status of women is also an important factor in determining women's command over agrarian resources and decision-making power. Despite being active participant in the agrarian activities married women in the reproductive age-group are not well-represented in the official records or various groups of farmers or peasants (Pattnaik, et al., 2018) owing to their engagement in care activities at the households. In addition to the care work, 'women's growing contribution of labour in agriculture adds to the already heavy work burdens of most rural women, thereby further undermining their well-being' (Pattnaik, et. al., 2018). On the contrary, those women who are recognized on the official record as owner of cultivable land and head of the household often suffer from insecurity and anxieties associated with an inferior social status for single women in rural India. Women above 20 years of age are generally reported as head of the households only when they are single (divorced/separated or widowed). The single women, particularly widows and separated/divorced already experience inferior social and familial status in the rural society. Therefore, their self-worth as a contributor of the households' expenses may not be realized, due to social, familial and economic pressures.

8. Conditional impact analysis of economic vulnerability among women in agriculture sector

Since the variable EV follows a normal distribution, in order to understand the conditional median and other quintiles of EV a non-parametric quintile regression technique is followed (Figure 8). As the literature and the descriptive tables in previous section suggest, the background characteristics such as sex, age and social group are included as control variables in order to address the possibility of unforeseen discrimination in the labour market that may have bearing with the economic vulnerability. Level of education or awareness and institutional effectiveness index are also included to understand the bearing of awareness and education with economic vulnerability. The regressions are conducted separately for agricultural workers (Table 6) and cultivators who are also head of the households (Table 7). “These exercises help in linking the conditional impact of economic vulnerability with the institutional factors as indicated by the institutional effectiveness index constructed by the variables available with NSS 2013 unit level data (Figure 10). The lowest quintile (0.10) indicates the highest economic vulnerability whereas the highest quintile (0.90) indicates the group with lowest economic vulnerability.”

Figure 8: Histogram of economic vulnerability index (EVI)

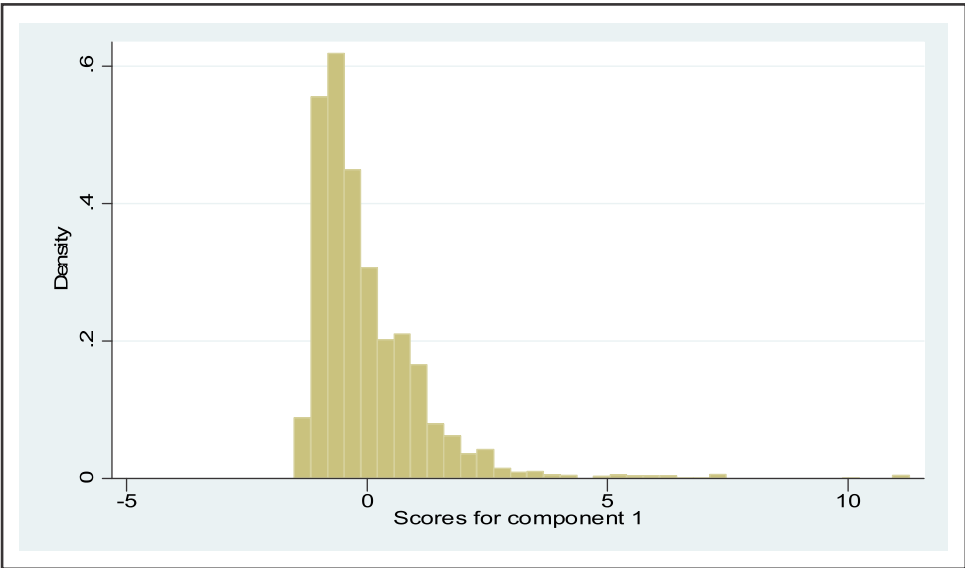


Table 6: Quintile regression results for rural agricultural workers: All India

Quintiles:	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
EVI	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)
female	-0.17*** (0.05)	-0.11** (0.04)	-0.04 ^w (0.04)	0.00 (0.03)	-0.01 (0.02)	0.00 (0.01)	0.00 (0.01)	-0.01 ^w (0.01)	0.00 (0.01)
age	0.15*** (0.01)	0.10*** (0.01)	0.08*** (0.01)	0.05*** (0.01)	0.04*** (0.00)	0.03*** (0.00)	0.03*** (0.00)	0.03*** (0.00)	0.03*** (0.00)
age ²	0.00*** (0.00)	0.00*** (0.00)	0.00*** (0.00)	0.00 (0.00)	0.00** (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 ^w (0.00)	0.00 (0.00)
ST	-0.56*** (0.09)	-0.58*** (0.06)	-0.62*** (0.05)	-0.76*** (0.05)	-0.49*** (0.04)	-0.29*** (0.03)	-0.18*** (0.01)	-0.11*** (0.01)	-0.09*** (0.01)
SC	-0.03 (0.14)	-0.10 (0.10)	-0.20 ^w (0.13)	-0.53*** (0.07)	-0.36*** (0.05)	-0.17*** (0.04)	-0.12*** (0.01)	-0.06*** (0.01)	-0.08*** (0.01)
OBC	-0.40*** (0.11)	-0.38*** (0.05)	-0.48*** (0.05)	-0.63*** (0.05)	-0.39*** (0.05)	-0.21*** (0.04)	-0.14*** (0.01)	-0.08*** (0.01)	-0.08*** (0.01)
edu_level	0.88*** (0.08)	0.78*** (0.06)	0.72*** (0.04)	0.40*** (0.05)	0.25*** (0.02)	0.15*** (0.01)	0.11*** (0.01)	0.07*** (0.01)	0.03*** (0.00)
constant	-2.66*** (0.24)	-2.16*** (0.18)	-1.99*** (0.13)	-1.40*** (0.15)	-1.57*** (0.06)	-1.57*** (0.06)	-1.64*** (0.02)	-1.70*** (0.02)	-1.69*** (0.02)
No. of observation	5396	5396	5396	5396	5396	5396	5396	5396	5396
Pseudo R2	0.18	0.18	0.17	0.18	0.19	0.22	0.25	0.28	0.31

Source: NSS, 2013

Table 7: Quintile regression results for rural cultivators heading the households: All India

Quintiles:	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
EVI	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)
female	-0.52 ^w (0.34)	-0.52 ^w (0.36)	-0.01 (0.37)	0.13 (0.29)	0.29 (0.44)	0.32 (0.59)	0.65 ^w (0.51)	0.57 ^w (0.65)	0.62 ^w (0.51)
age	0.12 ^w (0.08)	0.12 ^w (0.07)	0.10 ^w (0.09)	0.12 ^w (0.11)	0.16* (0.10)	0.16 ^w (0.17)	0.12 ^w (0.12)	0.14 ^w (0.12)	0.06 (0.09)
age2	0.00 ^w (0.00)	0.00 ^w (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 ^w (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
ST	0.76 ^w (0.53)	0.69 (0.89)	1.05** (0.58)	1.29* (0.78)	1.04 ^w (0.86)	0.95* (0.70)	0.45 (1.00)	0.14 (0.93)	-0.40 (1.15)
SC	1.30** (0.51)	1.73** (0.83)	1.96*** (0.37)	1.90** (0.73)	1.81*** (0.47)	1.82 ^w (1.66)	2.15*** (0.54)	2.31*** (0.73)	2.50*** (0.36)
OBC	-0.46 (0.61)	-0.04 (0.57)	0.05 (0.52)	0.18 (0.67)	0.39 (0.70)	0.38 (0.75)	0.39 (0.74)	0.38 ^w (0.40)	0.21 (0.59)
edu_level	0.54 ^w (0.36)	0.11 (0.76)	0.37 (0.47)	0.60 (0.69)	0.96** (0.63)	0.93* (0.64)	0.87 ^w (1.01)	0.48 (0.84)	0.40 (1.08)
IEI	1.63*** (0.55)	1.06** (0.42)	0.77*** (0.24)	0.58 ^w (0.50)	0.32 (0.59)	0.30 (0.67)	0.30 (0.81)	0.22 (0.45)	-0.07 (0.49)
_cons	-2.92 ^w (1.88)	-2.92* (1.69)	-2.97* (1.84)	-3.74* (2.18)	-4.96* (1.89)	-4.86* (3.30)	-4.16 ^w (3.22)	-3.95* (2.25)	-2.43 ^w (2.30)
No. of observation	438	438	438	438	438	438	438	438	438
Pseudo R2	0.81	0.76	0.72	0.68	0.65	0.63	0.58	0.51	0.56

Source: NSS, 2013

Women agricultural workers are statistically significantly more economically vulnerable compared to their male counterparts (Table 5). The labour-market opportunities and well-remunerative sources of income outside villages lead to out-migration. The out-migration, although helps households in improving the income; it doesn't contribute much to the economic well-being of women members individually, as it doesn't guarantee improvement in access to food, healthcare or education for women, but at the same time, it does imply more work-load for women while men go out even for a short duration.

The extent of economic vulnerability is further larger among women cultivators who are also heads of the households (Table 6). The disadvantage for a woman being head of the household in rural areas stems from various socio-cultural factors which also shape the overall policy environment in agriculture and land-holding. Women labourers not only belong to relatively more economically vulnerable households, but they are often found to be with no entitlement of land on their names. In the rural areas of India a woman heading a household often means that she is a single woman – either widow or divorcee/separated – experiencing an inferior life socially, as the norm of patriarchy values married women with high regard compared to women otherwise². Although social vulnerability is not the focus of this paper, one cannot deny the social fabric of villages in India within which this paper is being discussed. For a socially disadvantaged (single) woman the cultural practice of inheriting land adds further to the vulnerability of women farmers.

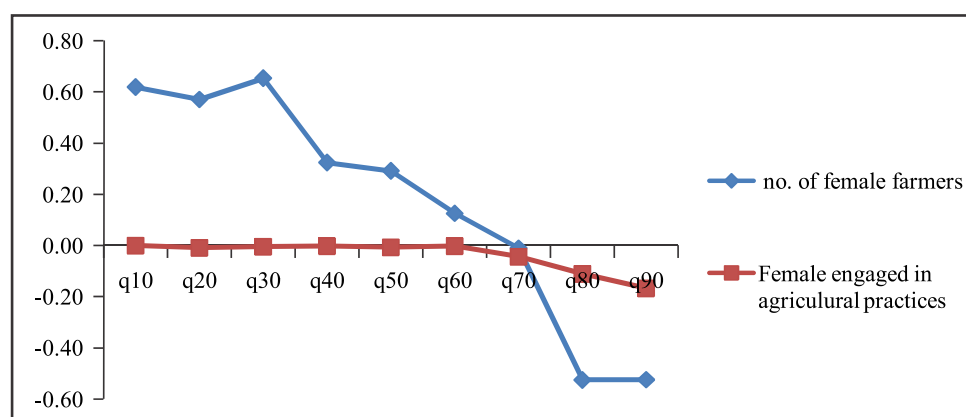
Contrary to the case of women farmers heading households, the women farmers, who are married and managing the farm in absence of the male members of the household find it is extremely difficult to negotiate at various levels, as they don't officially possess the land. As only 12.8% of total agricultural land is registered under women's names the average size of land-holding by women is also small³ (A woman holds an average of 0.93

² "After the death of her husband, the wife faces problems at three levels. Getting over the trauma of her husband's death, repaying the debt, and taking over the responsibility of singlehandedly running her household, along with the stigma of widowhood due to which she faces discrimination at family, societal and cultural levels." (MAKAAM, 2018).

³ "A woman holds an average of 0.93 hectare (ha), while men hold 1.18 ha. The average figure is 1.15 ha". (<https://www.indiaspend.com/lakshadweep-meghalaya-have-most-women-land-holders-punjab-west-bengal-fewest-54024/>, accessed on January 9, 2019)

hectare (ha), while men hold 1.18 ha. The average figure is 1.15 ha). Evidently the fall in the number of women farmers with the decline in economic vulnerability is rapid among women farmers than that among women agricultural workers (Figure 9).

Figure 9: Comparing the economic vulnerability among women agricultural workers and women cultivators (household-heads)



Source: NSS, 2013

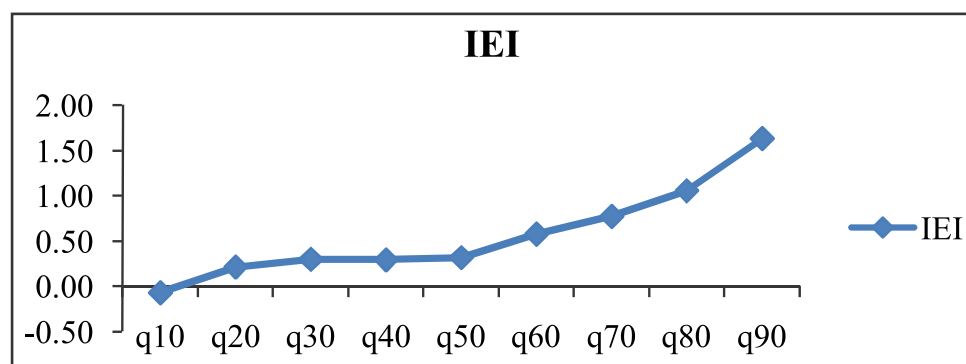
It is important to note that the reporting of women farmers pertains to not only the various socio-economic reasons, but also the official definition of ‘farmers’ in the government records. Most women are recognized not as ‘farmers’ but as the ‘cultivators’, who operate land. They are not officially recognized as ‘farmers’, due to lack of official ownership of land. As a result, those women who don’t own land (87% women in India do not inherit land) officially, “cannot avail of government schemes meant for farmers. They cannot access institutional credit for farming or get subsidies” (Bedi, 2018). Despite having recognized over 3.60 crore women as ‘cultivators’ under the Census 2011, the government so far has no proposal to provide identity cards to women farmers.

It may be noted that, women agricultural labourers and farmers are therefore present more in the lower quantile of EV compared to men across the rural areas of States and UTs in India.

What one can infer is that despite being necessary, entitlement to land is not sufficient for mitigating the vulnerability of women in rural farm sector (Chaves, 2018). Countries in the developing world such as those in Africa

and Latin America have shown that persistent gender gap in rural farm sector can only be reduced through the investment in women's movements (Chaves, 2018) toward land-entitlement, access to information and market. This paper also finds that institutional factors such as functioning of market, awareness about minimum support prices, usefulness of agricultural extension programme, etc., contribute to reduce the economic vulnerability (Figure 10) of women in the rural farm sector in India. High effectiveness of institutional factor is found to be associated with low economic vulnerability among women in agriculture in India.

Figure 10: Conditional impact of economic vulnerability and satisfaction with agricultural institutional factors among female farmers



Source: NSS, 2013

9. The way forward

As many of the previous studies suggest, the crux of the evidences in this paper lies with the a) efficiency of women headed cultivator households despite possessing smaller land-size; b) higher participation of women in non-economic or domestic activities a large part of which is unpaid family labour in farms; c) dissatisfaction with the present process of procurement of farm-outputs, and d) lower wages/salary received by women labourers. The results imply that the policies need to address the concerns for the command and control over resources by women in agriculture. In addition to the right and access to land, participation of women farmers as experienced in countries like Chile, Tanzania and those in Africa, in various user groups and unions may help in strengthening their voices in this sector.

The lack of awareness about MSP and heavy dependence on private procurement agencies are some other aspects that need to be strengthened. The heavy dependence on other private agencies indicates lack of trust on government procurement agencies owing to several reasons such as non-availability, quality of crops and pre-pledging. The reach of system of procurement to include small and marginal farmers, especially women, has to improve to a large extent so as to realize the effectiveness of minimum support price and better market for farmers.

The agricultural policies in India has so far broadly aimed at increase in income; quantifiable improvement in production and productivity; financial inclusion; reduction of yield gap with focused interventions, maximization of returns to the farmers from agriculture and allied sectors; augmentation of marketing interventions and export promotion; promotion of competitiveness in agriculture & allied sectors; meeting the challenges of climate change and evolve mechanisms for effective drought and flood management.

The process of rural transformation, as it is evident in many developing countries, includes commercialization, urbanization, technological and policy innovations and integration of farm sector into the global economy over time. In order to reap the benefit of such transformation in the food-supply chain the women workers at various stages of agricultural production, distribution and retailing must be strengthened with the required skill, knowledge and friendly technologies. Access to market and access to means of production such as land, technology and credit become increasingly important for the farmers. As it is evident that small-holder production systems suffer from pressures to commercialize, diversify and expand, the access to institutional credit and cooperative arrangements must emerge effectively for providing women the opportunity to access bigger size of cultivable land.

In India, although the union budget 2018-19 has announced several lucrative propositions for provisions such as increase in minimum support prices for agricultural produces and inclusion of small and marginal farmers in the market, the policies, *de-facto* are likely to address the concern for men as women are seemingly invisible in the farm-sector. As the Economic Survey published in November, 2018 proposed for integrating women as active agents in rural transformation, the policies now must be framed in such a

way that more and more number of women be recognized as 'farmers'. A discussion on the recognition of household head gender-less may contribute to improve women's (irrespective of marital status) right to land and recognize more number of women farmers on official records in future. Keeping the wide discussion on feminization in agriculture as a feminization of distress in mind, the policy must aim at empowering women's decision-making roles by ensuring the egalitarian access and right of women to resources. Of course there are difficulties at the level of policy formulation and enforcement combined with limitations of our understanding emerging from the methodological challenges and paucity of large sample data-base; but it is the time to take first step.

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The broad thrust areas of research at the Institute include Natural Resource Management, Agriculture and Climate Change, Industry, Infrastructure, Trade and Finance, Employment, Migration and Urbanisation, Poverty and Human Resource Development and Regional Development, Institutions and Governance.

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