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Analysis on Farmer Suicides: A study with reference to the year 2015

Ishan Janbandhu,

PhD Scholar and UGC J.R.F Fellow,
Gokhale Institute of Politics & Economics (GIPE), Pune, India.

Anand Philip Kurian,

PhD Scholar and UGC – J.R.F Fellow,
Gokhale Institute of Politics & Economics (GIPE), Pune, India.

Vishavdeep Sharma,

MSc Economics,
Gokhale Institute of Politics & Economics (GIPE), Pune, India

ABSTRACT

This paper explores the linkages of farmer suicides with various factors for the year 2015. The analysis suggests, farmers tend to not opt for suicides when production, productivity and irrigation facilities of certain crops are improved/increased. Normal rainfall and excess rainfall shows less likelihood of farmer suicides compared to non- farmer suicides. Based on our analysis the loan waiver in the states of Andhra Pradesh and Telangana could not significantly determine the fall or rise in suicides of farmers compared to non-farmers.

Keywords: Loan waiver, Ordered Logistic Regression, Irrigation, Farmer Suicides.
JEL Codes: Q18, C21, Q15, Q19

INTRODUCTION:

Agriculture traditionally played a pivotal role in the Indian economy. Indian subcontinent with its rich variety of soil and climatic conditions offered its population a wide selection of crops to cultivation. Evidence of growing crops in the area has been recorded even during the Indus valley civilization period.

However, 190 years of British rule resulted in agriculture being ruined to the level of subsistence farming.At the time of Indian independence, Agriculture formed 54.6 % of the GDP (1950-51) and employed around 72% of the total population. Having understood the importance of agriculture to the Indian economy, policy makers of that period gave primacy to agriculture development through the various 5 year plans.

During the 1st and 2nd 5 year plan periods, various schemes like Command Area Development (CAD), Integrated Agriculture Development Programme (IADP) etc. were started. Further, land reform measures were also initiated to increase productivity as well as improve the social conditions of agricultural laborers. These include abolition of intermediaries, ceiling on landholdings, tenancy regulations etc.

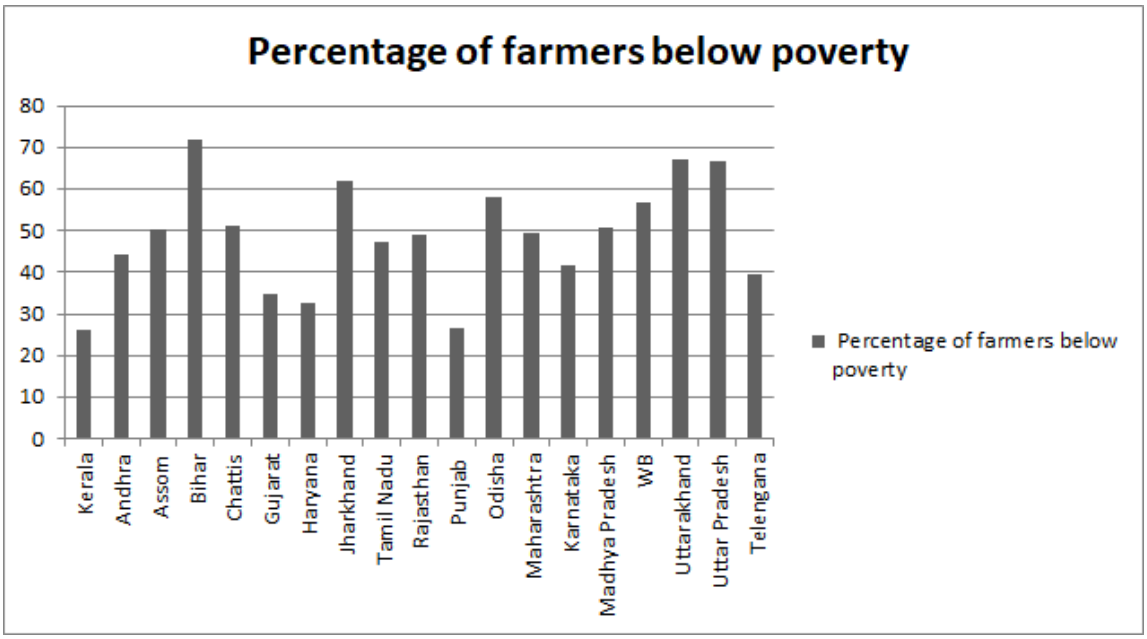
The next major boost to agricultural development came during the mid-1960 with the introduction of High Yielding varieties of crops, disease resistance & pest resistant seeds, technology improvement, intensive use of fertilizers etc., a phase commonly known as Green Revolution. This period further transformed India from the status of a food importing country to a self-sufficient country and further moving towards the direction of a food exporter.

However, during early 1990's, various domestic as well as global factors influenced agriculture development significantly. In the domestic front the Indian economy underwent significant transformation via Liberalization, Privatization, Globalization measures adopted by the government. At the international level, the coming of WTO and further reduction in subsidies as well as protection offered to agriculture opened Indian agricultural exports to international competition.

As a country undergoes development, the contribution of agriculture to overall GDP, employment reduces, and India is no exception. In India the share of agriculture to GDP reduced from 54.6 % (1951-52) to 17.32 %

(2016). In the case of employment, it reduced from ~ 72 % to ~ 47 % (2016). Thus we can see that although the GDP contribution of agriculture came down significantly, it still employs a sizable population of our country. However, agriculture in India is still plagued by various issues. These include low productivity levels compared to international levels, high dependence on the vagaries of monsoon, low technological adoption, fragmentation of agricultural land etc. Further, agriculture though employs ~ 47 % (2016) of the population, majority of the farmers earn only subsistence level. This could be understood by seeing the extend of poverty prevailing among the farmers in various states as shown in figure 1

Figure1: Percentage of farmers below poverty



Source: MoA&FW (2017): "Agricultural Statistics at a glance-2016"

It can be seen that bigger states like UP, Bihar, Jharkhand etc. having large portion of its farmers below poverty level. Further, as per the state of Indian agriculture report (2011-12), the state wise irrigation coverage varies from as high as 98 % in Punjab to ~10 5 % in states like Jharkhand as shown in Table 1. At all India level, irrigation coverage on an average stands at 45 %

Table 1: State wise irrigation coverage (%)

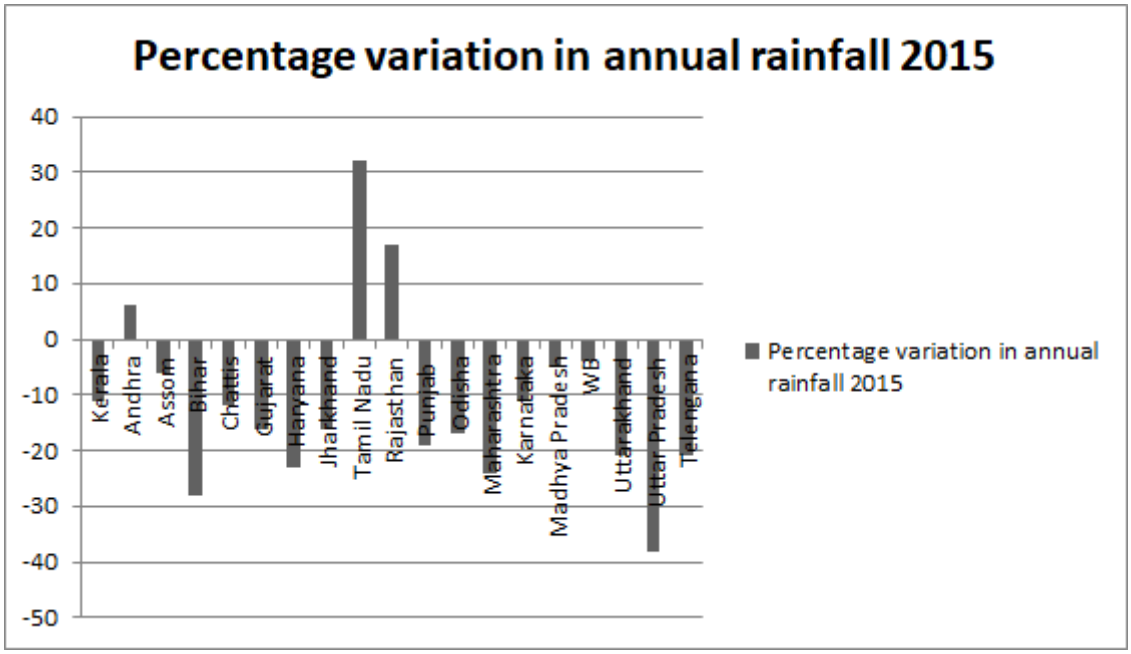
State	Irrigation %
Punjab	98
Gujarat	46
Karnataka	32
Jharkhand	10
All India (average)	**45**

Source: MoA&FW (2011)): "State of Indian Agriculture -2011-12

The lack of irrigation coverage to the vast sections of the farming area has resulted in the farming community primarily being depended on the vagaries of monsoon. Thus variations in monsoon affects the output of agricultural products. Fig 2 shows the percentage variations in annual rainfall (2015) across various states.

Thus figure 2. Shows that majority of the states reported negative variation in annual rainfall over the previous years. This coupled with lack of sufficient irrigation facilities acts as a catalyst in further lowering agricultural performance.

Figure 2: Percentage Variation in annual rainfall (2015)



Source: IMD (2016): "Rainfall Statistics of India – 2015

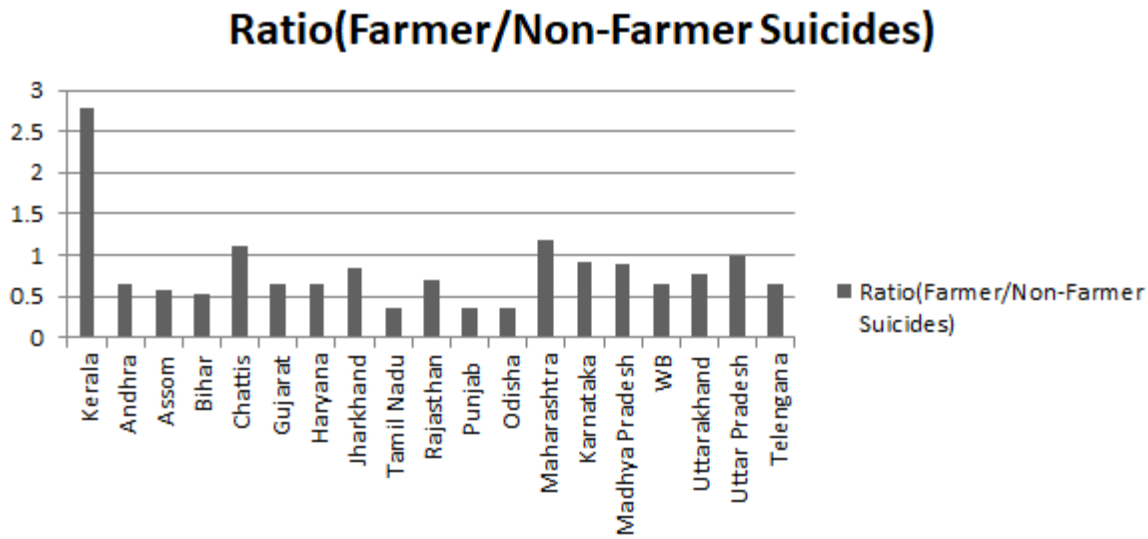
One issue in particular that has been in the recent past has been the case of agrarian distress and farmer suicides. The issue gains importance when we look at the numbers.

As per NCRB (2016), farmer suicides are on an upward trend with 11,772 suicides in 2013 (8.7% of total suicides) which rose to 12,602 suicides in 2015 (9.4 % of total suicides)

Further, state-wise analysis of NCRB data for the year 2015 points out that the following facts (NCRB 2015):

a. Maximum number of suicides by persons engaged in farming sector is observed in Maharashtra followed by Karnataka and Telangana.
b. Fig 3 shows the ratio of farmer to non-farmer suicides in various states. Maximum numbers of farmer suicides to non-farmer suicides happen in Kerala followed by Maharashtra.

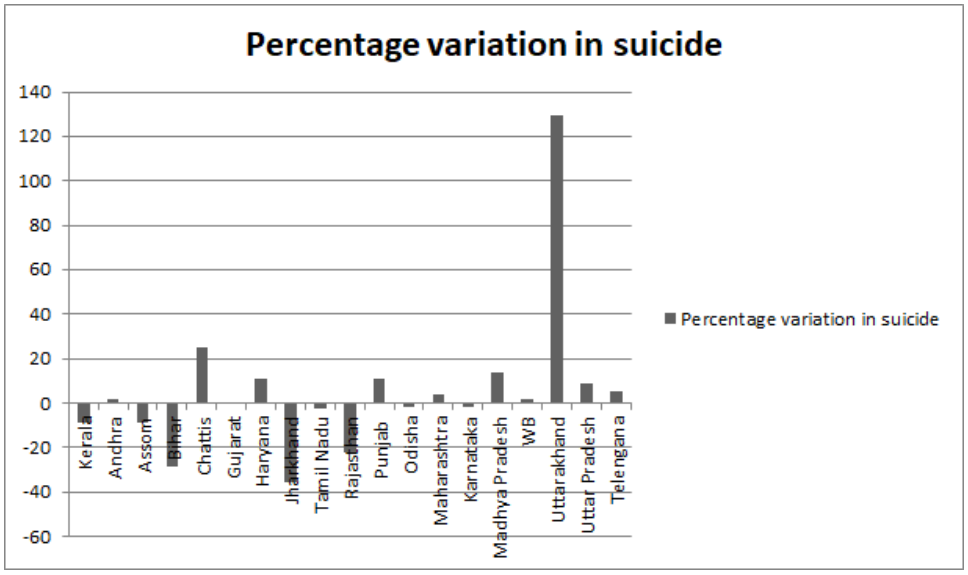
Figure 3: Ratio (F/NF) suicides in 2015



Source: NCRB (2016): "Accidental deaths & suicides in India- 2015"

c. The percentage variation in farmer suicide compared to 2014 has been maximum in Uttarakhand as shown in fig 4.

Figure 4: Percentage variation in suicide

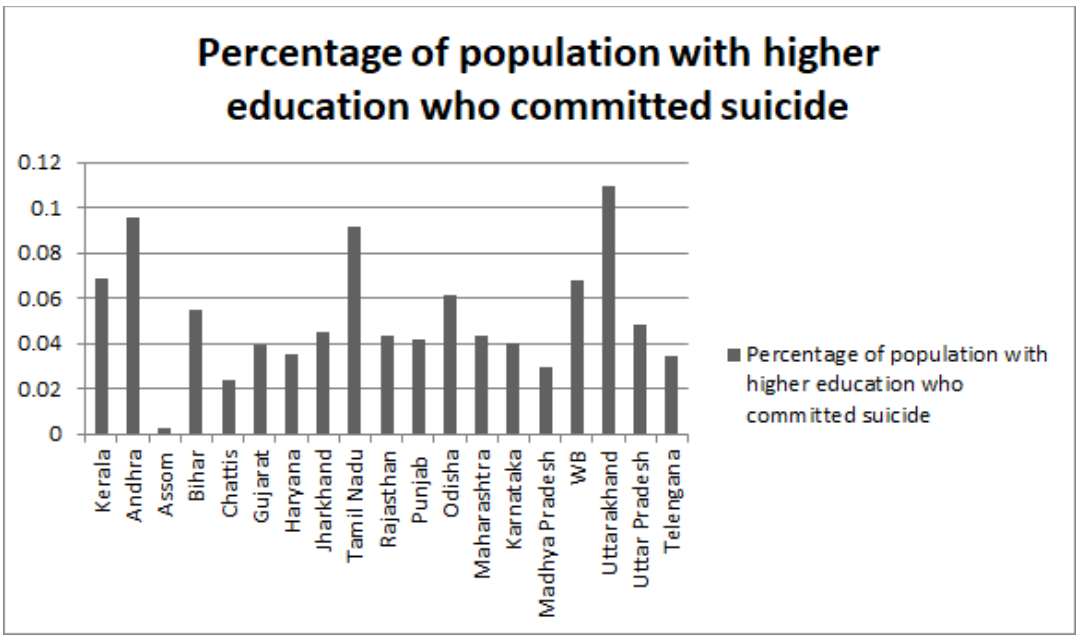


Source: NCRB (2016): "Accidental deaths & suicides in India- 2015"

Further, NCRB (2016) points indebtedness, farming related issues, family problems, illness, drug abuse, poverty etc. as the major reasons for famer suicides. Also, majority of farmers who did suicide due to indebtedness were indebted to Banks/Registered Micro Financial Institutions (2474 in 2015) compared to money lenders (302 in 2015). Additionally, the report states that, small farmers (land holding <1 hectare) formed the highest percentage (45.2 %) of farmer suicides followed by marginal farmers (land holding between 1 to 2 hectare).

NCRB (2016) data shows less likelihood (as low as less than 1.5%) of farmers committing suicides if they are highly educated. Here the figure 5 is obtained based on ratio of higher education which includes diploma, graduate and professional education over total farmer population commit suicide.

Figure 5: Percentage of population with higher education who committed suicide



Source: NCRB (2016): "Accidental deaths & suicides in India- 2015"

It is to be noted that based on the above graphs of variation in suicide, rainfall and loan waiver states in 2014 some relationship in rainfall and suicides is clearly visible whereas loan waiver impact cannot be easily established. Moreover, education has tendency to open up other doors of employment thus lowering the possibility of a farmer

commit suicide but data here does not take into account total population of higher education which gets engaged in agricultural activities. If higher educated population does not engage themselves in agriculture, then percentage of farmer population suicides with higher education will automatically be low. Thus loan waiver and higher education might not be significant in explaining the farmer suicides.

Agriculture being in the 7th schedule of the Indian constitution, the overall responsibility in the promotion and development lies with the state government. Thus agrarian distress and farmer suicides have played a major role in shaping the political scenario of various states. Political parties use farmer appeasement policies in the form of farm loan waivers to get back to power. One example is the 43,000 crore farm loan waiver offered in Andhra and Telangana (2014).

To summarize the reasons for farmer suicide based on previous study are, limited rural non-farm employment opportunities, increasing costs and fluctuating prices ,decline in size of holdings, falling investment, falling agricultural credit taken from formal sources, uncertainty of water availability, improper input and use of technology (Reddy and Mishra,2009), indebtedness (Mitra and Shroff,2007) and (Bharti and Vishav,2011), illiteracy and lack of basic support facilities related to health and education(Deshpande and Arora,2010), media sensationalize and glamorize suicide(Peter Mayer 2016), lack of community or support service (Patel et al,2012), loss of social regulation and loss of social integration(Mohanty,2005,2013),illiteracy and lack of alternative rural livelihood opportunities (Kumari,2009), lopsided policies (Jadhav,2008).

The key policy recommendation emerging has been improving access to credit facilities and helping in reducing transaction costs associated with borrowing, particularly for small and medium farmers (Deshpande and Arora,2010), focusing on sustainable rural livelihoods and introducing methods by which the rural population can be given specific training in livestock farming and using other rural resources effectively, investment in irrigation facilities and diversifying the possibilities for livelihood in rural areas by harnessing the potential of the fishing industries (Narayanamoorthy,2006), provision of better mental health services, especially in rural areas (Patel et al,2012).

Even though various studies have been done towards the economic consequences following farm loan waiver, the studies on the consequences of farm loan waiver on suicides has been very little.

LITERATURE REVIEW ON FACTORS AFFECTING FARMER SUICIDES:

Many studies have been conducted previously on the topic of farmer suicides.

Report of Survey on Farmers Suicides in Kerala (2009) points out that loans taken for agricultural purposes were diverted towards marriage, repayment of existing loans etc. which further leads to the conclusion that indebtedness of farmers were not completely because of agri related problems.

Further, the cost of cultivation i.e. wages, cost of seed, manure and pesticides increased about 100 times than in 1960's while the price of the most of the agriculture products and profit from cultivation is increased by only 10 to 15 times. The cost of production is invariably higher than the minimum support price due to ever-increasing prices of diesel and other inputs. Minimum Support Price should be regarded as the bottom line for procurement both by Government and private traders. In the report titled, Christian Aid, The Damage Done: Aid, Death and Dogma (2005) argued that the real origins of the agrarian crisis in Andhra Pradesh lie in international pressures for liberalisation in India. Cotton farmers had been hurt less by economic reforms than by policy failures. In addition to the collapse of state-supported credit and the provision of agricultural extension, the failure to give cotton farmers consistent access to world markets had also hurt them (Ramesh,1998). The farmers in the suicide-prone districts of Vidarbha region of Maharashtra are aware of the union government's package and they have availed of relief measures such as the interest waiver, rescheduling of loans and subsidy under various schemes. They were eligible for fresh loans and could also augment their incomes through subsidiary activities. However, as their capacity to cope with drought conditions is still weak the impact of this multiple scheme is limited. (Kalamkar and Shroff, 2011). As per Basu et al (2016), Farmer Suicide Mortality Rate (SMR) reached 8.76 per 1 lakh farmers (2009) from 4.95 per 1 lakh (1995). During 2005 to 2011 Kerala, Maharashtra, UP etc. had higher SMR than all India average. Deshpande and Arora (2010) finds indebtedness, illiteracy, lack of basic facilities in health & education as the major causes of farmer suicides. Further, they mention the need to reduce transaction costs related to borrowing. The role of indebtedness in farmer suicides has been also studied by (Mitra and Shroff, 2007; Bharti and Vishav, 2011). Reddy and Mishra (2009) find limited rural non-farm employment opportunities, decline in size of holdings, falling investment, falling agricultural credit taken from formal sources, uncertainty of water availability, improper input and use of technology, and increasing costs and fluctuating prices as a broad set of factors contributing to farmer suicides.

In the post-liberalization period, it is rightly argued that the farmers face not only yield risk but also price risk

(Mitra and Shroff, 2007). Mohanty (2005, 2013) attempts to examine how far Durkheim's types explain farmer suicides in India and find egoism and anomie to be the most relevant for the Indian case. Anomie results from loss of social regulation, while egoism indicates loss of integration. According to Mohanty, most farmers committing suicide belong to higher social yet lower economic strata and are not able to deal with the ignominy of not being able to pay off their debts. Narayanamoorthy (2006) shows inadequacy of relief packages announced by the government and suggest the government to refocus on long term investment measures like irrigation, diversification to agri allied areas etc. Kalamkar and Shroff (2011) analysed agriculture relief packages of Andhra Pradesh and Maharashtra and concluded that these packages did not bring any significant changes.

OBJECTIVE:

To analyze the linkages of farmer suicides with rainfall, irrigation facilities, and policies like loan waiver.

HYPOTHESIS:

Based on the objective specified above, the following Null hypothesis has been developed for testing.

H_{01}: Family problems do not have any impact on Ratio of farmer to non-farmer suicides. ($\eta = 0$)
H_{02}: Log Index do not have any impact on Ratio of farmer to non-farmer suicides. ($\omega = 0$)
H_{03}: Indebted Households do not have any impact on Ratio of farmer to non-farmer suicides. ($\delta = 0$)
H_{04}: Below Poverty do not have any impact on Ratio of farmer to non-farmer suicides. ($\lambda = 0$)
H_{05}: MSP of Cotton do not have any impact on Ratio of farmer to non-farmer suicides. ($\phi=0$)
H_{06}: Penetration index of government schemes do not have any impact on Ratio of farmer to non-farmer suicides. ($\xi=0$)
H_{07}: There is no significant difference in Ratio of farmer to non-farmer suicides between the people whose loan is waived and the people whose loan is not waived. ($\gamma = 0$)
H_{08}: There is no significant difference in Ratio of farmer to non-farmer suicides between where the rain is low and where the rain is medium. ($\beta = 0$)

METHODOLOGY:

This paper explores the linkages of farmer suicides with various factors which includes
1) Loan waiver,
2) Production efficiency,
3) Household indebtedness, Family problems,
4) Rainfall
5) Percentage of farmers below the poverty
6) MSP for cotton and Penetration index of government schemes proxy by literacy
7) for 19 major agriculture producing states in India.

The econometric specification for analysis is as follows;
a) Dependent variable is Ratio of farmer to Non-farmer suicides.
b) Independent variable used are – Rain (dummy), Loan waiver (dummy), indebted households, Family Problems, Index, and Percentage of farmers below poverty line (BPL).

$$F=\alpha + \beta\acute{R}+ \gamma\acute{L} + \delta H + \eta P + \omega I + \lambda B + \phi M + \xi E + \varepsilon$$

Where,
F denotes ratio of farmer to non-farmer suicides
Ŕ denotes rain indicator variable
Ĺ denotes loan waiver indicator variable
H denotes indebted households in a state
P denotes suicides due to family problem
I denotes calculated Index
B denotes farmers below poverty line
M denotes minimum selling price cotton
E denotes interactive variable indicating penetration index

The regression and correlation analysis is done using STATA statistical software, the output of which is presented below in fig: 6,

Figure 6: Econometric analysis using STATA software

Variables	Coefficients	Standard Error	P-Value	Significance
Familyprob	0.01239	0.011	0.264	
LoanWaiverDummy	6.15383	7.653	0.421	
Log Index	-3.55216	1.539	0.021	**
Rain Dummy				
1	-6.83574	3.279	0.037	**
2	-12.4427	6.083	0.041	**
literacyMspcotton	0.0000486	0.0000477	0.309	
Indebted HH std	-13.4847	6.838	0.049	**
belowPov	-0.1258	0.075	0.096	*
mspcottonquantity	-0.00003	0.00003	0.285	

** Level of significance at 5% level.
* Level of significance at 10% level.

Figure 7: Correlation analysis using STATA software

	Suicide2015	propofmarg~e	statewisec~d	Familyproblem	illness	Drug abuse	Poverty	BelowPov	Literacy	mspcottonq~y	LoanWaiver~y
Ratio FNF	0.1475	-0.145	-0.1397	0.1355	0.1299	0.3102	0.087	-0.2805	0.5851	-0.0638	-0.1222

The explanations to the variables are as follows:

1. Ratio(Ratio_Dummy): Takes values 0,1,2
   If Ratio_Dummy = 0, then the value 0<F/NF<0.5
   If Ratio_Dummy = 1, then the value 0.5<F/NF<1
   If Ratio_Dummy = 2, then the value F/NF>1
2. Family problem (Familyprob): This includes no of suicides of farmers that occurred due to family problems in 2015.
3. Loan waiver (LoanWaiverDummy): It signifies the loan waiver in states.
   If loan waiver (dummy) = 1: Loan waiver in 2014
   If loan waiver (dummy) = 0: No loan waiver in 2014
4. Index(log_index): The calculation of index is based on 3 crops namely cotton, sugarcane, food grains along with state wise irrigation percentage of the respective crops, state wise production level of the respective crops and state wise productivity of the respective crops.
5. Rain(rainDummy): It takes 3 values 0,1,2
   If Rain (Dummy) = 0: Below normal rain
   If Rain (Dummy) = 1: Average rain
   If Rain (Dummy) = 2: Excess rain
6. Indebted Households (indebted_HH_std): Includes the estimated number of indebted agricultural households in a particular state, values being standardized.
7. Below poverty (belowPov): Percentage of farmers below poverty level.
8. MSP Cotton Quantity (mspcottonquantity): Quantity of cotton in bales under state wise MSP operation.
9. Literacy MSP Cotton (literacyMspcotton): Compound variable indicating information penetration of MSP scheme among farmers. Here literacy level proxies the possibility of penetration.

Here, we have used the ordered Logistic econometric model. The selection of the states is based on relevance of agriculture production, significant suicide values etc.

Further, Summary Statistics have been provided in Appendix 1, Ordered Regression analysis is provided in Appendix 2 and Correlation analysis in Appendix 3.

RESULTS:

1. Based on ordered Logistic model, the following factors significantly explains farmer to non-farmer suicide ratio.
   a. Log (index) and Rain (dummy) with excess, Rain (dummy) with normal rainfall and indebted households at 5 % level of significance.
   b. Below Poverty is significant at 10 % level of significance.
   c. The cut level is also significant.
2. Whereas family problems, loan waiver (dummy), percentage of farmers below poverty are not significant even at 10 % level of significance.
3. Improvement/increase in log (index) which means improvement in state wise irrigation percentage of the respective crops, state wise production level of the respective crops and state wise productivity of the respective crops i.e. in cotton, sugarcane, food grains, it is more likely to have low farmer suicides to non-farmer suicides.
4. As the rainfall is normal/good, it is more likely that suicides of farmer to non-farmer ratio falls in lower category.
5. With increase in indebtedness, it is more likely that farmer to non-farmer suicide ratio fall in lower category i.e. lower level of farmer suicides compared to non-farmers.
6. Increase in percentage of population under below poverty category shows more likelihood that farmer to non-farmer suicide ratio fall in lower category i.e. lower level of farmer suicides compared to non-farmers.
7. Coefficient of MSP Cotton quantity indicates lower farmer suicides compared to non- farmers but is not significant in explaining the variation.
8. Based on simple correlation analysis MSP for cotton and loan waiver in states shows negative association with ratio of farmer to non-farmer suicides, which signifies the benefit of the above schemes.
9. Based on simple correlation analysis the association between number of below poverty and proportion of marginal farmer suicides with ratio of farmer to non-farmer suicide is also negative which may signify that suicide is not a major concern for below poverty or marginal farmers.
10. Based on simple correlation analysis family problems, illness, drug abuse, poverty are major cause for farmer suicides of which drug abuse shows the highest association with farmer suicides followed by family problems and illness.

LIMITATIONS AND SCOPE FOR FURTHER IMPROVEMENT:

The NCRB data is based on the reports made to police. It does not rely on any independent enquiries thus the reliability of NCRB data is not very high. Apart from this, the total number of observations used in this econometric analysis is small. With larger number of observations we can have more freedom to observe multiple explanatory variables and realize more precise understanding of the topic. The analysis can further be improved based on specifying the regions in tandem with IMD meteorological divisions. For example Maharashtra state can be subdivided into Konkan, Khandesh, Marathwada, Vidarbha etc. regions based on common features in agriculture. Thus the econometric analysis would be more reliable considering efficient grouping and adding more observations. The above model includes number of indebted farmers in the state; however it would be more efficient if level of indebtedness is taken into consideration. For e.g. highly indebted farmers may be more prone to suicides compared to non-farmers as well as low indebted farmers. To observe the cascading effect leading to suicides the panel data analysis along with additional variables like insurance and credit facilities will enhance the quality of the research. The data related issues is the major constraint for the analysis.

CONCLUSION:

The loan waiver is although insignificant based on the regression analysis, shows a negative association. Whereas based on simple correlation analysis. The loan waver in states shows negative association with ratio of farmer to non-farmer suicides, which signifies the benefit of loan waiver scheme. Although, it must be taken into account that loan taken is not always used for agricultural purpose but can be utilized for other benefits

including paying back the interest on loans so such a scheme need to be designed carefully to tackle the issue of farmer suicides.

If level of productivity, production, irrigation is improved for food grains, sugarcane and cotton, famer to non-farmer suicides is more likely to decline. This indeed is a long term solution to avoid the menace of farmer suicide. The regression result shows average and good rainfall tend to reduce farmer suicides compared to non-farmers this adds additional impetus on provision of irrigation facilities to tackle the problem of farmers suicides. The regression analysis shows states with higher number of indebted agricultural households are less likely to have higher farmer suicides compared to non-farmer suicides. This shows the level of optimism in the farmers of these states and thus less likelihood to commit suicides. Moreover, debts can be obtained by better off farmers which can explain lower tendency to suicides.

Percentage of population below poverty significantly explains the variation in farmer suicide with tendency of lowering of farmer suicides as its percentage increase; it can be taken as an indication that suicides are not the major problem related to below poverty agricultural workforce.

The simple correlation analysis further shows, the association between number of below poverty and proportion of marginal farmer suicides with ratio of farmer to non-farmer suicide is negative which also signify that suicides is not a major concern for below poverty or marginal farmers.

Based on regression analysis MSP scheme of cotton in various states shows likelihood of low farmer suicides but is not significant in explaining the variation Based on correlation analysis MSP cotton in states shows negative association with ratio of farmer to non-farmer suicides thus effectiveness of such a scheme cannot be neglected. The analysis done has certain restriction but an improved model with more reliable data and number of observation might be useful in establishing significant policy implications on the topic of farmer suicides.

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