Incidence of Farmers' Suicide in India: A Spatial Analysis

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Abstract

Suicide is a horrible incident in human society and suicide by farmers is one of the worst social and economic problems which definitely dent the welfare state image of India. Though suicide in general and by the farmers in particular are not new in India, but the recent increase in incidences in some of the agriculturally developed states made us to give attention to this issue. The present paper based on data published by National Crime Record Bureau and the Agriculture Statistics report by the Government of India. Here, attempted has been to analyse the spatial pattern of incidences of suicide in farming sector and to identify various reasons behind it. The important feature of spatial distribution of incidences of suicides in farming sector is that the incidences are more concentrated in the states located in the north-western part of southern plateau Punjab and Haryana. The states of Maharashtra and Karnataka are the most affected followed by Andhra Pradesh, Telangana and Madhya Pradesh. Other states having substantial farming have quite low incidence of suicide by farmers. It has been found that most of suicides are committed my male members of the family There are positive correlation between the suicide and the small land holding, poverty, practice high capital investment taking loans. It is negatively associated with cold storage facility, high intensity of cropping. To overcome suicide problem, structural changes in farming is the need of the hour.

Key Words: Farmers' suicides, Cropping Intensity, Mechanisation, farm-loan, welfare state

Introduction: With the increasing level of mechanisation and gradual decline in land holdings (the average per household size of land), the cost of farming is increasing in India. Farming is not as simple as it used to be as traditionally it was based on manual with aid of animals, use of cattle's dung as manure and seeds were used from the production of last years. In the present day farming, a farmer has to pay for most of the inputs right from high yielding treated seeds, chemical fertilisers, pesticides, use of machines in preparation of farms, irrigation, harvesting and even for transfer of the produces to home or mandies. A huge amount has to be spent on these, which has to be managed from local financial sources at exorbitant rate of interests as getting loan from banks is not easy. At the time of crops failure, farmers are not able to return the amount taken as loan and further they have to take loan for the next crops if there are consecutive crops failures resulting in farmers trapped in the vicious circle of the loan. In such a situation, many times such farmers end their life by taking extreme steps like suicide. The consecutive crop failure not only affects the farmers but also has an adverse impact on the earning capacity of agricultural labourers as they are directly dependent on farming and harvest of crops. There are hardly any alternate sources of livelihood in villages for such people. There are incidences of suicide by agricultural labourers too in such distress conditions. Suicide either by a farmer or by an agricultural labourer has social and economic implications not for the person but for the family, society, state, nation and the humanity. This happens differently in different regions. Hence, it becomes imperative to spatial analysis of the

issue of suicide by farmers and agricultural labourer in the rural parts of the country. The present paper attempts to find out the spatial pattern of such suicides in agriculture sector and tries to find out the correlates of such incidences with various socio-economic attributes in India.

Review of Literature: With the opening of economy of India for international market during 1990's economic reforms, a stiff international competition was experienced in agricultural sector too due to globalisation, liberalisation and privatisation. Under the WTO agreement subsidies in agriculture sector has been reduced and attempt is being to left the farmers to market forces. Though, there may be incidences of suicide by the farmers in India before 1990's but the incidences have increased considerably after that. There are number of studies conducted to analyse the incidences and causes of suicides by farmers at the country level as well as at the states level. Ramesh (1998) pointed out that though number of policy measures was introduced to support the farmers but the failure in implementing such policy hurt the farmers most. Reddy and Mishra (2010) in their book on "Agrarian Crises in India" dealt with the distress of farmers taking case studies of affected states and the failure of policy measures taken by the state and the central government. The issue of farmer's suicide in India has been highlighted on print and electronic media at local, national and international level. In this background, an attempt has been made to trace out the spatial patterns of farmer's suicide in India along with the factors responsible for it and to suggest some important policy measures.

Aims and Objectives: Following are the objectives and objectives of the present study:

    i)   To highlight the spatial pattern of farmer's suicide in India.

    ii)   To trace out the correlates of farmer's suicide in India.

    iii)   To suggest some policy measures to control the incidences of farmer's suicide in India.

Conceptual framework, Data Base and Methodology:

As per Cambridge English dictionary, suicide means act of killing yourself intentionally. The data on suicide in India is compiled and published by the National Crime Record Bureau (NCRB) of Government of India. The data pertaining to profession wise distribution of suicides are published in table 2.7 by the NCRB (Report 2018) in their report on Accidental Deaths and Suicides in India. There may be certain issues regarding the quality of data as zero cases of suicide by farmers and agriculture labourers are reported by some of the states and union territories of the country. Since this is the only source of data at India level available on suicides so there is no other option but to rely on it. On page number 244 and 245, the data is given under 5 headings relevant to our study. Under the first heading, the total numbers of suicide by persons engaged in farming sector is given. The persons engaged in farming sector is further subdivided into farmers/cultivators and the agricultural labourers. The farmers/cultivators category is again subdivided into two- those who are owners of the land and cultivating it themselves and those who are cultivating it on leasehold. Each of the above categories is further subdivided into male, female, transgender and total cases. Since no case of transgender is reported, the category has been dropped for further analysis. Suicide rate per lakh persons has been computed by dividing the total number of suicides by the total farming population [SR= (number of suicide in farming sector in 2018/total farming population in 2011) x100000]. The total farming population is computed by adding the rural cultivators and rural agricultural labourers (including both main and marginal workers). The states and union territories with zero cases have been also dropped for application of statistical analysis techniques. The data pertaining to correlated factors have been drawn from report of the Agriculture Statistics at Glance 2018 published by Government of India. The absolute figures have been represented with the help of diagrams and open source

GIS software. QGIS is used for visualisation of data on map. Pearson's co-efficient of correlation has been computed to understand the nature of relationship. Linear regression analysis was also done to understand the importance of various correlated factors on the incidences of farmer's suicide in India.

Results and Discussion:

Incidences of Suicides in India: As per WHO report, around 8 lakh persons died each year in the world while the number of persons died in 2018 due to suicide in India is 1.34 lakh. As per the NCRB data, there is an increase of 3.6 percent in number and 0.3 percent in the rate of suicides from 2017. The state wise break indicates that Maharashtra was leading with around 18 thousand cases in 2018, followed by Tamil Nadu, West Bengal, and Madhya Pradesh (Figure 1). The other group of states in the range of 4 to 8 thousand cases were Kerala, Telangana, Gujarat, Chhattisgarh, Andhra Pradesh, Uttar Pradesh, Odessa, and Rajasthan. In the states of Haryana, Delhi, Assam, Punjab, and Jharkhand the cases ranges from 1 to 4 thousand. The incidences in other states and union territories are below 1 thousand. Though there are some units, where the cases were reported zero.
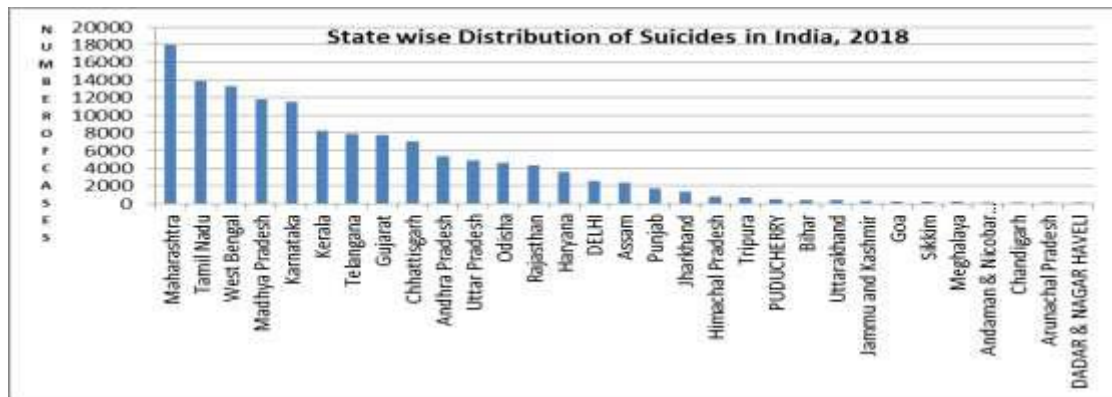

Figure 1

Incidents of suicide by Total persons engaged in farming sector in India in 2018: The persons engaged in farming sector mean those persons who are earning their livelihood form agriculture either as farming the land or as agricultural labourer. Though the state of Maharashtra (more than 3000) leads in the number of cases as in the case of general suicide but the other states are not at same place. The state of West Bengal has reported zero cases, which in fact may not be the correct figure. Karnataka is the second leading state with more than 2000 cases and Telangana is at third place with more than 800 cases (Figure 2). So, in terms of suicide cases of persons engaged in farming, only two states of Maharashtra and Karnataka need an urgent attention.
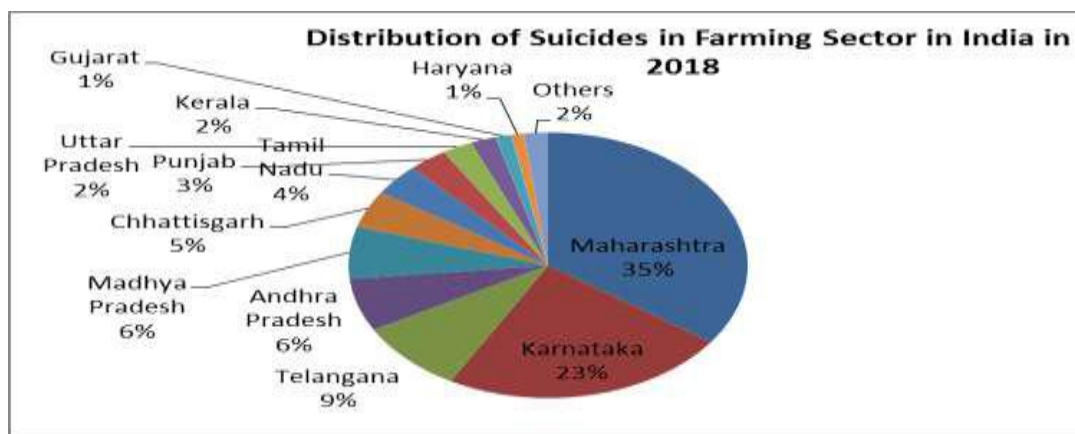

Figure 2

It is also highlighted that the male cases is high, and female cases are quite low as the proportion of male workers is quite higher in this sector. If we see state wise data, Maharashtra reported highest cases both in male and female (Figure 3).
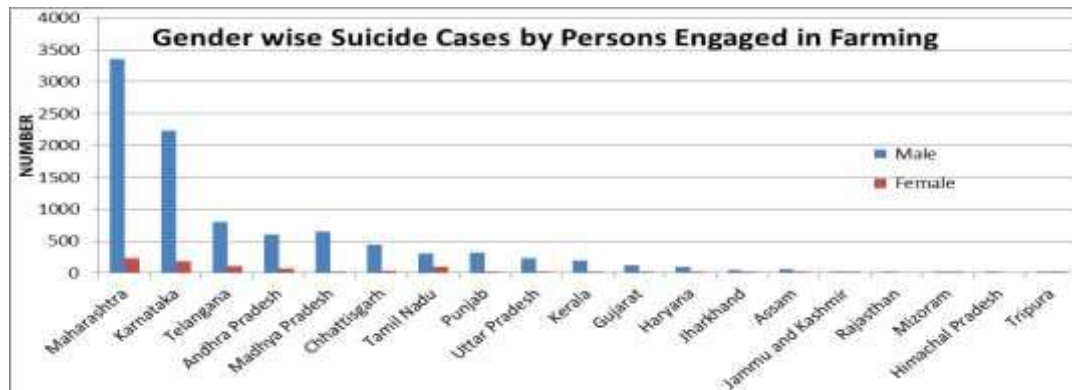

Figure 3

The spatial pattern depicted by the map (Figure 4) reveals that there is a concentration of incidences of suicides on the eastern slopes of the Western Ghats, where farming is more dependent on monsoon rain. Generally this area is dominated in cash crops where input cost is high and successive crops failure in these regions results into higher incidences of suicide cases.
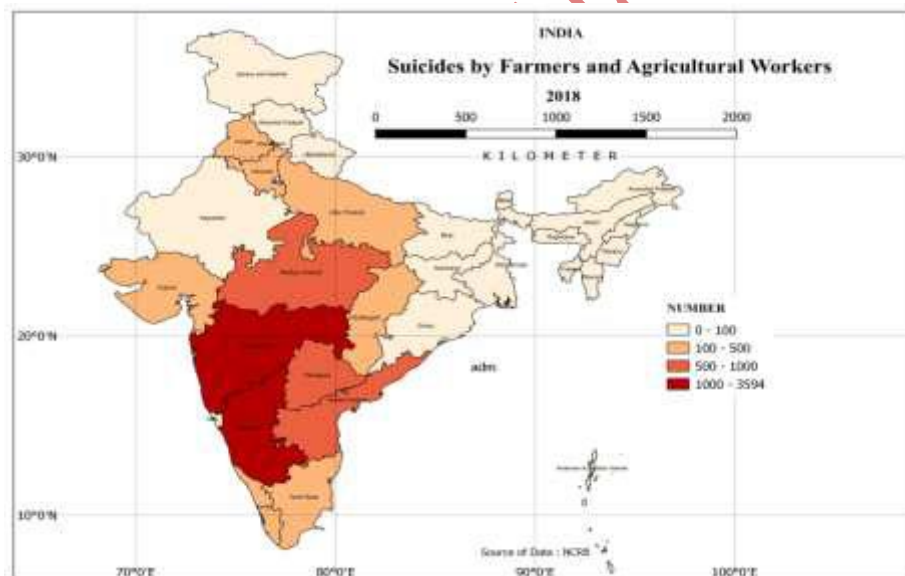

Figure 4

Incidents of suicide by Farmers/Cultivators in India (2018): Farmers/ cultivators mean those persons who are cultivating land to earn their livelihood. It includes both groups of the persons who are cultivating as the owner of the land and the leaseholders as well. The total number of suicide cases by farmers/cultivators closely follows the same pattern as of the total persons engaged in farming. The leading states are Maharashtra, Karnataka, Telangana, Andhra Pradesh and Chhattisgarh (Figure 5). The bar diagram representing suicide cases by farmers and cultivators separately indicates that the suicide number is quite high in farmers (owners) group than the cultivators (lease holders) one (Figure 6).
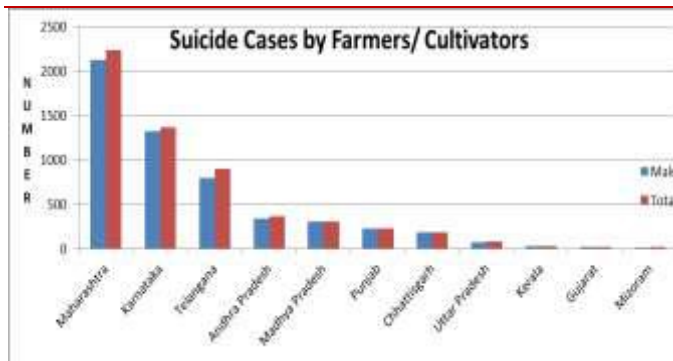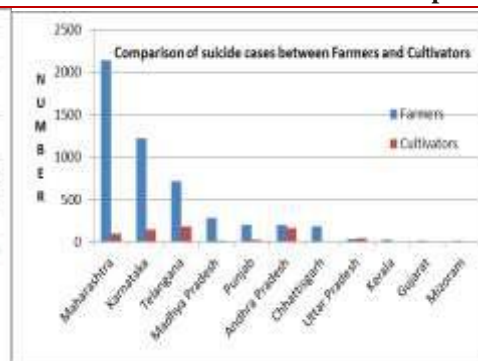
| Figure 5 | Figure 6 |

The spatial pattern of incidences of suicide by the farmers (cultivating own land), indicates that most of the states are located in the southern plateau except the state of Punjab. Such incidences are low in the fertile Ganga-Brahmaputra fertile plain where subsistence farming is still being practiced (Figure 7).
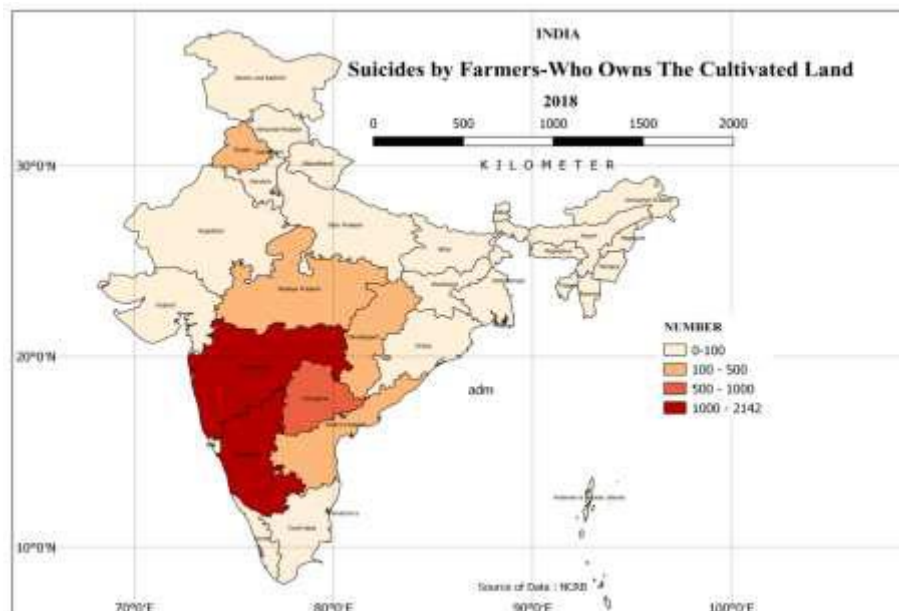

Figure 7

Incidents of suicide by Agriculture Labourers in India in 2018: Agricultural labourers are those persons who neither own the land and nor cultivate the land on lease but are engaged in farming as wage labours. The highest cases of suicide by agricultural labourer are reported from Maharashtra followed by Karnataka, Tamil Nadu, Madhya Pradesh, and Andhra Pradesh. The position of states in terms of cases of suicide by agricultural labourers is similar to that of suicide by farmers. It is because the labourers are dependent on the farmers for wages and if the farmers in a state are in distress, the labourers will also be distress (Figure 8). The states with higher incidences of suicide by agricultural labourers are spread from Tamil Nadu in the South except Telangana to Haryana in the north (Figure 9).
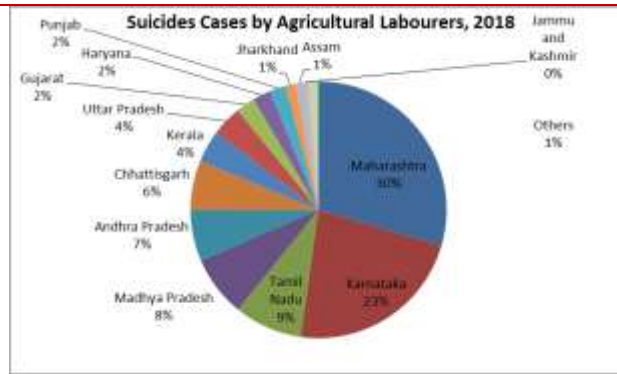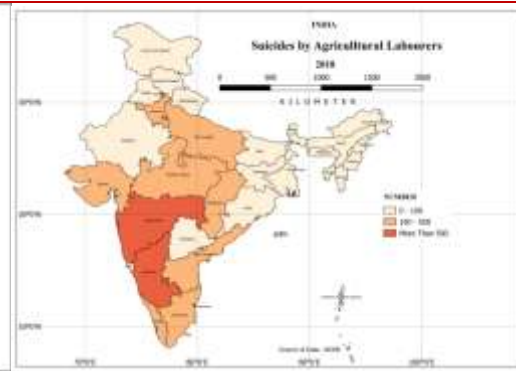
Figure 8

Figure 9

Suicide rate in farming sector: As explained in the methodology, incidents of suicides per lakh are calculated to analyse the incidences with respect to population. It is noticed that Karnataka, Maharashtra, Kerala, Punjab, Chhattisgarh were the leading states in terms of suicide rate in farming sector in 2018 (Figure 10). Karnataka recorded highest suicide rate whereas Maharashtra reported highest numbers of suicide cases. The spatial pattern of higher suicide rate (number per lakh) forms a continuous belt from Kerala to Chhattisgarh via Karnataka and Maharashtra. The states with higher suicide rates are surrounded by moderate incidences of suicide rate. The states of Uttarakhand, Bihar, Bengal, Orissa and Meghalaya have not reported any incidence of suicide in 2018 (Figure 11).
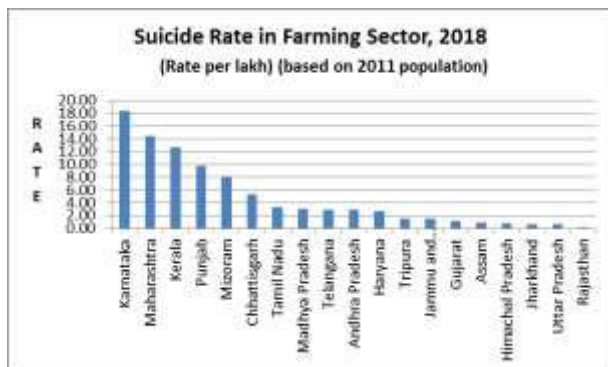
Figure 10
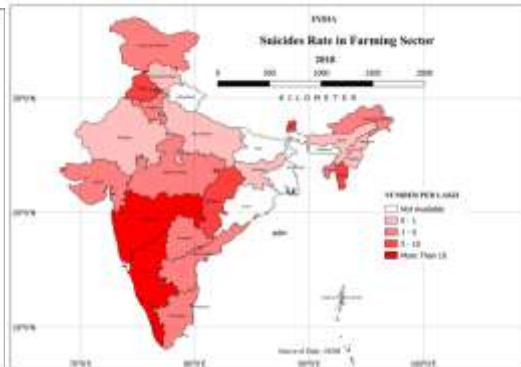
Figure 11

Temporal Changes in the cases of Suicide in Farming sector: The percent change in cases of suicide in farming sector indicate that there was a decline in most of the states during 2014-18 (Figure 12). In the states of Gujarat, Sikkim, Kerala, and Himachal Pradesh, the suicide cases declined significantly. On the contrary, there was very high increase in suicide cases in the state of Jharkhand followed by Punjab, Mizoram and Karnataka.
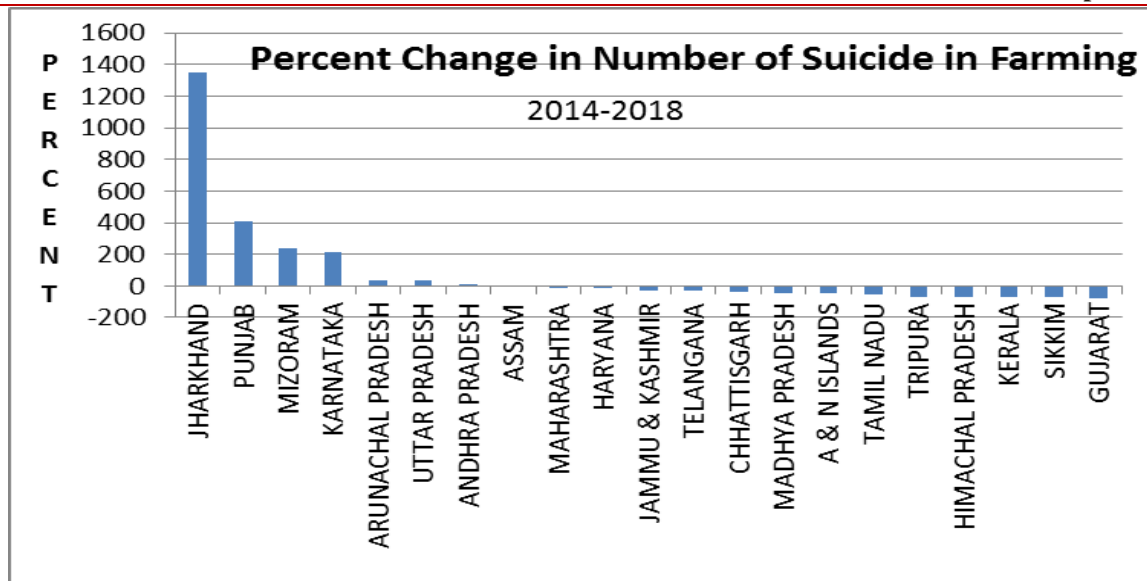
Figure 12

Correlates of incidences of Farmers Suicide in India: The incidences of suicides by farmers have attracted our attention recently. So, it becomes necessary to find out the correlates of such incidences to curb them. Five different types of number of suicides were selected as dependent variable – suicide by total persons engaged in farming sector, suicide by the farmers/cultivators (farmers land owners +lease holders), the farmers (only land owners), the cultivators (only leaseholders) and the agricultural labourers. Each of these has been further subdivided into male, female and total, making dependent variables 15. Besides the above 15, the suicide rate has also been taken as dependent variable making it 16. In this process, data pertaining to19 agriculture related independent attributes are collected from the Agriculture Statistics of India 2018. The latest data of some of these variables is not available, therefore, whatever latest data available, have been used in further analysis. These 19 independent agricultural attributes are – poverty estimates given by Ganguly committee (2011-2012), Net State Value Added (2017-18), Net Sown Area (2017-18), 3 year average value of agricultural output (2012-2015),   3 years average of the net irrigated area by canal ('000 hectares) (2012-2015), 3 years average of the net irrigated area by other sources ('000 hectares, 2012-2015), 3 years average of the net total irrigated area ('000 hectares, 2012-2015),   Cold Storage Capacity as on 31.3.2018 (in metric tonnes), Percentage Coverage of Irrigated Area under Principal Crops during 2014-15 (Provisional), Cropping Intensity((NSA/TCA)x100, 2014-15), N, P & K fertiliser consumption (in thousand tonnes) (2017-18), the agricultural loan disbursed in 2017-18 (amount in Rs. lakh), the agricultural outstanding loan in 2017-18 (amount in Rs. crore), the percentage of area insured (2017-18), the area of operational holdings by marginal size group (in hectares, 2015-16 provisional), the area of operational holdings by the small size group (2015-16) (provisional in hectares), the area of operational holdings by medium size group 2015-16 (in hectares, provisional), the area of operational holdings by semi medium size group (in hectares, 2015-16 provisional), the area of operational holdings by large size group (in hectares, 2015-16 provisional). These attributes have been taken with the assumption that they have direct relationship with the incidences of suicide in farming sector.

As a result, a correlation matrix has been prepared to explore the degree and direction of correlation of farmer's suicide cases with all the attributes mentioned. For the purpose of calculation of r values, only 18 states are

considered, where the suicide cases are more than zero and data pertaining to all attributes is available Finally, a matrix of correlation coefficient of 16 dependent variables and 19 independent attributes has been prepared to find out degree of association and its directions between these items. The significant r values, which are more than 0.5 are highlighted in the correlation table. The resultant correlation matrix is divided into two parts to simplify and make it presentable. The r values of 6 dependent variables (all 5 categories of suicide and the suicide rate) and 19 independent attributes are presented in Table-1.

Table 1: r values of 5 types of number of suicide (only total) and suicide rate

	Persons Engaged in Farming-	Farmers/Cultivators (Total)-F+C	Farmers-Own Land	Cultivators-Leasehold	Agricultural Labourers	SR	Direction of r value
Poverty Estimates (Rural)	0.49	0.45	0.46	0.13	**0.51**	**0.65**	All positive
NSA	0.47	0.44	0.44	0.21	0.49	0.09	All positive
value of agricultural output	0.39	0.35	0.36	0.21	0.42	0.05	All positive
net irrigated area	0.32	0.28	0.27	0.25	0.36	0.16	All positive
net total irrigated area by all sources	0.19	0.15	0.15	0.08	0.24	0.02	All positive
Fertiliser use	0.42	0.40	0.39	0.36	0.41	0.09	All positive
Agricultural Loan disbursed	0.28	0.21	0.19	0.35	0.37	0.20	All positive
Holdings – Small	**0.73**	**0.71**	**0.70**	0.46	**0.72**	0.24	All positive
Holdings - Medium	**0.62**	**0.59**	**0.60**	0.32	**0.63**	0.18	All positive
Holdings-Semi medium	0.30	0.28	0.30	0.05	0.31	0.03	All positive
Agricultural outstanding Loan	0.15	0.14	0.13	0.14	0.16	-0.06	5 positive
Holdings - Marginal	0.35	0.31	0.30	0.34	0.38	-0.004	5 positive
NSVA 2017-18	0.37	0.32	0.31	0.32	0.41	-0.01	5 positive
net irrigated area by other sources	0.14	0.11	0.11	0.04	0.19	-0.02	5 positive

Holdings- Large	0.002	0.004	0.02	-0.10	0.000	-0.12	4 positive
Cold Storage Capacity	-0.06	-0.06	-0.08	0.10	-0.05	-0.21	5 negative
Irrigated Area under Principal Crops	-0.16	-0.16	-0.18	0.07	-0.16	-0.14	5 negative
Area Insured	-0.07	-0.07	-0.06	-0.11	-0.06	-0.29	all negative
Cropping Intensity	-0.17	-0.17	-0.15	-0.25	-0.17	-0.17	all negative

All the 6 dependent variables (4 types of number of suicides, number of suicide by agricultural labourers and suicide rate) show a positive correlation with 10 independent attributes – rural poverty, net sown area, value of agricultural output, net irrigated area by canal, net irrigated area by all sources, use of fertilisers, amount of loan disbursed, small size of land, medium size of land, and semi-medium size of land. Among ten, the independent attributes like rural poverty, agricultural labourers, poverty and the suicide rate recorded high positive correlation having r value more than 0.5. Small landholding size and Medium landholding size record very high positive correlation with the most of the dependent variables (all categories of suicides). Four of the dependent attributes - agricultural outstanding loan, marginal area of operational holdings, net state value added, and net irrigated area by other sources, show a positive correlation with all the different types of suicides. Contrary to it, there is a negative correlation between suicide rate and above mentioned attributes. The high positive correlation between suicide and above mentioned attributes indicate that investment in fertilisers, irrigation, loan, small land holdings and poverty have great impact on the incidents and rate of suicide. It is also revealed that 14 of the independent records positive correlation with all the 5 categories of incidences of suicide (leaving out only suicide rate). Cold storage capacity and irrigated area under principal crops have a very low negative correlation with 5 dependent variables. Area insured and cropping intensity are the two independent attributes having negative correlation with all the dependent variables i.e. suicides. Cold storage capacity is an indicator of increase in shelf life of agriculture products and higher returns. As a result, there seems to be a negative correlation between incidences of suicide and storage capacity. The r values in relation to the same 5 dependent variables indicate that there exist a negative correlation but the degree is quite low. Surprisingly, the storage capacity has a very low positive correlation with the leaseholders. Two of the independent attributes namely cropping intensity and area insured, records a low negative correlation with all the dependent variables. It means where there is high cold storage facility, high insurance execution, and high multiple cropping the incidences of suicide are comparatively low.

Regression Analysis of Farmers Suicide Rate and Incidences of Farmers Suicide in Farming Sector: A best fit regression line helps in understanding the behaviour of dependent variable with respect to the independent attributes taken for analysis. Two dependent variables – suicide rate and total number of suicides in farming sector are selected to form best fit lines taking rural poverty and crop intensity as independent attributes. The regression line of suicide rate on rural poverty indicates, increasing deviation of states as one

goes away upwards from the origin point with high positive correlation (Figure 13a). On the other hand, the regression line of suicide rate on cropping intensity depicts that the states are spread distantly on both directions of the best line and higher residuals with low negative correlation (Figure 13b). The regression line of total number of suicide in farming sector on rural poverty indicates concentration of states with lower values of rural poverty and spacing keep on increasing, as the value of rural poverty increases with low positive correlation (Figure 13c). The regression line, of total number of suicide in farming sector on cropping intensity shows more concentration of states on negative side between 100 to 200 percent intensity with low negative correlation (Figure 13d). It confirms that multiple cropping is beneficial for farmers leading to low incidence of suicide in such areas.
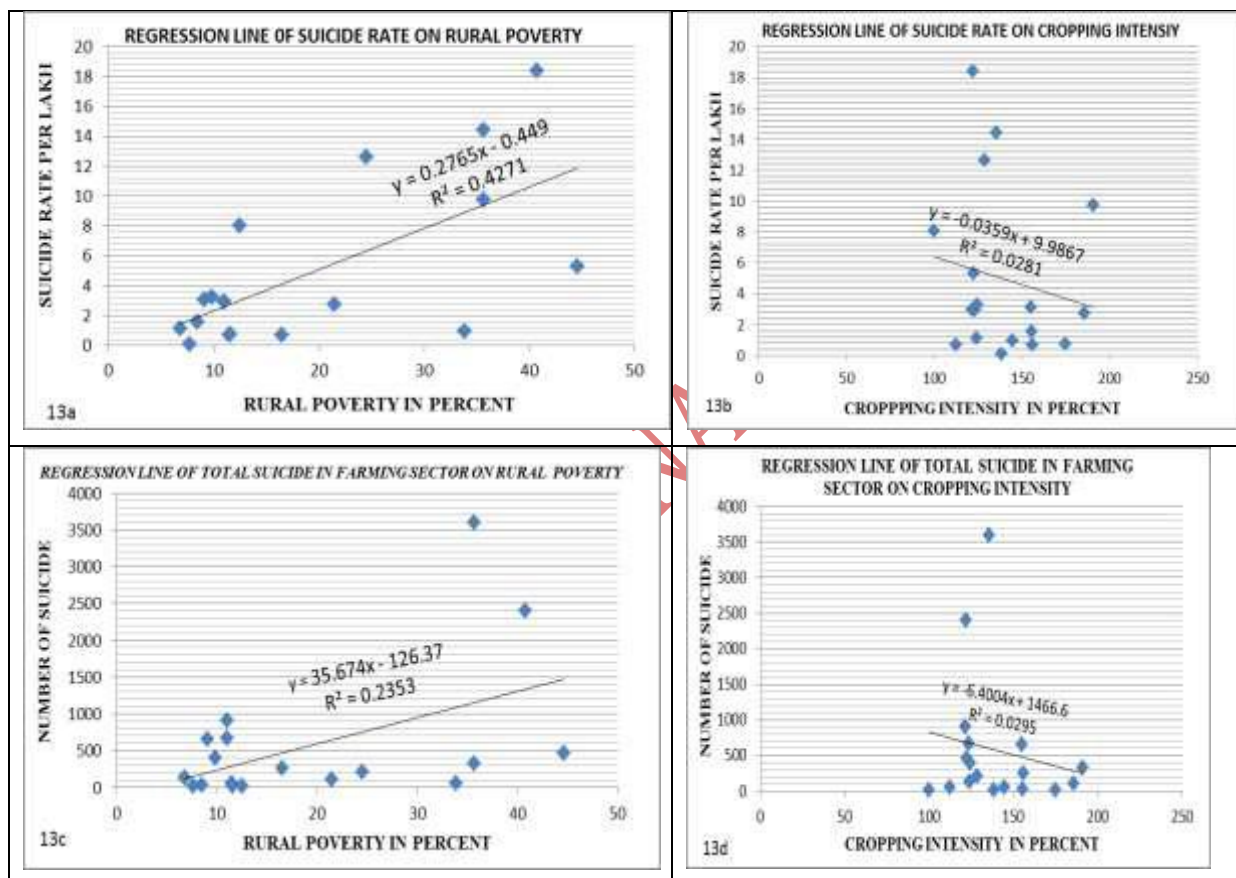

Figure 13 a, b, c and d

Policy Suggestions:

As far as policy implications are concerned, factors responsible for suicide in farming sector are natural as well as man-made. Agriculture in India is mostly dependent on monsoon rain. Monsoon rain is known for its erratic behaviour, variability and non-reliability. We need to ensure availability of water for irrigation to escape from crop failure during dry period. It has been observed that not only the scarcity of rain adversely affecting agriculture in India but at many places, its abundance is also a problem in the form of floods. Besides rain failure, there are many more factors responsible for the lower production in agriculture sector, like higher temperature during seeding/ fruit bearing stage, crop diseases, and exploitation of farmers during sale of the products, increasing cost of inputs due to mechanisation etc. To overcome these, there is a need to bring structural changes in farming by shifting from wheat-paddy to low water consuming and nitrogen fixing crops. Better irrigation methods, use of organic fertilisers, new varieties of seeds and a co-operative system for availing

costly farm implements. A well-developed social security system is required, for example a tsunami like warning system to forecast weather conditions in advance. For effective management a Farmer's Information System need to be developed through which a distressed farmer can share his condition and gets his issues fixed in time. It is high time to generate more reliable data based the field surveys.

Conclusions:

Suicide by farmers in India is one of the worst social and economic problems which definitely dent the welfare state image of the country. Though suicide in general and by the farmers in particular are not new in India, but the recent increase in incidences in some of the agriculturally developed states made us to give attention to this issue. The present paper based on data published by National Crime Record Bureau and Agriculture Statistics by Government of India attempted to describe the spatial pattern of incidences of suicide in farming sector and to identify the correlates. The important feature of spatial distribution of incidences of suicides in farming sector is that the incidences are more concentrated in the states located in the north-western part of southern plateau. The states of Maharashtra and Karnataka are the most affected one followed by Andhra Pradesh, Telangana and Madhya Pradesh. Other states having substantial farming have quite low incidence of suicide by farmers. It has been identified that most of incidences are committed my male members of the family. However in the states with higher incidences, some cases of suicide by females have also been reported. Some of the states reported zero incidences of suicide. Reporting may be the season but it needs thorough studies to establish the truth.

The suicide incidences are much higher among the farmers cultivating their own land as compared to those who are cultivating on leasehold. Such cases are again concentrated in the southern plateau region and Punjab. The cases from other states located in plain, north-east, Rajasthan and the eastern coastal region are lower. Though the number of suicide incidences by agricultural labourers is lower. Gujarat, Haryana, Uttar Pradesh, Chhattisgarh, Tamil Nadu and Kerala have high incidence of suicide by agricultural labourers. In other parts of the country the incidences by agricultural labourer are quite lower. The suicide rate is quite high in the belt starting from Kerala and continued up to Chhattisgarh via Karnataka and Maharashtra. Punjab and Mizoram are the two states away from the plateau region, where an incidence of suicide by agricultural labourers is high. Jharkhand, Punjab, Mizoram and Karnataka records very high increase in incidences of suicide by the farmers. Gujarat, Sikkim, Kerala, and Himachal Pradesh are the states where a significant decrease in the incidences has been recorded.

The present analysis identified that marginal, small, medium, and semi medium size of operational landholding, population below poverty level, net sown area, use of fertilisers, irrigated area, and disbursed amount of agriculture loan have positive correlation with the various categories of incidences of suicide and suicide rate. Cropping intensity, area insured irrigated area of principal crops and cold storage capacity show negative correlation with suicides leading to conclude that they are helpful in bringing down the incidences of suicide in farming sector. Though there is good correlation with number of incidences of suicide in farming sector but the amount of residuals are quite high and the states are spread on both sides of the regression line. There is a need for more comprehensive policy for agricultural sectors to enhance their productivity, diversification of cropping patterns, changing in methods of irrigation, use of chemical fertilizers, increase in infrastructures like cold storage, markets along with encouraging cooperative farming, non-farming economic activities etc. There is need for more reliable data generation for the formation of policies for agricultural sector.

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