CHAPTER - 1
INTRODUCTION AND RESEARCH METHODOLOGY

1.1   Introduction

Agriculture sector plays an important role in the growth of a developing nation. It is well known that economies of developing countries are based on agriculture sector. Most of the people in developing economies are dependent on agriculture and allied activities. The employment generation and livelihood depend only on agriculture and supporting business. Generally, focus of agricultural policy in developing nations is on employment generation in tribal and rural areas, poverty eradication and equal distribution of income with high economic growth. Moreover, it is expected to contribute these socially backward groups more in overall development of nation. However, there are limitations on the expansion of area under cultivation. Therefore, it is essential to increase productivity of agriculture sector through appropriate investment in basic infrastructure, research and expansion.[1]

Meaning and definition of agriculture

Agriculture is the most comprehensive word used to denote many ways in which crop plants and domestic animals sustain the global human population by providing food and other products. The English word agriculture derives from the Latin ager (field) and colo (cultivate) means field or land tillage. But the word has come to subsume a very wide spectrum of activities that are integral to agriculture and have their own descriptive terms, such as cultivation, domestication, horticulture, arboriculture and vegeculture as well as forms of livestock management such as mixed crop-livestock farming, pastoralism and transhumance. Agriculture is also frequently qualified by words such as incipient, proto, shifting, extensive and intensive and the precise meaning of which is not self-evident. Many different attributes are used to define particular.

.   Therefore the term agriculture means cultivation of land i.e. the science and art of producing crops and livestock for economic purposes. It is also referred to as the science of producing crops and livestock from the natural resources of the

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[1] Kalamkar S.K. (2011), "Agricultural Growth and Productivity In Maharashtra: Trends and Determinants", Allied Publishers Private Limited, New Delhi, Pp.01

earth. The primary aim of agriculture is use land to produce more abundantly and at the same time to protect it from deterioration and misuse. It is synonymous with farming and the production of food, fodder and other industrial materials.

Agriculture act 1947[2]

"Purposeful work which produces plants and animals for meeting the human needs through processing on natural elements. It depends on the growth and development of selected plants and animals within the local environment. Agriculture includes horticulture, fruit growing, seed growing, dairy farming and livestock breeding and keeping. The use of land as grazing land, meadow land, osier land, market gardens and nursery grounds and the use of land for woodlands where that use ancillary to the farming of land for agricultural purposes".

Agriculture as art, science and business of crop production

Agriculture is defined as the art, the science and the business of producing crops and livestock for economic purposes.

a. **As an art:** It embraces knowledge of the way to perform the operations of farm in a skilful manner. The skill is categorized as

Physical skill: It involves the ability and capacity to carry out operation in an efficient way i.e. handling of farm implements, animals, sowing of seeds, fertilizer and pesticides application etc.

Mental skill: The farmer is able to take a decision based on experience, such as time and method of ploughing, selection of crop and cropping system to suit soil and climate, adopting improved farm practices etc.

b. **As a science:** It utilizes all modern technologies developed on scientific principles such as crop improvement/breeding, crop production, crop protection, economics etc. to maximize the yield and profit. For example, new crops and varieties developed by hybridization, transgenic crop varieties resistant to pests and diseases, hybrids in each crop, high fertilizer responsive varieties, water management, herbicides to control weeds, use of bio-control agents to combat pest and diseases etc.

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[2] Chandrasekaran B, K. Annadurai & Somasundram A. (2010) , *"A text Book on Agronomy",* New Age International Publishers, New Delhi, Pp. 1-2

c.   **As the business:** Agriculture is the way of life of rural people and production is ultimately bound to consumption. But agriculture as a business aims at maximum net return through the management of land, labour, water, capital and employing the knowledge of various sciences for production of food, feed, fiber and fuel. Recently, agriculture is commercialized to run as a business through mechanization.

In short, agriculture is the systematic raising of useful plants and livestock under the management of man. It includes cultivation of field and horticultural crops, growing of trees, animal husbandry, fishery, bee-keeping, vermiculture, sericulture, etc. However, researcher has considered here only farm cultivation.

India is a developing country in the world. It accounts for only about 2.4 percent of the world's geographical area and 4 percent of its water resources, but has to support about 17 percent of the world's human population and 15 percent of the livestock.[3] These people live in the villages and majority of villagers are engaged in agriculture sector along with animal husbandry, forestry and fisheries. It has played significant role in the economic development of nation during the planning period. It is indeed, the economic prosperity of our country is mostly depends on prosperity of agriculture sector.

1.2   Indian agriculture overview

At the beginning of planning, agriculture was underdeveloped and farmers were hopeless and under the burden of indebtedness in India. Consequently, India had an acute food shortage due to low productivity and production of foodgrain. However, the situation has totally changed after introduction of green revolution in India. The goal of introducing green revolution was to increase production of food grains through increasing per hectare yield of food grain crops by adaptation of new technology.   This adaptation has brought fruitful results in agriculture sector. It is called Green Revolution in India.[4] The introduction of HYVP, IAAP and IADP during the sixties leads to improvement in per hectare yield of wheat, rice crops. Later, India has achieved considerable growth in per hectare yield of cotton, oilseeds, fruits and milk through white revolution, yellow revolution, pink

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[3] Government of India (2013) *"State of Indian Agriculture 2012-13"* Ministry of Agriculture, New Delhi, Pp. 01

[4] Joshi Mahesh (1999), *"Green Revolution and its Impacts",* A.P.H. Publishing Corporation, New Delhi, Pp. 10.

revolution and many others. Consequently, food grains production increased almost five times during the planning period. It had 55 million tonnes in 1949-50[5] and touched to highest level of 259.32 million tonnes in 2011-12.[6] Similarly, cropping pattern has changed since green revolution. At the beginning of the 20th century, more than 83 percent of land was under food crops and about 17 percent under non food crops.[7] By 1950-51, area under food crops had 74 percent and come down to 64 percent by 2007.[8] The shifting of cropping pattern from food grains to non food grains crops was mainly due to the higher prices of non food grains.

However, the share of agriculture in total GDP was 50 percent in 1947 and came down to 13.9 percent in 2012-13.[9] Similarly, the share of agriculture sector in total exports has also come down from 44.2 percent in 1960-61 to 9.7 percent in 2010-11 in India[10], although India has 10th rank in export of agriculture and food products in the world.[11] Despite a steady decline of its share in GDP, agriculture is still largest economic sector and plays a significant role in the overall socio-economic development of India. Therefore, the Economists always say that, agriculture is the backbone of Indian economy.

Hence, the agrarian crisis has become an important issue since new economic reforms in India. The national commission on farmers declared that unfinished agenda in land reform, quantity and quality of water, technology fatigue, access, adequacy and timeliness of institutional credit, opportunities for assured remunerative marketing and adverse meteorological factors are basic factors and centre of present agrarian crisis in India.[12] Moreover, declining public

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[5] Ruddar Dutt & Sundram K (2003), *"Indian Economy",* (Forty Eight Edition), S. Chand & Company Ltd, New Delhi, Pp.485

[6] Government of India (2014), *"Economic Survey of India 2013"* Directorate of Economics & Statistics, New Delhi, Pp. 175

[7] Ruddar Dutt & Sundram K (2003), *"Indian Economy",* (Forty Eight Edition), S. Chand & Company Ltd, New Delhi, Pp.488

[8] Ruddar Dutt & Sundram K (2003), "*Indian Economy",* (sixty Two Revised Edition), S. Chand & Company Ltd, New Delhi, Pp.525

[9] Puri V. & Mishra K. (2014), *"Indian Economy",* 32nd edition, Himalaya Publishing House, Mumbai, Pp.231

[10] Government of India (2013), *"Economic survey of India 2012-13- Statistical Appendix",* Directorate of Economics & Statistics, Delhi, PP. A88-A89[10]

[11] Government of India (2014), *" Economic Survey of India 2013",* Ministry of Finance, New Delhi, Pp. 189

[12] Government of India (2004), "*Report on servicing farmers and serving farming",* National commission on farmers', Pp. I

investment in agriculture sector, increased cost of production, structural changes in pattern of land holding, uneven and uncertain rainfall, low level of irrigation and the negative impact of globalization, liberalization and privatization on agriculture have also affected agriculture sector in India.

Consequently, farmers in India lose their confidence and it leads to frustration and ultimately tendency towards suicide. Small and marginal farmers, tenants and share croppers, landless agricultural labour and tribal farmers are largely affected due to above factors in India, whose coping capacity is very limited. Therefore, a large number of farmers have committed suicide and its intensity is continuously increasing overall India.

1.3   Overview of agriculture sector of Maharashtra

Maharashtra is the developed state of the India. It contributes almost 14.4 percent in GDP of nation at current prices in 2011-12.[13] State contributes 21.4 percent industrial output[14] and 15 percent of service sector output of nation. Similarly, it has a vital contribution in fruits, vegetables, flowers and spices production of nation. Maharashtra is the second largest fruit producing state, contributing 12.7 percent share in national fruit production. State contributes 8.8 percent share in loose flowers production, 11.5 percent share in cut flowers production, more than five percent share in vegetable production, 30 percent share in cashew nut production, 50 percent share in Mosambi production, 63 percent in grapes production, 66 percent in pomegranate production, 22 percent in Sapota production, 33 percent share in onion production of India.[15]

However, agriculture sector in Maharashtra is also surviving in crisis since new economic reforms, rather than intensity of crisis is more in agriculture sector of Maharashtra than all other developed states of the nation. A change in the agriculture policy according to new economic reforms, low level of irrigation, large number of uneconomic operational holdings, uncertain rainfall, seasonal nature of farming, absence of employment opportunities other than agriculture

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[13] Government 0f Maharashtra (2013), *"Economic Survey of Maharashtra 2012-13"*, DES, Mumbai, pp. 07
[14] Government of Maharashtra, *"Economic Survey of Maharashtra 2012-13",* Directorate of Economics and Statistics, Mumbai, Pp. 120
[15] Government of India (2011), *"Indian Horticulture Database 2011",* Ministry of Agriculture, National Horticulture Board, Gurgaon (India).

labour in rural areas, declining public expenditure on agriculture sector particularly for irrigation and other infrastructure development are adversely affected agriculture sector in Maharashtra. Therefore, farmers in Maharashtra are in frustration.

Features of agriculture sector of Maharashtra

1. The area under cultivation is large in Maharashtra. A NCA and GCA is almost 17.4 million hectare and 23.2 million hectare respectively, which accounts 56.6 percent and 74.8 percent of state geographical area.

2. Agriculture is known as the backbone of economy.

3. Maharashtra has divided into different agriculture zones according to rainfall, soil and atmosphere. Therefore, different crops are cultivated in different areas in Maharashtra. It means diversified cropping pattern is found across Maharashtra.

4. The large number of medium and large dams constructed in Maharashtra, but area under irrigation is stagnant below 20 percent of GCA.

5. The contribution of primary sector in SGDP has been continuously declined and it was almost 15 percent during 2011.

6. Most of the farmers are using traditional methods of irrigation in India.

7. Almost 50 percent population is dependent on agriculture sector.

8. Large numbers of farmers treat agriculture as the source of livelihood and not as the business.

9. Small sizes of operational holdings are large in Maharashtra. Almost 78 percent operational holdings are small and marginal.

10. Most of the farmers are financially poor and they are dependent on financial institutions for input.

11. Large numbers of farmers are indebted. Almost 55 percent farmers were indebted in Maharashtra during 2003 according to NSSO report.

12. The yield of various major crops is comparatively lower than average national yield. Further, there is large variation in yield of major crops among different districts of Maharashtra.

13. Income disparity among rainfed farmers and irrigated farmers is increasing in Maharashtra.

14. Cotton, sugarcane and soybean are growing large number of farmers as major crop in Maharashtra.

15. Large number of farmers are illiterate and don't have the knowledge of government policy and global changes.

16. Young educated peoples have apathy of doing farm business in Maharashtra.

The issues of agriculture sector of Maharashtra

1. Seasonal, uneven, uncertain and ill timed rainfall is one of the important issues in Maharashtra.

2. Almost 80 percent NCA is dependent on rainfall for cultivation.

3. The high deficiency of farm labour in peak season and mass unemployment during lean season. It leads to migration of landless and marginal farmers rather than only male earners.

4. Heavy pressure of dependent and increasing fragmentation and division of land.

5. Large number of uneconomic holdings and it leads to confusion of weather doing farm business or not among the farmers community.

6. Cost of production exceeds over the value of production of various crops is burning issue in Maharashtra.

7. Rapid increase in the prices of agriculture inputs and increasing dependency on marketed inputs.

8. An absence of resistance power in new GM seeds.

9. Increasing dependency on market seeds and high requirement of pesticides and insecticides.

10. Declining import duties and increasing import quota of major products

11. Exploitation by market intermediaries of inputs and outputs.

12. Over use of chemical fertilizers and neglect towards organic and zero budget farming.

Moreover, declining soil fertility, lack of quality infrastructure facilities, poor financial position, social customs and traditions, illiteracy, unwillingness of government are also important issues of agriculture sector in Maharashtra.

1.4 Origin of research problem

More than 50 percent population is dependent for survival on agriculture sector in Maharashtra. It has vital role in industrial and service sector development as well as in food security of nation. However, farm cultivators are in the distressed position in Maharashtra. Therefore, many researchers and social organisations have made studies to prevent the issue of farmers' suicides of Maharashtra. But, issue of farmers' suicides could not be removed while, as it is spread all over Maharashtra. Therefore, it is essential to know the factors responsible for increasing farmers' suicides in different regions of Maharashtra, decisions taken by the government for preventing farmers' suicide and its drawback and suggest remedial measures.

1.5 Need of study

Farmers' suicides have become a serious issue in many states of India including Maharashtra. Initially, the issue of farmers' suicides was only in Vidarbha region of Maharashtra, although large number of farmers are committing suicide in many other parts of Maharashtra in recent years. However, most of the studies were focused on the farmers' suicides of Vidarbha and little on the Marathwada. It is essential to study issue of farmers' suicide of different regions to know the particular responsible factors for farmers' suicides in each and every region of Maharashtra. It will benefit to farmers, government and society for preventing suicidal tendency of farmers through policy measures and bringing most valuable human capital in process of economic development of Maharashtra.

1.6 Scenario of farmers' suicides

Suicide is universal and the oldest concept in India. Many foot prints of suicide are found in Indian literature. Social custom "Sati" in which women had often kills themselves on their husbands' death. "Samadhi" is one of the universal examples of suicide in Indian literature.[16] Buddhist taught that the highest bliss was self distraction in Nirvana.[17] However, suicide records are properly available from 1971 in India recorded by department of NCRB, government of India. A

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[16] Emile Durkheim (1951),"*Suicide: A study in Sociology",* Free Press, New York, Pp. 219
[17]Emile Durkheim (1951),"*Suicide: A study in Sociology",* Free Press, New York, pp. 223

suicide data have been classified and published according to nature of occupation since 1995 by NCRB. Similarly, study is restricted for 1991-2011 period.

During the last 20 years period of 1995-2014, as many as 295097 farmers' have committed suicide in India, excluding absence of 1996 suicide data. Thus, an average 15600 farmers have committed suicide in India.[18] An average 15870 farmers' were committed suicide during the first decade of 1995-2004 and average 15226 farmers were committed suicide in second decade of 2005-2014 in India. These number of farmers' suicide are more than twice of the total number of suicides committed in top 100 countries of the world.[19]

Almost 53837 farmers have committed suicide during 1995-2014 in Maharashtra, which contributes 21 percent of farmers committed suicide all over India. The number of farmers' suicides has increased rapidly in Maharashtra than any other states of India. Farm suicides have increased by 284 percent during first decade (1995-2004) and 270 percent during second decade (2005-2014) according to 1995 base year.[20]It is indeed, large number of people have fear of law and order and they have not recorded as a suicide and large number of suicide cases are omitted from the list of farmers' suicide due to title of the land. Therefore, actual number of farmers' suicide might many times more than the registered by the NCRB in India.[21]

1.7 Statement of problem

Farmers' suicide is the burning issue not only farmers' but also to the government and society. The previous research studies made by various NGO's, government and academicians had focused on farmers' suicides of Vidarbha are not enough to suggest proper measures for preventing it. Present study mainly focuses on systematic study of factors responsible for increasing farmers' suicide in different regions, measures adopted by government to prevent it. Hence after, suggest the measures for preventing farmers' suicides in different regions of Maharashtra. Hence, the title of the study "A Comparative Study of Farmers'

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[18]www.ncrb.nic.in

[19] Behere & Behere (2008), "***Farmers' suicide in Vidarbha region of Maharashtra state: A myth or reality?***", Indian Journal of Psychiatry, 50(2), Apr-Jun 2008, Pp.124-127

[20] www.ncrb.nic.in

[21] K Nagraj (2008), ***"Farmers' Suicide in India: Magnitude, Trends and Spatial Patterns"*** , Madras Institute of Development studies, Pp. 03

Suicide in Various Regions of Maharashtra 1991-2011"- cause and Measures has been selected for study.

1.8 Objectives of study

The present study has following objectives.

1. To know nature, size and other characteristics of suicide victim households.
2. To ascertain source and level of income of suicide victim households.
3. To know size of land holding, availability of irrigation, cropping pattern of suicide victim households.
4. To study productivity of major crops in selected districts and compare to average productivity of nation.
5. To ascertain nature and causes of indebtedness among suicide victim households prior committing suicide and during field visit (2010-11).
6. To study the causes of farmers suicide in different regions of Maharashtra.
7. To know contemporary economic situation of suicide victim household.
8. To study the measures made by government to issue of prevent farmers' suicides in different regions.
9. To suggest the remedial measures for preventing farmers suicides.

1.9 Hypotheses

The present study has following hypotheses.

1. Mass Poverty is the prime cause of farmers' suicides in Maharashtra.
2. There is close association between marginal and small operational holding and farmers' suicide.
3. There is association between nature of family (nuclear family) and farmers' suicides.
4. Indebtedness is found more among suicide victim household prior committing suicides.
5. Most of the suicide victims were from working age group.
6. Productivity of major crops in selected district of Maharashtra is less than average productivity of nation.

1.10   Sample size and sampling procedure

The sample size has taken 652, which is 5.2 percent of total number of suicide victim registered in the records of government of Maharashtra during 2001-2011. The details of sample are given in table 5.1.

Table 1.1: Population (2001-2011) and number of selected samples of suicide victim farmers in selected district and regions of Maharashtra

Sr. No.	District	Farmers' Suicide				
		Number of Farmers' Suicide	Selected Blocks	Villages Selected	Selected samples	% of sample to farmers' Suicide of respective district
1.	Bhandara	280	2	21	39	13.9
2.	Wardha	789	2	12	49	6.2
3.	Chandrapur	323	3	13	17	5.3
4.	Nagpur Div	**1967**	**7**	**46**	**105**	**5.3**
5.	Yawatmal	2289	5	67	180	7.9
6.	Amravati	1798	3	35	124	6.9
7.	Buldhana	1212	2	16	61	5.0
8.	Amravati Div.	**7274**	**10**	**118**	**365**	**5.0**
9.	Vidarbha	**9241**	**17**	**164**	**470**	**5.08**
10.	Nanded	389	4	41	49	12.6
11.	Beed	525	4	20	40	7.6
12.	Marathwada	**1713**	**8**	**61**	**89**	**5.2**
13.	Jalgaon	487	2	21	32	6.6
14.	Nasik	195	2	9	20	10.25
15.	North Maha.	**1040**	**4**	**30**	**52**	**5.0**
16.	Satara	170	1	11	14	8.2
17.	Solapur	109	3	15	21	19.3
18.	West Maha.	**585**	**4**	**26**	**35**	**6.0**
19.	Thane	12	2	6	6	50
20.	Rest of Maha.	**1637**	**10**	**62**	**93**	**5.68**
21.	Selected District	8769	35	287	652	7.4
22.	All Maharashtra	12591	35	287	652	5.2

The selected sample size represents the total population of the study area. The geographical area and total population is large. Hence, the districts have been selected randomly stratified systematically and blocks and villages of respective

districts by simple random sampling method. Hence, sample size justifies the total population.

Maharashtra has five different regions- Kokan, Western Maharashtra, North Maharashtra, Marathwada, Amravati and Nagpur division of Vidarbha. Therefore, the researcher has chosen 13 districts from entire Maharashtra.

Besides, researcher had selected 10 non suicide victim farmers' from each selected district to collect data about intensity of various factors responsible for farmers' suicides in Maharashtra by same sampling method.

1.11   Respondents of the study

Following are the primary respondents of collect information and data for the selected topic.

1.   Family members of victim farmers (total numbers 652)
2.   Non suicide victim farmers (total numbers 130)
3.   Government officers "department of farmers' suicides" (14 members)
4.   Expert of the subject
5.   NGO's

1.12   Research Methodology

Keeping in view the set of aimed objectives and hypotheses, the main methodological thrust of the research is on collection of specific, relative and authentic secondary and primary data and on systematic data processing and analysis. The data was collected through primary and secondary sources with the help of official records and also by visiting the victim's families.

i.   Methods used for Primary data collection

The methodological approach of primary data collection includes methodologies available in any social scientific work. The schedule method, observation method and discussions with the key informant techniques were applied for collection of data. The research scholar has visited 652 suicide victim families. The purpose of field visit was to collect primary data about socio economic condition of selected suicide victims and observe the geographical features of selected region.

a.   Structured schedule

Number of samples was large and most of the respondents were either illiterate or educated. Therefore, separate schedules were prepared for collecting data from the suicide victim's households and non-suicide farmers and obtain the required information from the selected samples for study. The schedule prepared for suicide victim households and non-suicide farmers is given in the annexure.

b.   Discussions

The method of discussion was applied for the data collection through government officers, neighbourers and senior farmers of the village during field visit.

c.   Observation

The method of observation also applied to understand the economic and psychological condition of suicide victim households. Similarly, geographical features particularly soil quality, cropping pattern, level of irrigation, sources of employment were also understood properly during travelling than taken interview of any person.

ii.   Sources of secondary data

Secondary data was collected through the following resources:

1. Reports of central ministries are used for study. The reports of planning commission, central ministry of agriculture, ministry of finance, ministry of home affairs, directorate of economics and statistics, reports of national sample survey, reports of national commission on farmers, draft of planning commission related to various five year plans etc.

2. Reports of state government which includes economic survey of Maharashtra, reports of department of agriculture, reports of nongovernmental organizations, reports of various committees and commissions appointed by state government and reports of various research institutions.

3. Report on "Farmers suicide in Marathwada region of Maharashtra" published by Swami Ramanand Teerth Research Institute, Aurangabad.

4. Report on "farmers' suicides in Maharashtra" published by Tata Institute of Social Science, Tuljapur, Maharashtra.

5. Report on "Causes of Farmer Suicides in Vidarbha: Findings" published by Daily Sakal Newspaper.

6. Report of "Suicides of Farmers in Maharashtra: A Background Paper", Published by Indira Gandhi Institute of Development and Research, Mumbai.

Besides, reference books, magazines, periodicals and journals, working papers published by various institutions, news papers and electronic media were also used for collecting data.

1.13 Statistical tools used for data Analysis

The data was collected from thirteen districts of Maharashtra regarding the farmers' suicides and it was analyzed and interpreted by using the statistical tools. The tools percentage, average, standard deviation and graphical representation are used for study the trends, pattern, causes and socio economic condition of suicide victim households. Further, Pearson's Chi square test, Students t test and co-relation coefficient, Analysis of variance (ANOVA) for independence of attributes are applied for analysis of association between parameters of suicide victim households and its impact on number of farmers committed suicides. All these tools processed by the help of Microsoft Excel 2007 and SPSS. The applied statistical tools are discussed below.

1. Graphical presentation

The diagram is simplest way to understand complex situation. Therefore, research scholar has used bar, line and pie diagram to analyze the various variables.

2. Average Mean (Mean)

The average or mean had generally used for obtained further results of many variables.

$$\text{Average Mean} = \frac{\sum X}{N}$$

$$\sum X - \text{Total Value of Observations}$$

$$N - \text{Number of Observations}$$

3. Standard deviation

It is used to measure the variance of collected data.

$$\sigma = \sqrt{\left\{\left(\frac{\sum_{dx}2}{N}\right) - \left(\frac{\sum dx}{N}\right)^2\right\}}$$

σ − Standard Deviation

$\sum_{dx}2$ − Square of the values of various variable

$(\sum dx)^2$ − *S*quare of the total of all the values

N   - Number of observations

4. Correlation coefficient (r)

The correlation coefficient indicates the relationship between two variables. It represents cause and effect relationship between two variables keeping other variables constant.

$$r = \frac{\sum dxdy - \frac{\sum dxdy}{N}}{\sqrt{\left\{\left(\frac{\sum dx^2}{N}\right) - \left(\frac{\sum dx}{N}\right)^2\right\}\left\{\left(\frac{\sum dy^2}{N}\right) - \left(\frac{\sum dy}{N}\right)^2\right\}}}$$

r   − Correlation coefficient

$\sum dxdy - \frac{\sum dxdy}{N}$ - Covariance of the two series

$\sqrt{\left\{\left(\frac{\sum_{dx}2}{N}\right) - \left(\frac{\sum dx}{N}\right)^2\right\}}$ - Variance of series first

$\sqrt{\left\{\left(\frac{\sum_{dy}2}{N}\right) - \left(\frac{\sum dy}{N}\right)^2\right\}}$ - Variance of series second

5. Indices

The Indices are calculated by the following formula to know the annual change in the number of farmers' suicides all over India and Maharashtra.

$$P_{01} = \left(\frac{P0 - P1}{P0}\right) \text{X } 100$$

$P_{0,1}$ - Index number

P_0 -Value of base year

P_1 - Value of Current year

6.   Compound annual growth rate

The compound annual growth rate is calculated to ascertain the exact growth of variable i.e. national income, population, crop yield, agriculture production etc.

$$\text{CAGR } (t_0, \ t_1) = \left\{ \frac{Vt_0}{V_{t1}} \right\}^{\frac{1}{t1-t0}}$$

CAGR - Compound annual growth rate

t_0 - beginning year of related period

t_1 - last year of related period

v   - Value of variable

7.   Chi- square test (x^2 test)

Chi square test describes the magnitude of differences between observed frequencies and the expected frequencies under the certain condition. It is possible to find out whether such differences are significant or are insignificant by Chi-Square method.

$$x^2 = \sum \left| \frac{(O-E)^2}{E} \right|$$

x^2-   Value of chi square

O -   Observed frequencies

E -   Expected frequencies

8.   Analysis of variance (ANOVA)

Analysis of variance is an attempt made to find out whether the means given by the number of samples are significantly different from one another.

9.   T-test

Paired t-test is applied to know the association between two variables and conclusion were drawn by the SPSS.

1.14   Scope and Limitations of the study

This study considers brief introduction of economic structure of India and Maharashtra. Similarly, detailed knowledge of agriculture sector of India and Maharashtra and selected districts. The research study includes trends of farmers' suicides in India, overall Maharashtra and districts of Maharashtra. Moreover it considers socioeconomic characteristics of suicide victim households i.e. size of family, nature of house, main business, subsidiary business, income of the suicide victim households, per capita income of the suicide victim households and size of land holding, availability of irrigation, major crops of suicide victim farmers, source of credit, amount of outstanding credit, reasons of indebtedness. Similarly, sex, age, marital status, caste, means adopted for committing suicide, habit of suicide victim, immediate cause of suicide and post suicide socioeconomic situation of suicide victim households are also considered in study. Moreover, intensity of various causes of farmers' suicide is also calculated by the primary data collected through non suicide victim farmers'.

There are following limitations of the study.

1.   The issue of farmers' suicide is national. But area is restricted with the Maharashtra state only.
2.   The period from 1991-2011 is considered for study, although information of farmers' suicide in Maharashtra is available from 2001. Therefore, analysis about suicide victim farmers' is for period only 2001-2011.

1.15   Significance of the study

Agriculture is not only the backbone of Indian economy, but also is the source of livelihood of more than 50 percent of people in India. Therefore, the issue of farmers' suicide has become warmth of more than 50 percent people, rather than as a main source of food supply. Therefore, it is essential to know causes of increasing tendency of suicide among farmers in India.

During early reforms period, the farmers' suicide was the issue of Vidarbha in Maharashtra. However, it became important issue for other regions i.e. Marathwada, North Maharashtra and west Maharashtra. During the February 2006 to August 2006, period of eight months 23 farmers in the Nasik district have

committed suicide. Therefore, the problem of committing suicide is not limited with the Vidarbha and Marathwada region, but also this tendency has spread all over Maharashtra. However, most of the studies made by government, academicians and non government organisation are consists with Vidarbha.

On the other hand, human is the essential and most valuable capital of each country. It contributes major role in the development of nation. Therefore, healthy human capital is an essential factor for development of nation. But, the human capital is in distressed position in each country, particularly in India. The degree of the human distress is different in different nations. Consequently, the impact of the distress is shown on the efficiency of the human. Therefore, by this view present study is also important.

This study mainly focuses on "Does per capita income of suicide victim households meet the basic needs of suicide victim family? Whether the productivity of various major crops in selected district had higher or lower compared to nation? How many suicide victim farmers were indebted prior committing suicide and during field visit? What were the causes to unable to return loan? How many suicide victims were from working age group? and so on. All these issues have been discussed separately region wise in this study. Therefore, this study has an important place in life of farmers for taking precaution against responsible factors and government for decision making.

1.16 Concepts used in research work

Following concepts are used in research work.

1. **Agriculture:** Agricultural activity was taken to include cultivation of field and horticultural crops, growing of trees or plants such as rubber, cashew, coconut, pepper, coffee, tea etc., animal husbandry, fishery, bee-keeping, vermiculture, sericulture, etc. but research scholar has considered only farm cultivation.

2. **Agriculture loan:** It considers credit for agricultural and allied activities i.e rural artisans, village and cottage industries and SSI based on agriculture inputs.

3. **Working Member:** A person who is more than age 15 and up to 59 years and in working called working member.

4. **Dependent Member:** A person who is below 15 years and more than 59 years termed as dependent member.

5. **Farmer:** A farmer is defined as a person who possesses some land and is engaged in agricultural activities on any part of that land during the 365 days preceding the date of survey.

6. **Farmer Household:** A farmer household is termed as one in which at least one family member is farmer.

7. **Suicide victim farmers' household:** A suicide victim farmer household was termed as at least one member of farmer's family who committed suicide and registered by government.

8. **Joint Family:** Father, mother with son and his wife at least live together called joint family.

9. **Marginal Farmer:** The area operated by farmer is maximum 1 hectare or 2.5 acre is called marginal farmer.

10. **Nuclear Family:** A family is nuclear in which only father, mother and his unmarried child lives together.

11. **Suicide rate:** Number of farmers committed suicide per lakh population is called suicide rate.

12. **Small Farmer:** The area operated by farmer is between 1.0 ha to 2.0 ha is called small farmer.

13. **Medium and large farmer:** The area operated by farmer is more than 2.0 hectare called medium farmer and more than 5 hectare called large farmer.

14. **Operational holding:** All land which is used wholly or partly for agricultural production and is operated as one technical unit by one person alone or with others without regard to the title, legal form, size or location.

15. **Operated area:** Operated area includes both cultivated and uncultivated area provided part of it put to agricultural production during the reference period.

1.17   Chapterisation

The present study "A Comparative Study of Farmers' Suicide in various Regions of Maharashtra during 1991-2011"- causes and measures is divided into seven chapters.

1.   Chapter one deals with the introduction, objectives, hypotheses, methodology of study, terminologies used in the study and chapter scheme.

2.   Chapter second mainly presents the views of the expertise on factors responsible for farmers' suicides in India and particularly in Maharashtra and measures suggested by him. This study also focuses on the study reports of governmental and non-governmental organisations on the issue of farmers' suicides.

3.   Chapter third deals with economic structure of Indian economy and features of agriculture sector of India. This chapter mainly focuses on trends of gross cropped area, employment generation, share of agriculture sector in national income, share in international trade, irrigation extension, cropping pattern, production and productivity of major crops, economic growth rate and agriculture growth rate. This chapter represents share of agriculture sector in national income, international trade is continuously declined during planning period, although, productivity, production, irrigation extension is seen increasing overall India. However, government has neglected towards agriculture sector since introduction of new economic reforms and its negative impact has been seen in declining public investment for agriculture and irrigation development. Similarly, despite of continuous increase in the per hectare yield of various major crops, compound annual growth rate of food grains yield is declining during post economic reforms over pre economic reforms period.

4.   Chapter four is divided into two parts. Part first represents overall economy of Maharashtra and second features of selected districts. This chapter includes history, physical, geographical features of Maharashtra, land use pattern, rainfall pattern, demographic change, SGDP, economic structure, cooperative sector and industrial development in Maharashtra. Moreover, features of agriculture sector of Maharashtra and selected districts i.e. cropping pattern, production, yield, irrigation development, agro subsidiary

business, development of banking sector and loan allotted to agriculture sector, five year plan and outlay. It represents that agriculture sector is performing confidently during post economic reforms while lack of infrastructural facilities and declining government support.

5. Chapter five deals with the trends of farmers' suicide in India and Maharashtra, policy decisions taken by government for removing issue of farmers' suicide and causes of farmers' suicides in Maharashtra. This chapter presents that the suicidal tendency among the farmers' in Maharashtra is more than all major states of Maharashtra.

6. Chapter six deals with the data analysis and interpretation. This chapter considers data collected through field visit and its analysis. The focus areas of data analysis and interpretation are nature and size of suicide victim family, dependency ratio, main and subsidiary business, annual gross income, per capita income, number of estimated BPL households, size of land holding, major crops, sources of credit, intensity of indebtedness of suicide victims' households. Similarly, age, sex, caste, marital status, means used for suicide, immediate cause of suicide of suicide victim also studied. Further, socio economic condition and problems after commit suicide faced by suicide victim households are also considered in study.

Hence after, intensity of various factors responsible for farmers' suicide also measured views taken from non suicide victim farmers of selected district. Similarly, yield of different major crops of selected districts is compared with the average yield of overall Maharashtra and overall India. Besides, many factors regarding of suicide victim households are recorded in this chapter.

7. Chapter seventh consists with conclusion, findings, testing of hypotheses and suggestion regarding issue of agrarian distress and farmers' suicides.

1.18 Conclusion

The farmers' suicide is burning issue in India and it has become serious during the period of new economic reforms. Almost 60 percent population is dependent on agriculture sector for livelihood. It means minimum 60 percent and maximum entire population is affected directly and indirectly in India. Therefore, farmers' suicide have became major national issue. Despite of rapid economic

growth, Maharashtra is the most suicide prone district of India. Large number of farmers has committed suicides in Maharashtra, which contribute almost 20 percent of farmers' suicide of India. Initially, the issue of farmers' suicide was concentrated in Vidarbha region, but it has spread all over Maharashtra.

Therefore, it is essential to study causes of farmers' suicide and preventing measures made by government. Therefore, the title "A Comparative Study of Farmers' Suicide in Various Regions of Maharashtra during 1991-2011"-causes and measures is selected for study. This research is based on the primary and secondary data. For this purpose, many reference books, reports, journals and Ph.D. thesis and newspaper are studied during research tenure. Primary data about suicide victims and his families has been collected from 652 selected suicide victim households of 13 selected districts throughout Maharashtra. .

The main objective of collecting primary data regarding suicide victims and his families is to know the proper causes of farmers' suicide. Primarily, research scholar has focused on socio-economic, farming characteristic based issues during field visit. For this purpose schedule was also prepared. Moreover, researcher has taken views of non suicide victim farmers' from selected district about the intensity of various factors, which are responsible for farmers' suicide by preparing separate schedule for them.

To sum up, researcher has given proper justification to various issues of agriculture sector of Maharashtra while collecting primary data. As well as, factors considered in schedule are according to the hypotheses selected for study. Therefore, it is concluded that the results drawn from this study will be helpful to society, government and academicians.