

Assessing the Reasons Behind Farmers' Suicide and Identifying the Application of Improved Agricultural Supply Chain as a Solution

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Abstract— India is a fast growing and most promising economy in the world. A major workforce of the country is involved in agricultural sector which significantly contributes to the economy of the nation. Still a lot of ambiguity is involved in the system that leads to the distress conditions of the agricultural workers specially farmers. Various governing laws of agricultural marketing, inadequate storage and distribution, loss of crops and other related issues cause a poorer price realization to the farmers of the country. According to various literatures, suicidal tendencies and mental illness is directly linked with the economic crisis and this can be seen with the facts and data related to farmers' suicide in the country. Farmers' suicide has been a serious concern for the country from the previous decades. The government and various organizations are putting efforts to decrease the suicide rate among farmers but still not a major breakthrough has been observed. This paper closely studies the current situations and reasons behind the farmers' suicide in India. A survey based approach has been used to understand the root cause of farmers' distress. The study also frames out the government support and efforts for agricultural growth in the country. Paper explicate the working of agricultural supply chain management in the country and suggest strategies to improvise the agricultural supply chain network in order to reduce the indebt conditions of farmers' which is the main cause behind the farmers' suicide..

Key words: Farmers' Suicide, Agricultural Supply Chain Network, Supply Chain, Storage and Logistics

I. INTRODUCTION

With over 1.3 billion and the second largest population in the world, India has seen rapid growth and evolution in the economic state of affairs, technology, social and political systems, enhanced state of mind and emerged as a key player in the global market with fourth biggest economy in terms of buying capacity. [1] Still according to a report from census of India 2011, 68.84% of total population of the country belongs to rural region in which the major work source is farming. [2]

Year 2011	Population (In Crore)	Growth rate in last ten Years (In %)
India	121.0	17.6
Rural	83.3	12.2
Urban	37.7	31.6

Table 1: Population Distribution Growth In India

Source: Census of India 2011 [2]

Among the total workforce involved in agriculture more than 80 per cent belongs to middle scale, small scale or tenant or marginal farmers but their holding on total operating land area in country is around 44 per cent that unfolds the substantial land inequalities. [3] The curse of suicide can be seen most severe in small or marginal farmers. According to a report of National Crime Records Bureau of India, in year 2014, a total of 131666 people have committed suicide in which 5650 accounting for 4.3 per cent were related to farming with their profession. [4]. Table 2 describes the percentage share of farmers' suicide in country on the basis of land asset.

Year 2014	Land holding Status (In Hectare)	Percentage Share of Suicide (In %)
Large Farmers	More than 10	2.3
Medium Farmers	2-10	25.2
Small Small	1-2	44.5
Marginal Farmers	Less than 1	27.9

Table 2: Suicide Percentage share based on land holding

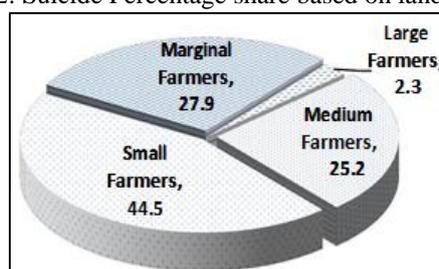


Fig 1: Suicide Percentage share based on land holding

Source: National Crime Records Bureau of India 2014 Report [4]

In various studies and researches, a number of causes have been identified behind the persistent problem of farmers' suicide that holds in the Indian scenario. Such causes include:

- Bankruptcy or Indebtedness
- Farming related issues
- Illness
- Family problems
- Alcoholic Addictions
- And other causes

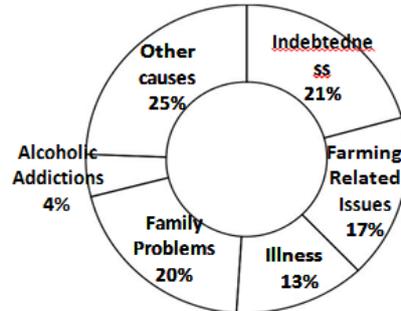


Fig. 2: Causes of Farmers' Suicide

Source: National Crime Records Bureau of India 2014 Report [4]

Other roots of farmers' suicide include sense of loss or hopelessness, social isolation, untreated mental problems, exposure to various chemical leading to depression and various others. The report of National Crime Records Bureau of India for year 2014 identifies that indebtedness and farming related issues like draught, irrigation problems, loss of crops, accounts for the maximum number of farmers' suicide among other reasons with a percent of 37.8 per cent. In another report submitted to UN, it has been identified that since year 1997, more than 100000 farmers have taken their life and surprisingly around 86.5 per cent of such farmers were in financial crisis. The seriousness of the problem can be understood with the fact that on an average since year 2002, we have accounted one farmers' suicide every 32 minutes. [5]

The study, "Assessing the reasons behind farmers' suicide and identifying the application of improved agricultural supply chain as a solution" specifically address the problem of farmers' suicide to understand the root reasons behind the conditions of farmers' which lead them to the state of suicide and investigate possible solutions to enrich the financial conditions of farmers through an improved and more effective agricultural supply chain network management. The main aim of the work is to suggest and develop a modified supply chain model in-order to counter ambiguities involved in the process.

The paper is comprised in the sections as follows: Section II describes the objectives of the paper. Section III explains the limitations that are included with the data collection and the work carried out. Section IV discusses the methodology, research design and data collection. Section V gives the results of the survey conducted over a number of farmers to understand the root cause behind farmers' distress. Section VI defines in brief about the measures taken by Indian government and the next section VII explains the role and strategies for improvising the agricultural supply chain. Section VIII, and IX conclude the paper with future work and conclusion.

II. OBJECTIVE

The very first objective of the study is to understand the ground realities of reasons involved and the seriousness of indebtedness conditions by interacting with farmers' belonging to prone areas. The next step will include understanding the measures taken by government and other agencies for handling the issue in order to comprehend degree of success for a comparative analysis with the proposed solutions.

The next phase of work is to design a feasible and enhanced agricultural supply chain network model. The study will identify concerns related to agricultural supply chain network and suggest strategies to overcome the issues. The proposed strategies will relate to proper setting up of inventory houses, better logistics and transportation facilities, direct marketing and corporate selling, superior information model, hazard and disaster management, risk management and other activities to counter the identified issues. The purpose of agricultural supply chain model will be to address the problem of financial crisis in farmers- the main reason behind farmers' suicide. The main objectives of the study can be summed as below:

- Assessing the reasons behind Indian farmers' distress and their financial conditions
- Analyzing the measures taken by Indian government.
- Suggesting strategies for improvising the agricultural supply chain model for an optimized condition.

III. LIMITATIONS

The study carried out has to undergo with several limitations. The sample size of the survey is less and does not include different geographical conditions. The study also not includes the results of various natural disasters. The various limitations can be summed as:

- 1) The survey conducted was in the local language and due to higher illiteracy rate; many of the questions can't be framed directly.
- 2) The data collection was limited to a small sample size and similar geographical conditions. Data may vary in accordance with different geographical environments.
- 3) Part of the paper has been constructed from the information collected from published and unpublished secondary sources.
- 4) Less availability of secondary source of data in the advancements and innovations in agricultural supply chain.

IV. METHODOLOGY AND RESEARCH DESIGN

The paper presents an overview on farmers' distress through critical exploration of economic conditions constructed on empirical data generated through detailed surveys, interviews and available statistics and information. The focal point of the paper is identifying the reasons behind farmers' distress and analyzing it over agricultural supply chain of India so as possible solutions can be estimated. The research was directed by utilization of diverse research methods including case study, literature review, content analysis, in-depth surveys and interviews. Methodologically, the study uses an interpretative phenomenological exploration in accordance with available literature. The emphasis of the analysis is not only to understand the economic conditions of the farmers but also to get the estimated information about the immediate problems they are facing and using this information to frame strategies which can enhance the existing agricultural supply chain for boosting the economic conditions of farmers. The work carried out does not directly emphasize over the psychology and suicidal tendencies in farmers but focus on the economic conditions that formulate the possibility of suicide in farmers who are under sever distress.

A. Data Collection

For conducting survey and interview of farmers to understand the root cause of their distress, initially, 6 different areas have been identified over the region of UP east and Bihar- Manserpur, Bisnupur Diyara, Tulsitol, Jahangirabad, Bhawanandpur and Tiyyara Nevada. A list of questions was prepared and a sample of 100 farmers was taken to analyze the result. The major limitation in data collection was the illiteracy among the farmers. The questionnaire was converted into the local language and was properly explained for getting the results. Still many of the farmers were not able to comprehend the questions properly and have provided vague details. Such cases have been discarded in our results. The immediate improvement they want to see that will improve their financial conditions was interviewed with the farmers. The questionnaire was made to took the input about basic details about the farmers firstly including the name, age, approximate land holdings, full or part time profession in farming and then specific questions about their economic conditions and problems related to agricultural supply chain was included.

The data related to agricultural supply chain and government support for improving the conditions of farmers was generated from the literature review and officials reports from government of India.

V. FARMERS' SUICIDE: THE ROOT CAUSE

As discussed earlier, the major causes behind suicides in farmers in India are related with indebtedness, improper farming conditions, family problems, health issues and addictions. Most of the reasons are directly or indirectly related with the economic conditions of the farmers. The land holding status of a farmer can be a good parameter for understanding the economic conditions. Reports from National Crime Records Bureau of India show that more than 70 per cent of overall suicides committed by farmers have a land holding of less than 2 hectare of land. The natural disasters like flood or drought also plays a critical role in the conditions of farmers' distress. On an average it can be estimated that India has faced the condition of drought once in every 3 years and the country is considered to be among most drought prone region in the world. [6] According to the report from National Rainfed area authority, Planning Commission, GOI, around 60 per cent of cultivable land in the country is affected with heavy rain or flood like conditions creating grave conditions to farm income. [7]

For a more precise understanding of the reasons behind farmers' distress, a survey and interview was conducted in the regions of Bihar and UP-East in which the data has been collected from 100 farmers. The survey was conducted on a diversified age group from eighteen years to sixty years and above and both the crops and vegetables farmers were included in the study. For the region of data collection, sixty three respondents have informed that there area has been hit by flood or drought in the past three years. Among the sample size, 77 farmers were completely dependent on agriculture for their finances and rest of 23 were involved with other work along with farming for their earnings. Figure 3 shows some of the responses of the queries asked in the survey.

In 76 responses, the main current concern was related to financial situations, much ahead of other responses of health, family and social issues. 63 farmers have agreed to take loans frequently for meeting their basic economic needs and for purchasing agricultural inputs like seeds, fertilizers and others. Only 9 among all have said they never have taken loans for purchasing agricultural inputs. In other queries, almost all farmers, irrespective of their land holdings, have conveyed that they do not get good return on their agricultural outputs and most of them, which consist of 98 per cent, were having the opinion that most of the benefits and profits of the agricultural products, either it be crops or vegetable products, goes to the middle man and not to the farmers. In a direct question to rank their financial current status on a 10 point scale, 79 farmers have agreed that they find their economic condition at 5 or below rating on the scale. Even forty per cent of respondents feel their economic conditions at 3 or below giving the sense of seriousness of the financial crisis in the farmers.

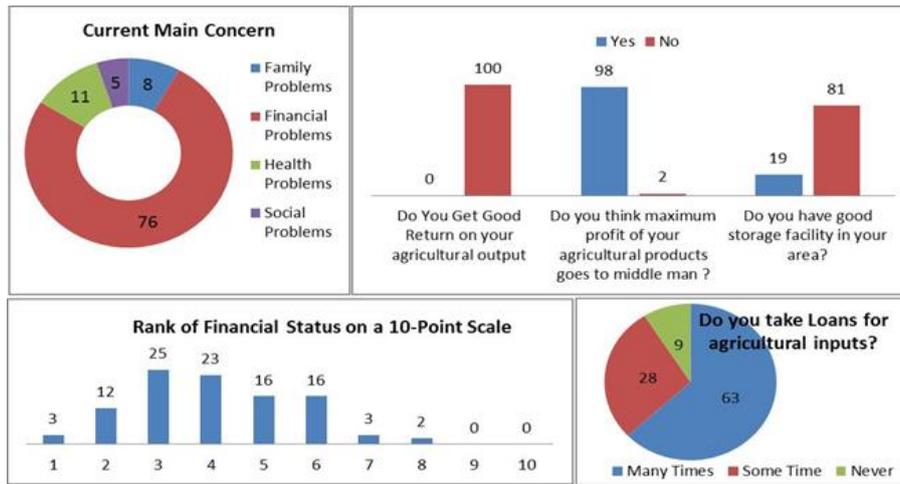


Fig. 3: Responses of the farmers in the survey conducted

In the interview with the farmers, the main problems which immediately needs resolution relates with improving the irrigation facility, storage, transportation, electricity supply, better market for sales of crops and vegetables and availability of seeds and fertilizers. The major reason of distress in farmers has also been identified as poor economic conditions and indebtedness. On the national level, the indebtedness rate was 48.60 per cent with Rs 12585.00 as the average unresolved loan per farmer domestic. If only the indebted households to be consider, then the rate even rises by Rs 25891.00, defining the level of concern. [8]

The very reason for farmers getting into the condition of indebtedness is loss of crop and discrepancy in the pay-back price for their crops. A study of Research Foundation for Science, Technology and Ecology, identified that under the realm of globalization, an agriculture based worker is losing its producer identity. Now a farmer is purchasing seeds, manures and other farming products on high cost from corporates and governments and is bound to sell their agri-products on much lower costs leading to the condition of indebtedness. [9] Most of the reasons of concern for the differences of high purchase and low sell are related to the paradigm of agricultural supply chain network. Any improvisation in Agricultural supply chain can play a pivotal role in enhancing the conditions of farmers' finances leading to a controlled condition of farmers' suicide.

VI. GOVERNMENT CONTRIBUTION IN EMPOWERING FARMERS

In the total GDP of India, the contribution of agricultural sector is 14.62 per cent which is the least among the contribution of service and industrial sector [10]. The government of India is putting good efforts and coming up with the initiatives to extemporize the agricultural sector and empowering the farmers. Various projects and schemes are launched by the government to flourish the sector with productivity and growth. Still in the interviews with farmers, it has been found that benefits of many of the projects of government are not directly reaching to them. In the survey it has been estimated that 92 per cent of the respondents are not satisfied with the MSP (minimum support price) policy of the government. Out of all respondents 77 per cent have KCC (Kisan Credit Card) and only 37 per cent are satisfied with the services offered under it.

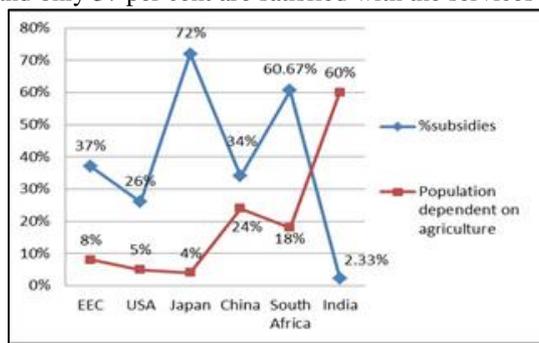


Fig. 4: The agriculture subsidy comparison in countries. [11]

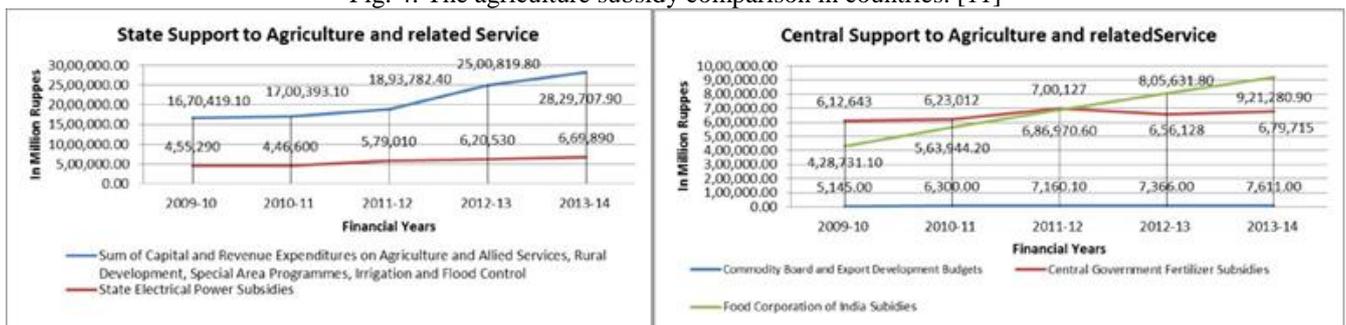


Fig. 5: State and Central Support to Agriculture and Related Service [12]

Figure 4 shows the comparison between developed and developing countries, for their percentage of subsidy shares to agricultural sector. On one hand the population dependency over agriculture in India is much higher and on other hand the subsidy share is significantly low for agriculture.

Constructed from report of GAIN, Figure 5 shows the classification of state and central support to agriculture and related services. [12] A significant increase can be observed in the subsidy and budget from last few years. The support and new initiatives from government has infused new momentum in the agricultural sector but to improve the financial status of farmers, which contributes around half of the population of country, a sustainable and prolong solution is required that should provide crop safety and maximum profit of agricultural output to the farmers.

VII. ENHANCED AGRICULTURAL SUPPLY CHAIN NETWORK: A POSSIBLE SOLUTION

Along with the concern of farmers' suicide, food safety is also a major worry for India. By the year 2020, on an estimate, India will need to increase its productivity over 340 million tons of food grains in order to meet the rising demand of its population growth. [13] Country has to set high standards and determined strategies to counter the problem of food safety along with empowering the financial status of farmers. Here comes the role of agricultural supply chain network. Supply chain management of agriculture consists of managing all the material flow activities in procurement of raw materials like seeds, fertilizers, production and storage of crops and vegetables, pricing and distribution of agricultural outputs, transportation and logistics, and information flows related to farming based activities. Figure 6 shows in brief a simple agricultural food supply chain network in Indian context.

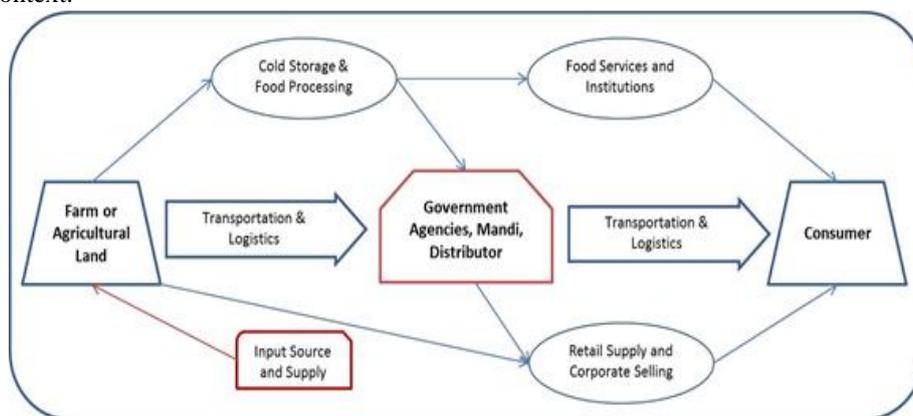


Fig. 6: A simple agricultural supply chain network in India [14] [15]

The agricultural supply chain largely classified into sub-chains of input procurement, production, output processing, storage, transportation and logistics. In Indian context, the integration and synchronization in between the sub chains are inadequate and most of the sub-chains work independently without taking input or information from other sub-chains. The absence of coordination critically effect efficiency on the production of agricultural output.[15] As per farmers are concern, the inadequacy in agricultural supply chain directly effects the finances of the farmers. Analysis and studies indicate that many of the farmers consider the state or government policies responsible for their economic difficulties. [16] Farmers have to purchase the seeds, fertilizers and other farming inputs at higher cost and they don't get the right market and right price for their output. The result of the survey conducted also indicate, most of the farmers have a sense that the maximum profit of the farm output goes to middle man and not to them. In the interview, a major portion of the farmers asked for better agricultural supply chain conditions as an immediate improvement concern for raising their financial conditions. In broad term, the need of improvement include, better pricing model, better storage facilities, better transportation facilities and better information flow regarding farming related issues.

A. Obscurity in Indian Agricultural Supply Chain Network

Being a vast and demographically very diversified country, the issues in Indian agricultural supply chain network varies with place to place but there are some common concern that holds to most of the region and people related to farming. In most of the developing nations, transportation and logistics are among major concerns of agricultural supply chain. Most of the farmers don not have much opportunity to improve their financial conditions by direct selling of their products due to poor transport facilities. [17] Some of the direct issues of agricultural supply chain network can be listed as below:

- 1) Improper Demand Supply Chain
- 2) Inaccurate forecasting of agricultural needs
- 3) Low infrastructure for storage facilities and inventories
- 4) Inappropriate inventory and warehouse location
- 5) Inadequate logistics and transportation facilities.
- 6) Improper pricing model and lack of information of current pricing conditions
- 7) Erroneous selling strategies of farmers in order to overcome the debt-pressure
- 8) Lack of direct marketing and direct selling conditions.
- 9) Productivity and quality of agri-products
- 10) Absenteeism of appropriate standardization or classification of products

By systematic improvising the agricultural supply chain network, we can address the issues listed above and can empower the farmers with better financial conditions taking away from the suicidal path.

B. Immediate Improvement Strategies to Incorporate in Indian Context

In a recent report from NITI Aayog, Government of India, the following steps are suggested for improving the agricultural scenario of India and empowering the farmers. [18]

- 1) A number of measures are required to improve the agricultural productivity.
- 2) Farmers must get a security of remunerative prices for their output. This measure include re-framing Minimum Support Price (MSP) to care farmers' aspect and fixing up a farmers' share in the amount paid by the final customer.
- 3) Direct Support to the tenant farmers by accepting them by laws as a full time farmers. Also a better and modified land leasing laws as the farmers get security of their land and property.
- 4) More efficient mechanism to handle the farming effect of natural disasters like flood, drought, cyclones, landslides and earthquakes.
- 5) Increase the productivity of the lands where natural resources are in abundance like north eastern states.

For improving the conditions of farmers and agricultural scenario, government of India is taking corrective measures to strengthen the system in order to ensure the food security and improve agricultural productions. The rise in the subsidies, new reforms and amendments to ensure betterment of farmers can be seen in last few decades. Warehouse and storage facilities play an important role for crop and vegetables storage and also give an opportunity to the farmers for better price realization. [19] Table 3 shows the warehouse handling capacity by the year 2010-11 by different organization in India.

Name of organization	Storage Capacity (in million tons)
Food Corporation of India - FCI	32.05
Central Warehousing Corporation- CWC	10.07
State Warehousing Corporation (SWC)	21.29
State Civil Supplies	11.30
Corporate Sector	15.07
Private Sector	18.97
Total	108.75

Table 3: Storage Capacities of Warehouses in India (2010-11) [19][20]

Government of India is putting good effort for better warehouse facilities. New act and regulatory committees are being set up to manage and improve the efficient operations of warehouse management.

The trading of food crops and grains by the farmers are also regulated by the jurisdiction of state and central governments. The Agricultural Produce Market Committee Act (APMC) of each of the state regulates the pricing and trading. Under the APMC act, farmers are not allowed sell directly to the retailers or other food processing units which gives the ways to middle man and intermediaries. Due to various loops in the APMC strategies most of the profit gets diverted towards the middle man and causing the economical constraints to the farmers. To make the Indian agricultural supply chain more efficient following strategies are needed which will improve the production efficiency and better price realization to the farmers.

- 1) Introduction and Encouragement of Public Private Partnership in Agriculture and Supply Chain Network.
- 2) Shared Farming Model, in which the profit sharing of farm produces in between the farmers, intermediaries and the sellers.
- 3) Dedicated Farming Model, in which farmers' ties up with corporations or retail food selling organizations. The organization provides the entire infrastructure besides land and in return farmer has to sell their produce dedicatedly to the same organization on pre-agreed prices.
- 4) Inclusion of Gram Panchayats and Local village authorities to provide basic agricultural supply chain support at each Panchayat or Village block level. Ensuring that Supply Chain Support-like warehouse, cold - storage, transportation facilities, farm input procurement facilities available at each village block level for the farmers.
- 5) Optimization of Crops, grains and vegetable delivery strategy.

In a report, "Improving the Agricultural Supply Chain - Case Studies in Uppsala Region", D. Ljungberg, G. Gebresenbet, M. Khilstrom, C. Oritz have presented an optimization model on grain delivery strategy.[21] The main function of the optimization model was to maximize the overall revenue of the sales of one farm produces. For the Indian context we can adapt the model as:

$$\sum () \quad [21]$$

The Max Z is the optimization function of sales of one farm. T, D, S defines the variable cost implying transportation cost to fixed destination as Tj, declining cost of crop quality as Dq and storage cost for time t as

St. Xj pqt refers to the decision variables for allocation of product p over the transport options of j, q, t. Rj pqt refers to revenue generated of the sales and Fp refers to the total fixed costs associated with the product. Product can be used as food grains or vegetables. The quality can be termed under the category of declining and non-declining products. Time t can be termed under immediate delivery and delivery with storage. By estimating and optimization the sales of farms we can improve the profit ratio and can also give better chance for profit realizations to the farmers.

The need is to create a self-sustainable agricultural supply chain model by using the collected data and suggested strategies, in order to maximize the price realization to farmers along with improving the production food security of the country.

VIII. FUTURE WORK

The paper describes the ground report of the reasons behind the distress conditions in farmers and assesses the causes of economic condition. The role agricultural supply chain is discussed and strategies are suggested that can provide better efficiency to the system. In future work, a more detailed survey is required so as better assessments of reasons can be done and a better understanding of farmers' condition can be evaluated over the different demographical regions of the country. The suggested strategies and model is also required to be validated in the future work. The paper has just given a brief detail of agricultural supply chain and has not much discussed about the effect government role and acts for regulation of agricultural supply chain. Future work will include the government role for better understanding of the measures taken over farmers' suicide conditions and what strategies can be made to overcome the problem.

IX. CONCLUSION

It is ironical that the producers of non-life-dependent goods are some of the richest men in the world and the producers of crop, which is the basic requirement of life, are struggling to earn the elementary needs of their life. As per the society is concerned, any loss of a human being is a loss to the civilization. A loss of farmers' life due to financial crisis shows the discrepancies in the societal system and raises the questions of incongruities. Government of India consciously identify distressed districts and offers Prime Minister's special rehabilitation packages, other subsidies and waives loan to empower the farmers but still significant suicides can be observed. [22] It shows the requirement of developing a sustainable system which will certify for establishing channels that can take farmers to that financial level where they don't depend upon support and subsidies. The paper has taken an effort to closely assess the reasons of farmers' suicide in India. The work has also given the factual data over the government support to the agricultural sector. Paper has given a brief detail about the agricultural supply chain in India and the reasons behind its in-efficient functionality along with discussing the impact of agricultural supply chain over the poor financial conditions of farmers. Few of the strategies has been suggested in the paper that can improvise the existing agricultural supply chain network that will help both the country and the farmers in different ways. With the collaborative efforts of government, organizations and people, the condition of farmers can be improved where they can live with complete economic security.

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REFERENCES

- [1] "India Country Overview 2011". World Bank. 2011.
- [2] "Census of India 2011". Ministry of Home Affairs, Government of India.
- [3] S. Mahendra Dev, "Small Farmers in India: Challenges and Opportunities", Indira Gandhi Institute of Development Research, Mumbai, June 2012, www.igidr.ac.in/pdf/publication/WP-2012-014.pdf.
- [4] "Farmers Suicide in India". National Crime Records Bureau of India, Ministry of Home Affairs, Government of India.
- [5] "International Farmers Suicide Crisis", A report submitted to United Nation by Amrita organization, www.un.org/esa/sustdev/csd/csd16/.../farmers_relief.pdf
- [6] P. Udmale, Y. Ichikawa, S. Manandhar, H. Ishidaira, A. S. Kiem, "Farmers' perception of drought impacts, local adaptation and administrative mitigation measures in Maharashtra State, India, International Journal of Disaster Risk Reduction 10 (2014) 250–269
- [7] "Contingency and Compensatory Agriculture Plans for Droughts and Floods in India- 2012", National Rainfed Area authority, Planning Commission, Government of India.
- [8] M. Rajeev, B.P. Vani, M. Bhattacharjee, "Nature & Dimensions of Farmers' Indebtedness in India and Karnataka", The Institute for Social and Economic Change, Bangalore
- [9] Dr. Vandana Shiva, Kunwar Jalees, "Farmers Suicides in India", Research Foundation for Science, Technology and Ecology
- [10] India Factsheet: Economic and Human Development Indicators", A report of United Nations Development Programme, http://www.undp.org/content/dam/india/docs/india_factsheet_economic_n_hdi.pdf
- [11] H.A. Salunkhe, B.B. Deshmukh, "The overview of Government subsidies to agriculture sector in India", IOSR Journal of Agriculture and Veterinary Science, Volume 1, Issue 5 (Nov. - Dec. 2012), PP 43-47
- [12] A. Mustard, "Government Fiscal Support of Agriculture" A report of Global Agricultural Information Network, GAIN Report Number: IN4044
- [13] G. Agoramoorthy, "Can India meet the increasing food demand by 2020?" Futures 40 (2008) 503–506
- [14] S. Mittal, A. Mukherjee, "Food for policy: reforming agriculture" Foundation Books, New Delhi, India; 2008: pp. 155–201
- [15] S. Parvez, "Supply chain dynamics of Indian agriculture: reference to information technology and knowledge management", Stewart Postharvest Review 2014, 1:3, ISSN: 1745-9656
- [16] L. Bryant, B. Garnham, "Economies, ethics and emotions: Farmer distress within the moral economy of agribusiness", Journal of Rural Studies 34 (2014) 304-312

- [17] G. Gebresenbet, T. Bosona, "Logistics and Supply Chains in Agriculture and Food", Swedish University of Agricultural Sciences, Sweden
- [18] "Raising Agricultural Productivity and Making Farming Remunerative for Farmers", An Occasional Paper by NITI Aayog, Government of India, 16 December 2015
- [19] P. Rajib, "Indian agricultural commodity derivatives market e In conversation with S Sivakumar, Divisional Chief Executive, Agri Business Division, ITC Ltd", IIMB Management Review (2015) 27, 118-128
- [20] Report of Working Group on Warehousing Development and Regulation for the Twelfth Plan Period (2012-17) Available at http://planningcommission.gov.in/aboutus/committee/wrkgrp12/pp/wg_ware.pdf
- [21] D. Ljungberg, G. Gebresenbet, M. Khilstrom, C. Ortiz , "Improving the Agricultural Supply Chain - Case Studies in Uppsala Region", VINNOVA Report VR 2006:03.
- [22] N.M. Kale, D.M. Mankar & P.P. Wankhade, "Consequences of Farmers' Suicide and Suggestions Perceived from Victim's Households to Prevent Suicides in Vidarbha Region" Global Journal of Science Frontier Research: D Agriculture and Veterinary, Volume 14 Issue 10 Version 1.0 Year 2014