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Trend Analysis of Minimum Support Price Impacting Farmers Community in West Bengal

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ABSTRACT: The issue of farmers' income is the primary concern of the research "Trend Analysis of Minimum Support Price Impacting Farmers in West Bengal." The government is implementing a number of initiatives to safeguard them from market shocks and to improve their income. The minimal support price is one of them. The purpose of the article is to determine the minimum support price trend and how it affects crop output and farmers' income. According to recent study, minimum support prices are directly correlated with higher yields and acreages in some locations. Crop diversification, a backup plan for farmers to raise their income, might have unfavourable effects if sustainability is not prioritized. Crop diversity influences finances likewise. This paper demonstrates that raising the minimum support price causes an increase in production, which results in surpluses. Moreover, failing to raise farmers' wages in regions like West Bengal and Orissa as well as having negative environmental implications. And the financial problem can be resolved by adding value to the output, producing and storing inputs on the farm, implementing an integrated agricultural system, adding value to the surplus, and precisely integrating and managing the finances to increase capacity. We were able to comprehend the true implications of the minimal support price with the help of data analysis.
Ultimately, we arrived to the conclusion that financial support for capacity building is absolutely necessary, rather than a minimum support. This will allocate funds in the right directions while also lessening the load on the government.

I. INTRODUCTION:

India has always been an agrarian society for centuries. Large part of populationis dependent on it. This sector has been the most vulnerable of all the sectors in an economy for centuries now. Due to its dependability for livelihood, raw materials and increasing population, its revival becomes necessary.Governmental policies implementation and automation in this sector can pose a great challenge. Nonetheless, India being with highest number of demographic dividends along with highest labour force participation in agriculture needs innovative yet inclusive.Indigenous mechanism and revamping certain traditional techniques as well as less dependent on chemicals and pesticides, can shade some light towards financial obstacles to overcome.Even after diverse natural agro-climatic blessings, still people are dependent on sporadic climatic conditions. These vast arable lands are in the hands of natural hazards, money lenders middlemen as well as market's fluctuations.

This research paper will focus on the trends of minimum support price, production and yield of crops, land holding size affecting the income of West Bengal in comparison to all of India, North east and western states mainly Punjab. The area due to climate vulnerability like tropical cyclones and sporadic monsoonal rainfallfaces a lot of uncertainty on the crop production and yield, which in turn affect the income of the region.West Bengal, agriculture being pre-dominant sector due

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to suitable climatic conditions. The cultivated area is 62% of the total geographical area which is 5.5 million ha. The cropping intensity is very high. Rice being the staple diet so being the staple crop. It is grown three times a year, namely Aus, Aman and Boro.

According to a government report, the farmer's income in West Bengal is around six thousand which is lower than the national average income of farmers.Along with these there are other issues like small landholdings and monocrop cultivation land-use planning, financial debt, non the less even adversity of nature. But in contrast we see North eastern state, were crop diversification, sustainable organic farming processes and skill training programme are able to increase their income.

1.1 Research Objectives:

The purpose of the research is to understand the effect of minimum support price on the factors like, production of food grains mainly paddy and wheat and non-food grain like cotton, jute and sugarcane, yield of the crops. The effect of minimum support price on the income of the farmers is analysed. Accordingly, the correlation trends between the various factors like production of food grain and non-food grains, present income of the farmers, landholding size over a period of 20 years from 2003-2023 are being diagrammatically visualised. Income of farmers, land size, production, yield is considered mostly of North-eastern states, Punjab, Haryana in comparison to West Bengal.

1.2 RESEARCH METHODOLOGY:

The paper took mixed method that is qualitative and quantitative methods. The quantitative data analysis supported the research questions arose from the research gaps. The qualitative data are sourced from RBI datasets.

1. Quantitative Analysis:

MATLAB plot visualizationthe data analyses are presented using the MATLAB based plot gallery which provides a multitude of plots for visual interpretation of data e.g. bar plots, line plots, pie charts and even scatter plots for discrete data visualization.

Correlation: In statistics, correlation represents a statistical relationship between two variables or bivariate datasets. In the broadest sense, if essentially refers to the degree to which two variables are linearly related. In the scope of this work, correlation coefficients are employed for comparison of trends between the presented data. Accordingly, the MATLAB corr (X,Y) function is used, which takes as arguments data X and data Y. The resultant coefficients present the correlated trends. X and Y can either be 1 dimensional vector or 2 dimensional matrix. A high correlation is indicated by an increased positive value, whereas reduced values under 0.5 indicate a decreased correlation. A value of 0 indicates no correlation between the data. The corr () function is based on Pearson's Linear Correlation Coefficient [1] [2]. For matrices X and Y, columns X_a and Y_b are present, such that the respective means or expectances are determined as:The Pearson's linear correlation coefficient $\rho_{a,b}$ is accordingly expressed using the covariance and standard deviation of the respective datasets. The numerator presents the covariance between the datasets X and Y, whereas the denominator consists of the multiplication of the standard deviation$\sigma_X \times \sigma_Y$ respectively.

$$\rho_{a,b} = \frac{\sum_{i=1}^{n}(X_{a,i} - \overline{X}_a)(Y_{b,i} - \overline{Y}_b)}{\left\{\sum_{i=1}^{n}\left(X_{a,i} - \overline{X}_a\right)^2 \sum_{j=1}^{n}\left(Y_{b,i} - \overline{Y}_b\right)^2\right\}^{1/2}}$$

The summation parameter n refers to the size of the columns indexed by the variable i.

2. **Qualitative Analysis**:This paper critically and in a comprehensive manner examines about the government agricultural policies. Along with a comprehensive review of various publications, journals, news articles. This literature reviewing elucidates and revealed about the present researches on the subject theme and also the research gap, which in turn given a direction to find an alternative solution to solve the issue. The study area is West Bengal and one of its district South 24 parganas (where the world's second largest mangrove forest is present i.e. the Sundarbans) in comparison to the Western states like Punjab, Western UP and Haryana.Several case studies on the various initiatives are also being assess upon. These case studies throw light on the innovative practices that can be taken upon with slight change according to the need of an hour. Analysis encompassed on the recent researches on the area, their findings and recommendations. The issues of having alternate source of income, challenges like environmental challenges of the alternative income.

2.3 Rationale: This paper deals with the policy, Minimum Support Price and it's the impact on the production of the crop and also the income of the farmers in West Bengal in compare with North eastern states, western state like Punjab and average of whole India. Such an area of discussion is chosen, to show how government policies being implemented to bring a positive change, but can

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have negative implications or have no implications in different regions.While analysing governments steps to improve the income as well yield and production of farmers and farm, through mainly focusing on Minimum Support Price, financial institution, green revolution and mega food parks.

Green Revolution took place in India at the time when India was on the verge of being famine. It is when in 1960s India adopted the policies when the same policy giving fruit world over. But it came with a lot of criticism later. Though it made India food surplus. There are various long -term impacts mostly environmental as well as socio-economic.With the introduction of HYV seeds, fertilizers, modern machineries and irrigation facilities gives added advantage to be able to produce crops which are not agro-climatically situated naturally. For example,states like Haryana, Punjab faces the rawth nature, with decreasing water table, land salinization, land and water pollution and many more.

Fixation of minimum support pricethe government's Price Support Policy aims to protect farmers from a significant decline in farm prices by offering insurance. The purpose of setting the minimum guaranteed prices is to create a floor below which market prices cannot go. Two types of administered prices were announced by the government up to the mid-1970s: procurement price and minimum support price.The government set the MSPs, which functioned as floor prices and provided producers with a long-term guarantee that the prices of their commodities would not drop below the set level—even in the event of a bumper crop—when establishing financial choices. Purchase prices were the costs of the rabi and kharif cereals at which the grain was to be purchased.As the policy ensures the fixation and assurance, leads to monocrop cultivation in most of the cases. Government has list of crops for which subsidies are given. This welfare schemes lead to the reluctance of growing any other crops. Under this scheme rice and followed by wheat gets the highest price.

Government policy on financial system for this priority sector. The growth of this sector depends on credit mostly because of various inputs require to have higher growth. Also, for the enhancement of the income. That is why credit holds an important place in development and strategy. NABARD (National Bank for Agriculture and Rural development) disburse loan to rural areas. Government focuses to have more financial inclusivity. Private banks are mostly reluctant to lend money to the small and marginal farmers for fear of NPAs (non- profit assets.). Government to have formal regulated financial systems such institutions are set up and even various policies on commercial banks such as priority sector lending made it mandatory.Even today farmers depend on informal institution for loans and even if they are taking it from formal institution the set up bears the burden of indebtness.For continuous growth and development, for the flow of credit government came up withschemes like Kisan Credit Card, Aquafarm loans, Agribusiness, Crop loans, Dairy loans, Horticulture loan and various others. The Indian agricultural credit system mainly consists of a network of institutional agencies, such as commercial banks, cooperative banks, regional rural banks (RRBs), and other financial organizations such as NABARD (National Bank for Agriculture and Rural Development).

Mega Food Park By bringing together farmers, processors, and retailers, the Mega Food Park Scheme seeks to establish a network connecting agricultural output to the market, maximizing value addition, reducing waste, raising farmer income, and generating employment opportunities, particularly in the rural sector. The Mega Food Park Scheme is based on the "Cluster" method and aims to develop modern support infrastructure.

Though so much of positive side of the policy but there can be also negative affects which need to be considered to control its side effects.

- Displacement of local communities: In order to establish giant food parks, land must often be acquired. This might result in the displacement of local people, particularly those who depend on agriculture for a living.
- Environmental concerns: By using more water, producing trash, and causing pollution from food processing, mega food parks may worsen the state of the environment. Environmental problems can be made worse by using inappropriate waste management techniques.
- Food supply chain monopolization: If huge firms own mega food parks, this could result in the food supply chain becoming monopolized. Small-scale farmers and suppliers may be exploited as a result, and customers may have fewer options.
- Growing dependence on processed foods: Food processing can help save food waste and extend its shelf life, but it can also result in a rise in the consumption of processed foods, which are frequently linked to health problems like obesity and non-communicable diseases.

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- Infrastructure strain: In order to manage water, provide electricity, and facilitate transportation, mega food parks need to make large infrastructure investments. The current infrastructure and resources may be put under stress by this, particularly in the rural areas where these parks are frequently found.
- Labour issues: Mega food parks may lead to job opportunities, but there may also be problems with wages, working conditions, and labour rights, particularly for migrant workers that work there.

II. DATA ANALYSIS:

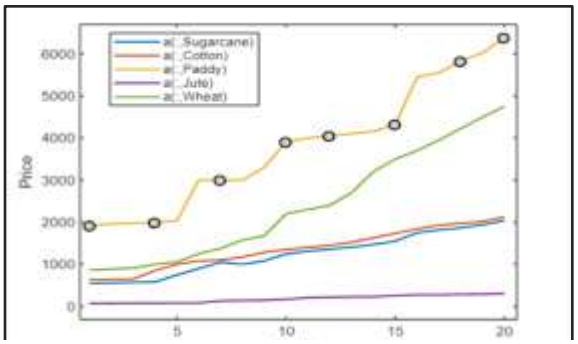

FIGURE 1: The above figure is a line graph showing the Minimum Support Price of both food grain production (i.e. Paddy,Wheat) and non food grain production (i.e. cotton, jute and sugarcane) for the timeline of 20 years (2003-2023).This figure shows, how over the period of time Minimum Support Price(MSP) has grown more, that is the MSP of paddy and wheat prices are higher than that of non food grains that is cotton , jute and sugarcane. The figure also depicts that paddy has the highest MSP than any other food grain or non food grain in the data analysis. And there is a sharp growing of paddy's Minimum Support Price. For Jute there is no sudden increase in MSP of jute. After plastics replaced jute along with various other aspect, the production of jute reduced. Even partition of East Bengal plays an important role here, as it is the largest jute producing regions.The increase in the MSP of rice along with green revolution also changed the farming pattern of Western India.This resulted that with the period of time the MSP of paddy is the highest, showing that the paddy, wheat gets the highest minimum support price from the government.

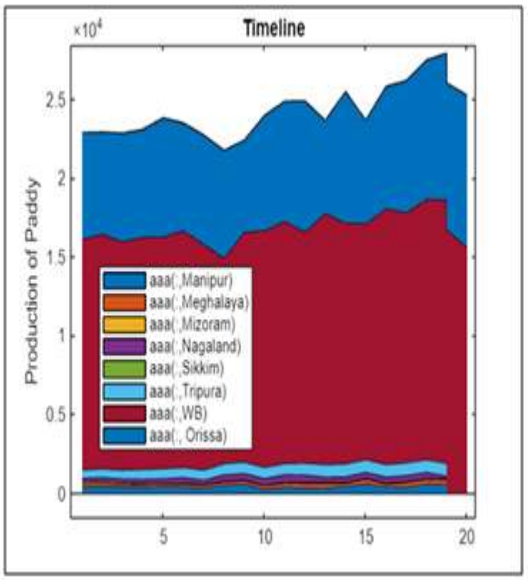

FIGURE 2: The above diagram shows the paddy production over a period of 20 years from 2003-2023 of the Eastern that is West Bengal and Orissa which is considered and the North-eastern States (all the seven states). The line graph shows that West Bengal and Orissa is having the highest paddy production than even the North Eastern states. Through this graph plot it is seen that West Bengal and Orissa has the highest production of rice with respect to the North Eastern States (7 sisters). The graph with the help of line graph shows Production of paddy increased over the years that is from 2003 to 2023. This diagrammatic format is a correlation between Minimum Support Price of Paddy over 20 years of time along with the change in paddy production in the state of West Bengal and Orissa on one hand and North Eastern States on the other. The result of the correlation points out with the increase in minimum support price farmer's behaviour for the states of West Bengal and Orissa acted differently. The farmers of both the states started turning to monocrop cultivation. On the other hand, North Eastern states did not increase in the production of rice even though Minimum Support Price has been increased. This resulted, with the increase in MSP of paddy for West Bengal and Orissa increased their production whereas in North East the increase in MSP did not affect the production cultivation of rice. So, through this scattered diagram we can draw conclusion that minimum support price at different parts of the country has different impact. And this statistical analysis proves it.

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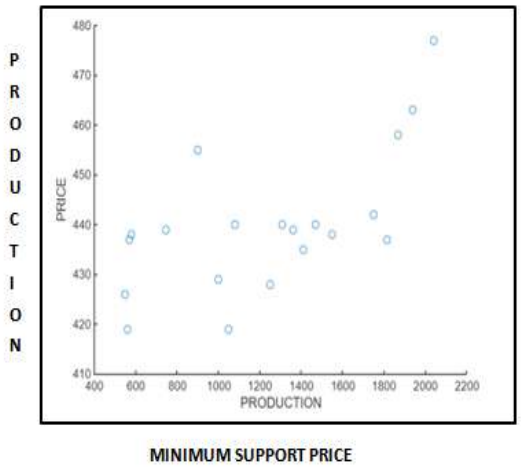

FIGURE 3: The above figure is showing a relation which is positive between, minimum support price and production of rice over 20 years that is from 2003 to 2023. The data is sourced from RBI statistical data base. Through this correlation we understand that with the increasing minimum support price of crops farmers tends to increase its production leading to monocrop cultivation and affecting diversification of crops.So, from the result from this above scattered diagram we can comprehend that minimum support price for paddy is positively correlated with the production of rice. The positive relation leading to the understanding Minimum Support Price is another reason of the increase in rice cultivation.

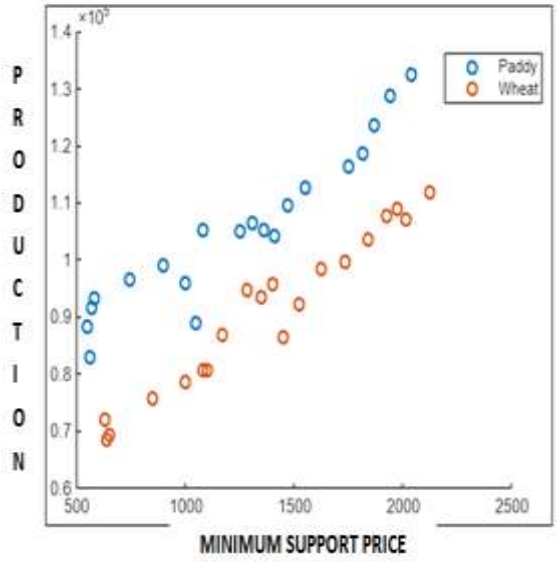

FIGURE 4: The above figure showing the relation between Paddy Minimum Support Price and Paddy production in all states of India from 20 years of timeline (2003-2023). X axis showing the production of food grains in thousand tonnes and Y axis is Minimum Support Price.Paddy in relation wheat lies above the points of wheat. So, first thing rice Minimum Support price is the highest. Also, the increasing trend of paddy is much more than wheat, as the points are lying below paddy. The above figure showing that Minimum support price and production of Paddy and Wheat both has a correlation. That is, the above figure showing a positive correlation of minimum support price and production of paddy. That is why the scatter plots are showing upward moving curve.

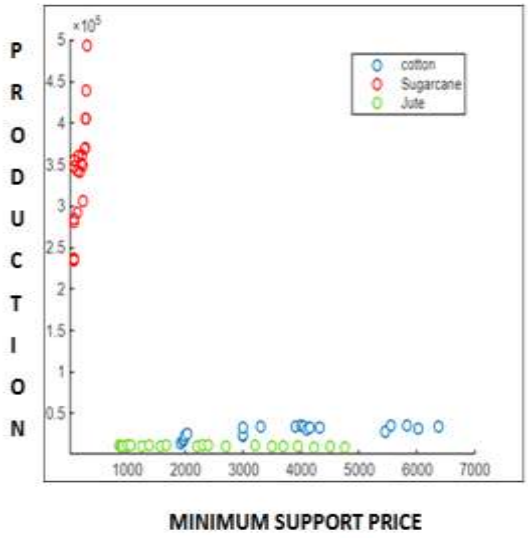

FIGURE 5: The above scattered diagram showing the Non-Food grains that is cotton, sugarcane and jute. The figure diagrammatically depicts the correlation between the non-food grain production to the minimum support price over the span of 20 years from 2003-2023.The result shows that for the non-food grain products like cotton, jute, sugarcane the minimum support price over the period of 20 odd years did not increase much and did not have any dramatic effect on the production Sugarcane on the hand even though its minimum prices are increased still the production level of the crop did not increase. Then for the crops of cotton and jute even though the minimum support price did not increase as the level of paddy and wheat but the production of the crops with respect to minimum support price has increased.

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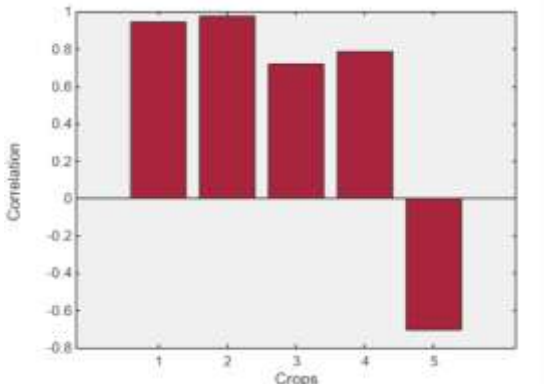

FIGURE 6: This is a correlation shown diagrammatically through bar graph. In the X axis we have plotted crops that is two food grain crops paddy ad wheat and other non- grains cotton, jute and sugarcane. This graph shows the correlation between production of the food grain crops paddy and wheat and non-food crops jute, cotton and sugarcane. This correlation tries to explain the production of these crops and minimum support price over 20 years from 2003 to 2023. For the first 4 crops is showing positive correlation and the last which is sugarcane showing in negative. This means in the first four crops with the increase in minimum support price there is an increase in production whereas the 5th crop showing opposite, a negative correlation. The crops which all are positively related show with the increase in minimum support price of production of the crops that is cultivation of the crops increases that means monocrop culture is also increasing for the crops which higher MSP. And the crop which is showing negative correlation that means the relation between the Minimum Support Price and the production of the crop for increase in MSP does not increase.

1	2	3
1.0000	0.9860	0.9698
0.9860	1.0000	0.9477
0.9698	0.9477	1.0000

FIGURE 7: The above table showing the correlation of Paddy crop for the years from 2003-2023. The correlation is showing a highly positive relation between the Production, Yield and Minimum Support Price of Paddy. So, we can interpret that the increase in minimum support price leading to increase in production and yield.

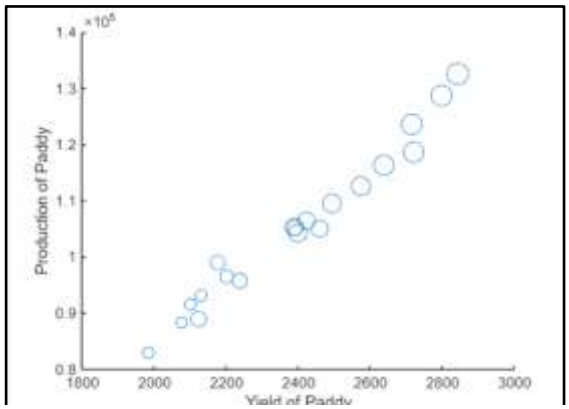

FIGURE 8: The above diagram showing the Production of Paddy in the Y axis, Yield of paddy in the X axis and minimum support price is shown as the size of the circle that is the radius of the circle of the scattered plot. The findings of the diagram is showing that the production of the paddy is increasing with the increasing yield in contrast to the increase in minimum support prize which is depicted in the radius of the circle. But the amount of increase yield to production is not to that extent of production.

1	2	3
1.0000	0.9777	0.9783
0.9777	1.0000	0.9570
0.9783	0.9570	1.0000

FIGURE 9: The above diagram is showing the correlation between the production of wheat, yield of wheat and the minimum support price of yield. The correlation is showing a positive correlation.

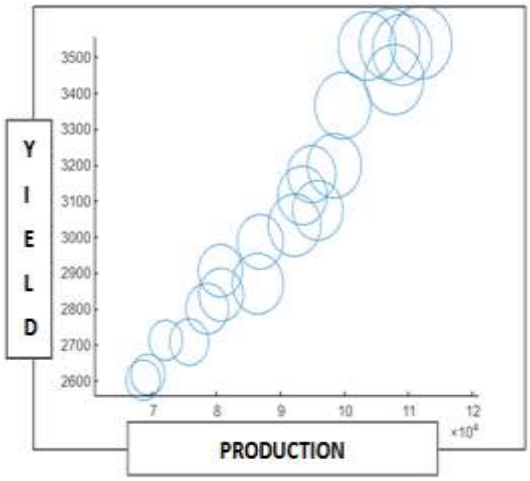

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FIGURE 10: The above diagram is depicting the increasing yield; production and the size of the circle is showing increasing trend through upward moving graph in the scattered plot. That means it has a positive correlation. This results in minimum support price for the wheat do have a co-relation between the production of the grain.

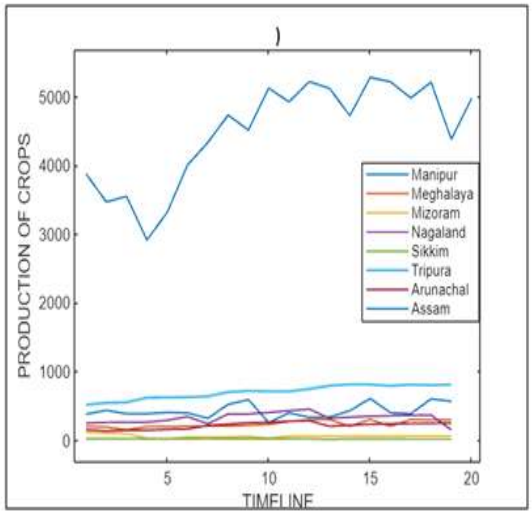

FIGURE 11: The Above figure is showing how over a periodic timeline that is from 2003-2023 the production of paddy got increased. Assam showing the highest of increase in production. And other states even though it increases but not as much as Assam or any other rice production states.

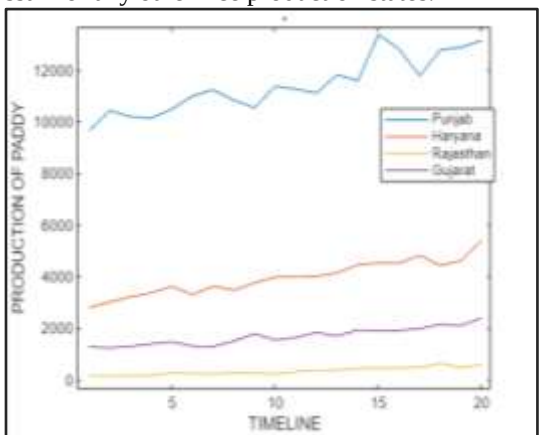

FIGURE 12: The above diagram is a line graph showing the increase of production of paddy in the west Indian states like Punjab, Haryana, Rajasthan and Gujarat.

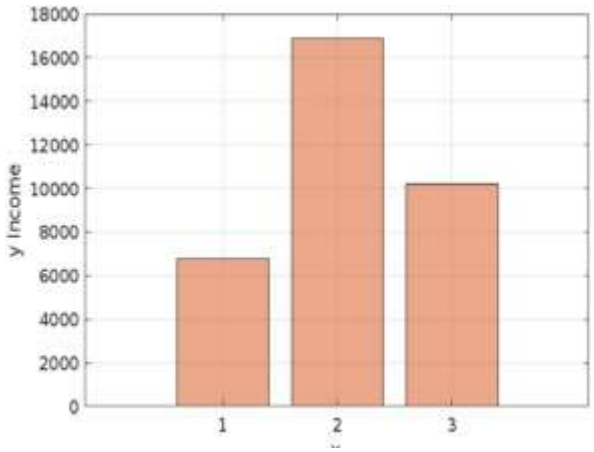

FIGURE 13: Though this bar graph it is showing income level in the Y axis and in X axis, 1 represents West Bengal, 2 represent Northeast and 3 represent India as a whole. This figure is showing the variation in income amongst the farmers in the respective states in the above in contrast to whole of India.The bar graph is to show the average income of the farmers of West Bengal in comparison to North Eastern States and also the average income of the farmers in India as a whole. The result that can be concluded that, even though North Eastern states land holding size is smaller than that of the average India, the income level is done to show even though the landholding sizes are smaller in the North-eastern state they have higher than the average income of Indian farmers.The graph gives a clear indication that even though even though the land sizes are small in the North East the income of the farmers did not affect as the crops that are mostly that are cultivated high valued or crops which has less supply for which the market price are higher.

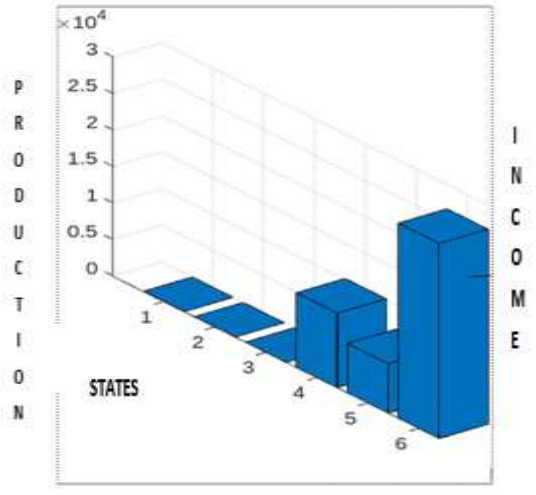

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FIGURE 14: The above 3D bar graph is showing the comparison of land holding size and income of whole of India along with West Bengal and Punjab. Punjab which has the largest landholdings even higher than the country's average is likely to earn more due to its higher production. West Bengal on the other side is below than the national average even though according to the report West Bengal has 92% of the arable land.Results- this comparison is done to show the average landholding size of whole of India and on the other West Bengal's landholding size and Punjab (as in the western Indian states has less fragmentation of lands so the average size of land holdings are bigger). This is to depict that the income of the farmers does vary on the basis of size of the land.

III. CONCLUSION:

The findings from data analysis gives an insight for the importance of policy review for various centrally sponsored or central schemes. As data analysis depicts the actual results of the policies that are being implemented. In policy making impact assessment for the agricultural policies are necessary in long term. To fulfil aims and objectives. The purpose of this research started with the study of farm income of West Bengal was the land are fertile and the landholding are small. In contrast to the North East were the land holding sizes are small but are able to achieve income more than national average.Through data analysis, it is able to show that small holdings can give much more return when cropping pattern are being diversified. The most talked about issue is the size of the land which affect the farm income, in which North east states can become a case study. Second, minimum support price has its impact differently in different parts of the states in India. If one focus in western part of the state mostly Punjab Haryana Western Uttar Pradesh (only these states are being considered as they are the highest rice producers) the income of the farm is more as their production of crops are high as they have larger land holding which is proportionate to minimum support price. And through findings of data analysis production has increased for these states with the increase in minimum support whereas for North-East in the production remain same. In contrast for West Bengal and Orissa with the increase in price production increased but income from it did not. But non- food grains the production did not as minimum price for non- food grain did not increase as much as wheat and paddy.That is why we can conclude that minimum support price is having its impact differently at different region as income of the farmers. Also, minimum support price leads to monocrop cultivation, environmental impacts, government expenses. And small landholdings will not always give less return to output.

The conclusions and findings lead to the following recommendations:

2.1. The diversification of crops requires action swiftly, instead of increasing the minimum support price and the crop procurement price. It's essential to diversify the sources of income from the same product depending on the product's supply and demand. For instance, the price of any crop tends to decrease anytime it is produced in large quantities. In order to stop adding value to the produce, this must happen. When rice is sufficient during a particular harvest season, for instance, rice can be used for the production of rice noodles, which are considerably healthier than refined wheat flour. Farmers with small landholding can diversify high valued crops like vegetable/fruit production, beekeeping, mushroom cultivation, medicinal plant production etc.

2.2. Farming needs to be an integrated system. From production to selling in the wholesale market. Agriculture sector need revolutionised financial system. Here Self- Help Group can play an important role. As the model of self - help group can tackle the issue of financial pressure both for government as well as the farmers.

2.3. Promotion of research and development and to understand the value of indigenous crops.Diversification of crops and promoting of agro-climate based needs to promote as it provides with food security, natural wellbeing as well as self- reliance on financial support.

2.4. Decentralization of public distribution system. That is like Odisha, grain community centre can be formed to deal with food security as well as distribution system. This not only reduce the financial expenses, also increasing the efficiency of the government distribution system.

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