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The Impact of Chemical Fertilizer on Potato Production in Birbhum District, West Bengal

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Abstract

Agriculture is the most important factor affecting the economic development of any developing country. Birbhum is generally known as a predominantly agricultural district as large or medium scale industries have not flourished in the district. The current study is stand on primary & secondary data source obtained from various published and unpublished sources. As the amount of cultivable land per capita is gradually decreasing due to increasing population, urbanization, industrialization etc. Some thought needs to be given now to maintain the production of the district at an appropriate level in the future. The main objective of this paper is to analyze the effect of chemical fertilizers on potato productivity in Birbhum district. This paper discusses potato production in Birbhum district. The amount of chemical fertilizers used per hectare in the district is slightly higher than the state average. As a result of increased use of these fertilizers, effects on potato productivity have been observed. With the increase in potato cultivation in this district, the production level has also increased. Farmers in the district have reduced the use of organic fertilizers due to increasing dependence on chemical fertilizers. One thing needs to be made clear to them that if the fertility of the agricultural land of Birbhum district is to be maintained at a high level for a long time, more organic fertilizers must be used. It promotes long-term food production while minimizing negative impact on the environment & human body.

Keywords: Chemical fertilizer, Potato Productivity, Organic fertilizer.

Introduction:

Located in the western part of West Bengal, Birbhum district covers an area of 4545 square kilometers. The western part of Birbhum is a rough region, a part of the Chota Nagpur Plateau. Birbhum is generally known as a predominantly agricultural district as large or medium scale industries have not flourished in the district. The soil of this district is not barren. The climate here is generally healthy. The average annual rainfall in the district is 1501 m.m. The main rivers here are Ajay Mayurakshi, Kana , Bakreshwar, Chandravagha, Sal, Dwarka , Basloi, Palashi etc. Among them, Ajay is the largest river. The river does not have abundant water for 12 months. During the monsoons the rivers become full of water.

The scientific name of potato is Solanum tuberosum. The potato was first tamed in areas of southern Peru and northwestern Bolivia, from 8000 B.C. to 5000 B.C. Now it has diffuse around the world and has become a main crop in many countries. Potato is a minor crop in India and ranks second in the world in terms of production. The country has achieved remarkable success in potato production over the past five decades. India produced a record 48.6 million tons of potatoes in 2016-17. In 2015, Uttar Pradesh was the top potato producing state in terms of volume and production, followed by West Bengal. The amount of chemical fertilizers used per hectare in the district is slightly higher than the state average. The increase in the use of these fertilizers has been found to have an impact on the productivity of potato. With the increase in potato cultivation in this district, the level of production has also increased.

Agriculture is the most important factor affecting the economic progress of any developing country. The main objective of this paper is to analyze the effect of chemical fertilizers on Birbhum potato productivity. It was also found that agricultural productivity oscillate due to inappropriate use of N-P-K.

Statement of the problem:

In Birbhum district, the amount of cultivable land per capita is gradually decreasing due to population growth, urbanization, industrialization, etc. Some thought needs to be given now to keep the production of the district at an appropriate level in the future. The amount of chemical fertilizers used per hectare in the district is slightly higher than the state average. The increase in the use of these fertilizers has been observed to have an impact on the productivity of potato. With the increase in potato cultivation in this district, the level of production has also increased. Farmers in the district have reduced the use of organic fertilizers due to increasing dependence on chemical fertilizers. One thing needs to be made clear to them that if the fertility of the agricultural land of Birbhum district is to be maintained at a high level for a long time, more organic fertilizers must be used. It promotes long-term food production while minimizing negative impact on the environment & human body. So the researcher chose this topic, "The impact of Chemical fertilizer on Potato production in Birbhum District, West Bengal.''

Literature survey & Review:

Literature review is a very important part of any research for better and clear understanding of the perspectives of the research problem**.**

Mahdi SS, etc. al (2010) in their paper entitled "Bio-fertilizers in organic Agriculture" published in the journal of Phytology 2010, 2 (10) :42-54, ISSN: 2075-6240, examined that bio fertilizers play an important role in ensuring soil fertility and sustainability. Many studies have proven that it is more environmentally friendly due to increased soil fertility, reduced pollution and improved plant and animal biodiversity.

S. Patra et al (2016) discussed that more use of chemical fertilizers has no strong correlation with increased agricultural production and yield. It was also locate that agricultural production oscillate during this period probably due to inappropriate use of N-P-K over the years beyond the assimilation capacity of the soil. Moreover, overuse of chemical fertilizers has also resulted in over-extraction of groundwater in the area.

A. K. Pathak et al.. (2014) revealed that the growth of agriculture and the growth of the fertilizer industry complement each other, both walk hand in hand.

M.B. Roy et. al (2015) noted that using chemicals is requested to increase strength but it also creates many problems. For example, increasing soil acidity and groundwater levels have adverse effects on the environment. Hence, education and organic farming methods are emphasized.

Objectives of the study:

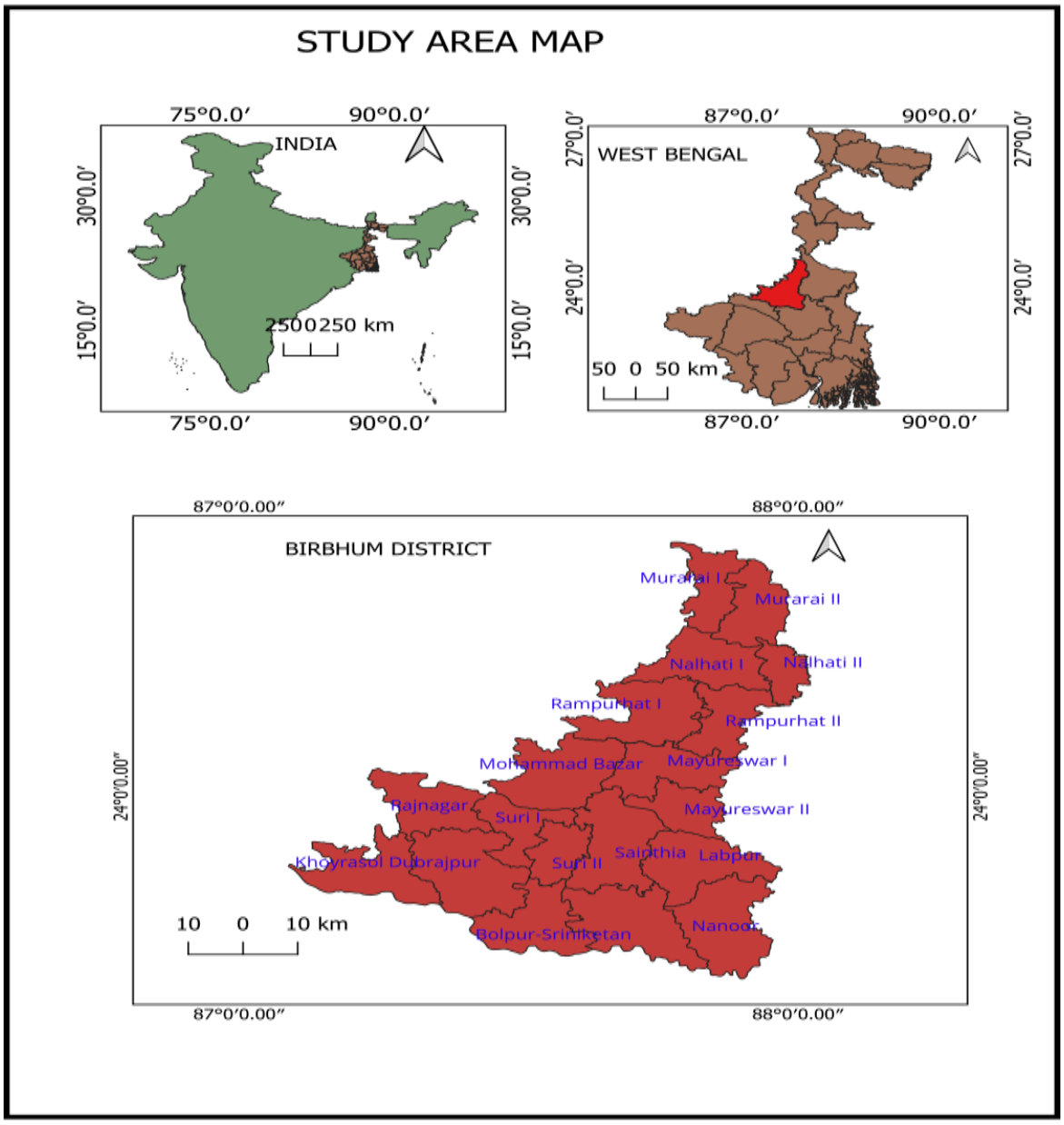
The objectives are:

1. To observe the effect of modern agriculture

2. To observe the relationship between chemical fertilizer and potato production.
3. To analyze the effect of chemical fertilizers on potato productivity.

Location of the study area:-- Birbhum is an important district of "Rarh Region" located in the western part of West Bengal. The district headquarters is in Suri. Birbhum district Situated between 23° 32' 30" and 24° 35' 0" north latitude and 87° 5' 25" and 88° 1' 40" east longitudes.

Fig.1:-Location map of Birbhum district



[Sources: Prepared by the Author from QGIS]

Database & Research Methodology:

Methodology is very important part for any research. .The entire work was achieved in three phases-i.e. pre field work, field work, post field work . The current Study is formed on both

primary and secondary data base. The study is based on primary data collected through questionnaire, survey, face-to-face interview and questionnaire based on responses from families of 400 farmers of Birbhum district. The researcher applied purposive sampling and collected data from field survey method

Some secondary data were collected from numerous published and unpublished sources such as District Statistical Handbooks, Department of Agriculture, Bureau of Applied Economics and Statistics, Government of West Bengal. Tables and graphs are analyzed from secondary data for the study. In the post field collected data maps and different figures and charts were prepared through proper statistical and cartographic method with diagram.

Discussion:

The history of Indian fertilizer industry begins in 1906 when the first chemical fertilizer plant with an annual capacity of 6000 metric tons was set up at Ranipet near Chennai (Tamil Nadu). The Fertilizers and Chemicals Travancore of India Limited (FACT) in Kochi, Kerala, and the Fertilizer Corporation of India (FCI) in Sindri (present-day Jharkhand) in Bihar were the first large-scale fertilizer factories in the mid-twentieth century. Chemical fertilizers are mainly of three types: nitrogen (N), phosphate (P), and potassium (K).Nitrogen includes saltpeter, niters, ammonium sulfate, sodium nitrate and urea which affect crop growth in various ways. It gives a green color to the leaves and enhances the foliage. If used in excess, it is harmful to crops. If it is used in poor quality and quantity, it delays crop maturity, causes diseases, weakens stems and causes lodging in food grains. Phosphate is formed from bone and rock phosphate. Phosphate increases crop maturity, promotes root development, enhances disease resistance, improves crop quality. An important characteristic of phosphate is that it does not damage crops if over-applied. Potassium fertilizers are applied to the soil in the form of potassium chloride and potassium sulfate. It gives the necessary green color to the leaves, increases the fatness of potatoes and balances the effect between nitrogen and phosphate. The current paper focuses on the effect of chemical fertilizers used in agriculture and potato production.

West Bengal is the second largest potato producer in India . Average use of chemical fertilizers in the district in 1984-85 was 20 to 22 kg per hectare.1997-98 and 1999-2000, the use of chemical fertilizers was almost stable, but in the next two years, the level of application of chemical fertilizers increased by about 60 percent in the district. The amount of chemical fertilizers used per hectare in the district is slightly higher than the state average. Large areas of Birbhum are deficient in nutrients such as nitrogen, phosphorus and potassium, requiring the provision of large amounts of nutrient fertilizers to the soil. As a result of increased use of these fertilizers, effects on potato productivity have been observed. With the increase in potato cultivation in this district, the production level has also increased. Between the years 1997-98 and 2001-2002, the yield rate of potato came to 17.6 to 22.4 tons per hectare. Farmers in the district have reduced the use of organic fertilizers due to increasing dependence on chemical fertilizers. Worryingly, chemical fertilizers are being used indiscriminately in the district influenced by propaganda like developed countries to sustain production. The area of potato cultivation in Birbhum district has expand from 14715 hectares in 1997-98 to 18385 hectares in 2001-02 .The overall production has increased from 259152 tones to 413578 tones during this period, especially in some blocks like Saithia, Mayureswar etc. farmers are getting good results with relatively less effort and cost by using true potato seed. Although the area of potato cultivation in Birbhum district has expand from 17.9 thousand hectares in 2012-13 to 18.2 thousand hectares in 2013-14 , but production has

declined drastically from 537.8 thousand tones in 2012-13.to 445.1thousand tones in 2013-14.

Table and Statistical analysis:

Table.1: Area Under Potato Cultivation in Birbhum District (2012-2021)

YEAR	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
AREA (THOUSAND HECTARES)	17.9	18.2	16.2	16.9	15.5	15.4	21.1	20.8	21.1

Source: District Statistical Hand Book Birbhum, 2017 & 2021

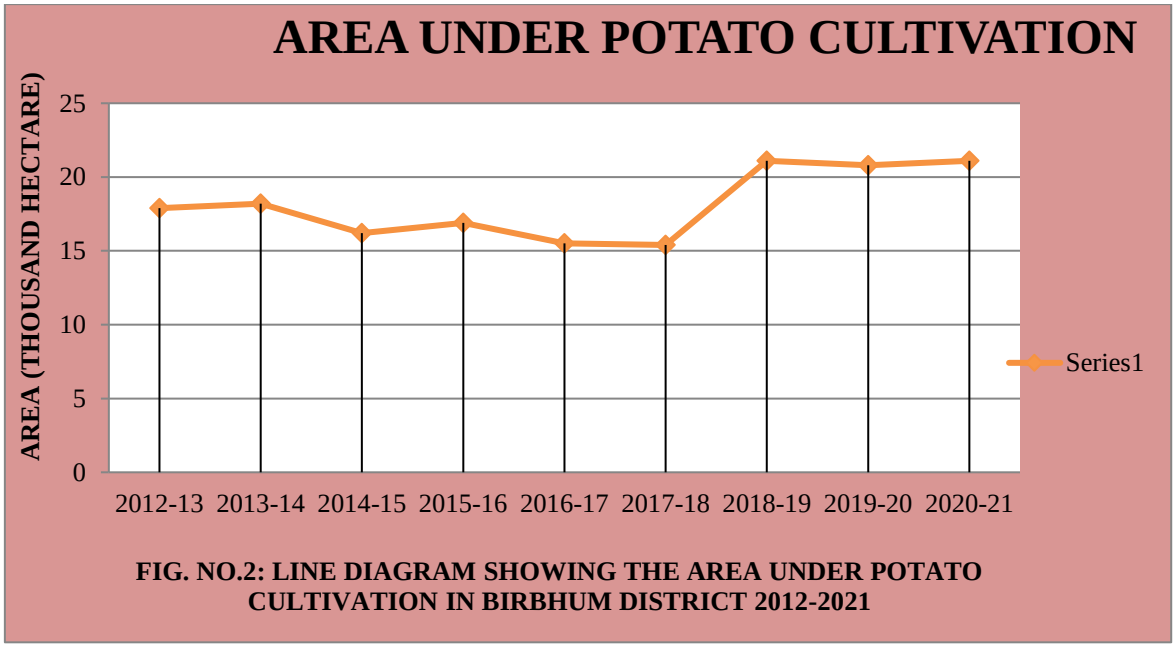


FIG. NO.2: LINE DIAGRAM SHOWING THE AREA UNDER POTATO CULTIVATION IN BIRBHUM DISTRICT 2012-2021

The above table and line diagram are showing that the area of potato cultivation in Birbhum district has expand from 17900 hectares in 2012-13 to 21100 hectares in 2020-21.

Table.2: Production of Potato In Birbhum District (2012-2021)

YEAR	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
PRODUCTION (THOUSAND TONNES)	537.8	445.1	492.6	485.7	499.3	534.8	673.5	616.3	664

Source: District Statistical Hand Book Birbhum, 2017 & 2021

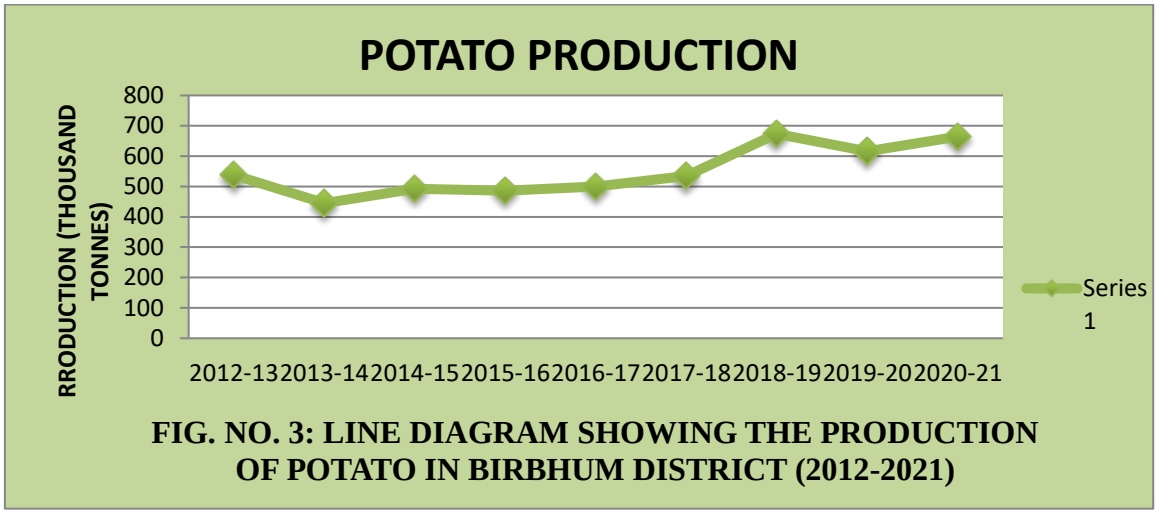


FIG. NO. 3: LINE DIAGRAM SHOWING THE PRODUCTION OF POTATO IN BIRBHUM DISTRICT (2012-2021)

The above table and line diagram are showing that the production of potato cultivation in Birbhum district has enhanced from 537.8 thousand tones in 2012-13 to 673.5 thousand tones in 2018-2019. But 2021 potato production has decreased compared to earlier, 2020-21 production is 664 thousand tons. But the overall production has increased.

Table.3: Yield rates of Potato In Birbhum District (2012-2021)

YEAR	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
YIELD(K.G PER HECTARE)	30013	24458	30493	28743	32217	34677	31385	29175	31545

Source: District Statistical Hand Book Birbhum, 2017 & 2021

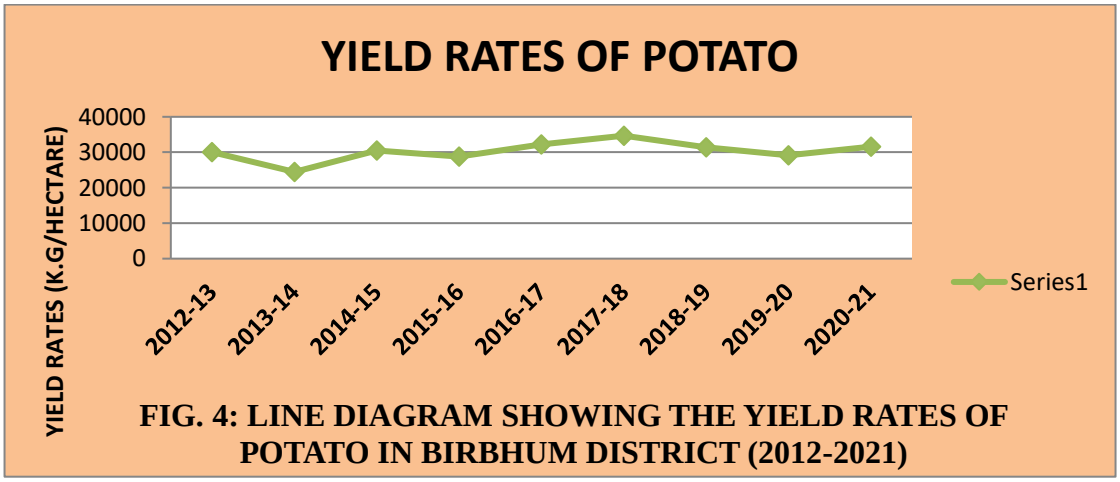


FIG. 4: LINE DIAGRAM SHOWING THE YIELD RATES OF POTATO IN BIRBHUM DISTRICT (2012-2021)

The above table and line diagram are showing that the yield rates of potato cultivation in Birbhum district has increased from 30013 kg per hectare in 2012-13 to 31545 kg per hectare

in 2020-2021. The yield rates in 2017-18 were highest at 34677 kg per hectare. But the potato yield rate has decreased significantly in 2021-21 compared to 2017-18.

Table No.4: Chemical Fertilizer Consumed in the District of Birbhum

CHEMICAL FERILIZER CONSUMED IN THE DISTRICT OF BIRBHUM (IN THOUSAND TONNES)				
YEAR	NITROGEN (N)	PHOSPHATE (P)	POTASH (K)	TOTAL
2012-13	47.6	22.9	12.7	83.2
2013-14	40.6	16.8	14.5	71.9
2014-15	48.6	19.9	15.9	84.4
2015-16	48.1	20.2	14.5	82.8
2016-17	49.46	18.21	14.28	81.95
2017-18	48.7	22.30	17.9	88.9
2018-19	48.65	22.18	18.13	88.9
2019-20	48.65	22.18	18.13	88.95
2020-21	48.65	22.18	18.13	88.95

Source: District Statistical Hand Book Birbhum, 2017 & 2021

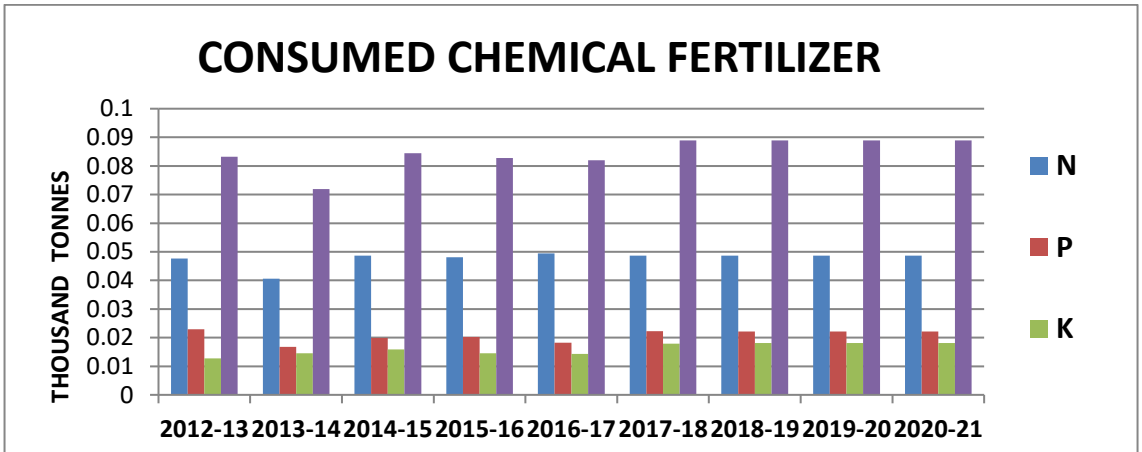


FIG. NO.5: BAR DIAGRAM SHOWING THE CONSUMPTION OF CHEMICAL FERTILIZER IN BIRBHUM DISTRICT

The above table and bar diagram are showing that chemical fertilizer is used largely in this area for the production of various crops .Although rate of consumption of chemical fertilizers varies greatly from crop to crop, small to large farmers. The consumption of chemical fertilizers in Birbhum district has raised from 83.2 thousand tones in 2012-13 to 88.95 thousand tones in 2020-21.

Table.5: Use of organic fertilizer by the farmers in Birbhum District (in percentage), (sample based, not whole)

BIRBHUM	ONLY CHEMICAL FERILIZER USE	CHEMICAL & ORGANIC FERILIZER USE	ORGANIC FERTILIZER USE	TOTAL
NO. OF FARMERS	240	128	32	
% OF FARMERS	60	32	8	100

Source: Field Survey

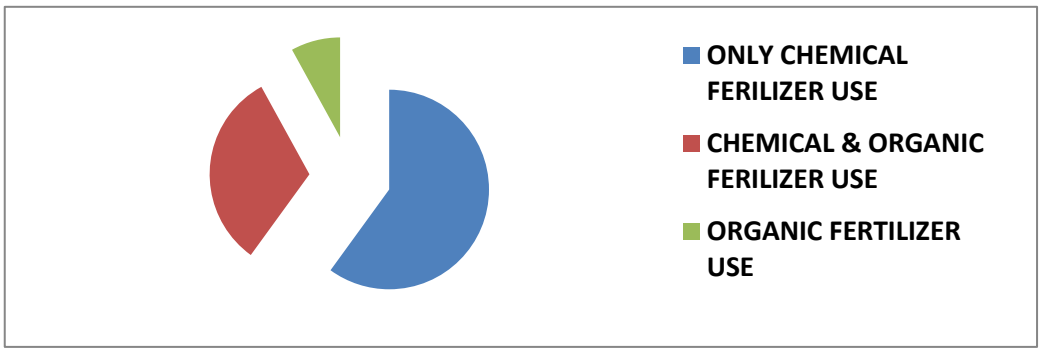


Fig. No.6: Pie diagram showing the use of organic fertilizer by the farmers in Birbhum District

The above table and pie diagram are showing that organic fertilizer is used nominally in this area for the production of crops. only 8% farmers are used organic & bio fertilizer. 32% farmers are used both fertilizer, chemical and organic. But 60% farmers are used only chemical fertilizers. So the use of chemical fertilizers is more in this region.

Table.6: Yield rates(k.g/ hectare) of potato in the blocks of Birbhum District for the year2020-2021

BLOCK NAME	YIELD IN K.G / HECTARE
NALHATI-I	32940
NALHATI-II	32110
MURARI-I	32040
MURARI-II	32130
MAYURESWAR-I	32060
MAYURESWAR-II	32120
RAMPURHAT-I	31750
RAMPURHAT-II	31860
MD BAZAR	32125
SAINTHIA	32680
DUBRAJPUR	29440
RAJNAGAR	29030
SURI-I	31180
SURI-II	31160
KHAYRASOL	29320
BOLPUR	32360
LABPUR	31680

NANOOR	31725
ILLAMBAZAR	31650

Source: District Statistical Hand Book Birbhum, 2021

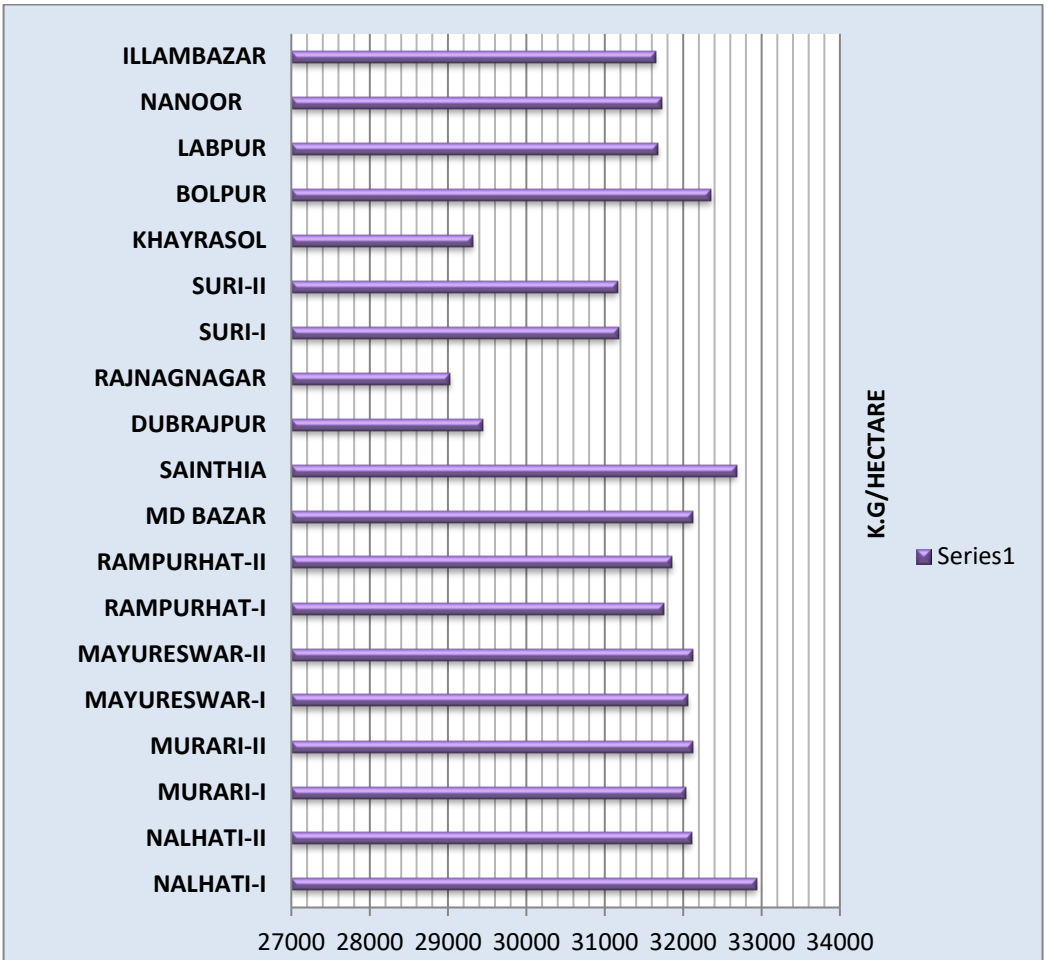


FIG. NO. 7: BAR DIAGRAM SHOWING THE BLOCK-WISE POTATO YIELD RATES IN BIRBHUM DISTRICT 2020-21

The above table and bar diagram are showing the block wise Potato yield rates in Birbhum district 2020-2021.The highest crop yield of potato has been found 32940 kg/hact in Nalhati –I block and lowest as 29030 k.g/hact in Rajnagar block. This diagram clearly understood that, the potato production is high in Nalhati –i, Sainthia, Bolpur , Mayureswar-ii, Murari-ii block. The potato production is moderate in Nalhati –ii,Murarai –I, Mayureswar I, Rampurhat –i, Rampurhat-ii, Md bazaar, Labpur, Nanoor,Ilambazar block.& production is low in Khayrasol, Suri-I, Suri-ii, Dubrajpur , Rajnagar block. So it is clearly the potato production is high in the northen and south western block of Birbhum district.

Conclusion:

Potato productivity in Birbhum district has increased due to excessive use of chemical fertilizers. Although the productivity of potato is very high in some blocks but the productivity is very low in many blocks. Lack of irrigation, lack of modern technology, lack

of communication, fluctuating market prices, raised in the price of chemical manure, non-use of organic manure, weather disasters and poverty of farmers in these blocks are causing low production. While the use of chemical fertilizers has increased greatly here, the use of organic fertilizers has gradually decreased. Farmers in the district have reduced the use of organic fertilizers due to increasing dependence on chemical fertilizers. The government should encourage the farmers of Birbhum district to grow potatoes and provide sufficient loans. Although chemical fertilizers are an important factor in increasing agricultural productivity, they do not lead to sustainable growth in agriculture. Improper use of chemical fertilizers is causing environmental degradation and bad effects on human body. So it is very important to know the proper use of chemical fertilizers. At present, the soil here is in such a condition that even if more chemical fertilizers are given, the production will not increase. The soil research center of Visva Bharati's Palli Shiksha Bhavan is working on the preparation of organic fertilizers from special wastes with the help of some special species of earthworms. If necessary, the help of this center can be taken for increasing the use of organic fertilizers in the district. With the help of this technology, there is also a great scope for the development of minor scale industries in the district in the field of organic fertilizer production. One thing needs to be made clear to them that if the fertility of the agricultural land of Birbhum district is to be maintained at a high level for a long time, more organic fertilizers must be used.

Plate.1:-Potato cultivation in Birbhum district

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