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CHEMICAL FERTILIZERS AND THE CROPS PRODUCTIVITY: A CASE STUDY

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ABSTRACT

The agricultural operations, from the preparatory tillage to harvesting are greatly influenced by a set of physical factors like soil, terrain, location of the farms and climatic factors like temperature, rainfall, humidity, snowfall, wind, fog, etc. Also it is influenced by economic, technological and socio-cultural factors. Among these the role of technological factor especially the application of fertilizers is supposed to be the most important in today's world. Because its application boosts up the crops productivity which is urgently needed to feed the teeming billions of the world. It has established by innumerable scientific observations that, there is direct relationship between the application of fertilizers and crops productivities. Two types of fertilizers namely organic fertilizers ie manure and chemical fertilizers are used in the study area to produce a variety of crops like aman paddy, boro paddy, wheat, mustard seed, potato and so on. After the application of fertilizers the productivity increases here from 1.3-3.8 quintals/acre in case of mustard seed to22.5-75 quintals/acre in case of potato from their pre application period.

KEYNOTES:*Agriculture, Fertilizers, Crops, Productivity, Manure*

INTRODUCTION

Agricultural landscape, on which human being, animals and plant thrive for their sustenance, is being influenced continuously by a set of physical and cultural factors. The physical factors influencing agriculture include relief, geology, climate, soil, drainage and alike. The agricultural landscape of a region is also influenced by cultural factors like irrigation, organic manure, chemical fertilizer, plant protection measures, capital, marketing, transport, institutional facilities and so on. Among these the technological factor especially the **chemical fertilizer** plays most important role in boosting up of crops productivity. It is found that, after the application of chemical fertilizers the productivity of crops has increased significantly all over the world. There is a direct relationship between the food grain production and fertilizer consumption. It has been proved that, one kg of nitrogen of the nitrogenous fertilizer can produce 10kgs to 12kgs of extra production (ICAR-1976). According to FAO over 50% increase in food grain production in India as well as elsewhere in the world is due to the application of chemical fertilizers.

OBJECTIVES OF THE STUDY

Major **objectives** of the present study are

- To study the nature and extent of application of organic manures.
- To study the nature and extent of application of chemical fertilizer.
- To study the relationship between the application of chemical fertilizer and productivity level of crops.

DATA BASE METHODOLOGY

The preset study is based on primary sources of data which are collected from door to door survey of a minimum of 250 household belonging to different caste and religion like higher caste Hindu, middle caste Hindu, Schedule caste, Schedule tribe and Muslim by making suitable questionnaire. The households have been selected purposively from five different villages located in different corners of the study area from different land holding classes of farmers like marginal, small, medium big and very big. Then these collected data have been transformed into *indicator*, after processing those statistically. Point to be noted that, to know the nature of agriculture and productivity of crops in this area before the introduction of chemical fertilizer, large number of interviews are taken from aged (60-80 years) farmers.

LOCATION OF THE STUDY AREA

Interfluve of the **Mayurakshi** and **Basloi river** in Birbhum district located in between 23^0 52′ 23.7″ N latitude to 24^0 32′ 17.5″ N latitude and 87^0 27′ 16.1″ E longitude to 88^0 01′ 21.8″ E longitude has been selected for the present study. It has r an area of 1833 sq kms with a population of 1448338 in 2001. The area covers nine blocks namely Mayureswar-I, II, Md. Bazar, Rampurhat-I, II, Nalhati-I, II, and Murarai- I ,II. For the data collection five villages namely **Angargoria, Dakshingram, Kamakha, Paikar** and **Tail Para** have been selected purposively form different corners of the entire study area.

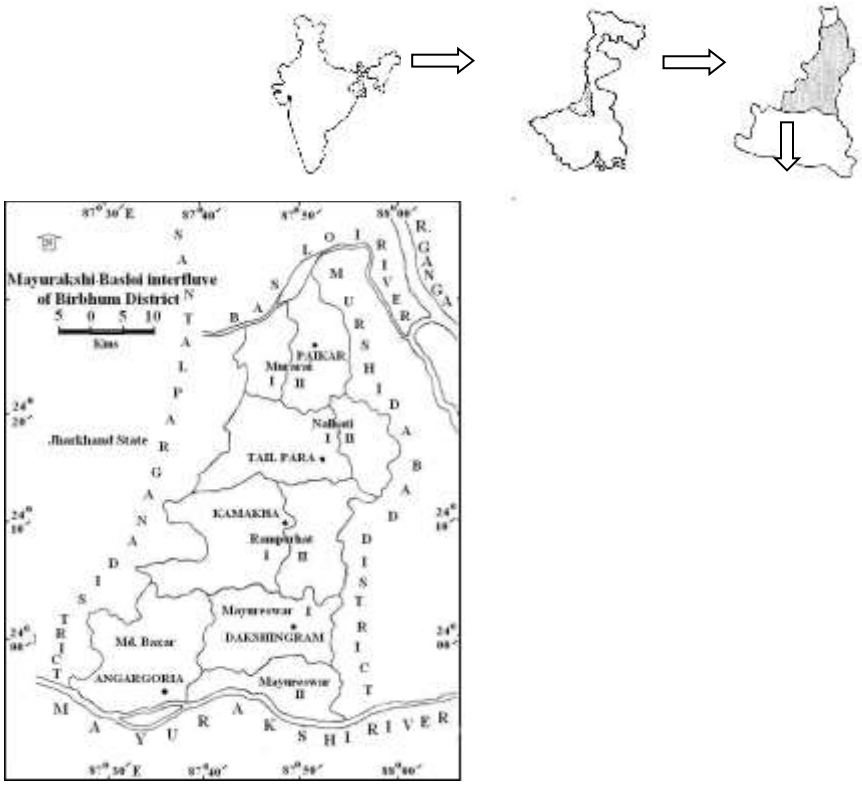

Fig-1: Location of the study area and study villages

LITERATURE SURVEY

At the beginning of human civilization the limited pressure of population on land encouraged farmers to cultivate with traditional **organic manures** which provided lower yield without ecological distortion. Gradually, due to heavy pressure of population, the farmers have no alternatives but to go for massive use of **chemical fertilizers** for assuring higher productivity. In this respect the study made by Panos Institute, London;

Floor Brouwer (2002); Klingauf Pallutt (2002), VISTA (Vietnam Information for Science and Technology Advance), (2006), Irabanta Oinam (2006), Panos Institute, London; Floor Brouwer (2002); Klingauf Pallutt (2002), Irabanta Oinam (2006), FAI (1985, 1994), ICAR (1976), Chadha (1999-2006), Kushwaha, Ochi, Abubakar, Ayoola (1999) deserve worth mention.

UTILIZATION OF FERTILIZERS TO AGRICULTURAL CROPS

Fertilizer is a substance that supplies artificially the essential nutrients needed by plants growth (ICAR-1987). Two types of fertilizers are used here to produce a variety of crops namely organic fertilizer (manure) and chemical fertilizer. **Organic manure** is the carbonaceous materials mainly of vegetable and/or animal origin added to the soil for the nutrition of plants (FAI- 1994). During pre independence period farmers in this area used to apply solely this type of manure especially farm yard manure to produce crops like aman paddy, mulberry, vegetables, arum, cauliflower, wheat, mustard seed, potato, arum, boro paddy etc crops. Along with the farm yard manure gradually some of the farmers in different parts of the study area used to apply *bio-gas slurry, the ash of rice mills, poultry waste, sewage water* etc bio materials to some extent to produce different crops. But the amount of organic manure (FYM) produced in each farms was inadequate to meet the requirement of all the lands under plough. As a result, in most cases this manure is not applied to produce all the crops. The small and marginal farmers are only able to apply it to all their fields where as the medium and big farmers having large amount of ownership holding use it to produce some selected crops only in one or two alternate years. The quality of manure was also not good. As a result, the productivity of crops was not upto the expected level of the farmers.

As a fact of **green revolution**, farmers here start to apply *technological package* especially **chemical fertilizer** in production process during the sixties of the last century. Most common type of chemical fertilizers used in production process in the study area includes **NPK 10-26-26, DAP, urea, gromor, potash** and **super phosphate**. Generally such fertilizers are applied to crop fields during the final preparation of land as **basal dose** but urea is also applied to standing crop as **top dressing**. Along with the application of chemical fertilizers the farmers also apply chemical **pesticide** and **weedicide** to protect crops from insect / pest attack.

Table-1; Rate of consumption of chemical fertilizer and urea for some selected crops.

Crops	NPK fertilizer application in kg	Urea application in kg
Aman paddy	20-50	12.5-45.0
Wheat	37.5-100	12.5-75.0
Mustard seed	37.5-75	12.5-75.0
Boro paddy	37.5-100	20.5-75.0
Potato	150-400	25.0-100.0

Source-Field survey-2010

INCREASE OF PRODUCTIVITIES AFTER THE APPLICATION OF CHEMICAL FERTILIZERS

The main objective of the application of chemical fertilizer to agricultural fields is to **increase the productivity** of crops. This fact has been proved by countless farmers in different parts in the world as well as in the states and districts in the country including the study area. Through field investigation in different parts of the study area it is learnt that, after the application of chemical fertilizers the crop productivity has increased in every farm but with varying magnitudes. Here the increase of productivities of crops has been measured by differentiating the productivity **with** and **without the application of chemical fertilizers.** For the study, productivity increment of some selected crops has been calculated and is discussed there after one by one in next sections.

INCREASE OF PRODUCTIVITIES OF AMAN PADDY

The study shows that the difference of productivity of aman paddy is in between 3.8 quintals and 15 quintals per acre, after and before the use of chemical fertilizers. That means the productivity of aman paddy increases from 3.8 quintals to15 quintals per acre due to the application of chemical fertilizers from its pre application period. Majority of the farmers in different villages generate low to moderate amount of productivity increase of this crop ranging in between 3.8 quintals and 9 quintals per acre after the application of that input. On the other hand,

only 10.4% farmers this area gets 10 quintals to 15 quintals of extra production for the same, in which the farms of Dakshingram village predominate numerically.

Table-2: Increase of productivity of aman paddy after the application of chemical fertilizers

Villages	Increase of productivity of aman paddy (Q/acre)			Total
	3.8-9	9-10	10-15	
	Percentage of farms			
Angargoria	76	24	0	100
Dakshingram	16	44	40	100
Kamakha	34	58	8	100
Paikar	90	10	0	100
Tail Para	78	18	4	100

Source: Field survey

INCREASE OF PRODUCTIVITIES OF WHEAT

In case of wheat crop, the productivity increase is in between 3.8 quintals and 10 quintals per acre due to the application of chemical fertilizers. Majority of the farms in different study villages achieve moderate to larger amount of productivity increase of this crop. Considerable number of wheat cultivators of Kamakha and Paikar villages produce larger amount of wheat per acre after the application of chemical fertilizers. On the other hand, in case of the farms of Tail Para, Dakshingram and Angargoria villages the productivity increase of this crop is of moderate amount, ranging in between 4 quintals and 5 quintals owing to the application of chemical fertilizers. Because of the inadequacy of irrigation, no use of organic manure and application of traditional type of seed the productivity and total production of this crop in this area never reach upto the expected level of the farmers.

Table-3: Increase of productivity of wheat crop after the application of chemical fertilizers

Villages	Wheat not cultivated	Increase of productivity (quintal/acre)			Total
		3.8-4	4-5	5-10	
		Percentage of farmers			
Angargoria	34	14	40	12	100
Dakshingram	24	8	42	26	100
Kamakha	10	8	32	50	100
Paikar	28	24	20	28	100
Tail Para	10	30	46	14	100

Source: Field survey

INCREASE OF PRODUCTIVITIES OF MUSTARD SEED

The productivity of mustard seed is found to increase in the study villages in between only 1.3 quintals and 3.8 quintals per acre as an outcome of the application of chemical fertilizers. Here most of the farmers experience smaller to moderate amount of productivity increase of this crop. Considerable number of farms of Tail Para and Paikar villages generate smaller amount of productivity increase of mustard seed after the application of chemical fertilizers. But most of the mustard seed cultivators at Kamakha and Dakshingram villages experience moderate amount of productivity increase for the same. Only a few numbers of farmers at Dakshingram, Kamakha and Angargoria villages produce comparatively larger amount of mustard seed per acre ranging in between 2.5 quintals and 3.8 quintals after the application of chemical fertilizers. The following table shows it clearly.

Table-4: Increase of productivity of mustard seed after the application of chemical fertilizers

Villages	Mustard seed not cultivated	Increase of productivity (quintal/acre)			Total
		1.3	1.3-2.5	2.5-3.8	
		Percentage of farmers			
Angargoria	32	26	36	6	100
Dakshingram	14	8	62	16	100
Kamakha	4	16	70	8	100
Paikar	10	74	16	0	100
Tail Para	8	76	16	0	100

Source: Field survey

INCREASE OF PRODUCTIVITIES OF BORO PADDY

Chemical fertilizers respond well in enhancing productivity of boro paddy crops in this area. The increase in productivity of this crop takes place in between 7.5 quintals and 20 quintals per acre in different study villages after the application of chemical fertilizers. The study shows that, in most of the farms, the boro paddy cultivators achieve smaller to moderate levels of increase in productivity. In terms of lower levels of productivity increase, the farms of Paikar village are abounding in numbers followed by Angargoria and Tail Para villages. Also considerable number of farmers of that two villages experience moderate levels of productivity increase. On the other hand, moderate to larger amount of productivity increase of boro paddy ranging in between 12 quintals and 20 quintals per acre is obtained by most of the farms of the cultivators of Dakshingram and Kamakha villages. All the facts are cleared by the table given below.

Table-5: Increase of productivity (q/acre) of boro paddy after the application of chemical fertilizers

Villages	Boro paddy not cultivated	Increase of productivity (quintal/acre)			Total
		7.5-12	12-13	13-20	
		Percentage of farmers			
Angargoria	0	56	34	10	100
Dakshingram	2	16	38	44	100
Kamakha	2	8	52	38	100
Paikar	2	70	28	0	100
Tail Para	8	40	38	6	100

Source: Field study

INCREASE OF PRODUCTIVITY OF POTATO

Potato crop in this area shows highest increase in productivity, ranging in between 22.5 quintals and 75 quintals per acre after the application of chemical fertilizers. That means chemical fertilizers respond well in terms of productivity of this crop. Large number of farmers of Tail Para, Angargoria and Kamakha villages experience smaller amount of productivity increase after the application of chemical fertilizers. But the increment of productivity of this crop at Dakshingram village is towards the moderate to larger in amount.

Table-6: Increase of productivity of potato crop after the application of chemical fertilizer

Villages	Potato not cultivated	Increase of productivity (quintal/acre)			Total
		22.5-45	45-50	50-75	
		Percentage of farmers			
Angargoria	38	48	2	12	100
Dakshingram	0	22	34	44	100
Kamakha	40	46	6	8	100
Paikar	76	10	12	2	100
Tail Para	10	66	20	4	100

Source: Field survey

The chemical fertilizers respond well in the cultivation of **vegetables** and so their output in this area. The productivity of this crop is increased in between 12.5 quintals and 50 quintals per acre in different study villages after the application of chemical fertilizers. After the application of chemical fertilizers the **arum crop** also shows a significant increase of productivity. The increase of productivity ranges here from 20 quintals to 62 quintals per acre in different study villages.

From the discussion it found that, application of chemical fertilizers without doubt increases the productivity and total production of crops in all the study villages although in varying magnitudes. This increases the **gross** and **net** value of productivity.

Chemical fertilizers not only help to increase the productivity of crops quantitatively but it also upgrades the quality of production, if applied in **balanced proportion**, because balanced fertilization makes healthy soil, which in turn produce healthy crops. Recently it has been established that, the crop quality in terms of their *appearance, smell, composition,* and so the *commercial value* is improved due to the application of chemical fertilizers (FAI-1994).

Although application of chemical fertilizer gives rise to higher production but at the same time it causes the **damage** of resources, distortion of ecosystem, deterioration of environment, health hazards and alike problems if it is applied haphazardly. Such problems have become serious concern to the present world agriculture. The scientists have started rethinking about how to come out of the pollution traps. As a result, several alternative measures have so far been brought to light by re-introducing farming without chemicals.

CONCLUSIONS

The farmers in this area produce a variety of crops after using different types of chemical fertilizers like **NPK 10-26-26, DAP, urea, gromor, potash** and **super phosphate** and some amount of traditional type of **organic manures**. It is found that, due to the application of chemical fertilizers productivity of crops have increased unquestionably but with varying magnitudes in different farms. The crops like potato, arum, boro paddy etc respond well to fertilizers. As a result the rate of increase of productivity increment of these crops is also larger almost in all the farms. Although the application of fertilizers increases the productivities of crops but it at the same time may causes deterioration of environment including the crops itself if the same are used unscientifically. For this **integrated nutrient management system** must be followed to make the agriculture sustainable.

REFERENCES

1. *Agriculture Department West Bengal Govt., "Basundhara" (Bengali), Sept. - 2005, Vol- V, pp, 2-14*
2. *Ali, S. J., "Saar Samachar" (Bengali), FAI, Eastern Region, 42nd year, Jul- Sept.- 2004, Vol- II, pp, 25-27.*
3. *Bokhtier, S. M. and Sakurai, K. (2005), "Effects of Organic manure and chemical fertilizer on Soil fertility and productivity of plant and Ratoon crops of Sugarcane", Archieves of Agronomy and Soil Science, Tailor and Francis Ltd. Vol.- 51, No.- 3, pp, 325-334*
4. *Deb, D. L. (1976), "Effect of Organo-mineral mixtureon crop yields and soil fertility", Fertilizer News, 21 (9): 60-63*
5. *Majumder, D. D.(1975), "West Bengal District Gazetteer", Birbhum District, pp, 1-55, 120-150.*
6. *Majumder, M.,(2001), "Mrittika, Saar O Phasal" (Bengali), West Bengal State Pustak Parsad, pp, 66-99, 272*
7. *Misra, S., "Saar Samachar" (Bengali), FAI Eastern Region, 43 rd year, Jul-Sept-2005, vol-II, pp-37-43*
8. *Tisdale, S. L. and Nelson W. L. (1971), "Soil Fertility and Fertilizer" (Second Edition), Macmilan Co., Newyourk, pp, 1-4, 650-674.*
9. *Husain, Mazid, (2006), "Systematic Agricultural Geography" Rawat Publication, Jaipur and New Delhi.*