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Appraisal of Land Resource and Vermicomposting of East Champaran District

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Abstract :

Vermicomposting is a process in which earth worms are used to convert organic materials into humus - like material known as vermicompost. Nutrient profile in the vermicompost is generally higher than tradition compost. In fact, vermicompost can enhance soil fertility, physically, chemically and biologically. Physically, vermicompost treated soil has better aeration, porosity, bulk density and water retention. Therefore, vermicomposts should be applied at moderate concentration in order to obtain maximum plant yield. This review paper discussed in detail the effects of vermicompost in soil fertility physically, chemically and biologically. Future prospects and economy on the use of organic fertilizers in agriculture sector were also examined.

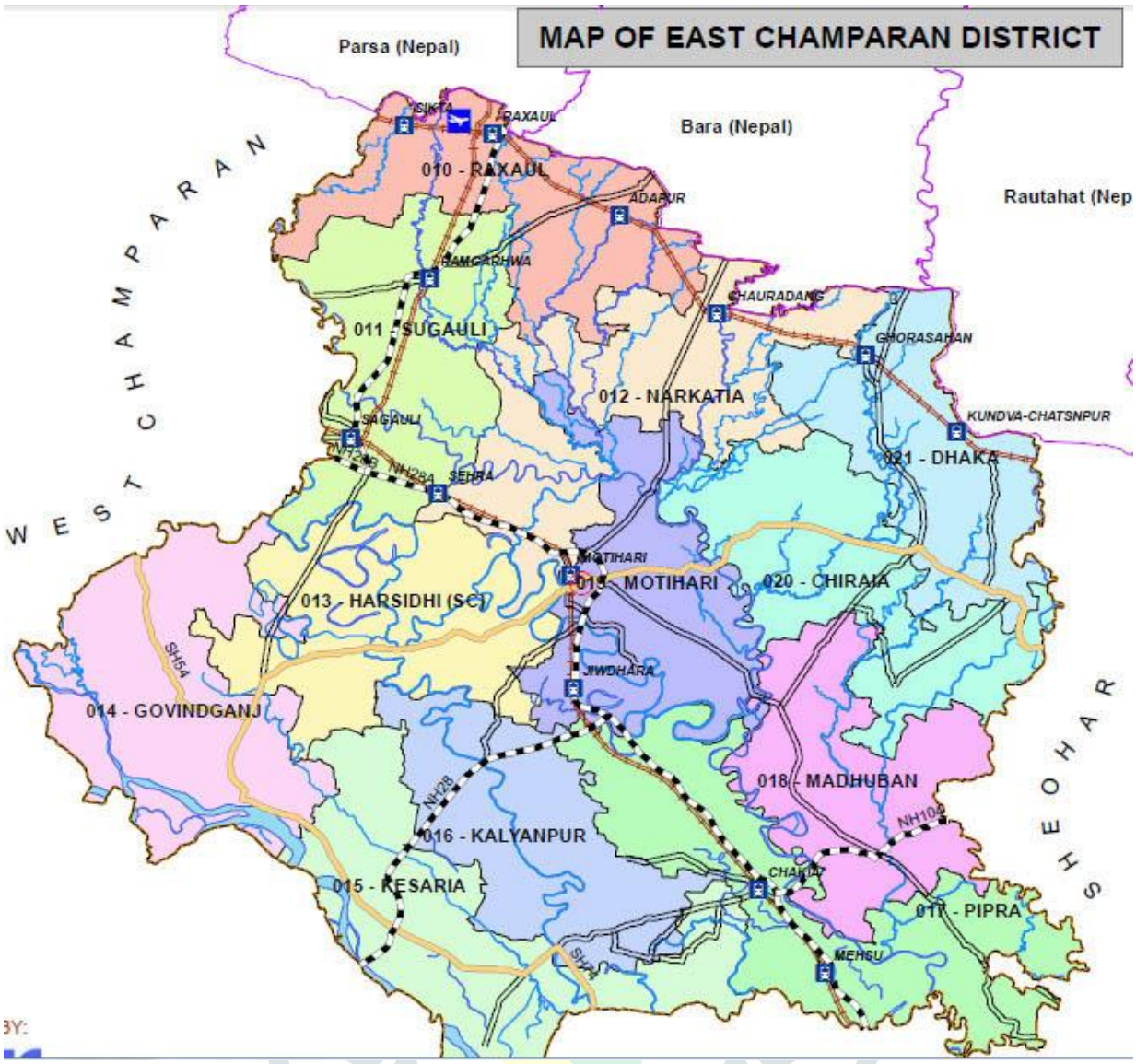
Keywords : Vermicompost, Agricultural development, Nutritive value, Cropped area, Land use .

Introduction :

To feed this fast growing population sustainable development of agriculture of the district is urgently needed. Agricultural scientists, planners, geographers, politicians and administrators must think seriously for third green revolution.The chemical properties such as pH, electrical conductivity and organic matter content are also improved for better crop yield. Nevertheless, the enhanced plant growth could not be satisfactorily explained by improvements in the nutrient content of the soil, which means that other plant growth influencing materials are available in the vermicomposts. Although vermicompost have been shown to improve plant growth significantly, the application of vermicomposts could impede the growth due to the high concentrations of soluble salts available in the vremicomposts. Therefore, vermicomposts should be applied at moderate concentration in order to obtain maximum plant yield.

Study Area

East Champaran district of Bihar state lies between N 26º 15’ 10” and 27º 01’ 30” and E 84º 30’ and 84º 17’ 50” covering an area of 3968 Sq. Km.



The district is bounded in the North by Nepal, South by Muzaffarpur, part of Gopalganj, East by Sitamarhi and Sheohr and West by West Champaran and part of Gopalganj district. On 1st of December 1971, Champaran district was split up into two districts, viz. East Champaran and West Champaran. The headquarter of East Champaran district is at Motihari. The district headquarter is Motihari which is well connected to different parts of the state by all weather roads and rail. It is about 170 Km from Patna by road. Location of the district is of strategic and historical importance. The district has been the centre of communication for the border areas of Nepal. It has six sub-divisions with 27 blocks. Administrative details of East Champaran district are given below in As per the census of 2011, the district has a population of 5,082,868 with 2,674,037 males and 2,408,831 females. The population density has been found to be 1281 persons per sq. km. The male female sex ratio has been found to be 901 females per 1000 males. Literacy rate is 58.26% with 68.02% for male and 47.36% for female. Overall literacy percentage in the district is 58.26% with 68.02% of male and 47.36% of females literacy.

Basin/sub-basin, Drainage

The river Gandak or Sikrahna (BurhiGandak) is the most important river in the the district from North West to South East. In the northern part of its course in the district, the river Gandak is known as Sikrahna and in the southern part of its course it is known as BurhiGandak. The river Gandaj has often changed its course in the past causing floods in many parts of the district. An abandoned channel of this river, called Dhanauti, has stopped to flow because of silting up of its off–take. Presently, this channel is a sluggish drainage channel with many loops before joining with river Sikrahna at Pakridayal. The other important rivers in the district are Lal Bakeya and Bagmati. The river Lal Bakeya originates in the foot hills of Nepal and flows through the district in southern direction forming the eastern boundary of the district with Muzaffarpur before meeting river Bagmati near the village KhoriPakur. Other rivers reported from the district are Tilawe, Kachhna, Motia and Tiur.

Irrigation practices

The economy of the district mainly depends upon agriculture. The major crops of the district are Paddy (Basmati Rice), Mustard, Sugarcane, Jute, Lentis and Vegetables. The irrigation in the district is mostly influenced by the presence of canal system in the northern and eastern parts. This has greatly improved the irrigation facilities in the district. Irrigation through lifting of water by means of swing buckets, by constructing bunds on the river and distribution of the water by means of 'Pynes'. Other irrigation means are shallow tubewells, tanks and wells. Gross irrigated area reported from the district is 183000 hectares of land with Net irrigated area of 141000 hectares of land. Along with this, total cropped area is 390473 hectares and net sown area is 304875 hectares of land.

Climate and Rainfall

Flood and drought has remained a regular feature of the area. The district of East Champaran is known for its hot summers and severe winters. The summer season starts from the end of March with average temeperature of about 35º C and maximum temperature of 46º C in the months of May and June. In winter season the temperature goes down to 4 - 5º C. Lowest temperature is reported from the end of December to January.

The rainfall in the region is received through South West Monsoon during June to end of September in the area. During the rest of the period the rainfall is sporadic or scanty. The average rainfall reported from the area is 1241.6 mm. Very heavy rainfall is reported in the month of July to September. Winter rains along with pre monsoon showers are common in the district. A plot showing month wise rainfall (in mm) of East Champaran district is given below .

Geomorphology and Soils

The topography of the area is fairly even and has fertile alluvial plains. These alluvial plains are divided into two tracts by the river BurhiGandak (Little Gandak) with both the plains having remarkably different characteristics. The river Sikarahna (BurhiGandak) divides the tract from North West to South East. The northern portion of the tract is of older alluvium and has low land area which is suited for cultivation of kharif but is unsuitable for rabi crops. The southern portion of the tract has recent alluvium deposits of the river Gandak which has changed its course moving further west. This southern portion is suited for cultivation of both Kharif and Rabi crops. The area of this region is characterized by stretches of upland varing in places by large marshy depressions known as 'Chaurs'. The major slope of the area is due south-east.

The most remarkable feature of the district is presence of a chain of nearly 40 lakes running through the centre of the district covering an area of around 350 sq. km. The important lakes are located at Sugaon, Talsaraiya, Turkaulia, Motihari, Pipra, Siraha, Nawada and Tetaria. The depth of the lakes varies from 1-5 m and remains mostly filled up with water during summers. The prevalent soil is older alluvial type which is characteristic feature of the Gangetic plain. The soil is lighter in texture. In the northern region the soil is strong clay known locally as 'Bangar' covering an area of about two-fifth of the district. In this area, paddy crops are cultivated during sufficient rainfall seasons. In the Southern region of the river, the soil is mainly light sandy loam not suitable for kharif but yields good crops of wheat, mustard linseed etc. Major soil types found in the area are Paleustalfs, Haplaquents and Udifluvents soils.

Objectives :

(i) An attempt has been made to suggest an alternative measures to increase crop production in the study by using vermitechnology.

(ii) This research paper discussed in detail the effects of vermicompost on soil fertility physically, chemically and biologically.

(iii) Future prospects and economy on the use of organic fertilizers in agriculture sector were also examined.

Methodology :

The present research work based on the observational description and observational rational methods in order to decipher the theme of the research. Various statistical and cartographic methods has applied where ever needed. The present research study based on both primary and secondary data. The primary data collected through personal observation, interview, questionnaires schedule

etc. while the secondary data collected from concerned district or block headquarters. Map and diagrams, graphs etc. have been widely used in this research papers.

Discussion :

Agricultural scientists, planners, geographer, politicians and administrators must think seriously for second green revolution. At present formers of the districts in order to get high yield are using chemical fertilizers at the ratio of 13:3:1 (Nitrogen, Phosphorous, Potassium) than the prescribed stand ratio of 4:2:1 in a haphazard way, resulting in soil pollution, depleting soil micro-nutrients and affecting soil chemistry. The soil of the area is becoming barren and yield of the crop is either stagnant and decreasing.

It has been observed that a middle class former family with 2-3 animals and 2 to 2.50 acres of land can support his 5-7 members family well by adopting this technology and will be able to sell food grains in the market to meet out other expenditure of his family. It has been empirically observed that there is very poor adoption of this technology in the rural areas of the district while, there is immense benefit from it. The lack of propogation illiteracy of the farmers and harassment of the Government officials and local leaders are some causes of poor adoption.

Table - 1
District:- Madhubani
(Total Cropped Area 2011-2012)

S.No.	Harvests	% age to the total cropped area
1	Rabi	52.02
2	Bhadai	29.37
3	Agahani	15.18
4	Garma	3.44
	Total	100.00

Source :- Zinsbar Report , Dist. Statistical Office , 2011-2012

Vermitechnology is less costly, less prone to soil erosion, less moisture loss, pollution free, eco-friendly and almost doubles the crop yields. In vermitechnology earthworms of special species Rs. 500-600 per 5 kg. from Khagaria, are used to prepare, vermicompost manure/against the traditional animal dung compost. These earthworms make use of plant residues organic waste, animal urine and dung. These earthworms by virtue of their feeding and general behavioural activities like burrowing, leading to micronising, digesting, excreting and decomposing of complex waste matters into simple forms. Thus play vital role in increasing soil fertility. They also mix the different layers of soil 1 mm to 5 mm thick surface every year and turnover soil from 2 to 250 tonnes per hectares yearly, depending on the species of earthworms and soil characteristics

(physical and chemical both). Thus they bring various complex organic nutrients closer to plant roots for absorption. The capacity of these earthworms to break up complex organic matters into compost form in 2 to 5 times faster than conventional method, in conventional composting, generally it takes 6 months while these special earthworms convert 1 tonne per month in a 5 meter pit linked with animal's urine track. These earthworm's activities promote hasten and enable humification process and provide 15% to 30% more phosphorous and 6% more nitrogen to the soil. Besides it, some other plant nutrients like Calcium, Magnesium, Potassium, Phosphorous and Molybdenum are more available to plants through warm cast than surrounding soil, it has been observed periodic turnover and mixing of organic matters in traditional compost pit is labour intensive process. While in vermitechnology composting and all process related to aeraction (i.e. turning, mixing and bringing various plant nutrient to the roots of plants) is done by earthworm.

Table - 2
AGRICULTURAL AREA

S.N.	Crop	Category Crops	Area devoted in Hect	%age
1	Cereal crops	Rice, Wheat, Maize, Barley	91321.3	73.38
2	Food cash crop	Sugarcane, Potato, Vegetable, Fruits, Spices, Oil seeds	14325.4	11.51
3	Pulses	Gra,. Arhar, Mung, Urad, Peas, Khesari etc.	3894.97	3.13
4	Millets	Marua, Kodo, Sawan, Jowar, Bajra, Kauni etc.	3145.45	2.53
5	Fodders	Oat, jenera, Napier etc.	2834.39	2.28
6	Fibers	Sanai, Pat Jute etc.	5647.95	4.54
7	Non-food cash crops	Tobacco, Betel leaf etc.	1814.67	1.46
8	Other crops	Kerao, Bokla, SuthaniLulthi etc.	1472.57	1.18
Total			124457	100.00

Source: Zinsbar Report, District Statistical Offices, 2011-12

The above mentioned table shows the land devoted to different crops in the district. Out of the total agricultural area 73.38% (91321.3 hec.) land is devoted to the cereal crop that comprises rice, wheat, maize, Barley etc. Food cash crops cover 11.51% (14325.4 hec) cultivable land in the district which consists sugarcane, potato, vegetables, fruits, spice, oilseeds etc. Pluses, gram, arhar, mung, urad, peas, khesari etc. are grown, Mallets that includes marua, kodo, sawan, jowar, Bajra, Kauni etc. covers 2.53% cultivable lands comprising 3145.45 hec. Fodders includes oat, jenera, napieretc, These crops are grown on 2834.39 hec. of cultivable land and it covers 2.28% of the total agricultural area.

Fibers crops include Sanai, Pat, Jute etc. 4.45% (5647.95hec) of the total agricultural area. A Non-food cash crop that includes tobacco, betel leaf etc. covers 1814.67 hec. Cultivable land that stands for 1.46% of the total cultivable land. Only 1.18% cultivable land is devoted to other crops kerao, bokla, suthn, lulthi, etc.

According to Prof. S. JasrajPuri from earthworms bodies medicines are prepared through unanipathy for the treatment of wounds, piles, arthirities, jaundice, gallbladder stone, hernia, Asthma and sexual impotency.

Thus, the whole process done by these special earthworms is known as vermitechnology or vermicomposting. These earthworms have maintained C/N ratio (Carbon-Nitrogen) and C/P relationship (Carbon-Phosphorous), brought down to 20:1 and made Nitrogen available to plants.

Nutritive Value of Vermicompost in Madhubani District

It has been observed that some minerals like Copper, Magnesium, Cobalt which are useful to increase crop yield are decreasing due to excessive use of pesticides like thylate, phiolone and chlorophyriphos to kill termites (in potato crops) has made the soil poisonous.

Table - 3
Nutritive Value of Vermicompost

Sr.No.	Nutrients	Value	% or ppm
1	Organic carbon	9.15	18.52%
2	Nitrogen	0.52	1.63%
3	Phosphorous	0.15	0.36%
4	Potassium	0.26	0.62%
5	Sodium	0.08	0.40%
6	Copper	2.00	9.35 ppm
7	Iron	5.80	11.23 ppm
8	Zinc	5.80	11.23 ppm
9	Sulphur	1.30	556 ppm

In the study area Madhubani district application of vermicompost is encouraging author in Bahadurpur village adopted by Shri RamlalMahto, a middle class progressive farmer cum service man in following three cereal crop like wheat, rice and maize and in the cultivation of some vegetables like potato, tomato, cauliflower, cabbage, raddish, elephant foot (suran), stripped pear gourds (parwal), bottle gourd (lauki, ghiya), pumpkin (kaddu). For the onion, garlic and one horticulture crop banana the result is encouraging and the maximum yield of wheat increased from 22-25 qtl. per hectare to 40-48 qtl. per hectare. The soil scientists of Bangalore Agriculture

University in a village Nagsandra, 40 km away from Bangalore have tapped maize yield 83 qtl. per acre is increases of 27 qtl. per acre more by applying new technology (use of urine). The growth of banana is robust and vegetables yield almost has doubled.

Table - 4
Estimated Production of Various Crops (2021 A.D.) After Use of Vermicompost

Sr. No.	Crops	Total cropped area (in ha)	Production (in mt. tonne)	Average production (qtl./ha)	Expected production (in lakh mt. tonne)
1	Wheat	73276	251687	34.35	5.3
2	Rice	17534	56533	26.54	9.3
3	Maize	51219	101789	19.83	2.0
4	Pulses	7755	7508	9.68	0.15
5	Oilseeds	15119	16857	11.15	0.33
6	Potato	40518	845165	208.59	16.9

The cost of chemical fertilizers (Nitrogen) at present is Rs. 5-6/kg., while the cost of vermicompost is only Rs. 4-6/kg., which includes packaging also. It has been suggested that the middle class family with 5-7 members having 2.00-2.5 Acre of land with 2 or 3 cattles can support his family well and will have excess foodgrains to sell in the market. It has been observed that there is very poor adoption of this technology in the district inspite of its immense benefit. It has been suggested that the officials of agricultural department must take serious interest in propagating its benefits in demonstrating and providing training to 5 young educated, energetic, unemployed and progressive young farmers from each gram panchayat for training at block headquarter in the initial stage. Government must provide some incentive for its propagation among the masses. The feedback of this project must be evaluated periodically. Carrot and stick policy must be adopted seriously to check the corrupt official, otherwise fate of this development technology will fade like other government development projects.

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