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Environmental Sustainability On Agriculture In Paschim Medinipur District, West Bengal, India

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Abstract

Environmental sustainability is the responsibility to conserve natural resources and protect global ecosystems to support health and well being, now and in the future. Environmental sustainability maintains the health and bio-capacity of the environment. Sustainability promotes a better economy where there is little waste and pollution, fewer emissions, more jobs and a better distribution of wealth. Sustainable agriculture consists of environment friendly method of farming that allow the production of crops or livestock without damage to human or natural systems. By adopting sustainable practices, farmers will reduce their reliance on non-renewable energy, reduce chemical use and save scarce resources. Keeping the land healthy and replenished can go a long way when considering the rising population and demand for food.

The Paschim Medinipur District in the state of West Bengal is chiefly an agricultural district where more than 70% of the population lives in rural area and among them majority depends on agriculture and agriculture related occupations. This paper describes the Environmental Sustainability on agriculture in Paschim Medinipur District, West Bengal Different methods like crop rotation, agro forestry, cover crop, organic farming mulch-poly culture etc. are used for the sustainability of agriculture.

Keywords: Sustainable agriculture, Environmental sustainability, Fertilizers, Farmers.

Introduction:

The idea of a sustainable agriculture has gained prominence since the publication of the Brundtland Report in 1987,alongside the overarching concept of sustainable development (Tait et al.2000).The term " Sustainable agriculture is defined the integration of biological, chemical physical, ecological, economic and social sciences in a comprehensive way to develop new farming practices that are safe and do not degrade our environment (Lighthouse et al2009).Broadly, sustainable agriculture can be defined along the three dimensions of sustainable development, namely environmental health, profitability and social and economic equity. These imply ensuring agriculture is not harmful for the environment (thus soil, water, air and other natural resources are preserved)while simultaneously guaranteeing a fair remuneration for all the stakeholders involved securing livelihoods ensuring equity , diversity and inclusion (FAO , 2020).

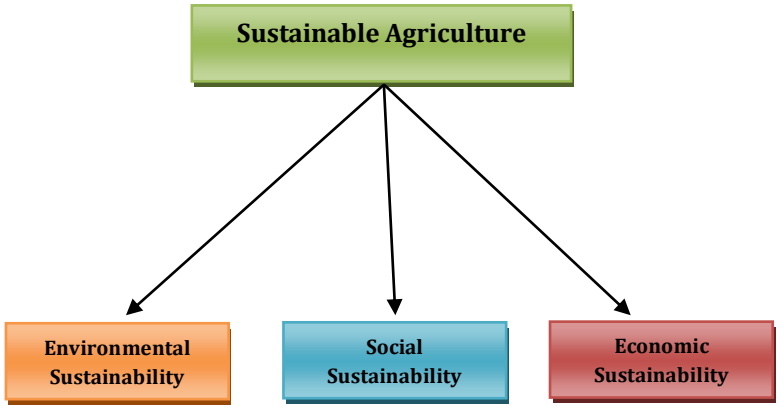

Figure-1: Dimensions of Sustainable Development

Literature review:

1.According to MacRae et al (1989)achieving sustainability in agriculture depends on pursuing particular agricultural techniques meant to reduce the long-term effects of human activity on natural resources.

2.Hobbs et al(2008)concludes that CA is a more sustainable and environmentally friendly management system for cultivating crops.Case studies from the rice- wheat areas of the Indo-Gangetic Plains of South Asia and the irrigated maize-wheat systems of North West Mexico are used to describe how CA practices have been used in these two environments to raise production sustainably and profitably.

3.S.K.Yadav et al.(2013)have been explained that organic farming can provide quality food without adversely affecting the soils health and the environment.

Research gap and emergence of problems:

In Paschim medinipur district, though there are so many micro levels analysis has been completed before but no studies have been done on sustainable agriculture yet. Therefore environmental Sustainability on agriculture is the subject matter of this paper.

Majority of the people in Paschim medinipur district stress on Amon monoculture (Kespur-26.29,Narayangarh-36.02,Debra-26.29,in '000 hectares)due to limited awareness of other potentialities. The contribution of other crops to the Gross cropped Aea(GCA) is minimal (Kespur-0.433 ,Debra-0.040,Kharagpur-ll-0.002,Pingla-0.869 in'000 hectares).Recently farmers are using high yielding seeds, excessive amount of chemical fertilizers, pesticides, insecticides for more increasing their production (Table-1).

Table-1: Fertilizers supply April'21 to March' 22, Paschim Medinipur

Fertilizers	Amount in MT
DAP	23484
MOP	16732
NPK	121518
SSP	37566
UREA	71730
Total	271394

Source: Government of India Ministry of chemicals and Fertilizers
Department of Fertilizer

Objective:

1.To protect agricultural land and also environment from excessive use of chemical fertilizers pesticides, insecticides in Paschim medinipur district

2.Distinguish between traditional and modern agricultural techniques.

Study Area:

Paschim Medinipur District is located in South-West of West Bengal in India. The district is divided into three subdivisions(Kharagpur, Medinipur sadar and Ghatal),twenty one blocks and seven Municipalities. The population of Paschim Medinipur District in 2011was 5,913,457.The literacy rate is 79.04%.The district comes under red lateritic and old alluvial agro-climatic zone. Average annual precipitation is 2,111mm and temperature is 30.52 degree c.North to south or south-east is the direction of the rivers. Rivers like Kangsabati, Kolaghai,Subarnarekha are the most significant.

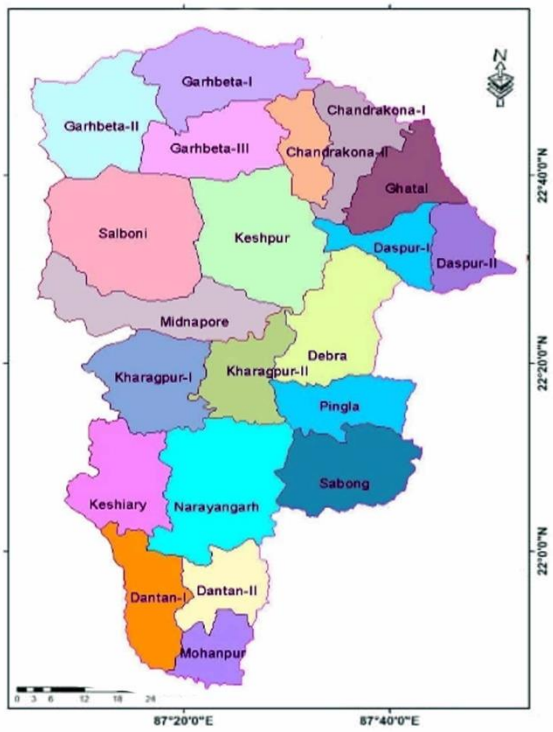

Figure-2: Paschim Medinipur Disctict

About 72.61%(2017-2018)of the net cropped area is irrigated.Entire Ghatal subdivision and part of Kharagpur sub-division are flood-prone(142647Ha).The district has a drought prone area of 18611Ha.The Gross cropped Area is 807957Ha and net cropped Area is 6760Ha with cropping intensity of 189.32%.About 31.14% of the cultivators in this district are small and marginal fermars.

Materials and Methods:

Secondary data collected for this paper three sources: District Human Development Report, Paschim Medinipur, 2011,Government of India, Ministry of chemicals and fertilizers ,Department of fertilizers and Department of Agriculture, office of the principal Agricultural officer,Annual plan,2005-06;The data such as Net cropped Area (NCA),Gross cropped Area (GCA),consumption of fertilizers , the area production of principal crops, are sourced from this database.

In order to obtain necessary information primary data also collected from fifty low(50)economic classes farmers by using through and organized questionnaire. Descriptive statistics like percentage, mean etc.are used to describe the various data set.Maps are drawn with the help of QGIS software. Actually crop rotation,cover crops, agro-forestry,sustainable livestock farming, polyculture etc.methods are applying for describing sustainable agriculture in Paschim Medinipur District.

Discussion:

1. Crop rotation:

In Paschim medinipur district, West Bengal, is widely practiced with paddy being the primary crop,often rotated with pulses,oilseeds,potatoes and sugarcane. It helps to maintain soil health and fertility by alternating crops with different nutrient needs. A high percentage of land under crop rotation due to the diverse crop mix of this district.

Table 2: Area Under Principal Crops by Block Paschim Medinipur Discrict, 2006-07 (in '000' hectares)

Block	Aus	Aman	Boro	Wheat	Potato	Til	Mustard	Vegetables	Others
Medinippur	0.20	19.62	0.49	-	2.14	0.73	0.28	1.98	-
Salboni	-	24.41	0.89	1.14	7.26	5.43	2.26	1.91	-
Keshpur	1.75	37.46	6.94	2.22	9.28	5.08	2.69	2.16	0.433
Garhbeta-I	7.31	14.72	1.75	-	12.72	9.85	-	5.31	-
Garhbeta-II	0.58	18.30	1.67	1.69	8.93	7.11	0.09	2.92	-
Garhbeta-III	4.51	13.21	1.75	0.03	9.13	7.34	1.73	2.49	-
Kharagpur-I	-	17.13	1.67	-	-0.01	0.41	0.02	1.29	-
Kharagpur-II	0.80	21.07	0.09	0.01	0.06	0.03	0.03	1.31	0.002
Sabang	1.42	21.40	1.00	0.05	0	0.12	2.76	2.28	1.295
Pingla	1.79	15.83	3.58	0.03	0.22	0.35	0.84	1.77	0.869
Debra	1.06	26.29	21.51	0.04	-	0.76	0.23	2.00	0.040
Narayangarh	0.15	36.02	15.93	-	-	2.04	0.08	2.97	-
Dantan-I	0.11	19.41	19.57	-	-	0.55	-	1.50	-
Dantan-II	0.20	13.45	7.95	-	-	0.11	0.01	1.14	-
Mohanpur	-	6.27	3.94	-	0.01	0.03	-	1.11	-
Keshiary	-	17.00	5.62	-	-	0.44	0.01	1.01	-
Ghatal	1.25	11.6	8.8	0.48	2.95	2.36	0.47		
Chandrakona-I	1.73	15.84	4.17	0.06	10.16	8.41	0.66	1.46	0.087
Chandrakona-II	0.06	11.24	2.04	-	9.9	5.44	0.06	0.86	0.005
Daspur-I	0.01	7.72	8.98		3.44	1.38	0.27	2.49	1.096
Daspur-II	-	12.05	10.69	-	0.45	0.11	0.16	2.42	0.585

Source: District Statistical Handbook Paschim Medinipur

2. Cover Crops:

The most common cover crop found is paddy particularly is the lowland plains due to the fertile alluvial soil,with other crops like pulses, oilseeds,vegetables and potatoes(Table-2) also being cultivated depending on the specific area and soil type within the district. The southern regions tend to be better for oilseeds and millets while the northern part is more suitable for crops like mustard and sugarcane depending on the soil profile. Cover crops are any plants grown specifically to manage soil erosion, soil fertility,soil quality,water and several other ecological aspects in a field (Fageria et al.,2005).Cover crops are traditionally planted after vegetable crops are harvested and allowed to grow through the fall, winter and early spring, at which time they are terminated usually by plowing the crop under.

3. Agroforestry:

It is a landuse management system that combines agricultural and forestry technologies which practiced in the Paschim Medinipur District. The district has dense forests in the Garbeta,Medinipur,Kharagpu, Narayangarh C.D.Blocks.The SAPCCs in the district have considered agro forestry as a way to increase tree cover outside of the forest area and sequester carbon.

4. Sustainabl livestock farming:

Here are some initiatives for sustainable livestock farming in Paschim Medinipur district:

- Sheep,goat and pig rearing:A source of sustainable income for poor and landless farmers.
- Home gardens: A sustainable land use system that combines livestock, trees, shrubs, fishery and annual and perennial crops.
- Livestock farming training: The animal Resource Development (ARD)department trains SHG members in livestock farming to generate income.

5. **Polyculture**:
   Paschim Medinipur District in West Bengal, India is known for its agriculture, which includes polyculture farming of avariety of crops:
   - Paddy:The main crop, with varieties such as aus, aman, boro
   - Pulses:The district produces 4.9thousad tons of pulses.
   - Oilseeds:The district produces 107.1thousand tons of potatoes.

The district is a surplus producer of vegetables. Sugarcane, jute, maize,betel vinegar,mat-stick etc are the major crop in this district.

Case Study:

Table-3: **A Short profile of the marginal farmers about sustainable agriculture in Paschim Medinipur District:**

Sl no	Category	Main crop	Other crop	Chemical fertilizer and their application(amount in kg / katha)	Pesticides and their application(amount in Lit / Bigha)	Cow dung and compost manure (amount in kg / katha)	Production in % for main crop	Mount of land (acre / katha)
1	SC	Paddy	Flower	4-5	2.5	50-60	75%	10
2	OBC	Paddy	Flower	3-4	2.5	40-45	65%	30
3	SC	Paddy	Wheat	3-4	2.5	40-45	60%	15
4	OBC	Paddy	Wheat	2-3	2	50-55	60%	25
5	ST	Paddy	Vegetable	3-4	1.5	40-50	65%	10
6	ST	Paddy	Potato	4-5	1.5	55-60	70%	10
7	GEN	Paddy	Potato	4-5	2.5	65-70	75%	25
8	SC	Paddy	Potato	3-4	2	60-65	70%	15
9	GEN	Paddy	Mustard	3-4	2	60-65	70%	20
10	SC	Paddy	Mustard	2-3	2.5	55-60	65%	25
11	SC	Paddy	Vegetable	2-3	1.5	40-45	60%	10
12	ST	Paddy	Til	2-3	2	40-42	65%	25
13	OBC	Paddy	Til	3-4	1.5	35-40	65%	10
14	ST	Paddy	Millet	3-4	1.5	35-40	65%	10
15	SC	Paddy	Millet	4-5	-	55-60	70%	15
16	SC	Paddy	Flowers	3-4	2	55-60	65%	10
17	ST	Paddy	Flower	5-6	1	50-60	70%	15
18	SC	Paddy	Potato	3-4	-	60-65	68%	15
19	GEN	Paddy	Wheat	5-6	2.5	60-70	72%	10
20	SC	Paddy	Potato	3-4	3	50-55	64%	12
21	SC	Paddy	Potato	6-7	-	65-70	74%	27
22	SC	Paddy	Vegetable	3-4	1	45-50	61%	12
23	ST	Paddy	Til	4-5	2.5	35-40	69%	15
24	ST	Paddy	Flower	3-4	1.5	40-45	60%	15
25	ST	Paddy	Vegetable	6-7	-	60-70	71%	10
26	GEN	Paddy	Vegetable	4-5	1.5	40-50	64%	25
27	SC	Paddy	Vegetable	2-3	2	40-45	58%	10
28	ST	Paddy	Vegetable	3-4	1.5	55-60	55%	7
29	SC	Paddy	Vegetable	3-4	3	50-55	65%	15
30	OBC	Paddy	Wheat	2-3	2	55-60	60%	20
31	GEN	Paddy	Til	2-3	3.5	60-65	65%	10
32	SC	Paddy	Vegetable	5-6	1.5	40-42	71%	25
33	SC	Paddy	Vegetable	3-4	2	55-65	58%	20
34	GEN	Paddy	Mustard	6-7	2	65-70	77%	30
35	SC	Paddy	Mustard	4-5	2.5	40-50	67%	10
36	SC	Paddy	Mustard	3-4	1.5	45-55	65%	20
37	SC	Paddy	Mustard	4-5	3.5	50-60	69%	17
38	OBC	Paddy	Til	6-7	2.5	50-55	72%	22
39	ST	Paddy	Flowers	4-5	2.5	60-65	61%	10
40	GEN	Paddy	Flowers	6-7	2.5	60-65	74%	32
41	OBC	Paddy	Flowers	5-6	3	60-65	73%	25
42	ST	Paddy	Mustard	4-5	1.5	55-60	65%	10
43	OBC	Paddy	Vegetables	5-6	2	65-70	71%	25
44	GEN	Paddy	Vegetables	6-7	1.5	60-65	68%	20
45	OBC	Paddy	Vegetables	4-5	2	65-70	71%	27

46	SC	Paddy	Mustard	6-7	2	40-45	63%	15
47	SC	Paddy	Mustard	4-5	1.5	40-50	65%	20
48	SC	Paddy	Potato	4-5	2.5	55-60	66%	15
49	ST	Paddy	Potato	5-6	1.5	60-65	63%	10
50	SC	Paddy	Potato	3-4	2	65-70	73%	20

Above profile(Table-3) reveals that most of the marginal farmers uses less amount of chemical fertilizers, pesticides, insecticides etc.but their production is comparably high due to uses of bio- fertilizers like cow dung and others. Most of the marginal fermars are sc,st and obc categories. Rice is their main crop but they also produce wheat, potato,mustard, til flowers and vegetables.

Results:

1.Rice is the main crop all over this district but it is largely produced in Sabang, Pingla, Debra and Narayangarh blocks.

2.Crop Combinations are mainly found Ghatal subdivision and Daspur land ll blocks.

3.Southern parts of Paschim Medinipur District is ideal for growing millets ,maize and oilseeds(as drought prone area due to impact of two factors:weakening of easternly jet stream and the warming equtorial ocean (Ghosh,2019).

4.Potatoes are mainly grown Daspur l and ll,Garbeta l,ll and lll Ghatal and Debra blocks. 5.The highest percentage of farmers or 81.29%,were in Sabang block. In Pingla farmers made up 45.10% of the total labour force. 6.31.14%of the cultivators in this district are small and marginal farmers. Small and marginal farmers contribute 28.39%.

Implementation of Schemes:

lndian Government as well as State Government has Launched various schemes from time to time ensure welfare of farmers including small and marginal farmers in our country. Government has also been initiated different types of schemes for sustainable agricultural systems. These are given below:

1.Launch of PM-KISAN in 2019, an income support scheme providing Rs.6000 per year in 3 equal installments.

2.Paramparagat Krishi Vikas Yojana (PKVY) was initiated in 2015-16 to promote organic farming in the country.

3."One Time Assistance to small and marginal farmers for purchase of small Farm impliments(OTA-SFI)under the Farm Mechanization Umbrella Scheme, was launched on 12th February, 2013 by the Agriculture Department, Government of West Bengal with the purpose to aid the farmers in procuring manually operated small farm implements necessary for agricultural operations.

4. A special drive has been under taken since February 2020 to provide concessional credit with focus on covering all PM-KISHAN beneficiaries through Krishan credit cards (KCC).5

5.Government also propose to promote sustainable natural farming systems through the scheme Bhartiya Prakratik Krishi Pahati(BPKP).The proposed scheme aims at cutting down cost of cultivation, enhancing resource conservation and safe and healthy soils , environment and food. Besides these, Prashant Mantri Fasal Bima Yojana(PMFBY)2016,PDMC ,2015-16,NBHM,2020 etc also initiated for this purpose.

Conclusion:

To conclude sustainable agriculture is not widely practiced in Paschim medinipur district. Majority of the people (Sabang, Pingla, Debra block)stress on amon monoculture. Different methods like crop rotation, cover crops (Ghatal, Daspur l&ll),agro forestry (Garbeta, Medinipur, Kharagpur and Narayangarh, polyculture, sustainable livestock farming etc are uses only few villages of this district. People in low economic classes (sc,st and obc)are mainly uses bio fertilizer (cow dung and others).In Paschim medinipur, there are several barriers that prevent farmers from adapting and scaling up sustainable practices such as lack of knowledge, skills and incentives, limited access to markets finance etc.

Now population increases rapidly, so in order to meet the growing needs of the expanding population it is bound to produce more nutrition food. In this context sustainable agriculture is a capital investment because it contributes to the formation of natural capital. But good management of both natural and human resources is critical. Though Indian Government and also State Government has taken several efforts to promote long-term agricultural development.

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