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Agro-Biodiversity and Livelihoods in the Selective Blocks of South Twenty-Four Parganas District, West Bengal

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Abstract: *Agriculture is the most important economic activity of the people of the South Twenty-Four Parganas district. Agro-biodiversity's richness affects the livelihoods of the people of selective blocks of South Twenty-Four Parganas district. Small farmers in the selective block also prioritize high-value crops such as Potatoes, Paddy, Mustard etc. and many farmers engage in Pisciculture and Livestock farming.*

Keywords: Agro-Biodiversity, Pisciculture, Livestock

Introduction

West Bengal is an agro-based state, maximum number of people depend on agriculture and its related sectors. In the majority of West Bengal's districts, industry and services have yet to account for a significant portion of the net district domestic product, much alone employing a big portion of the state's rapidly rising labour population. As a result, rapid agricultural growth in the state is required, with per-acre agricultural productivity in terms of value production rapidly increasing (Mukherjee and Chattopadhyay, 2017). Agricultural diversification refers to a shift in cropping patterns in favors of high-value crops that contribute to agricultural growth. Agro-biodiversity richness and crop diversification also aid small and marginal farmers in increasing their revenue by allowing them to cultivate a variety of crops throughout the season. As a result, agro-biodiversity and crop diversification are critical components of the state's internal agricultural growth (Majumder, 2014). The study blocks of the South Twenty-Four Parganas have some geophysical and climatic challenges for agriculture and livelihood. But crop diversity or agricultural diversity helps them to survive their livelihood.

The Study Area

South Twenty-Four Parganas district is located in the south of West Bengal. District latitudinal and longitudinal location is 22° 31' 48.00" N and 88° 19' 48.00" E. Study blocks of the district are part of the active delta region of the Ganga River.

Objectives of the Study

- To study agro-biodiversity and its richness in rural regions of the study areas.
- Examine the relationship between sustainable agriculture and livelihood in rural regions of the study areas.

Methodology

The present paper is based on the collection of secondary data collected from the different offices of the government and literature study. And the Primary data collected from the field survey. The main emphasis of the primary survey was on the agro-biodiversity richness, agro-economic conditions, and livelihood conditions of the rural peoples. Based on statistical data, analysis was done to represent the Crop Productivity (Kendal's Method), Productivity and Rainfall (Correlation Coefficient), and also calculated the t-test value and p-value during the field survey, farmers' and local people's perceptions about the agro-biodiversity and agricultural-based livelihoods.

Significance of the Study

The present study focuses on the agricultural biodiversity in the study blocks of the South Twenty-Four Parganas district of West Bengal. That block is the part of Lower Gangetic Delta Plain area. Thus, the region has high agricultural productivity. The study is emphasized the existing natural resources useful for agricultural practices as well as the environmental conditions in the study region. The farmers of this region

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prefer to take a variety of crop species. This type of farming helps them to mitigate the problem of food and fodder scarcity. Livestock and Pisciculture are also an important part of farming in the study area. Dynamic changes in the Ganga Delta and climate change affect the agriculture and livelihood of the native peoples.

Food Crops of the Districts

The food crops include the production of rice, wheat, pulses, oilseeds, dry chilli, potato etc. All over the district's main food crop is rice, and maximum rice production depends on the Kharif and Zaid seasons. The total rice production area is 392.5 thousand hectares all over the district. In the Kharif seasons, the total rice production area is 324.3 thousand hectares.

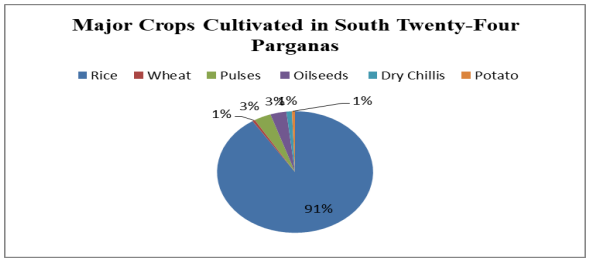

Figure: Major crops of the study region (Source: District agricultural profile data)

Major crops of the district are Rice, Wheat, Pulses, Oilseeds, Dry Chili, potatoes etc. Maximum farmers cultivated all the following crops in seasonal changes. And also their livelihood depends on seasonal crop production.

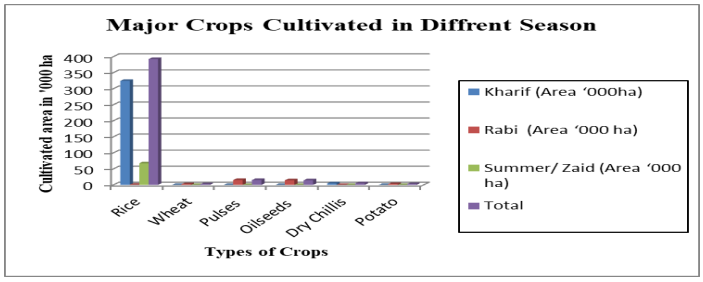

Figure: Major crop production in the study region (Source: District agricultural profile data)

Horticulture

South Twenty-Four-Parganas district is known for different horticulture crops like Guava, Banana, Brinjal, and Cucurbits. All the seasons are important for the horticulture crops in the district. Baruipur and some other blocks of the district are famous for guava production. Major fruits like mango, banana, papaya, guava, and litchi are distributed all over the district. But banana and guava were cultivated all over the district in 2.12 and 1.99 thousand ha respectively. Other fruit crops like mango, papaya, and litchi cultivated 1.0, 0.9, and 0.51 thousand ha respectively.

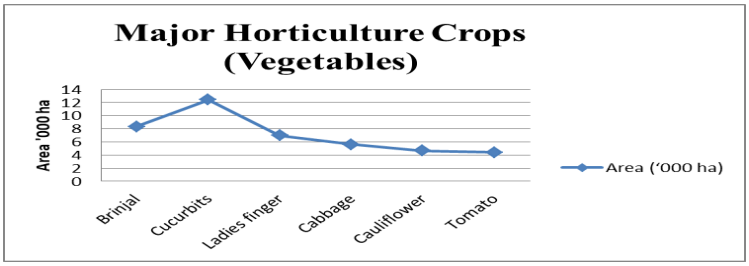

Figure: Major horticultural crops (Vegetables) in the study regions.

South Twenty-Four Parganas soil was properly developed by the Ganga deltaic alluvial deposits. For this reason, this district is properly suitable for vegetable production. The main vegetable crops are brinjal, cucurbits, ladies' finger, cabbage, cauliflower, tomato, and potato. In the district brinjal cultivated 8.33 thousand ha of the district area, cucurbits cultivated 12.45 thousand ha area, ladies finger cultivated 7.0

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thousand ha area, cabbage cultivated 5.6 thousand ha area, cauliflower cultivated 4.66 thousand ha and tomato cultivated 4.39 thousand ha area respectively. Namkhana, Mathurapur-I & II, Sagar, Kulti, Bishnupur-I & II, Gosaba, Bhangar-I & II, Jaynagar-I & II, Falta, Canning-I & II, Magrahat-I & II, Basanti, Baraipur, and Patharpratima blocs are well known for vegetable production of the district.

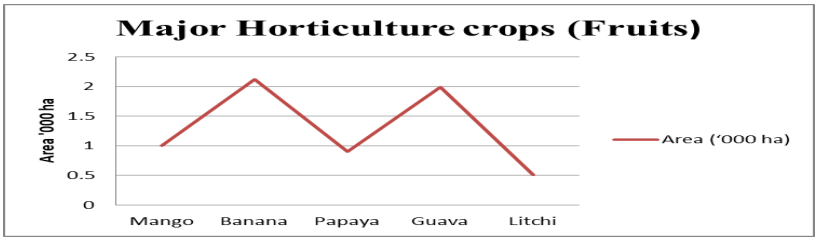

Figure: Major Horticultural crops (Fruits) in the study regions

Livestock and Pisciculture

The study area, basically developed livestock farming for local needs. Many farmers and other local people developed cows, goats, cattle and poultry farms. Livestock is also important for the local livelihood and economy.

South Twenty-Four Parganas District is famous for fishing. A lot of fish variety is seen in mangrove forests because it enhances fish production by both the provision of food and shelter. Mangrove forests are highly productive. Mangroves were particularly effective as nursery grounds for many fishes and juvenile species (James Hutchison, 2014). Most of the villages of the Sundarbans Delta are dependent on fishing. Most of them are traditional fishermen, i.e. fishing is their ancestral occupation. Some of them are engaged in fishing since childhood. Though fishing is their ancestral occupation they generally use traditional techniques for fishing. Many others block people engage in pisciculture and fish-related business. And it is also related to the local people's daily life and livelihood.

Landholding Size of Farmers in the Selective Block of the South Twenty-Four Parganas

For the present study in the South Twenty-Four Parganas district, 140 Farmers and their farms were observed. As per the observation, 20 farmers in the study are having more than 30 acres of farmland. In the case of the study area, the farmers who are having below 20 acres of farmland are equipped with irrigation facilities, and those farmers who are having more than 30 acres of farmland are mostly cultivated farmland. In the selected district 15 farmers are having 20 to 29 acres, 30 farmers have 10 to 19 acres, and 75 farmers have 1 to 9 acres of farmland respectively.

Area in Acre	Total Farmer
Above 30	20
20 to 29	15
10 to 19	30
1 to 9	75

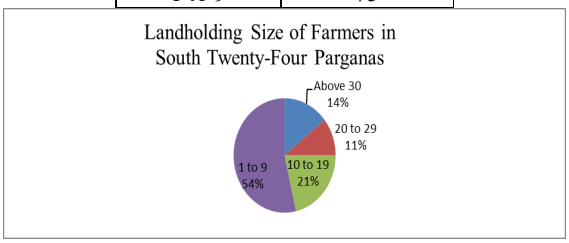

Figure: Landholding size of farmers of the study areas.

Crop Productivity by Kendal's Method in selective blocks of South Twenty-Four Parganas

The ranking coefficient method adopted by Kendall is quite simple and easy to apply. In this technique, the component areal units are ranked according to per hectare yield of crops, and the arithmetical average rank called the ranking coefficient for each of the components areal units is obtained. A component area unit with relatively high yields will have a low-ranking coefficient, indicating high agricultural productivity.

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Rice is the main crop in South Twenty-Four Parganas. Crop productivity is calculated by Kendal's method are follows:

Name of the Blocks	Total Rank	Productivity
Baruipur	184	5.94
Patharpratima	176	5.68
Magrahat I & II	254	8.19
Canning I & II	174	5.61
Jaynagar I & II	220	9.10
Bhangar I & II	282	9.10
Sagar	158	5.10
Namkhana	159	5.13
Budge Budge I & II	126	4.06
Kultali	159	5.13

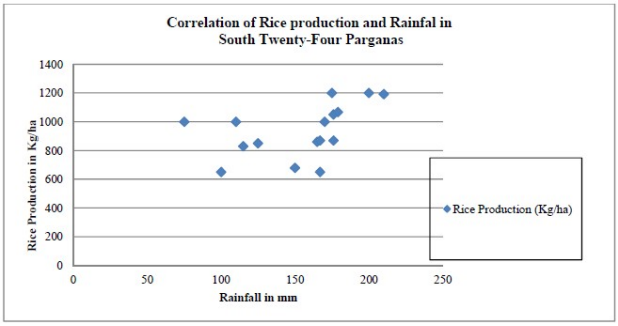
Productivity of the Jaynagar – I and II, Bhangar – I and II and Magrahat – I and II are very high. But some other blocks Baruipur, Patharpratima Canning -I and II, Sagar, Namkhana, Kultali and Budge Budge – I and II block crop productivity are moderate to low.

Correlation of Productivity and Rainfall

The use of the following first formula to obtain r is rather laborious and inconvenient unless some form of calculating machine is available to do the arithmetic. Fortunately, as with the standard deviation, a more suitable formula for machine computation may be found, and

$$r = \frac{\frac{1}{n}\sum(a-\bar{a})(b-\bar{b})}{\sigma_a \, . \, \sigma_b}$$

$$r = \frac{\sum(a \, . \, b)/n - \bar{a} \, . \, \bar{b})}{\sigma_a \, . \, \sigma_b}$$



Blocks	't-test value	'p-value
Baruipur	5.10	0.0012
Canning I & II	3.51	0.0010
Gosaba	6.14	0.0001
Jaynagar I & II	5.25	0.0003
Kakdwip	4.92	0.0008
Patharpratima	3.00	0.0011
Sagar	6.01	0.0002

The above graph indicates how the rainfall and production of Rice in South Twenty-Four Parganas correlate. Here is a positive correlation between rice production and rainfall. The reason behind this is comparatively that other blocks of South Twenty-Four Parganas. All coastal blocks of the district have high rainfall. Rainfall and rice production are interring dependent but sometimes heavy rainfall and cyclone damage the

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production of rice. For this reason, maximum rainfall sometimes indicates less production of rice in the South Twenty-Four Parganas.

Here is the calculating production movement correlation method; the 'p-value and statistical significance are two-tailed. 'p-value equals 0.0012 and by conventional criteria, this difference is considered to be extremely statistically significant.

Correlation of Production and Fertilizer

Blocks	Co-relation (r)	't-test value	'p-value
Baruipur	0.76120	5.32	0.0012
Canning I & II	0.65210	4.521	0.0011
Gosaba	-0.31145	6.871	0.0001
Jaynagar I & II	0.64410	4.25	0.0008
Kakdwip	0.334127	5.314	0.0009
Patharpratima	0.8624	3.12	0.0015
Sagar	-0.423120	7.24	0.0003

Baruipur Block: In this block rice production and fertilizer correlation are positive (0.76120) observed. From 2009 to 2011 production and fertilizer both are increasing.

'p-value and statistical significance are two-tailed. 'p-value equals 0.0012 and by conventional criteria, this difference is considered to be very statistically significant. The t-test value is 5.32 and the standard error of the difference is 2217.526.

Gosaba Block: The above table shows the negative (-0.31145) correlation between rice production and fertilizer. A general trend of production increased from 2009 to 2011. The highest production and use of fertilizer were observed in 2010 and the lowest production and fertilizer is observed in 2011.

'p-value and statistical significance are the two-tailed p-values equal to 0.0001 and by conventional criteria, this difference is considered to be extremely statistically significant. The t-test value is 6.871 and the standard difference is 2280.720.

Cultivation and Livelihood

Agriculture continues to be a major source of livelihood in these blocks of South Twenty-Four Parganas of West Bengal. However, due to poor crop management practices, limited resources, and lack of know-how productivity and income are incising by agricultural activities. Maximum farmers are marginal and they depend on agricultural productivity.

In South Twenty-Four Parganas district many blocks like Patharpratima, Gosaba, Sagar, Namkhana, Kakdwip, and Caning-I & II, Bishnupur, and Baruipur farmers' incomes are very low and their livelihood quality is very low because their income is low. But vegetables and fruit production in the district is very high, and it helps to change the livelihood of the people

Conclusion

The study was carried out for establishing the agro-biodiversity and livelihood scenario of the South Twenty-Four Parganas district of West Bengal. All of my study blocks are facing agro-biodiversity and livelihood relations and sustainable rural development. The agro-biodiversity, livestock, and fishing are the progressive factors for economic growth in these blocks of South Twenty-Four Parganas.

The impact of Salinization and cyclones are becoming principal concerns which sometimes lead to extreme environmental hazards. Climate change, cyclones, salinization, and riverbank erosion are common here. Sundarban, Bokhkhali, Ganga Sagar Island, Kakdeep etc. being tourist spots with great attractions of sea beach are also considerably affected by human beings. The Sundarban and Gangasagar Islands are contaminated by the local as well as foreign tourists by spreading used materials here and there in the eco-sensitive area which is the prognostic sign of upcoming environmental hazards. In this situation, Government should take some immediate prohibitive measures as soon as possible.

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However, it can be concluded that whenever some developmental policies are tried to adopt, environmental protections, agricultural productivity, and public health consideration should be the principal concern so that the man-environmental relationship should be stabilized in a balanced and sustainable manner.

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