# Changing Scenario of the Agro-biodiversity in Laxmijanardan Pur Gram Panchayat, Pathar Pratima, C. D. Block, West Bengal

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**Abstract:**

The present study is an endeavour to explain the change of agro biodiversity with changing pattern of modernization in agriculture including green revolution with the use of chemical fertilizer, pesticides and modern irrigation system and infrastructural development. Main theme of this study is to understand the changing scenario of agro-biodiversity in Laxmijanardan Pur Gram Panchayat of Pathar Pratima, C.D. Block, West Bengal, in Indian Sundarban in context of deltaic region of Bay of Bengal. So, cyclones and flood are common factor of this area. Agro-biodiversity change not only destroys sustainability of natural environment but also affects on socio-economic environment. This change is appeared as on economic development in the initial stage but it loses the balance of the environment for a long time. Due to the conflict between natural environment and technology, many indigenous species are being lost. We have to be careful about this change from the beginning. Otherwise, we have to suffer its negative environmental and socio-economic consequences.

***Key words:*** Green Revolution, Modernization, Agro-biodiversity Change.

## I. INTRODUCTION

As a scientific discipline, geography is concerned with the human nature inter-relationship. Today, no part of the world is devoid of human footprint. Agro biodiversity is not an exceptional case. Agriculture is defined as "the science or practice of farming, including cultivation of the soil for the growing of crops and the rearing of animals to provide food, wool and other products"[1]. Agriculture biodiversity includes higher plants, higher animals, arthropods and micro-organisms [2].Agro-biodiversity or agricultural diversity is a "component of biodiversity which includes the plant genetic resources including different cultivars, landraces, ecotype weedy races and wild relative etc. are used for food production through agriculture"[3]. According to the FAO, 1999 a, agricultural biodiversity is "the variety and variability of animals, plants and micro-organisms that are used directly for food and agriculture, including crops, livestock, forestry and fisheries". Agricultural biodiversity is essential to satisfy basic human deficiency for food and livelihood security. In Indian agriculture modernization is a new concept. During 1966 to 1969 period that a new strategy of agricultural development which focusing on modernization of agriculture has been introduced in India. Mainly, this strategy for modernization of agriculture is referred to the Green Revolution which has been followed vigorously in Indian economy since 1967[4]. The rapid modernization of agriculture has resulted in intensification, marginalization, concentration and specialisation of farming [5]. 75% of crop diversity was lost during 20$^{th}$ century [6]. After the green revolution, the folk varieties with valuable features have been first dwindling, causing severe genetic erosion and homogenization with high yielding varieties [7]. Pesticides can also kill non target plants, beneficial insect, birds, fish and other wildlife [8]. Other causes of genetic erosion are population pressure, environmental degradation, legislation/ policy, pests/ weeds, changing agricultural system and over exploitation of species [9].

The economy of Sundarban mainly depends upon agriculture. In this region, 88.53% of the total workers are engaged in Agriculture [10]. In Sundarban region, the land is not perfectly flat and many areal depressions exist, high water levels of 0.5 metre and more occur frequently on the rice fields during the monsoon period [11]. The ground water is normally salty, except at great depth (>300m), where a fresh water aquifer exists [11]. Soil pH range of Sundarban is 5.5 to 7.5, which acidity and alkaline natural and it is suitable for agriculture [12].

## II. OBJECTIVES

The major objectives of this research paper as follows.

1. To understand the pattern of agro-biodiversity in Laxmijanardan Pur Gram Panchayat of Pathar Pratima, C. D. Block, West Bengal in India.
2. To know the temporal changes from traditional to recent agro-biodiversity in the study area.
3. To find out the role of modernization of agriculture on change in agro-biodiversity and its consequences.

## III. METHODS AND DATA BASE

The primary data have been collected through direct field observations and oral interviews with the local respondents with the help of the scheduled questionnaire. The secondary sources are books, journals, research report which have been used to make clear comprehension of the said issue. Simple random sampling is used during survey. Analysed data have been presented through simple percentage method. Collected information are quantified, analysed and represented with the help of Microsoft word and Microsoft excel.

## IV. STUDY AREA

Laxmijanardan Pur Gram Panchayat is a part of the deltaic region of Patherpratima C.D. Block of South 24 Pargana District in Indian Sundarbans of West Bengal. It is situated in the north eastern part of Patharpratima C. D. Block and near about 20 km South West from Raidighi town. The latitudinal and longitudinal extension of the study area is from 48˚13' 25" N to 51˚22' 54" N and 86˚46' 35" E to 88˚30' 15" E. Three major rivers is flowing along three sides of the study area, as Mrydangabhanga river (North and West), Kuyemari river (East) and Atargachhiya river (South).

## V. RESULT AND DISCUSSION

### 5.1 Traditional agro biodiversity

More than 20 years ago, traditional crop diversity in this area was not same today. Main varieties of rice were *Sarna, Pankoj, Joya, Lathisa, Patnai, Malabati, Palui, Kamolbhog, Kumalgar, Morisal, Auspongali, Sadha Mota, Ghechipatni.* Rice was cultivated only two times, one is rainy season and another in summer season. In rainy season, rice was cultivated at high land and in summer season, rice was cultivated at low land. Other major crop was jute, water melon and cantaloupe.

Other minor crops were Pumpkin, Green Chilli, Tomato (*Avinastu*), Brinjal (*Bonomala, Kanta begun*), small Bitter Gourd, Lady's Finger, Pulses (Grass pea and Black Gram is use for globule), Onion, Ginger, Turmeric, Edible root, Mustard and Sesame. These minor crops were cultivated on dykes (*aal*). Many birds like Owl, Crow, Sparrow, Egret, Parrots, Kestreal, Vulture, Drongo and Turtledove collect their food from these crop fields. They collect grain and insect, moth, fly, worm, beetle, absorber from crop field. Another animal who are related with agro-biodiversity was Reynard, Weasel and Rat. Animal like cow, goat, sheep and bird like hen and duck's excrete are used in the agriculture field as manure. Many types of weed, bees, butterfly, spider, spinach, grass etc are found in the traditional crop biodiversity.

Aquatic biodiversity is also a part of agriculture biodiversity. Fishing is an important economic activity in Laxmijanardan Pur Gram Panchayat. Indigenous fish are Catfish, Plaice, Shrimp, Rosy Barb, Clayfish, Batasio, Flatfish, Tigerfish, Sole fish, Butterfish, Walking fish, Barramundi etc. Aquatic biodiversity was not only fish diversity, it was also related with many types of Crab, Snail, Periwinkle, Oyster, and fritter etc. Here also find Kingfisher, Diver, Snake, Frog, Duck which catched fish and other aquatic species.

Cow, goat and sheep are the main traditional livestock in this area. Every livestock is indigenous. *Bagrol* is the most important animal. Regularly cow, goat and sheep are killed by *Bagrol.* Cleg, Botfly, Gadfly, mosquito are also important species which are harmful for livestock.

The traditional poultry biodiversity was the most important domestic farming. Hen and duck were the main source of poultry farming, both are indigenous. Other important animals are reynard and civet cat, they killed hen and duck.

### 5.2 Recent agro biodiversity

Today**,** in the study area, crop biodiversity is not same as like 20 years ago. Here recent crop diversity is affected by hybrid seeds. Most of crop is hybrid. Main crop are rice (*Santosi, Morisal, Hazar 17, Prathikha, Nilanjona, Hiramoti, Pankoj, Dudheswor*), Green Chilli (*Tejossini, JK78, Agnihot*), Tomato (*O4, 58, 48, Deb*), Pumpkin (*Vena*), Brinjal (*Lorki, Uthcolprova, Muktokeshi*), Bitter Gourd (*6260, 6215, 6213*), Potato (*S1, Joty*), Lady's finger, Sunflower, Pulse (Grass pea, Mung), Cotton, Onion (*Jhar, Bombay*), Sesame, Mustard etc. Other cultivated crops are Bean, Edible root, Turnip, Cauliflower, Cabbage, Ginger, Cucumber etc. Some indigenous crops are cultivated high agricultural land but it is less quantity. Some indigenous rice is cultivated, that are *Ranjit, Morisal, Hiramoti, Dudheswar*. Dudheswar is indigenous and also hybrid. Some harmful pests, insects are increase. Green absorbers are increased due to the use of hybrid seed.

Recent aquatic biodiversity have been changed. Indigenous and hybrid both are found in this area. Indigenous fishes are including Salmon, *Catla*, Troul, Batasio, Yong fish, *Bata*.New fishes are including hybrid Catfish, hybrid Plaice, hybrid Climbing fish, Pomfret, Tarpon, Silvercarp, Rohu carp, *Japaniputi*, Nile Tilapia, Mozambique Tilapia, Sardine, Flat fish. Shrimp, Crab, Oyster, Snail, Pana, Alge, Moss Diver, Kingfisher, Snake, and Frog are also found in aquatic biodiversity. At present aquatic biodiversity has been declined than past.

Recent livestock biodiversity has also being changed. In genetic varieties, indigenous and *Jarsi* cows are found. Besides indigenous and *Patnai* goat are also found. But sheeps are only indigenous. Overall varieties of livestock are being increased.

Indigenous and hybrid varieties are also found in poultry biodiversity. *Koilar*, Broiler, *Rhodel* are belonged to hybrid hen. Hybrid duck is called as *China duck*. Very recently Badri birds are cultivated in some poultry farms in this area. Often duck and hen are killed by Foumart (covet cat), cat and Bagrol.

Table No. 1 Pattern of Change in Crops Diversity

| Crop Type | Crop | Past(Before 20 Year Ego) Day Crop Cultivation Varieties | Present Day Crop Cultivation Varieties |
|---|---|---|---|
| Grain | Paddy | *Santosi, Pankoj, Jaya, Lathisa, Patnai, Boro, Malabati, Kamolbhog, Ghechipatni, Auspongali, ShadaMota, Palui, Dudheswar, Kumalgar, Ranjit, Morisal, Hiramoti, Nona Bokra, Roghusal, Blak rice* | *Santosi, Hazar 17, Maharaj, Prathikhkha, Nilanjona, Hybrid Dudheswar, Ranjit, Morisal, Hiramoti, Pankoj* |
| Vegetable | Tomato | *Avinastu* | *O4, 58, 48, Deb* |
| | Pumpkin | Indigenous | *Vena* |
| | Brinjal | *Bonomala, Kanta Begun* | *Lorki, Utkolprova, Muktokeshi* |
| | Bitter gourd | Small bitter gourd, *Kerela* | *6260, 6215, 6213* |
| | Bean | *Mukul, Buti bean* | *Mukul, Buti bean* |
| | Cabbage | Normal | Normal |
| | Cauliflower | Normal | Normal |
| | Cucumber | Normal | Normal |
| | Lady's finger | Normal | Normal |
| | Drumsticks (*Sojina data*) | Normal | Normal |
| | Kohlrabi (*Olkophi*) | Normal | Normal |
| | Ribbet gourd | Normal | Normal |
| | Snake gourd | Normal | Normal |
| | Potato | - | *Joty, S1* |
| | Edible root | Normal | Normal |
| Spice and other | Onion | *Muri* onion | *Jhhar, Bombay* |
| | Chilli | normal Chilli | *Thejosini, JK78, Agnihot* |
| | Turmeric | Normal | - |
| | Oil seed | Mustard, Sesame, Linseed | Mustard, Sesame |
| | Pulse | Grass Pea, Black Gram | Mung, Grass Pea |
| | Fruit | Mango, Banana, Papaya, Sapota, Jackfruit, Dates | Mango, Banana, Papaya, Sapota, Dates, Jackfruit, Carambola, Lemon |
| | Melon | Watermelon, Muskmelon, Cantaloupe | - |
| | Cotton | - | Carpas |
| | Sunflower | - | Normal |

Source: Field Survey, 2017

Table No. 2 Pattern of Change in Fish Diversity

| Type of Fish | Past Day ( Before 20 Years Ago) Fish Diversity | Present Day Fish Diversity |
|---|---|---|
| Fish | Catfish, Plaice, Shrimp, Clay fish, Flat fish, Tiger fish, Butterfish, Sole fish, Walking fish, Barramundi, Rosy Barb, Batasio, Boal, *Sarolputi*, Chitol, Eel, Shing, Small fry. | Salmon, Catla, Barramundi, Trout, Young fish, Batasio, Hybrid Catfish, Hybrid Climbing fish, Pomfret, Tarpon Fish, Silvercarp, Japani Puti, Nile Tilapia, Sardine, Flat fish, Chitol, Rohu carp. |

Source: Field Survey, 2017

Table No. 3 Pattern of Change in Livestock Diversity

| Type of Livestock | Past Day ( Before 20 Years Ago) Livestock Diversity | Present Day Livestock Diversity |
|---|---|---|
| Cow | Indigenous | Indigenous, *Jarsi* |
| Goat | Indigenous | Indigenous, *Patnai* |
| Sheep | Indigenous | Indigenous |

Source: Field Survey, 2017

Table No. 4 Pattern of Change in Poultry Diversity

| Type of Poultry | Past Day ( Before 20 Years Ago) Poultry Diversity | Present Day Poultry Diversity |
|---|---|---|
| Hen | Indigenous | *Koilar*, Broiler, *Rhodel.* |
| Duck | Indigenous | Indigenous, *China*. |

Source: Field Survey, 2017

Table No. 5 Pattern of Change in Diversity: Past and Present

| Agriculture Type | Number Of Varieties | |
|---|---|---|
| | Past Day ( Before 20 Years Ago) | Present Day |
| Crop | 54 | 55 |
| Fish | 19 | 17 |
| Livestock | 3 | 5 |
| Poultry | 2 | 5 |

Source: Field Survey, 2017

**5.3 Causes of agro bio diversity change**

The losses of agro biodiversity have some causes. They are mainly based on modernization. Modernization in agricultural is a new concept. Indigenous agro biodiversity are declined due to modernization in agricultures. Modernization in agricultural mean use of chemical fertilizer, pesticides, insecticide, hybrid seeds, machinery in agriculture field. After the Green Revolution, modernizations of agriculture are increased.

*5.3.1 Use of chemical fertilizer and pesticide:* Soil is affected by more use of chemical fertilizer. As a result soil fertility is declining day to day. Lack of proper knowledge of the farmer about the dose or quantity or amount of fertilizer need to be used, they use more and more chemical fertilizer for getting better result in production. The farmer usually takes advice from shopkeeper for implementation of fertilizer and pesticide dose. Sometimes they use harmful pesticide and as a result many organisms are destroyed. Birds, Herb, Rat, Spider, Earthworms, important insect etc. are going to decline because of more use of insecticides, fungicides, herbicides in the crop field. In past time, 90% farmer use only organic fertilizer but now no body depend upon only organic fertilizer and pesticides (Fig. 1). The relationship among the different interconnected parts of the agro ecosystem is becoming disconnected and ecological processes are breaking down due to excessive use of Chemical fertilizer and pesticides.

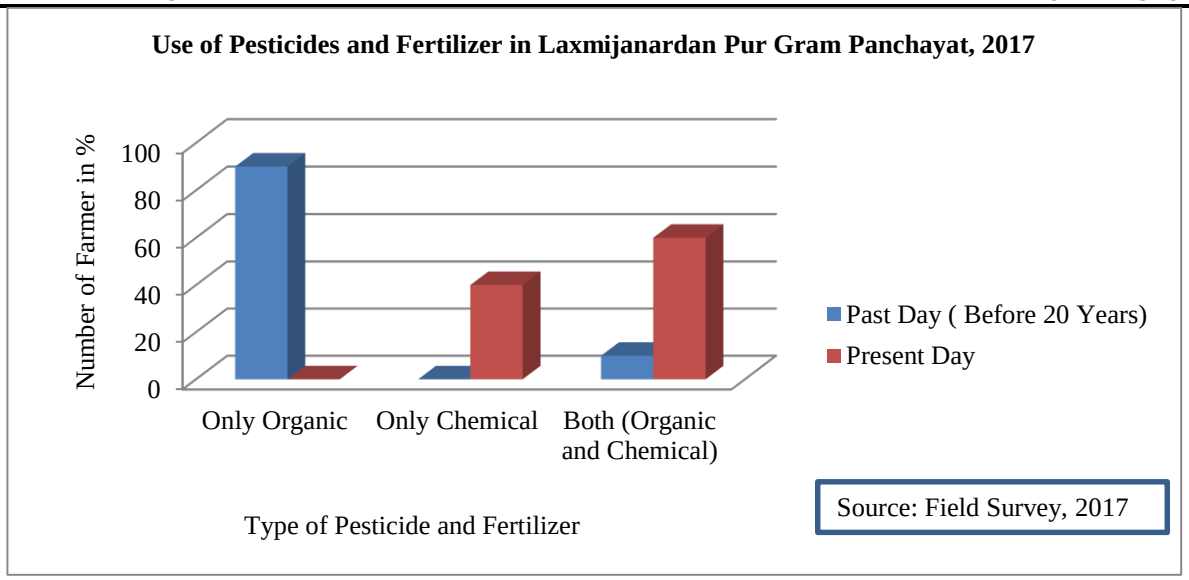


Figure 1: Use of Fertilizer and Pesticides compared between past and present day

*5.3.2 Unplanned drainage system:* Low land cultivated field are affected by unplanned drainage system. In this situation, the lower portions of field cannot produce any crop due to rainy season. Large portion of field is immersed by bad water outlet system. 35% farmers are affected by unplanned water outlet system (Fig. 2).

*5.3.3 Lack of interest in cultivation:* Recently, farmers are less interested for indigenous cultivation. The less number of family members, problem of selling the crops, no suitable market and price, high labour cost, low production and finally low profit are became the main reason to decrease the farmer's interest in farming. So, farmers are losing interest. They are more interested for fish catching rather than crop cultivation. The problem of cultivation is that 25% farmers are affected by soil, 35% farmers are affected by water outlet system, 10% farmers are affecting by climate and 30% farmers are affected by other problems (Fig. 2).

*5.3.4 Environmental issues:* In study area, cyclone, heavy rainfall, temperature, and disease are the common environmental issues for the impact on agro-biodiversity. Huge amount of agro-biodiversity are loss due to this hazards. 10% farmers are affected by the climatic problem (Fig. 2). Aila in 2009 is an example of big environmental issue which create lots of problem in agro-biodiversity in this area.

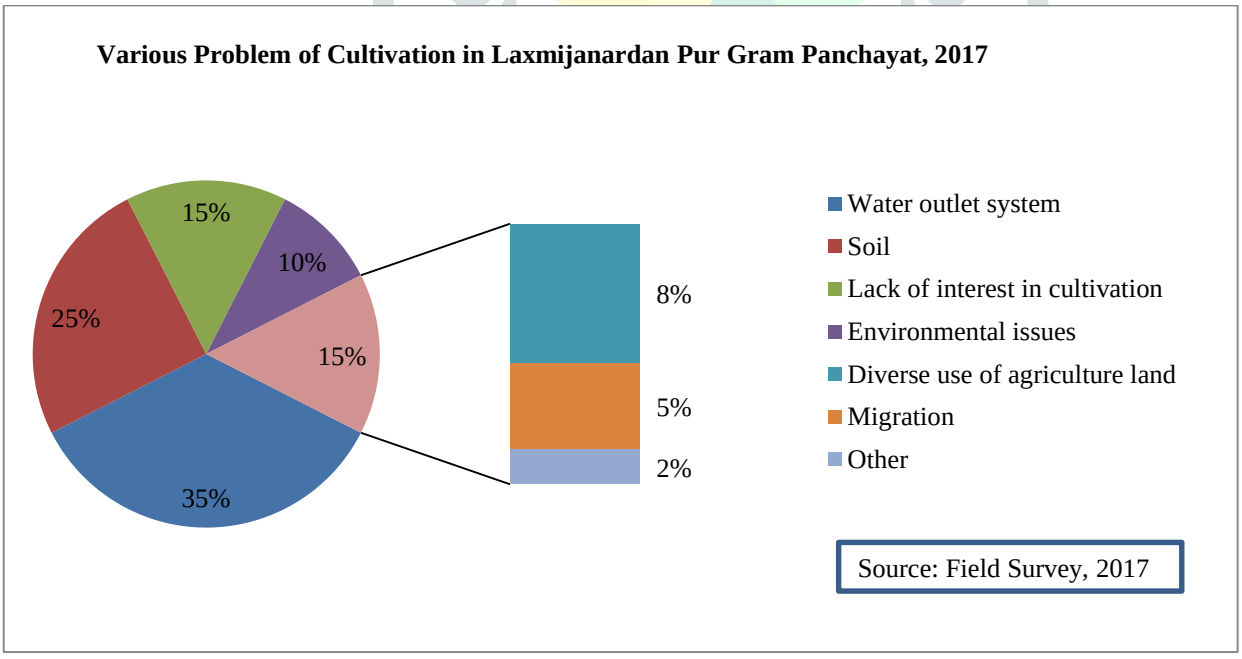


Figure 2: Various Problems in Agriculture

*5.3.5 Diverse use of agriculture land:* Habitats are being loss both agriculture fields and forest animals due to increase of population and there residence demands. The conversions of the good agricultural lands to the non agricultural purposes are also increasing in this area.

*5.3.6 Migration:* Migration of people is one of the causes of loss of agro biodiversity. New generation migrate from study area to urban area for various causes like educational and job purpose.

*5.3.7 Politics:* Politics is another important factor which helps to decline agro biodiversity. Unplanned drainage system and lack of government interest are also responsible for this situation. Governmental help is not equally distributed for all farmers. As a result many farmers come to impassive.

*5.3.8 Over fishing:* In past time so many fishes and other water species come from river during flood time and they settle at pond and fisheries. But now this process is stopped because fishermen catch baby fish from the river. And as a result very few fishes come from the river.

## VI. MANAGEMENT

1. It is urgently required to reintroduce those salt tolerant rice varieties (*Shada Mota, Nona Bokra, Kumalgar*) in the area that have been replaced by the high yielding varieties.
2. More use of organic and green manure. Compost are from crop residues, tree garbage and other plant/organic residues; Intercropping and cover crops, particularly legumes, which add nutrients, fix nitrogen and pump nutrients to the soil surface.
3. Linseed cultivation does for Soil fertilizer increase. To protect the soil fertility the farmers must be cultivated such types of crops *'Danche'*, 'Mung beans', 'Mustard'.
4. Integration of earth worms or other beneficial organisms and biota into the soil to enhance fertility, organic matter and nutrient recycling.
5. Elimination or reduction of agrochemicals especially toxic nematicides that destroy diverse soil biota, organic material and valuable soil organism.
6. The central and state governments must educate the people about agro biodiversity. It has been observed that over a period of time the people have lost their traditional knowledge. The government should conduct training and mass awareness programmes about agro biodiversity loss. Mixed farming system will be increase. Some farmer in this study area cultivation done by mixed farming like, Cauliflower and Cabbage, Ribbet gourd and Snake gourd etc.
7. Emphasized on traditional cultivation, mixed farming, use of organic manure, crop rotation system, recycling crop and animal wastes.
8. Established of agriculture health centre.

## VII. CONCLUSION

No single factor is responsible for the changing pattern of agro biodiversity. Both human behaviour as well as other socio-economic and environmental factors are responsible for change of agro-biodiversity. Generally, indigenous species are going to decline but new species be born for including HYV seeds.New or hybrid species take possession of indigenous species. In the study area, most of all indigenous species are moribund and some species are vanished. The names of some genetic moribund species are *Dudheswor*, Pumpkin, birds are Crow, Hawk, Kestrel and fish are *Channa fish*, *Boal*, Catfish, Batasio, Walking fish, *Pakal* fish, *Sarolputi*, *Eel* and *Clay fish*,Shrimp, *Kucho Chingri*, Scallop, Oyster, Crab etc. Vanished species are rice (*Sarna, Pankoj, Joya, Lathisa, Patnai, Malabati, Palui, Kamolbhog, Kumalgar, Morisal, Auspongali, Sadha Mota,Dudheswor, Ghechipatni*), Jute, Watermelon and Muskmelon.Most of indigenous species are decline.

This change is not same for crop, aquaculture and livestock. In crop, agriculture diversity increased but traditional agriculture diversity are going decline. In aquatic diversity, it is decline but some new fish species includes. In livestock diversity, it is increase both for animal and poultry. And altogether indigenous agro-biodiversity are going decline and new species diversity are going increase day to day.

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