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Constraints of Land Oriented Economy in Rural India; A Case Study of *Puruliya* District in the State of West Bengal

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Abstract

Land oriented economy in Puruliya is closely related to the ecological history of the tribal people of the district. The colonial period saw breakdown of the age-old customary system and introduction of market-linked systems of land resource utilization. Post-colonial era experienced random invasion of hybrid seeds, indiscriminate use of chemical fertilizers and introduction of groundwater irrigation techniques by the name of 'green revolution'. The result was catastrophic as it permanently altered the sustainable nature of agriculture in Puruliya.

Constraints of land resource utilization in Puruliya are divided into physical and socio-economic groups. Harsh climate, particularly high summer temperature and vagaries of monsoon, highly erosive soil, scarcity of water and sometimes biotic influences cause severe loss to agriculture. On the other hand, instability in tenancy, recurring fragmentation of land and poverty restrict farmers to take initiative to improve the situation. Conservation of land resources starts with making utilization process eco-friendly. Switch over to less moisture demanding crops and efficient irrigation techniques can bridge the gap between supply and demand of water. Besides practice of agro forestry and animal husbandry in commercial way can reduce the vulnerability of farmers from crop failure.

Introduction

A traditional economy, like that in India, is characterized by the combination of social, institutional, technological and economic activities through which the community, particularly the rural one, seek to enhance their material and social well-being. There is always an interaction between the land in which the community lives and their practices that led to sustain their livelihood. Land, that surrounds the people, provides several goods, services and amenities to them, but using the land for one purpose always reduces its ability to provide other services. In India this natural resource faces many conflicting demands from the stakeholders across the society. Agriculture forms the base of West Bengal's economy and wet rice-paddy farming is regarded as its back bone.

Puruliya district demarked the western boundary of West Bengal. It is located

between 22º42´23´´to 23º45´North latitudes and 85º45'to 87º East longitudes. Undulated plains dotted with hillocks and plateaus formed of hard crystalline rocks dominate the landscape. Damoder, Kangsaboti, Shilaboti and Subarnarekha are four major rivers that drain the region. Slope gradually decreases towards east. Relief almost follows the slope pattern with few exceptions in central, northern and southern parts. Climate is essentially monsoonal with a continental tendency. Alfisols are the predominant soil group in the district. Puruliya once had thick forest cover but now it has been reduced into patches.

Puruliya district has a total population of 2,536,516; among them scheduled castes and scheduled tribes jointly form 36.56 percent. The district is essentially 'rural' as 89.93 percent of its total population resides in villages. Total literacy rate of the district was merely 55.57 percent in 2011. Workers comprise 44.4 percent of Puruliya district's total population. Among the total workers, only 25.4 percent are main workers (Census – 2011).

Objectives:

The main objectives of this study are –

I. To appreciate the present form of land oriented economy prevailing in rural parts of Puruliya district.

II. To delineate the major physical and socio-economic constraints active in Puruliya that are playing significant role in downsizing the economic growth.

III. To find out the viable way to minimize the impacts of the growth-constraints through proper utilization of available resources in Puruliya district.

Materials and Methods

Present work is dependant mainly upon secondary data from different sources. Department of Land and Land revenue, Department of Agriculture, Department of Statistics of The Government of West Bengal and the Census Department of Indian Government were the major source of secondary data for the purpose. The study is of empirical nature, ground check has been made where-ever it needed.

Present land cover- land use pattern in Puruliya: Puruliya district got 625.48 thousand hectares of land surface. Almost 12 percent of the total land is under forest cover. A considerable 13.55 percent of the total land resources are under nonagricultural uses that include rural and urban settlements, roads and railways, industries and other infrastructural uses. Barren and uncultivable land i.e. area under rocky outcrops, hills and badlands

comprises of 4.31 thousand hectares while 650 hectares of land is considered as permanent pasture. Another 820 hectares of area is under miscellaneous tree groves and not included in net sown area. The district have large amount of cultivable waste land and it comprises almost 14 percent of district's total land resource.

According to village papers 350,281 hectares are accounted as Net Sown area. Thus, 56.19 percent of districts' land is cultivated in Puruliya. Per capita agricultural land is 0.15745 hectares which is well above the West Bengal average 0.08025 hectares per Person. Most of the cultivators in Puruliya district practice subsistence farming under adverse and risky environmental conditions. The natural resource base can be characterized as, poorly suited to agriculture, due to climatic extremity, water scarcity, and unfertile soil. Several decades of non-sustainable land use practices led to rapid deforestation and accelerated soil erosion in many parts of the district. The families, particularly the tribal families that live there often depend upon non-agricultural incomes to sustain their livelihood, especially during the pre-Monsoon season.

Constraints of agro-economy in Puruliya district: Agriculture in Puruliya faces some multi-dimensional problems. It is evident from low yield rate of principal crops that always stay much below the national and the state average e.g. in 2004-05, yield rate of rice in West Bengal was 2,574 kg per hectare when the same for Puruliya was 2,326 kg per hectare only. In wheat production, Puruliya records yield rate of 1,982 kg per hectare when the state average was 2,103 kg per hectare. Recurrent crop failure is another sign of existence of some kind of agricultural problems in Puruliya district.

Agricultural problems are multi-faceted and multi-dimensional. Broadly it can be divided into two categories i.e. physical and socio-economic. Primary level survey detects them as below:

1) Physical constraints: Physical problems of agriculture in Puruliya denotes the natural forces active here that prevent either the development of agriculture or responsible for crop failure. It should be noted that often human activities augments the calamity of nature.

Physical factors restraining agriculture in Puruliya can be sub classed as climatic, edaphic, hydrologic and biologic. These are as follows:

a) Climatic factors: Climate is one of the determining physical factors for agriculture. It consists of several components like

temperature, length of growing season, sunshine, frost, fog, moisture condition, snow, hailstorm and wind (Husain, 1998).These elements of weather affect the cropping pattern of a region both directly and indirectly.

The crop plants are less steady than their natural counterparts, so need much care of the cultivator. With advancement of agricultural techniques any crop can be grown anywhere now a days if labor and expenses are not in question (ibid). Economically saying, crops are cultivated where they can fetch maximum returns.

Climatic factors are closely interrelated. Effect of one can be modified by others. Diurnal and annual variations of climatic elements determine the efficiency of crop growth and production per unit area. The micro-climate around the plants affects the output of crops favorably or adversely (ibid).

Climate in Puruliya district show some extent of extremity. Unevenly distributed rainfall over the year and high degree of temperature fluctuations, both daily and annual, make the situation vulnerable. In a district like Puruliya, backward in every kind of socio-economic aspects, farmers have nothing but to prey before natural forces for good returns from their fields.

b) Temperature: Every crop has minimum, optimum and maximum temperature limits for each of its stage of growth. Tropical crops require high temperature throughout the year while crops like barley rye and winter wheat have relatively low temperature demand. Crops like gram, lentil, potatoes, mustard, rape-seed and linseed, widely cultivated in Puruliya, need relatively warm temperature during the growing and ripening period and low temperature in development stage.

Chilling and freezing temperature can also retard plant growth by influencing germination, growth and development. It may even kill the plant if temperature goes down the minimum tolerable limit of that particular crop. Near freezing temperature for consecutive three days can kill the saplings of rice, cotton and chili (Husain, 1998). Minimum temperature for rice is 20ºc, for wheat 5ºc, for maize 9ºc and for rye 2ºc.

Apart from the maximum and minimum temperature limits, each crop has requirement of accumulated temperatures. Wheat need 2,000 day-degree ºc accumulated temperature throughout the season. Same for rice is 3,000 to 4,000 day- degree ºc during the entire growth period (Symons, 1996). Puruliya records high range of annual temperature. In the year 2001, maximum temperature was observed in April and it touched 44ºc. Lowest

temperature was recorded in January and it was just 8ºc (D.S.H-04). Such a high range of temperature-36ºC- can affect proper growth of crops. Temperature for summer months, March to June, always stays above 40ºc in Puruliya. If sufficient moisture is not provided, it can wilt the summer rice. Mean minimum temperature goes down to 10ºc in winter months of December and January. Sometimes it stays below 10ºc for weeks. Freezing temperature associated by dense fog causes severe damage to winter harvest.

c) Rainfall: Within wide temperature limits observed in Puruliya district, moisture becomes the most important environmental factor for crop development. All crops take water from soils. Rainfall is the prime source of water in soil. Every crop has optimum moisture condition for development. Different amount of water is needed in various stages of development of different crops e.g. water logged condition is needed for summer paddy at the time of germination of seed, moderate need of moisture is observed at the time of grain formation and moisture demand almost nil at the time of ripening.

Most of the rainfall in Puruliya district occurs during the end of the summer by the prevailing south-eastern monsoon wind. The wind coming from Indian Ocean, impregnated with high amount of water vapor creates heavy downpour during the months of June, July, August and September. An amount of 1,426 mm. of rainfall is considered 'normal' in Puruliya (Dept. of Met, 2006). Rest of the months remains dry, particularly the winter months of November, December and January. No rainfall was occurred between January and April in 1999 (Dept. of Met, 2000). Such uneven distribution of rain raises demand of moisture in field and proved harmful to the yield rate. Moreover the monsoonal rain is highly uncertain in nature. Failure of rain or excessive rain in a short period have brought repeated crop failures in Puruliya district e.g. crop failure in kharif season in 2005 due to shortfall of rain in Puruliya. It rained only 724 mm, 279 mm short of the previous year (Directorate of Agriculture, 2007).

Heavy rainfall can directly damage plants and interfere with flowering and pollination. Heavy downpour during the mature stage of wheat, rice, gram and oilseeds causes lose of both seeds and fodders. The occurrence of hail storm at the mature stage of winter crops cause disaster (Husain, 1998).The intensity of damage depends on the stage of growth of the crop and the intensity of the hail storm.

d) Edaphic factors: Soils form the cradle for all crops and plants, so it has the utmost importance in any agricultural operation (ibid). The top 15 to 20 cm layer of the soil is

the natural body where plants grow and farming activities take place. The availability of nutrients and moisture, aeration and chemical reaction of this layer determines soil fertility and governs its productivity. Generally these are controlled by soil texture, structure, porosity and permeability, drainage, amount of available organic matter and the Ph value of the top layer. Excessive erosion of the top layer cause loss of essential plant nutrients and removal of organic matter thus made the soil infertile.

National Bureau of soil Science and Land Use Planning' of India have classified soils of Puruliya district into three groups i.e. entisols, alfisols and inceptisols. They vary greatly in physical and chemical characteristics. Entisols and inceptisols are found in patches, therefore covers a small area. Alfisols are the predominant soil class of the district. All of these three soils are of 'ustic' suborder i.e. a moisture regime which is characterized by hot summer, plenty of rainfall and a long dry period after that (Foth, 2003).

Alfisols in Puruliya are sub-classed as paleustalfs and heplustalfs. Former is the course grained, gravelly thin layer of acidic soil found on the western highlands of the district. It covers the plateau slopes and tops of the Ajodhya massif. This porous, non-cohesive soil is well drained and thus deficient in moisture. Absence of moisture restrict breakdown of organic matter hence it is essentially a mineral soil. Bare hill slopes often subjected to rain wash that form gullies and ravines along the slope. This soil is however not suitable for any agricultural activities. Forests of larger plant species generally prevails on this kind of soil in Puruliya.

Heplustalfs are comperatively finer soils. This derived lateritic soil covers most of the district except some patches. Concentration of iron and alumina in the surface horizon made this soil alkaline in nature. But long dry period promotes up-welling of acids from lower horizons that makes the soil neutral or slightly acidic in reaction. Most of the farm crops can tolerate that e.g. optimum pH range for rice and wheat are 5.0 - 6.5 and 5.5 – 7.5 respectively, same for barley, rye, sugarcane and tobacco ranges between 5.5 and 7.5 (Spurway, 1941). Vulnerability to fluvial erosion and low moisture holding capacity forms the main constraint of agriculture in this type of soil.

Entisols found in Puruliya are of orthents and fluvent suborder. These recent soils are fine grained, contains high amounts of minerals and lack in organic matter content. Ustorthents are true or common entisols and ustifluvents are derived from floodplain

materials. Both of them are not much suitable for agriculture.

Inceptisols found in Puruliya is of ocherepts suborder. Presence of ochric epipedon made them pale. This young soil is mainly deposited through fluvial actions thus found in the narrow flood plains of the main rivers flowing through Puruliya district. Finer texture and higher clay content leads to high moisture retention capacity and less vulnerability to erosion. This is the most fertile soil of Puruliya and can support almost all kind of crops cultivated in the district.

e) Hydrologic factors: Ground water hydrology plays a decisive role in availability of moisture in field in a region. Puruliya being a drought prone district depends highly on availability of ground water for agricultural development. In fact it is the only answer to vagaries of monsoon in most part of the district. Demand of ground water irrigation touches its peak in ravi season when long dry winter sweeps moisture from the soil surface. Even in kharif season if monsoon come late, it helps germination of paddy.

Groundwater occurs in Puruliya in two types of formations i.e. consolidated or semi-consolidated and hard crystalline rocks and Gondwana sandstones. In areas of crystalline rocks or consolidated formations the water occurs in 10 m below ground level (blg) and 65 m blg with discharge capacity within 20 m3/ hour. In Gondwana sandstone regions water occurs in fracture zones within 100 m bgl with discharge capacity of 10 m3/ hour to 22 m3/ hour (CGWB, ERO). However capacities of these groundwater tables are low. Water tables are of unconfined type. Large bore-hole pump tests in Hanumata, Nengsai and Shankh sub-basins accounts the transmissive value between 2,042 and 1,161 m3/ day. The specific yield rate of dug-wells in granite- gneiss, mica-schist and sandstone were 4.80 m3/ hr, 0.92 m3/ hr and 16 m3/ hr respectively (Saha, A.K.1997).

Water tables fluctuate between 3 to 4 m bgl with season change. Greater fluctuation occurs in mica-schist and Gondwana formations than crystalline rocks. Three types of fluctuation patters recorded by Central Ground Water Board during last 16 years viz. pre-monsoon falling, post-monsoon rising; pre-monsoon falling, post-monsoon falling and pre-monsoon rising, post-monsoon rising (ibid).

The ground water in Puruliya is fresh and potable and also suitable for most crops on almost all soils. In some areas of north-eastern, northern, north-western, central and south-central Puruliya, excess of iron occurs in ground water. There is also problem of

salinity in some areas of north-eastern, eastern, northern, central, south-central and north-western parts of the district. Bacteriological contamination in dug wells and tube wells are almost endemic in Puruliya (ibid). Thus low water yielding capacity of the aquifers proves to be insufficient and restricts cultivation in dryer months of the year.

f) Biologic factors: Biological factors that restrain agriculture in Puruliya generally include attack of harmful weeds, fungi, bacteria and pests, loss of harvest by wild elephants, wild boars and other wild animals and birds. It must be stated that these factors have much lower impacts than the former three and is highly localized.

Socio-economic constraints: Agricultural practice is governed and influenced by the socio-economic condition of the farmers. In traditional societies like India land is worshiped as 'mother god' and there are various taboos across the society that governs the time of seeding and harvest of particular crops. They also determines the technology used in farming thus influence the yield rate to a great extent.

Puruliya has an agro-based economy. Cultivators comprise 31.3 percent of district's total worker. Another 36 percent is agricultural laboures (census-2001). Agrarian community of the district is essentially 'subsistence farmers' i.e. they cultivate primarily for food to ensure the yearlong subsistence of their family. Large parts of the cultivators in Puruliya are scheduled caste and scheduled tribe. Their cultivation techniques are governed by age-old customs and rituals, tools are primitive, sizes of plots are often too small and agricultural knowledge is limited. Moreover, a miserable economic condition restricts them to afford modern means of agriculture.

Land tenancy has an important role in agricultural planning (Husain, 1998).Usually a farmer with right of ownership has freedom to choose the production system and amount of investment that can sustain quality of his land. But in short term tenancies, a tenant tries to make maximum return from land and put back the minimum. Consequently the health of soil and system of crop rotation is ignored (ibid).

Most of the tenants in Puruliya are marginal farmers. Before the land reform movement they often faced forceful eviction by the zaminders and joteders. After the land reforms they do got freedom from that and enjoy rights through barga registration and patta holdings but they are still subsided in debt taken from privet money lenders or the mahajans. Debt have been taken from the mahajans to buy seeds, fertilizers or bullock,

even to bare ceremonial costs like marriage, cremation of dead etc against the agricultural land at an exorbitant rate of interest. These debts are never repaid and generally pass through generations. Eventually the mahajans become the policy maker about the land. In process the actual farmer lost interest on the land and the matter of agricultural development and extension is highly neglected. Even in some cases, lack of appreciation of the rights provided by the government and the negligence of the authorities to protect the bargaders' right lead to malicious treatment to them. These social indignities keep the aspiration level of the poor Puruliya farmers low that create constraint to agricultural growth.

Large part of the farmers in Puruliya belongs to scheduled tribe and scheduled caste groups. Often they cultivate the lands actually owned by the forest department. There are some agreements between the forest department and the tribal groups. Forest department have sole right to extend or cancel that agreement, without any compensation. This leads to serious loss of money and human labor. There are so many uninhabited forest villages in Puruliya that bares the sign of that kind of irrational activities.

Size of holdings is related to operational efficiencies that can save labor and capital. Fragmented holdings make management and supervision of the farm activities difficult. A land holding is considered fragmented when it becomes divided and subdivided by expansion of cultivation irregularly over wasteland, by purchase or sale, by extinction of families in the absence of direct heirs and consequent division of property among a large number of distant relatives. Marginal and small holdings comprise 189,910 hectares of total 260,291 hectares agricultural lands in Puruliya district. Semi medium and medium holdings comprise 69,742 hectares lands. These are almost 73 percent and 26.74 percent of total cultivated land of the district. Large holdings are only 688 hectares, a mere 0.26 percent of the total cultivated land (Agricultural census, 2000-01). Huge amount of fragmented holdings thus restrict the scope of farm mechanization and improvement of agriculture in Puruliya district.

Shortage of capital forms serious constraints in agricultural development in Puruliya. Most of the farmers are very poor and they cannot afford investments required for agricultural extension. But all agricultural inputs like purchase of land, seeds, fertilizer, pesticide, insecticide, labor, machines, carts, vehicles, fuel and power, repair and maintenance need capital. Bank loan is not readily available and micro-finance is just getting its way to

Puruliya. In such circumstances, privet money lenders are only menace of finance for most of the farmers in rural Puruliya. Exploitation by these private money lenders leads to extortion of agricultural advancement.

Ease of transport and proper accessibility to market enables a farmer to make cultivation economic. Better transport prevents the damage of surplus production by adverse weather, rats, pests or diseases (Husain, 1998). Smoother link to market on the other hand enables the farmer to sell the surplus and accumulate the capital. Unfortunately poor transportation facilities restricted farmers of Puruliya to access the national as well as the global market. They are still much dependant on the middle mans, often from the urban areas, to sell out their surplus production. Most of the time, they are thus deprived of proper price.

Mitigation: in search of viable solutions: Agricultural development is a much needed thing now a day in Puruliya district. Necessity of drastic reformation in agricultural practices is felt across the society and it includes grass-root level farmers to agricultural scientists, government officials to political leaders and students to academicians of the district. Yet there are much differences of opinion about the process and method of change. How agricultural 'revolution' can be made possible that can suite most to the districts' population is a matter of debate and still less interest is shown in this matter. Some suggestions for agricultural development in Puruliya district that came from different parts of the society are as follows:

Extension of irrigation: Irrigation is the answer of mankind against the adverse climatic conditions in way to protect his farm. It helps to keep temperature admissible in scorching summer and reinforce moisture in soil when rain is insufficient. Thus makes a farm 'alive' and reduces vulnerability of crop failure. Unfortunately, only 19.43 percent of total cultivated area in Puruliya gets irrigation from different sources. Moreover, only 44 percent of these irrigated lands get water from government canals. Rest 66 percent mitigates their water demand from tanks and ground water. As the availability of water in dry season is not much dependable from these sources, large part of the so called irrigated lands is also vulnerable to climatic extremities. In such a situation reformation of irrigation process and appreciation of newer irrigation potentials are demanded. Followings are suggested by various people to improve the irrigation situation in Puruliya:

i) Dependence on traditional irrigation sources should be reduced and much

importance should be given to rain water harvesting.

ii) Water demand in agricultural fields should be mitigated locally through proper and intense micro-water shade planning.

iii) Age-old system of runoff collection through 'jorbandhs' or the depressions storages should be revived.

iv) Proper maintenance of surface storages is needed. Periodic excavation maintains the water storage capacity. Besides new surface storages should be created.

v) Plastic mulching of the supply ducts prevents seepage loss of water during transport. Evaporation loss can be controlled through plastic cover or by application of synthetic gel on storage water.

vi) Sprinkler irrigation, pitcher irrigation and drip irrigation should be introduced instead of common flood irrigation process. It can preserve a lot of water as well as maintain moisture availability in soil more effectively.

vii) Sand mulching or other type of covers should be used to protect the soil moisture for longer periods.

viii) Initiative should be taken to utilize the enormous probability of irrigation provided by the Ajodhya hills through numerous rivulets flowing down its hill-slope. Suitable planning can make it the 'water reservoir' of Puruliya.

Soil amelioration: Less fertile soil possess a bar for agricultural development in Puruliya. Soil here is deficient in available N P K. Micro-nutrients like boron and molybdenum is very low and availability of zinc is high. Soil organic matter content is insufficient and moisture holding capacity is poor. All of these constraints can be overcome through amelioration of soil. Chemical fertilizers should be applied in required quantities to replenish the nutrient pool in the soil. Compost or vermi- compost fertilizers and 'green fertilizers' should be used to improve the organic matter content of the soil. Lime should be used to reduce acidity of the soil and to enhance its water holding capacity. It should be kept in mind that large scale amelioration of soil need scientific knowledge and proper examination of the site. So it must be done under supervision of competent authorities, preferably from government or reputed non -governmental organizations.

Scope of change in crop combination: Crop combination reveal degree of diversification practiced in agriculture in a particular region. Diversification enhances the chance of survival of the system against natural odds.

Besides it makes the rural economy prosperous. Monoculture can also pay good returns if the vulnerability factor is reduced through proper technology and investment. In most third world countries monoculture is practiced for the sake of subsistence thus they are prone to disastrous situations that lead to starvation and famine.

In kharif season all of the twenty blocks of Puruliya district sow rice. Every kind of available agricultural land is used for cultivation of summer paddy. Only some diversification of crop happens in ravi season. But a large portion of land remained uncultivated due to dearth of water at that time. Even in the winter, seven out of twenty blocks practice monoculture. Therefore Puruliya district needed a change in crop combination in order to eradicate the hazard of crop failure due to adverse climate.

There is enough scope of changing crop combination in Puruliya. Average soil pH in the district ranges between 5.5 and 6.5 (Mondal, 2007).The range suite almost all cereals, oil seeds, vegetables, flowers and fruit crops (Spurway, 1941). So it may not be difficult to adopt some new, moisture efficient and 'economic' crops provided that other factors like moisture holding capacity, supply of nutrients etc are maintained manually. Farmers of this district generally ensure yearlong supply of rice for their family through the kharif paddy cultivation. On the other hand they sell their winter harvest for profit. So it may be difficult to motivate them to change their crop selection in kharif season but with proper initiative it may not be very difficult for the ravi season. Some suggestions that came from the experts, NGO workers and farmers to improve the crop combination in Puruliya are as follows:

i) Dry farming should be practiced instead of flooded rice cultivation, particularly for the baid and kanali type of lands that have higher elevation and slope and for the lands situated far from the source of irrigation.
ii) More moisture efficient crops should be introduced that can tolerate drought better than the rice.
iii) Subsistence type agriculture should be altered to market farming. At beginning, those two types may be combined to build up the confidence of the farmer i.e. intensive rice cultivation in summer and commercial farming of mustard, ground nut etc in winter. A combination of subsistence and commercial farming may also be practiced simultaneously separating

the farm land for different types of crops.

iv) Some of the typical agricultural practices of Puruliya should be given importance. These are well balanced with local physical conditions and can help in crop diversification. Cultivation of sugar-cane, almost without irrigation, in Sirkabad in Arsha block, ground nut cultivation in Hura and Puruliya-II blocks and in the hilly tracts of Bandwan block cultivation of babui ghas , a kind of grass found in plateau regions of West Bengal and used for rope making, are mention worthy in this regard.

v) Cultivation of vegetables should be emphasized instead of cereals. It takes relatively shorter periods to become harvestable and require less water. Moreover vegetables give steady returns thus more economic than the cereals.

vi) Different types of pulses i.e. lentil, gram, tur, maskalai etc have shown rapid development in terms of yield rate and total production in recent years. Area under these crops should be enhanced.

vii) Cultivation of spices and oil-seeds should be given more importance.

viii) Farming in Puruliya has a bias for food crops. This should be ended and cash crops that suites the local environment should be given importance. Naturally grown flora like lemon grass, jatropa etc can be helpful in this purpose.

ix) Puruliya have suitable climate for seasonal flower cultivation. Floriculture has already started in some parts of the district. Area under floriculture should be enhanced.

x) Farmers should show enthusiasm in horticulture. Cultivation of local fruits like mango, jack fruit, guava, water melon etc can fetch a good deal of money.

xi) Puruliya is a natural storehouse of various medicinal plants and herbs. Scientific cultivation of those will give rural economy a boost.

xii) Puruliya may become ‘seed producer’ for adjoining districts. It takes short period and less water.

xiii) Fodder cultivation is economically more viable in degraded agricultural lands and lands with water shortage. Cultivation of alfalfa and other types of fodders in such lands should be emphasized.

Scope of agro-forestry: Agro-forestry is the raising of trees and agricultural crops either on the same land or in close association (Sagreya, 2005). Food, fodder, timber and fuel can be grown simultaneously in a single farm in this way. Agro- forestry helps rural people to overcome the odds in the off-agricultural season. Puruliya district provides a great scope for agro forestry. Following are the causes why agro-forestry can be a boon for Puruliya district:

i) Soil of Puruliya district better supports large trees than agricultural crops. Trees like mango, tamarind, jack-fruit, sal, segun etc can grow almost without any human support. So the farmers have to take least effort compared to cereal crops.

ii) Planting tree crops in waste lands can control soil erosion effectively that can increase organic matter content and moisture holding capacity of the adjacent agricultural fields. Thus the total productivity of land can be increased substantially.

iii) Trees along the bunds or the field enhance soil stability adding organic matter in it, protect the soil from erosion through root systems, provide shade for young saplings and protect essential moisture in soil. In this way they enhance soil fertility and provide good yield rate for crops.

iv) Farmers get a solution to crop failure, as they can rely upon tree crops or the timber produced through agro forestry to mitigate the need of money to sustain their life.

v) Puruliya district has huge percentage of degraded and waste land. Agro forestry can bring those lands under economic production system.

vi) Farmers of Puruliya are very poor. They spend lots of effort collecting fuel and fodder. Agro forestry helps them to spend much time in their fields as the supply of fuel and fodder is now stable.

vii) Seasonal migration in off agricultural seasons will be stopped as there will be yearlong employment in agro forestry fields.

Scope of animal husbandry and dairy farming: In India, cattle rearing, poultry farming and dairy farming are the only means of subsistence for thousands of rural poor. Unfortunately its potential is mostly neglected. Generally the responsibility of cattle rearing and poultry maintenance is given to females and Childs of the family.

Seldom are their efforts noticed though they reduce pressure on main source of income effectively. They provide eggs, milk and meat for consumption of the family and also generate some income by sale of animal products. Animal husbandry provides the source of animal protein for rural poor in Puruliya; proper planning can transform it to a magnificent income generator and thus boost up the rural economy and solve the problem of rural unemployment.

Puruliya ranks high in cattle population among the districts in West Bengal. The district has the highest number of buffalo and goat population in the state (animal census-2003).

Cattle reared in Puruliya are indigenous breeds with small size and low productivity. Their resistant power to diseases is high and can grow almost without care. That is why the poor people of Puruliya choose those indigenous breeds instead of their low productivity. Goat and sheep are reared for meat. Their population in this district is highest in the state. Goats are smaller in size and black coloured. Their meat production capacity is low but reproduction rate is high. Sheep are very popular for their meat in the district. They also produce wool. Smaller breeds of 'Sahabadi' and 'chhotonagpuri' types are common in Puruliya. Poultry farming is very common in rural Puruliya. Almost every homestead possesses some fowl, hen or duck. Hens are mainly 'Asin' type breeds. They are big in size and weight but low in egg production (Bhattyachariya, 2007). Pigs are reared mainly by scheduled tribe people. Black skin short sized indigenous variety is preferred for their high reproduction rate and low mortality. Intensive planning for spreading the knowledge of scientific cattle rearing and poultry farming should be initiated with proper enthusiasm. That must include the following:

i) Puruliya have dry type of climate, very suitable for cattle ranching. Public and private initiatives should be taken to develop modern dairy farms in this district.
ii) Cultivation of fodder should be encouraged to ensure the supply of the cattle feed.
iii) Farmers should be encouraged to rear cattle with high productivity like jersey cow in order to develop total amount of milk production in the district.
iv) Rearing of meat producing cattle should also be encouraged.
v) Intensive campaign is needed to raise the aspiration level of the rural people so that they can rely on animal husbandry and dairy

farming as their main source of livelihood.

vi) Poultry farming is becoming more and more popular among the rural youths now a days. Government should take the advantage to reduce rural unemployment and strengthen rural economy.

vii) Good quality poultry breeds with higher egg and meat productivity should be supplied to the farmers in subsidized rates. Improvement is necessary in veterinary services.

viii) Funding through banks or micro-credit societies should be arranged for the farmers for farm modernization.

ix) Proper marketing strategy is needed to make the above initiative fruitful because the products are perishable items. Instead of local markets, emphasis should be given to state and national markets. It may become possible through co-operative movements or self-help groups with active support of local governmental agencies.

Conclusions

Primary survey among the farming community of the district reveals that hundred percent of them cultivate wet paddy while fifty percent of them depend on wheat cultivation in winter. Almost thirty percent of the farmers cultivate mustard and vegetables in winter and seventy percent of them raise potato in winter. Fifty percent of farm lands cultivated by these farmers are bi-cropped when the rest part is divided equally in mono-cropped and tri-cropped lands. Rain is the only source of irrigation for sixty percent of the farm lands while for the rest section there are alternate sources of irrigation like ponds and streams. Seventy percent of the farmers depend on high yielding verities, rest being dependant on indigenous seeds. Organic fertilizers are used by thirty percent farmers and fifty percent of them depend both on organic and chemical fertilizers. Conspicuously, sixty percent of these farmers have suffered more than three times from crop failure during the last decade.

In fine, land oriented economy in Puruliya district is in a state of transition. There are distinct clashes between tradition and modernization. The age-old traditional agriculture inculcates a strong bond between the land and the farmer. Land is worshiped as ‘mother’ and several rituals guide the agricultural processes. Farmers of Puruliya inherit the knowledge of their ancestors, but they do realize that this old system cannot feed the huge population at present. Thus,

slow but steadily, past is giving way to the present in the agricultural fields of Puruliya drawing up the plans set and so to realize the best selection. The report demonstrated scientific theoretical study of game models and their effective use in developing educational process.

References

[1] Adhikari N, 2003: Puruliya: Joler Eitihya; Ed. Sarkar. P, Swadeshcharcha Lok, Vol. 95, No.1; Bangadarpan, Kolkata, 351-355p.

[2] Bandopadhaya D, 2000: Land reform in West Bengal: Remembering Harekrishna Konar and Benoy Chowdhury; Ed. Pandey M.K, Economic and Political Weekly, Vol. 18, No. 6, New Delhi.

[3] Bagchi A.K, 1998: Studies of the economy of West Bengal since independence; Ed. Pandey M.K, Economic and Political Weekly, Vol. 18 No. 4, New Delhi.

[4] Bhattyacharjee N, 2007: Puruliya; from the view point of minor irrigation; West Bengal, Puruliya district issue, June- 2007, Ministry of Information and Culture, Government of West Bengal, Kolkata.

[5] Bhattyachariya S, 2007: Evolution of animal resources in Puruliya district; West Bengal, Puruliya district issue, June- 2007, Ministry of Information and Culture, Government of West Bengal, Kolkata.

[6] Bureau of applied economics and statistics, 2004: District Statistical Handbook, Puruliya; Government of West Bengal, Kolkata.

[7] Bureau of applied economics and statistics, 1997, 1998, 2000, 2005, 2006: Economic Review; Government of West Bengal. Kolkata.

[8] Chatterjee B and Ghosh D.K, 2003: Towards a District Development Report for West Bengal; State institute of Panchayats and Rural development, Government of West Bengal, Kalyani.

[9] Central Ground Water Board, 2002: Handbook of hydrology, Puruliya district; Ministry of water resources, Government of India, New Delhi.

[10] Department of Agriculture, 1928: Royal report on agriculture; Government of India, Delhi.

[11] Department of Census

Operations, 2003: Census Report, Puruliya District- 2001; Government of India, Kolkata.

[12] Department of Meteorology, 2003: Annual weather report, Puruliya district; Government of India, Kolkata.

[13] Directorate of irrigation and water ways, 2005: Report on Medium irrigation projects in West Bengal; Government of West Bengal, Kolkata.

[14] Foth H.D, 2003: Fundamentals of soil sciences: 8E; John Willy and Sons (Asia) Pvt. Ltd, Singapore.

[15] Hansted and Brown, 2004: Land reform law and implementation in West Bengal; Rural Development Institute, Washington D.C.

[16] Hunter W.W, 1868: The Annals of Rural Bengal; West Bengal District Gazetteers, Government of West Bengal, Kolkata, XXVI+409.

[17] Hussain M, 1998: Agricultural Geography; Concept Publication Pvt. Ltd, New Delhi.

[18] Kumar R, 2001: Birhors; Ed. Sengupta S, Lokayata Manbhum- Part-II, Antaral, Kolkata.

[19] Ministry of Agriculture, 2002: Agricultural census, 2000- 2001; Government of India, Kolkata.

[20] Mondal A.K, 2007: Problems and prospects of agriculture in Puruliya district Ed Roy S, Paschimbanga, Vol. 40, No. 11, Department of information and culture, Government of West Bengal, Kolkata.

[21] Roy S, 2003: Puruliyar Janasamaj: Jal o Jalashoy; Ed. Sarkar P, Swadwsh Charcha Lok, Bangadarpan, Kolkata.

[22] Russell E.W, 1961: Soil conditions and plant growth; Longmans, Norwitch.

[23] Sagreya K.P, 1967: Forests and Forestry; National Book Trust, New Delhi.

[24] Spurway C.H, 1941: Soil reaction preferences by plants; Mich. Agr. Exp. Sta. Spec, Bull 306, East Lansing.

[25] Tudureska M.R, 2005: Kherwal Bansa Dharam Punthi: Translated in Bengali by Shikder. S and Kisku S.P, Nirmal Book Agency, Kolka.