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THE ENVIRONMENT PEOPLE AND FARMING SYSTEMS OF KRIBP(E) PROJECT CLUSTERS IN WEST BENGAL: A BASELINE STUDY FOR AQUACULTURE RESEARCH AND DEVELOPMENT PLANNING.

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The environment , people and farming systems of KRIBP(E) project clusters in Purulia and Midnapur Districts of West Bengal

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1. INTRODUCTION

This report presents the findings of a baseline study for the Integrated Aquaculture research Project. funded by the DFID High Potential systems research Programme and implemented in collaboration with the Indo-British Rained Farming Project, managed in India by Krishak Bharati Cooperative Ltd. (KRIBHCO). The study is focused on the project clusters of Purulia and Midnapur districts of West Bengal, and has been produced by the Aquaculture Research Team, in collaboration with other KRIBP(E) project staff.

The main objectives of the study are :

- To highlight the agro-climatic conditions prevailing in the area and its implication on the different farming systems existing.
- To identify the different types of water resources existing in the area and their seasonality.
- To review the socio-economic structure of the people inhabiting the project cluster areas in terms of their economic status, religion, level of literacy, the family structure and gender roles.
- To review the different farming systems prevailing in the area.
- To find out the livelihood activities of the people, their sources of income and priorities.
- To identify the possible implications of studies made above on aquaculture development.

In West Bengal, the KRIBHCO Indo-British Rained Farming Project covers 8 (eight) clusters in Purulia and Midnapur districts and two clusters in Birbhum district. The list of the cluster and the villages covered in Purulia and Midnapur district are shown in Table 1.

Table 1: Project Clusters and Villages of Purulia and Midnapur districts of West Bengal

District	Cluster	Head quarter	Villages
Purulia	Jabarrah	Purulia	Jabarrah, Natundih, Mudidih, Dumardih
	Kaipara	Purulia	Kaipara, Bamu, Loadih, Brajrajpur, Khawasdih
	Jugidih/Kashidih	Balarampur	Jugidih, Kashidih, Cholagora, Ratandih
	Senabona	Sirkabad	Senabona, Kultanr, Barpara
Midnapur	Pasro	Jhargram	Pasro, Kazla, Ghotidoba, Kusumdanga, Brindavanpur
	Medni	Binpur	Medni, Parulia, Birgeria, Khanripahari, Kharikabad, Kishda
	Beldangri	Jamboni	Beldangri, Ranipal, Bahirgram
	Dhansole	Gopiballavpur	Dhansole, Pandisole, Purnapani, Chitamatia

Source:KRIBP(E)W.B.

2. THE PHYSICAL ENVIRONMENT AND AVAILABILITY OF WATER RESOURCES

2.1 Introduction

The features of the rainfed farming system in the project cluster areas of Purulia and Midnapur districts can be summarised as follows :

- The soil of the area is mostly red-laterite, gravely and sandy-loam. A great proportion of the cultivable area is undulated upland which is mostly unbunded thereby prone to soil erosion leading to poor fertility.
- The area falls under high rainfall of short duration i.e. 3 to 4 months with some unpredictability.
- The majority of the waterbodies are seasonal but perennial water bodies are also present. Project clusters of Midnapur district have considerably lower level of abundance than that of Purulia district.
- The people of the area mostly belong to deficit class with their very limited source of livelihood.
- Literacy rates among males is quite higher in the subject in Purulia and Midnapur district (42.4 and 59% respectively) compared to that of females (15.3% and 30.9% respectively).
- Majority of the people are Kharif growers due to very limited source of irrigation. Paddy is the prime crop.
- There is a range of livestock like cattle, buffaloes, goat, sheep, poultry and pig being reared up by the people but the ownership level of livestocks per household among deficits has been found to be quite low.
- There is high level of migration among the rural deficits in the Rabi and summer season as there is very limited scope for local livelihood generation activities in the seasons.

2.2 The Physical Environment

2.2.1 Climate, Geography and Soil

The average annual rainfall ranges between 1100mm to 1500mm, thereby the area is under high rainfall. The monsoon generally extends from mid June to September. The general pattern of rainfall is heavy rain continuously for few days leading to soil erosion and then completely dry spell for next few days affecting crop. Occasionally it faces drought like situation in some years while some years faces downpour. . The maximum temperature in summer goes up to 42 to 44^{o}c while minimum below 10^{o}c. Evaporation rate is very high in the area.

General topography of land is undulated. Land can be broadly divided into upland, medium land and low land. The soil of the area is dominantly red-laterite with very low nitrogen and phosphorus percentages with poor water holding capacity. The soil is often sandy loam, clay loam and in some cases it is clay. Soil depth varies from 4 to 6 inch.

In KRIBP(E) area which covers clusters of Bihar, West Bengal and Orissa upland constitutes 60 % to 70 % , while medium land 20-30 % and low land 10-15 % on an average. Upland is mostly dry except when it rains. It is plain or sloping having poor bunding or may be unbunded. It is infertile due high soil erosion resulting in washing of upper nutrient layer to medium or low land. Medium land is well bunded and comparatively more flat and fertile. It retains water for most of the monsoon. Low land is wet throughout the monsoon and retains water for Rabi crop. It is well bunded and fertile. It has been found that medium and low land percentage is more in Midnapur area than in Purulia. The average distribution of upland, medium land and lowland per village and per household for the two project districts is illustrated in Table 2

There is very limited natural green coverage in KRIBP(E) clusters of Purulia district. There is only 116 acres of forest located in Kashidih and Cholagora villages of Jugidih-Kashidih cluster. In Midnapur district clusters the forest cover is considerable greater constituting 1874 acres, the bulk of

which is found in Medni and Dhansole clusters. Of course, the area surrounding the project clusters has considerable forest coverage.

Table 2 Land statistics in project areas of Purulia and Midnapur districts

Table-2

	Purulia	Midnapur
Total area of cultivable land (acre per village)	239	107
Land holding (in acre per HH)	Acre (% of total holding)	Acre (% of total holding)
Total	2.94 (!00)	1.99 (100)
Upland (all categories)	1.50 (51)	0.88 (44)
Upland (homestead)	0.22 (7.5)	0.27 (13.5)
Medium land	0.86 (29)	0.69 (35)
Low land	0.58 (10)	0.42 (21)

Source : KRIBP(E)Office,W.B.

2.2.2 Water resources

Due to seasonal rainfall, for much of the year the only water available for domestic and agricultural purposes is that retained in water bodies, or sources such as springs or rivers. The different types of water resources available in Purulia and Midnapur districts were identified during the process of developing water resource profiles with COs. These have been classified as perennial ponds, seasonal ponds, doba/goria, natural stream, paddy field, water harvesting tank, check dam, irrigation canal and khal. Key features of these resources are summarised in Table 3, including occurrence in project clusters, seasonality, and details of ownership uses and users. The broad physical features of these resources are summarised in Box 1. Table 4 presents data on the numbers of the most commonly occurring water bodies in the project clusters. Quantitative data on the availability of other water resources in project clusters have not been presented here.

2.2.3 Social and economic role of water bodies.

In the project areas the social factors which influence the potential use of water resources for aquaculture include ownership, control, users, associated uses and rights of use (Stewart et al, 1996). These can often involve a wide range of stakeholders for a given water resource. Owners of the pond can include government, community, kin groups and individual household. Control of water resources is often use related and may involve stakeholders other than owners while general access to pond may involve the whole community. These particular group may have a right to manage the fish culture, while others will have rights to abstraction for irrigation and the community as a whole may have rights of use for domestic and livestock needs. The pattern of ownership, types of users, uses and management are almost same in case of seasonal and perennial ponds except the fact that the perennial ponds involve comparatively larger group for management and control. These issues are discussed in more detail in Report 2.

Table 3: Classification of water resources of Project clusters of Purulia and Midnapur

Type	Distribution								Seasonality	Ownership	Users	Uses
	Purulia				Midnapur							
1. Perennial pond	S	K	J	JK	B	P	M	D	Throughout the year	Individual, Group, Govt., Community	Community	Irrigation, Bathing, Washing, Fisheries, Animal use
2. Seasonal pond	S	K	J	JK	B	P	M	D	Aveg.6 months	Individual, Govt., Group, Community,	Community	”
3. Irrigated seasonal pond	S					P			6 to 8 month	Group & Community	Community	”
4. Doba/Goria	S	K	J	JK	B	P	M	D	Water available generally up to 4 to 5 months	Individual and Group	Community	Domestic use, Irrigation of homestead land, Fisheries, Bathing
5. Natural steam	S				B	P			Water available during monsoon, perennial	Common	Community	Rabi cultivation in Senabona
6. Paddy field	S	K	J	JK	B	P	M	D	Water available during cultivation of rice	Individual	Individual	Paddy cultivation, Fisheries
7. Water harvesting tank	S	K					M	D	Water available form July to Oct.	Individual and Govt.	Community	Soil water conservation, Irrigation and Fisheries
8. Check dam	S	K							Throughout the year	Community	Community	Irrigation, Fisheries
9. Irrigation coral	S						M		Water available from 8 to 10 months	Group and Community	Community	Irrigation
10. Khal							M		May be perennial or seasonal	Govt.	Community	Irrigation, Washing, Bathing and Animal use
11 Spring					B	P		D	May be perennial or seasonal			

S-Senabona, K-Kaipara, J-Jabarrah, JK-Jugidhih-Kashidih, B-Beldangri, P-Pasro, M-Medni, D-Dhansole

Table 4 Water storage ponds in project clusters

District	Cluster	Perennial pond	Seasonal pond	Doba/Goria
Purulia	Kaipara	11	66	2
	Jabarrah	27	30	-
	J/Kashidih	4	20	10
	Senabona	27	46	3
Midnapur	Dhansole	7	11	-
	Pasro	3	2	1
	Medni	3	4	1
	Beldangri	6	4	-

Medni : 2 water holding tanks, 1 perennial khal. Beldangri : 16 tanks Source : Water resource profile

Box 1 Features of Water resources in project clusters (see Table 2)

	Water resource	Features
1	Perennial ponds	These ponds retain water throughout the year. During rainy season most of the parts of the pond gets inundated while in winter and summer seasons the water holding area becomes smaller.
2/ 3	Seasonal ponds	These ponds retain water mostly during the rainy season while in summer season they dry up. Their water holding period varies from 4 to 10 months. Seasonal pond may be irrigated in case of its proximity to river in which water from the river is drained into the pond to increase its water holding period. In West Bengal ponds are named as Bandhs which may be seasonal or perennial while very small seasonal ponds are called hapas and tanks.
4	Doba and Goria	Small seasonal ponds situated mostly in homestead areas. These ponds are relatively more deep and slope. The size of goria is relatively smaller than doba.
5	Natural stream	A natural water body with a high gradient of flow.
6	Paddy field	People of the project cluster areas are mostly paddy growers. The paddy fields retain water for 3 to 4 months.
7	Water harvesting tank	It is formed by raising the ground level at one side of a small depression with considerable potentiality of inflowing water from the high water catchment areas.
8	Check dam	Water impoundment's created by raising a bundh across a flowing water or water coming out through seepage.
9	Irrigation canal	Canals draws out from a river or a large perennial source of water to irrigate the agriculture fields.
10	Khals	These are the abandoned, elongated, narrow strip of waterbodies found in the roadside or on other places
11	Springs	Groundwater seepage, may be seasonal or perennial

2.2.4 Implications of the physical environment on the farming systems and the livelihood of people

- The area is under high rainfall and is the only support for paddy cultivation but its short duration and intermittent dry spells often create high dependence on existing waterbodies for irrigation. The rainfall has no direct contribution towards rabi cultivation.
- The soil is particularly upland which is present in major proportion and lacks major nutrients such as nitrogen and phosphorus and has less water holding capacity due to high percolation rates leading to poor productivity for different farming systems.
- There is a range of waterbodies such as perennial ponds, seasonal ponds, dobas and goria, water harvesting tank, check dam and others for supporting the aquaculture activities but high dependence on these waterbodies for irrigation, domestic purpose and other uses tends to limit aquaculture activity.
- The majority of waterbodies are seasonal and has the very limited potentiality to be used for irrigation for rabi cultivation. The summer cultivation is almost nil.
- The dominance of paddy cultivation in the Kharif season seems to create a favourable situation for taking up short duration aquaculture in paddy field.

2.3 THE PEOPLE, SOCIO-ECONOMIC CHARACTERISTICS

2.3.1 Wealth And Food Security Status

Unequal distribution of wealth and resources is inevitable consequence of socio economic characteristic of the people of the project areas. Wealth statistics evaluates three categories of people quoted as surplus, self sufficient and deficit, the proportions of which are illustrated in Table 5.

Table -5 The percentage of people divided on the basis of possession of wealth are as follows.

District	Surplus	Self-sufficient	Deficit
Purulia	8.1 %	18.3 %	73.5 %
Midnapur	6.4 %	14.3 %	79.3 %

Source :KRIBP(E) Office,W.B.

In West Bengal rice is staple food for all the categories but the feeding habit is bound to differ between the three categories. Surplus people procure more foodgrain than required for whole year hence they sell extra foodgrain in the market for income. They have more land of better quality which is generally medium and low land and have more yearly income by different sources. They have comparatively better living standards, and can afford varieties of food in their daily diet eg. rice, pulses, wheat flour, vegetable and others. Meat and fish often find a place in their diet. Surplus people often provide secondary employment, and nutrition to the socially disadvantaged i.e. subsistence farmers.

Self-sufficient people have land for their own food. They produce sufficient food for their family through their own cultivation or share cropping. Their aim is to produce more food for their own use as well as to increase the investment capacity. They can approach two square meals per day and able to manage their livelihood in limited source of earning. Regarding their diet they prefer rice, vegetables and pulses, occasionally they take wheat flour, fish, meat etc. During times of agriculture disaster i.e. drought or heavy rain, they can suffer. 20 % to 30 % self-sufficient farmers take short term loan in emergency from relatives and neighbouring villagers without interest. Self-sufficient villagers have economic pressure but it is less compared to deficits due to alternative sources of income.

Deficits are the most disadvantaged group, often struggle for two square meals. all years. Rice is their main staple food which they try to manage by working as wage labourer. Occasionally they take fish and meat during feast or ceremonies in small quantity. Vegetables are added to their meal occasionally. They find millet flour as substitute of wheat flour. They have generally a small plot of land mostly in upland areas which is of very poor quality. They have less alternative sources of income so most of the time they work as wage labourers. 70% to 80% of deficit farmers have to access to non-institutional credit at high interest rates.

2.3.2 Ethnic, religious and leadership structure

The people of Purulia and Midnapur districts are dominated by Scheduled Tribes with Midnapur constituting a greater proportion. The next dominant group is of scheduled Castes constituting almost 17% in both districts while others constitutes 47.5% and 10.7% in both the districts. Others include other backward class as newly designated by the government and general class. There is 13 caste e.g. Mahato, Kalindi, Sahish, Das, Gorai, Mondal(SC), Kaibar, Sardar, Singh, Karmakar, Pramanik, Laya and Mondal(general). The majority of people belong to Hindu community.

An overview of the Social structure in the two project districts is presented in Table 6, and a more detailed analysis at the village and household level presented in Table 7. It can be seen that both mixed and single social group (i.e. caste/ tribe) communities are found in the project villages.

Leadership within these communities involve a range of traditional, formal and informal leadership structures as follows:

i Traditional leadership
Among tribal people 'Traditional leadership' pattern is still prevailing which influences the tribal mass. Decisions are taken by their religious leaders in the field of religion, culture, dispute settlement etc. locally without panchayat intervention in collaboration with other tribal people. But developmental decision are taken by panchayat committee with the assistance of village people. Partial dependence on panchayat members is an evidence. Leadership found among tribal communities include:
Majhi - Settle dispute
Jagmajhi - Negotiate marriage affairs
Gorait - Community messenger
Naike - Performs community worship

Generally Majhi is the judicial head of the village. No external force influence the judgement of judicial board, composed of Majhies

ii Formal leadership
The villagers elect their panchayat leaders. He is negotiated to settle dispute, look after the developmental work with the help of other government organisation. Major decisions in village are taken up jointly. So no ones leadership prevail specifically in the village.

iii Informal leadership
Mostly there is no formal leadership in village communities, but honourable elders or older persons decide conflict in the village meetings and fine is charged from the defaulter, which is deposited in village fund.

Table-6 Social structure of the project clusters

Caste / Group	Purulia	Midnapur	Name of subcaste
ST	35.2%	72.30%	Singh, Sardar, Majhi, Santhal, Murmu, Hembram, Soren, Tudu, Mandi, Besra, Kisku, Hansda
SC	17%	17%	Kalendi, Das, Mondal
Others OBC/General	47.5%	10.7%	OBC - Karmakar, Gorain, Mahato General-Momin, Brahmin, Napit

Source :KRIBP(E) Office,W.B.

Table-7 Social groups found in clusters of Purulia and Midnapur

District	Cluster	Village	No. of HH	SC	ST	Others
Purulia	Kaipara	Kaipara	196	28	58	110
		Brajrajpur	65	-	51	14
		Khawasdih	38	-	-	38
		Loadi	17	-	-	17
		Bamu	56	15	5	36
	Senabona	Senabona	249	29	5	215
		Kultanr	151	-	151	-
		Barpara	23	-	23	-
	Jabarrah	Natundih	46	-	-	46
		Jabarrah	222	92	8	122
		Dumardih				
		Mudidih	30	-	30	-
	J/Kashidih	Kashidih	80	-	80	-
		Cholagora	35	-	35	-
		Ratandih	11	-	11	-
		Jugidih	61	61	-	-
Midnapur	Dhansole	Chitamatia	46	8	37	1
		Purnapani	75	-	75	-
		Pandisole	71	20	51	-
		Dhansole				
	Medni	Khanripahari	23	-	6	17
		Parulia	27			
		Kisda	69			
		Medni	99	9	89	1
		Birgeria	31	-	31	-
		Kharikabad				
	Pasro	Brindavanpur	41	-	41	-
		Pasro				
		Kazla	32	-	32	-
		Ghotidoba	37	-	37	-
		Kusumdanga	26	26	-	-
		Guripukur	26	10	7	7

Source : Village profile

2.3.3 Education Profile

Midnapur district has higher level of literacy than the Purulia district. Among males 42.4 % are educated in Purulia district while 59 % in Midnapur district. The level of literacy among females in two districts are 15.3 % and 30.9 % respectively while mean literacy comes out to be 32.6 % and 49 % respectively. The literacy percentage prevailing among male and female children is comparatively higher than that of male and female adults.

There is very poor infrastructure for imparting education in most of the villages. Most of the villages have only one primary school with poor staffing and building construction. For higher education children have to travel long distance.

KRIBP(E) since its inception has assumed a dominant role towards all round development of the people of project cluster areas resulting in greater awareness of the farmers towards various developmental needs. The active literacy campaign taken up by KRIBP(E) is also making great impacts on the access of the people to information. Due to the support of KRIBHCO the farmers in project cluster areas are now in a better position to implement various programmes of their benefit

like crop cultivation, vegetable cultivation, fruit plantation, agro-forestry, goatery, duckery, vermiculture, selvi-pesticulture etc. KRIBP(E) has also initiated women's training programme for various cottage industries. Apart from it, health camp for humans and livestock is also being organised which has created great awareness towards better health condition and preventing epidemic diseases. Exposure visits of Jankar to various facilities and institutions of importance has also resulted tremendous improvement in the knowledge about the systems. Besides this KRIBP(E) cluster villages have also contacts with various external agencies and government run campaign's like Integrated child development scheme, Literacy programme, Health department, Government agriculture extension workers, Forest departments has able to create some impact in different aspects of life.

2.3.4 Family Structure and Gender Roles

Most of the families in Purulia and Midnapur districts are individual families (nuclear families) whose size varies from 1 to 6. An individual families consists of a husband, wife, children and occasionally grandfather and grandmother also reside with them. Key points relating to the division of labour, and the gender division of decision making are presented in Tables 8 and 9 respectively.

Mostly the families in W.B. are headed by an elder male, who is having the control over the resources and is the main decision maker with respect to income generation and family affairs. Males are mostly involved in livelihood generation activities. Their involvement lies in agriculture, livestock care and works as wage labours in brick kiln, road construction, building construction, transportation of goods etc.

Women of all categories deal with all the household activities such as child care, cooking, washing utensils and clothes house cleaning, firewood collection, water collection, preparing fuels from locally available materials etc. Surplus women do not work in agriculture field. Women from self sufficient and deficit category plays important role in paddy cultivation i.e. transplanting, weeding, harvesting and threshing. All sort of processing involved in rice preparation in home are done by females. Apart from agriculture they are engaged in livestock care, animal grazing and income generating activities such as pottery, bamboo basket making, selling vegetables and fish etc.

Deficit women go to others field to transplant and harvest paddy on exchange basis and for wage earning. They go to the forest to collect the fuels for own use and selling. Women are free to move in village, but are restricted from going away to town with out the permission of male members. Most of time they are accompanied by male members or sometimes by other women in a group.

Women play a vital role in managing household economy and as a co-decision makers. Women of tribal community have a dominant role over decision making, as their economic contribution to family is more, as men expend most of the parts of their income in liquor consumption. Women take a more dominant role in making decisions about household finance, marriage, child care and household tasks.

Children are considered as assets by the parents to extend a helping hand in income generation activities, in most of the cases in case of deficit families. Hence, they are prevented from going to school. Apart from it they also assist the parents in household affairs.

The role of young men and women are almost similar to adults, the major difference lies in the control of resources and decision making as these aspects are dealt mainly by men and female adults.

Table-8 Gender division of labour

Household	Household tasks	Farming
Women	child care, cooking, washing utensils and clothes, taking food to farm, house cleaning, firewood collection, preparing fuels form locally available materials, water collection, animal grazing, selling vegetables, rope making, animal care, making bamboo basket, marketing etc.	threshing, transplanting paddy, cultivation in homestead land and farm, harvesting paddy, working as labourer in other's field, weeding, preparing seedling bed and manuring.
Men	managing livestock, selling groceries, managing household economy.	ploughing, cultivation, manuring, harvesting, threshing, preparing seedling bed, irrigation, aquaculture, working as labourers in others field.
Children	water collection, collecting manure from livestock, animal grazing, fuel collection, extending a helping hand to mother and father in their works.	helping parents.

Table-9 Gender division in decision making and control of resources

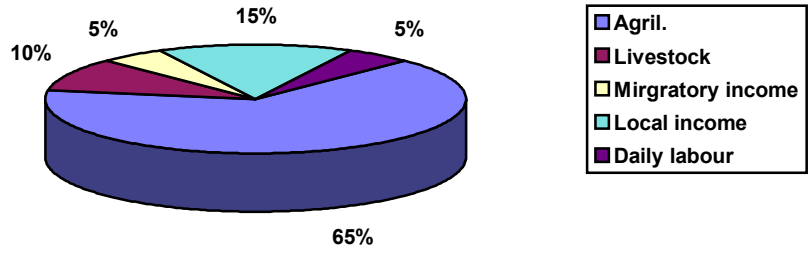
Household members	Decision making household and agricultural	Control of resources (physical & financial)
Women	Household finance, marriage, child care, household tasks, leadership in family affairs dominant in STs.	Ornaments and cosmetics, clothes income from wages, daily use items.
Men	Land, outside finance, loans, marriage, farming activities, religious activities, selling and purchasing of livestock, migration, education and ceremonies	Livestock, land, house, agriculture produce, pond.

3. THE FARMING SYSTEM, FARM HOUSEHOLD LIVELIHOOD ACTIVITIES AND PRIORITIES

3.1 Introduction

Agriculture is the main source of livelihood to the rural people. Due to lack of irrigation facilities a majority of the people are Kharif growers with paddy being the prime crop. In Rabi season people generally seek other sources of income and may cultivate vegetables depending upon the availability of residual moisture and irrigation facilities. Livestock rearing is the second priority of the people for livelihood generation. The range of livestock reared up in order of importance are cattle and buffalo, poultry, goat and sheep, pig and fish. As these resources are not sufficient to meet the whole year requirement of the rural deficits they go for off farm income generation activities of migratory and non-migratory nature. A summary of the relative importance of a range of livelihood activities for project participant households is presented in Figure 1. The remainder of this section considered these in detail.

Figure 1 Percentage (approx.) composition of livelihood from different sources in KRIBP(E) areas



3.2 Crops

Crop is the most common form of production for the people of the project cluster, often justified as a more productive and effective approach for income generation. Average cultivated areas per household for Karif and Rabi seasons are presented in Table 10.

Paddy being the prime crop for the people, its cultivation is viable during the kharif season due to facilities of irrigation and rainfall. For instance, in upland, medium land and lowland 95%, 95% and 100% of total cultivated area, respectively are used for paddy cultivation (Table 11). But the acres of per household paddy cultivation indicates that it is very low and falls far short of the annual food requirement for self sufficient and deficit class people. Cultivation of other crops such as pigeon pea, groundnut, blackgram, maize, sunhemp etc. is measurably at low level than paddy (i.e. only 5%).

Cultivation in rabi season is limited by the occasional rainfall and available little irrigation facility to support the process. The crop is grown based on the available remaining moisture in the soil and availability of irrigation facility. The crop grown in order of importance are wheat, potato, vegetables, paddy, mustard etc (Table 12). The production achieved seldom fulfils a major role in the food wed of the project areas. The scarcity of irrigation in summer season offers negligible scope for crop cultivation.

Table 10 Seasonal production areas per household

Area cultivated by season acre /H.H.(% total area)	Purulia	Midnapur
Kharif	2.53 (86)	1.58 (79)
Rabi	0.17 (6)	0.23 (11.5)
Summer	0.01 (0.3)	0.03 (1.7)
Cropping intensity	0.92	0.92
H.H with irrigation	33.9	24.1

Source : KRIBP(E)Office,W.B.

Table-11 Karif season crops produced

Crop	% of Karif cultivation	Purpose of prod	Level of production (kg / ha)	Seasonal prodn. cycle
1. Paddy i. Upland ii. Medium land iii. Lowland	 95 % 95 % 100 %	Own consumption stored to be applied as seed in next year, surplus for sale	2250-2625	Seed to seedling 15-20 June onwards. Transplantation of seedling starts from July onwards and harvesting by Nov.
2. Pigeon pea	5 %total	Own consumption, surplus for sale	300	June 15th onwards to Nov.
3. Ground nut		”	NK	End of June to 90-100 days onwards
4. Blackgram		”	200-225	Mid June to 80-90 days onwards.
5. Maize		”	150-175	Mid June to 70-90 days onwards.
6. Sunhemp		”	NK	”

Table-12 Rabi season crops produced

Crop	Land type	% of Rabi cultivation	Purpose of prod	Level of prod (kg /ha)	Seasonality
1. Wheat	Upland	60 %	Consumption, sale and retained as seed	750-900	Sowing 15th Nov.-15th Dec.
2. Potato & Vegetable	”	40 %	Consumption and sale		Harvested in Mid March
3. Mustard	”	NK	Sale and consumption	300-350	Starts from Sept. to 90 days onwards
4. Potato	Medium land	65 %	Sale and consumption	2500-3500	Mid Nov. to 90 days onwards
5. Wheat & Mustard	”	35 %	”		
6. Paddy	Lowland	100 %	Consumption	3000-3700	Dec. to Feb.

Source : Village profile

3.3 Livestock

Livestock are an integral and important part of agricultural communities. They are valued for their services, food and other products they provide. Nearly 90% of the total draught power is used in agriculture through out the project cluster of KRIBP(E) is provided by animals. Use is made of animal wastes for fertiliser and fuel. Project data for livestock ownership and uses are presented in Tables 13 to 15.

Cattle/Buffalo
The most important of the livestock is probably cattle/buffalo. The number per household is generally two, which is mostly draught and scavenging category. There is little occurrence of milking cattle and buffaloes because these tend to rely on large amounts of expensive concentrates and cereal based feeds, which is the limitation of the people. Keeping cattle is the first preference of the people, as they provide a diversity of functions including ploughing the agriculture field, transportation, milk, and wastes used as fuel and fertilisers.

Goat and Sheep.
The relative distribution of goats and sheep per household is generally 3 to 4 and in flocks of 4 to 5 or more respectively, but still keeping 2 goats is very much common. The percentage of people keeping goat and sheep are comparatively lower. It is the second preference of the people.
Use * For meat and milk
* Wool and skin are sold at high price.

Poultry :
Extensive rearing of poultry is common, 60% of cluster households have 1 to 10 birds, number may go up to 45 to 50 or more in case of self-sufficient and surplus people. According to the preference ranking it comes on third position. Poultry keeping people are second highest in number.
Use * Egg and meat as cash generating source.
* Own consumption.

Pigs
The percentage of people keeping pig is least.
Use * As meat.
* Selling of piglets provides cash.

Fish Culture
Fish culture is a traditional activity in the area, typically involving culture in perennial, involving very small or no addition of inputs, resulting in very low fish production. Though traditional fish farmers have some knowledge about manuring, feeding and stocking practices but they seldom implement it to its full potentiality due to factors such as input resource constraints, dependence on the waterbodies for crop irrigation, and in some cases social and cultural factors, outlined in section 2.2.3.

Depending upon the available cash in hand they purchase the fish seed from the local traders and stock it into the pond. As the manures and available potential fish feeds find high priority use in other areas they occasionally supply them into the pond. Sometimes traders stock the seed on his own and comes at the time of harvest with his net and takes away half of the harvest in exchange for supply of seed. In general the preference of the people for fish culture varies according to the abundance of the waterbodies prevailing locally. The percentage of people involved in fish culture depends upon their economic capabilities as well. Fish is used mainly for consumption while cash generation is the second choice.

Unlike other livestock, in which most ownership is at the household level, fish culture as currently practised is dominated by group activities. Thus in some communities there may be only one pond used for fish culture, but most of that community has a stake in the activity.

Table 13 Herd size Distribution
Purulia

Herd size	Large ruminants cattle, buffalo (%)	Small ruminants goat, sheep (%)	Poultry (%)	Pig (%)
0	22	43	23	93
1-5	59	46	48	6
6-10	16	8	15	0.37
11-15	2	0.6	11	0
16-20	0	0.375	0.65	0
20+	0	0	0	0

Midnapur

Herd size	Large ruminants cattle, buffalo (%)	Small ruminants goat, sheep (%)	Poultry (%)	Pig (%)
0	29	44	27	80
1-5	57	43	34	19
6-10	11	11	26	0.35
11-15	0.6	1.2	12	0
16-20	0	0.6	2	0
20+	0	0	0	0

Source : Village profile

Table 14 Average distribution of livestock among different wealth categories

District	Mean no. / H.H.	Surplus	Self-sufficient	Deficit
Purulia	Cattle	5.88	2.58	1.4
	Buffalo	1	0.93	1
	Goat	1.85	1.5	1
	Poultry	8.55	4.75	3.56
	Sheep	2.88	1.86	0.34
	Pigs	0.13	0.06	0.2
	Others	0.8	0.25	0.19
Midnapur	Cattle	5.48	3.23	2.23
	Buffalo	0.7	0.35	0.08
	Goat	2	2.08	1.35
	Poultry	5.48	7.66	4.68
	Sheep	0.55	1.41	0.35
	Pigs	0.66	0.55	0.26
	Others	8.75	0.68	0.31

Table 15 Relative importance of livestock to work, food and income generation

Livestock	Work	Food	Income	Preference ranking
1. Cattle and Buffalo	agriculture, transportation	milk	agriculture, transportation	1
2. Goat & Sheep	-	meat, milk	meat, skin, offal, milk	2
3. Poultry	-	egg, meat	egg, meat	3
4. Pigs	-	meat	meat, piglets	4
5. Fish	-	consumption	sale	5
6. Others (duck, pigeons, goose etc.)	-	meat, egg	meat, egg	6

At present there are more fish culture activities in Purulia district project clusters than in Midnapur, due to higher abundance of culturable waterbodies in the former. In Kaipara cluster in Purulia district

on an average 50% to 60% people are involved in fish culture; in Senabona cluster, all the household of Kultanr village have a stake in fish culture, while in Senabona and Barpara villages 60 out of 200 households and 12 out of 23 households respectively, are involved. In Jugidih village in J/Kashidih cluster 100% households have share in fish culture activities and in Ratandih village all the household have share in activities in one perennial pond. The involvement in fish culture activities in rest of the village is 40 to 50%. In Jabarrah cluster the involvement is 100% in case of Jabarrah village and 50 to 60% in rest of the villages.

Though there is other no report of rice cum fish culture in Purulia and Midnapur districts except one case in Midnapur. In a village of Pasro cluster good growth and production of a Japanes pothi belonging to the genus *Pontius*, a type of minor carp stocked in low lying paddy field has been achieved.

Box 2 Recent Aquaculture development activities and approaches of KRIBP(E).

Due to KRIBP(E) initiatives in fish culture which started last year, the situation has little changed a little. The farmers have become more aware of fish culture activities and their possible implications on livelihood. The project has undertaken fish culture activities and nursery rearing of spawn in one or two ponds in each cluster with major supply of inputs from the project while farmers are also making some share in it. The pond management activity is executed through the interested farmers' group already selected by the project. The management practices involve high stocking densities of advance fingerlings with all sorts of care like water quality management by application of lime, disease preventive measures through the application of lime, KMNO4 and turmeric powder, organic and inorganic fertiliser manuring constituting cowdung, single super phosphate and urea application and daily feeding practices involving rice bran, mustard oil cake with intermittent mixing of soybean meal and vitamin mixture. Though the management practices do not seem to commensurate with high stocking densities. Lack of full time technical expertise might be the cause of this. Hence, the harvest of fish is expected to be well below semi- intensive levels (around 2 tons/ha) even though the stocking has been made on intensive level (around 10000 fingerlings/ha.). Actual performance remains to be assessed.

Note: The present aquaculture development activities are focused on the extension of standard aquaculture practices for well resources systems, and is focused primarily on the development of perennial water bodies. While there may be a role for such aquaculture, the sustainability of higher input output systems, both in terms of investment and inputs required, and the potential impact on the other resource users, must be a subject for close monitoring and evaluation activities, and will form a part of the aquaculture research agenda. Of primary interest to the research project is the potential for the development of aquaculture associated with the other water resources identified, and for the development of low input low output systems which might offer better potential for sustained production by resource poor producers.

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3.4 Other local income generating activities

Livelihood generation from agricultural activities is insufficient to meet the whole year requirement of the rural people and they have to resort to other local income generation activities, illustrated in Table 16. Among the range of local income generation activities some are common, prevalent in all the areas while the some others may be more dominant or prevalent in a particular area depending upon the availability of natural resources, type of development activities going on, caste and economic structure and preference of the people.

Preparation of bamboo crafts, making sal leaf plates, selling firewood collected from forest, preparing liquor from mahua and selling of local goods such as sal seeds, sal leaves, khendu leaf, khendu fruit and mahua seeds are the major income generating activities of the rural people. While other income generation activities like opening tea shops, making ready made garments, working as black smith, shoe and chappal making, rope making and playing drum in the marriage and other local ceremonies are of common occurrence, in the most of the areas but the percentage of people involved in activities is quite low. The occurrence of brick kiln and pottery making depends upon available soil texture.

Coming up to the gender division in income generation activities females work in brick kiln in equal proportion to males while the preparation of ready made garments is mostly done by females. Contribution of women in making bamboo crafts, pottery and selling of local goods is almost equal to males. Making sal leaf plates, selling firewood collected from forest and preparing liquor from mahua and rice are totally done by females. The rest of the activities are performed by males.

Table-16 Local income generating activities and gender divisions in project clusters

Income generating activities	Gender structure	
	Male (%)	Female(%)
1. Brick kiln	50	50
2. black smith	100	-
3. Tea shops	100	-
4. Shoe and chappal making	100	-
5. Ready made garments	25	75
6. Preparation of bamboo craft	50	50
7. Playing drum in marriage and other ceremonies	100	-
8. Rope making	100	-
9. making sal-leaf plates	-	100
10. Selling firewood collected from forest	-	100
11. Pottery	50	50
12. Preparing liquor from mahua and rice	-	100
13. Purchasing local goods such as sal seeds sal leaves, khendu leaf, khendu fruit, mahua seed and flowers and selling in market	50	50

3.5 Off farm income generating activities of migratory nature

Generally villagers migrate because of less opportunity for income generation prevailing locally. The percentage of migration in Purulia and Midnapur district are illustrated in Table 17.

The range of migratory income generating activities are brick making, building construction, road construction, earth work, transportation of material and as labour in agriculture field (Table 18).

The migration for livelihood generation starts just after the final harvest of paddy i.e. in November and continues up to May by the time which the preparation for the cultivation of next batch of paddy starts. People return in the mid of the January for a short period for a festival and return back to finally come in May.

Proportions of households involved in migratory and waged labour for all project villages in Purulia and Midnapur are shown in Table 19.

Table-17 Level of migration from project clusters

District	HH migrating(%)	Male (%)	Female(%)
Purulia	23.9	16.2	9.7
Midnapur	42.3	27.1	17.2

Table-18 Migratory labour activities and seasonality

Income generating activities	Seasonality	Gender structure (%)		Income
		Male	Female	
1. Brick making	Nov. to May	50	50	Rs 40 /day + one meal
2. Building construction and earth work	”	50	50	Rs 44 /day
3. Transportation of material	”	100	-	Rs 30-35 /day
4. As labour in agriculture field	”	50	50	Rs 30-35 /day no meal

Table-19 Migratory and wage labouring in different villages of Purulia and Midnapur districts

District	Cluster	Village	% of H.H migrating	% of HH working as wage labour
Purulia	Jabarrah	Jabarrah	0.9	56.31
		Natundih	-	47.83
		Mudidih	26.67	93.33
		Dumardih	-	
	Kaipara	Kaipara	52.04	53.57
		Bamu	35.71	67.86
		Loadi	41.18	11.76
		Brajrajpur	60	66.15
		Khawasdih	55.26	47.37
	J/Kashidih	Jugidih	3.28	59.02
		Kashidih	31.25	45.5
		Cholagora	-	62.86
		Ratnadih	45.45	-
	Senabona	Senabona	4.02	45.38
		Kultanr	26.49	28.48
		Barpara	-	65.22
Midnapur	Pasro	Pasro	25	-
		Kazla	-	-
		Ghotidoba		
		Kusumdanga	38.46	92.31
		Guripukur	11.54	65.38
		Brindavanpur	39.02	-
	Medni	Medni	26.26	65.66
		Parulia	40.74	66.67
		Birgeria	-	80.65
		Khanripahari	60.87	-
		Kharikabad		
		Kisda	34.78	62.32
	Beldangri	Beldangri	26	-
		Ranipal	-	-
		Bahirgram	6.93	-
	Dhansole	Dhansole	35.11	57.45
		Pandisole	77.45	97.18
		Purnapani	61.33	92
		Chitamatia	65.22	-

Source : Village profile

4. IMPLICATIONS FOR AQUACULTURE DEVELOPMENT

The broad features of farming systems and the livelihoods of people living in the project clusters of Purulia and Midnapur districts described above will have a range of very significant implications for the potential for aquaculture development. Key issues in relation to the resource base and potential for development, investigated in more detail in the second report, are as follows:

- The short duration of rain with intermittent dry spells creates high dependence of the rural people on the available water resources for crop irrigation, which limits aquaculture development. Simultaneously, the high dependence on these waterbodies for domestic and animal use creates conflict with the aquaculture activity.
- A great proportion of land is upland which offers little scope for aquaculture activities due to high water run off.
- The soil is nutrient poor and having high percolation rates which considerably reduces the productivity of overlying water.
- The abundance of seasonal waterbodies and high dependence on these for different uses with multiplicity of users of diverse interests limits aquaculture development.
- As the project cluster area is characterised by the people who are not able to procure sufficient food from 7cultivation as required for the whole year, they resort to other income generating activities which fetches them immediate cash, which goes against the ethics of aquaculture.
- People of the area are mostly deficit and have little to mobilise their resources for aquaculture development.
- Paddy is the subsistence crop for the people of the area, hence paddy growing is the first priority of the people while livestock rearing is the second priority as it is used for agricultural operation and for generating immediate cash. Aquaculture development activities is of lower priority to them.
- The low investment aquaculture with limited labour requirement does not seem to cause conflict with agriculture and other income generating activities in terms of labour requirement.
- There seems to be the possibility of augmenting fish production by effectively utilising the low lying water logged paddy field for the purpose. But it needs the development of suitable technology.

These features of rainfed farming systems make them quite different from regions where most of the present Indian aquaculture is practised, and where most of the aquaculture technology development has occurred to date. As this is a resource poor and risk prone environment there is a need to take local capacity, opportunities and constraints into account to ensure that any aquaculture development activity is integrated into the other elements of the systems so that this technology may become an additional valuable source of income and food for the rural people. The range of linkages which must be considered in formulating an aquaculture research and development interventions are illustrated in Figure 2.

The objective of this report has been to present an overview of the farming system, people and environment of the project clusters. This study provides the basis for a more detailed analysis of the potential resource base available for aquaculture presented in the second report.

Figure 2. System linkages and features to be considered in the planning of aquaculture research and development interventions.