REQUEST FOR PROJECT/PROGRAMME FUNDING FROM THE ADAPTATION FUND

ENHANCING ADAPTIVE CAPACITY AND INCREASING RESILIENCE OF SMALL AND MARGINAL FARMERS IN PURULIA AND BANKURA DISTRICTS OF WEST BENGAL

By

Development Research Communication and Services Centre (DRCSC)

Through

NATIONAL BANK FOR AGRICULTURE AND RURAL DEVELOPMENT (NABARD)

REQUEST FOR PROJECT/PROGRAMME FUNDING FROM THE ADAPTATION FUND

The annexed form should be completed and transmitted to the Adaptation Fund Board Secretariat by email or fax.

Please type in the responses using the template provided. The instructions attached to the form provide guidance to filling out the template.

Please note that a project/programme must be fully prepared (i.e., fully appraised for feasibility) when the request is submitted. The final project/programme document resulting from the appraisal process should be attached to this request for funding.

Complete documentation should be sent to:

The Adaptation Fund Board Secretariat
1818 H Street NW
MSN P4-400
Washington, D.C., 20433
U.S.A
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Email: afbsec@adaptation-fund.org

ADAPTATION FUND

PROJECT/PROGRAMME PROPOSAL TO THE ADAPTATION FUND

PART I: PROJECT/PROGRAMME INFORMATION

Project/Programme Category:	REGULAR PROJECT
Country/ies:	INDIA
Title of Project/Programme:	ENHANCING ADAPTIVE CAPACITY AND INCREASING RESILIENCE OF SMALL AND MARGINAL FARMERS IN PURULIA AND BANKURA DISTRICTS OF WEST BENGAL
Type of Implementing Entity:	NIE
Implementing Entity:	National Bank for Agriculture and Rural Development (NABARD)
Executing Entity/ies:	Development Research Communication and Services Centre (DRCSC)
Amount of Financing Requested:	**2,510,854** (in U.S Dollars Equivalent)

Project / Programme Background and Context:

Provide brief information on the problem the proposed project/programme is aiming to solve. Outline the economic social, development and environmental context in which the project would operate.

1. Climate Vulnerability Profile of India

A vast country with multiple agro-ecological and meteorological zones, India supports one sixth of the world's population on only 2% of its landmass. Nearly 59% of India's land area is prone to risks of earthquakes, 12% is prone to floods, about 8% is prone to cyclones and is exposed to tsunamis and storm surges, 2% of land is landslide prone and 68% of India's arable land is affected by droughts. Thus the entire country is significantly impacted by at least one hazard and related mortality. Intensification of these risks or slower onset disasters like land degradation, drought and floods, are predictable impacts of climate change and climate instability in future. Lack of access to technological and financial resources along with high dependence on climate sensitive livelihood sectors like agriculture, fisheries and forestry, makes India highly vulnerable to climate change.

Some current trends and projection of climatic factors[1]

Surface Temperature: At the national level, increase of 0.4^{o} centigrade has been observed in surface air temperature over the last 100 years.

[1]Source of data –National Action Plan on Climate Change (NAPCC)

Rainfall: Long-term rainfall does not show a very significant trend. Marginal increase in monsoon rainfall is expected along the west coast, northern Andhra Pradesh and north-western India (+10~12%). A decreasing trend is observed in eastern and north-eastern India, part of Gujarat and Kerala (-6~8%).
Extreme Weather: Over the last 130 years no large-scale droughts and floods have been recorded. However, there has been an increasing trend in severe storm incidents along the coast at the rate of 0.011 events per year.
Sea level rise: North Indian Ocean is showing a sea level rise of 1.06~1.75 mm per year. Sea level fluctuations have been estimated at 21 °31' 00"N, 88°03' 00"E during 1985-2000, which shows that the relative mean sea level of the Bay of Bengal is rising @ 3.14 mm/year.

Indian Scientists at the Indian Institute for Technology (IIT) Delhi have indicated that that the severity of floods under the projected climate change is likely to intensify (Gosain et al, 2006). The projections by the National Institute of Oceanography (NIO) showed an increased occurrence of cyclones in the Bay of Bengal, particularly in the post-monsoon period, along with increased maximum wind speeds associated with cyclones and a greater number of high surges under climate change (DEFRA/GoI, 2005). Along with floods, India will also suffer from acute water shortage.

Amongst all the disasters mentioned above, though the number of deaths directly attributable to drought during 1963-1992 is quite less (3%) compared to that caused by floods (26%) and tropical cyclones (19%), yet the number of persons affected by drought (33%) is the highest amongst all the natural disasters and the significant damage caused by drought is 22% which is comparable to the corresponding values of floods and tropical cyclones.

Three fourth of India's annual rainfall comes from the summer monsoons that occur between June and September. Major staple crops like rice, maize and some millet are rain-fed and sown during this season. The agricultural sector lies at the core of Indian society employing 60% of the population and contributing approximately one fifth of the country's GDP. Thus the monsoons are one of the most important factors for the country’s growth. The monsoons and other climatic factors also control the well-being and food/nutrition security of the majority of the Indian populace. 43% of the rural population is landless or near landless (<0.2 ha.) and is dependent on seasonal rain-fed farming or collection of small forest produce or work as wage labour. Monsoons are also responsible for recharge of ground water and surface water systems. A water famine is looming on the horizon because of erratic rainfall, longer dry spells between rainy days, increases in temperature, consecutive droughts and over exploitation of ground water. Water levels in North India fell by 4 centimeters per year, between August 2002 and August 2008. Practices like shifting from growing water prudent millets like sorghum which needs 300 mm of water to water intensive crops like sugarcane which needs 2,500 mm of water, contributed to this situation. More than 109 cubic km of ground water disappeared from aquifers during this time.

Red and Lateritic Soil zone of India

Water scarcity, coupled with poor soil quality increases the vulnerability of the area dominated by **Red and Lateritic soil**.

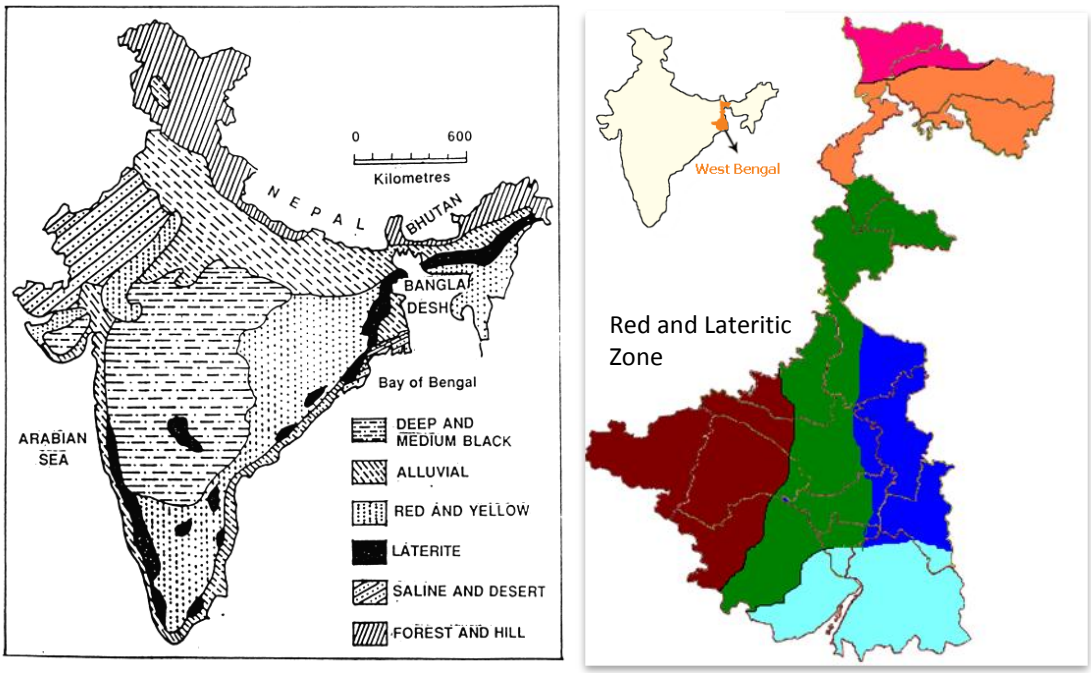


Figure 1: The lateritic zone in India and West Bengal

Red soils are generally red or reddish brown in colour. The colour is due to the coatings of Ferric oxide on the soil particles. Red soil ranges in depth from shallow to very deep, is thin in composition, gravelly in the uplands and deep to very deep in the plains and valleys. The pH varies from generally neutral to slightly alkaline (pH 6.3 to 8.0). Down the slope the pH changes from acidic to neutral (or alkaline). The soil is severely deficient in organic matter, nitrogen, phosphorus and lime but is well supplied with potassium. In some cases, deficiency of calcium and magnesium is also reported.

On the other hand, lateritic soils are deep reddish in colour due to the presence of hematite. These soils are deeply weathered and may extend up to several meters deep. With depth, there is a decreasing intensity of red colour and clay content. The soils are generally well drained and porous. Laterization is intensified with the increase in rainfall. The soils are generally acidic in nature with a pH of 5.5 to 6.5. All lateritic soils are very poor in lime and magnesium and are deficient in nitrogen. Occasionally P_2O_5 may be high, probably being present in the form of iron phosphate, but K_2O is deficient.

Table 1: Red and Lateritic soil areas in India

State names	Area (km^2)	Projected soil zone population
Tamilnadu, Madhya Pradesh, West Bengal, Andhra Pradesh, Kerala, Assam, East Rajasthan, South Karnataka	590,000	416 million (approx.)

Red soil is generally poor in its water holding capacity, which does not permit post rainy season cropping. Such areas face severe problems of soil erosion and are unfit for raising crops. The lateritic soils are also poor in terms of deficiency in phosphate, potassium, calcium, magnesium, zinc and boron content. This pre-condition clubbed with undulating terrain and erratic rainfall has made the target zone for this proposed project more vulnerable. The red/laterite soil zone of India supports some of the worst

rural poverty in the nation. It is also home to approximately 416 million people out of which 53.7 million belong to scheduled Tribes (STs), and Scheduled Castes (SCs) 12.4 million.

A large part of the country's agricultural land has been brought under irrigation but the limited extent of lands owned by the SCs remain almost wholly un-irrigated, forcing even small farmers among the SCs to depend on agricultural wage-labour.

STs, proud masters of their traditional territory, are being progressively deprived of their lands and have, in many cases, been reduced to minorities in their own home-lands. The lands that still remain with them are poorly developed, are rarely irrigated and are unintegrated or poorly integrated with the market, leaving the field open to exploiters and middlemen from outside. Irrigation projects undertaken in the tribal areas, submerged tribal lands, thereby scattering their settlements. As a result an increasing number of STs are forced into agricultural wage labour and the proportion of STs among agricultural wage labourer has increased in recent decades. Traditional symbiotic relationship between tribes and forests has been unilaterally abrogated and abridged.

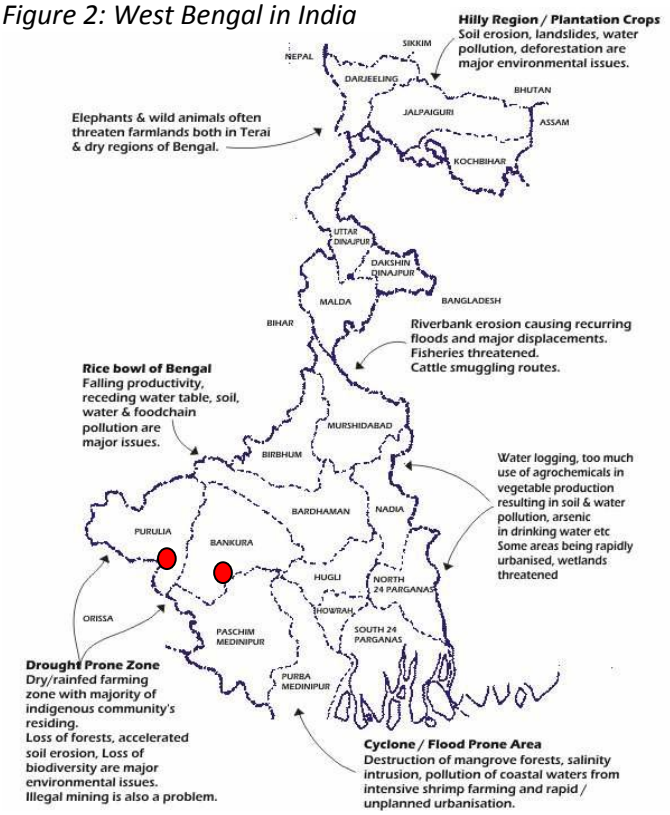
2. West Bengal, the target state profile and position of the districts covered by the project

West Bengal is an eastern state of India. The Net State Domestic Product (NSDP) of West Bengal in respect of climate dependent sectors (agriculture including animal husbandry and horticulture, forestry and fisheries) for the year 2012-13 was 17.4% of the total NSDP at constant 2004-05 prices[2]. Further, 70% of its total population, mainly the rural population, was dependent on these climate sensitive sectors for their livelihood. Of the total rural workers, 19.5% and 19.3% respectively were cultivators and agricultural laborers. According to the Planning Commission, 23% of the total rural population lived below the poverty line in 2011-12 in the state of West Bengal.

Covering only 2.7% of the Indian landmass, West Bengal is home to 12.3% of the nation's flora and fauna. The state has more than 7,000 species of described flora including bacteria, algae, fungi, bryophytes, pteridophytes and angiosperms and more than 10,000 species of described fauna.

[2] Source: Bureau of Applied Economics and Statistics, Govt. of West Bengal

Figure 2: West Bengal in India



West Bengal is also a multi-hazard state with the following agro-ecological zones (Figure 3 left):

- Hill region
- Old Alluvial Zone
- New Alluvial Zone
- Red and Lateritic zone
- Saline Coastal region

Multi-hazard events and the subsequent loss of production and income due to climatic hazards demonstrate that almost the entire state is significantly impacted by at least one hazard and its related vulnerability.

Figure 3: Hazards in different zones of West Bengal

Table 2: Red and Lateritic areas in West Bengal

District names	District Population[3]	Area of the soil zone (km^2)	Estimated soil zone population	Percentage of Households living in poverty[4]	Percentage of Tribal Households[5]
Purulia	2,927,965	6,259	2,898,685	43.6	18.3
Bankura	3,596,292	4,697	1,134,264	42.5	10.4
Birbhum	3,502,387	4,545	2,311,575	44.0	6.7
Paschim Medinipur	5,943,300	7,520	4,280,424	32.9	8.3
Bardhaman	7,723,663	1,821	471,143	26.2	6.4
Total	**23,693,607**	**24,842**	**11,096,091**		
West Bengal	91,347,736	-	-	36.4	5.5

Source: DRCSC estimates compiled from Census data (2011), maps, and state data.

The Red and Lateritic soil zones cover major part of West Bengal and a large proportion of the population lives in this zone (Table 2). The percentage of households living below the poverty line is higher than the state average of 36.4%. The project aims to focus on the **sub-humid west climatic region with Red and Lateritic soil zone in the districts of Bankura and Purulia** to strengthen the

[3]Census of India, 2011

[4]According to a survey done by Govt. of India in 2002. No other survey was done after that and Govt. of India is still undecided about the criteria of Poverty Line.

[5] Census of India 2001

capacity of small and marginal farmers to build resilient livelihood models in line with SAPCC of West Bengal.

Development of successful models can lead to scaling up in similar climatic regions of West Bengal and throughout the other seven states with similar soil conditions in India (Table 1).

3 Characteristics of targeted districts

The chosen areas in Bankura and Purulia share the following characteristics:

- Rainfall is both unpredictable and poorly distributed;
- Rate of soil erosion, deforestation, distress migration, under nutrition and illiteracy is quite high, while farm and forest productivity is low.
- The districts are home for about 2.3 million SC/ST population.

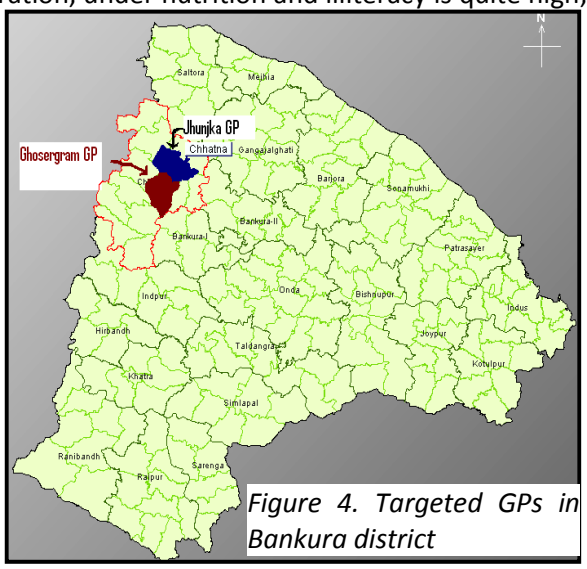


Figure 4. Targeted GPs in Bankura district

The causes of these problems are multidimensional. Undulating terrain and shallow topsoil, high temperature & consequent evaporation loss along with long dry season and periodic dry spells even within the rainy season are part of the problem. In addition to that overgrazing, cultivation of water/chemical intensive crops & adoption of inappropriate cropping/farming system, inadequate investment in developing basic infrastructure as well as lack of community participation in defining developmental priorities are also contributing factors.

Natural forests/water bodies, as a source of fodder-firewood and uncultivated food have decreased – partly due to mining, dams and development projects and partly due to replacement by short or long term mono-species plantations and over harvesting. This combined with restrictions on collection and use of NTFPs has affected the living condition of the landless poor. Rope making, soap making, basket weaving, palm sugar making, mat making and hundreds of other small crafts based on agro waste or forest produces have gradually disappeared as sources of livelihood due to either negligence or lack of support, exploitative monopoly, lack of appropriate technology or a combination of all these.

District profile of Bankura (Physical, Climatic[6] and Demography)

Bankura is situated between 22° 38’ and 23° 38’ north latitude and between 86° 36’ and 87° 46’ east longitude. It has an area of 6,788 km² which is the connecting link between the plains of Bengal on the east and the Chotanagpur plateau to the west. The areas to the east and north-east are low-lying alluvial plains and to the west the surface gradually rises, giving way to undulating topography, interspersed with rocky hillocks. The area consists of two different tracts. The western part of the district has poor, ferruginous soil and hard beds of laterite with scrub jungles and sal (*Shorea robusta*) woods. However,

[6] Prepared as primary research by Dr. Swadesh Mishra, Ex-Agricultural Meteorologist & Rainfall Registration Authority of West Bengal, based on data from Agricultural Meteorology Division, Directorate of Agriculture, Govt. of West Bengal and India Meteorological Department, Govt. of India. With reference from District Statistical Handbook (2005). Bankura and Purulia, Bureau of Applied Economics and Statistics, Govt. of West Bengal.

there is no marked ridge of hills. The rolling downs of the central part gradually merge with the alluvial plains.

Hills and Rivers: The hills of the district consist of outliers of the Chotanagpur plateau and only Biharinath and Susunia are of any great height. Rivers of the area flow from the north-east to the south-west in roughly parallel courses. They are mostly hill streams, originating from the hills in the west. The rivers come down in floods after heavy rains and subside as rapidly as they rise. In summer, their sand beds are almost always dry. Damodar, Sali, Dwarakeswar, Shilabati and Kangsabati are the most important rivers flowing through the district.

Geology: This region is primarily undulating with mounds and valleys and exhibits different grades of the laterisation process in its soil formation. Soils are well drained, susceptible to erosion due to rapid external drainage or run off. Soil reaction ranges from acidic in ridges and near neutral in valleys. Organic carbon content, phosphate and potassium are low. Ground water is not easily and economically accessible. Prevalence of moisture stress on standing monsoon crop in late monsoon period is very common.

Agriculture: Net cultivable area of the district is 430,000 ha and number of cultivators is 447,000. Availability of net sown area per cultivator is approximately 1.0 ha. Due to continuous division and fragmentation of cultivated land, agriculture is becoming less remunerative. About 46% of the net cropped area is under irrigation. The gross cropped area is about 600,000 ha and cropping intensity is 147%. Rice, wheat, oil seeds and vegetables are the principal crops occupying on most of the gross cropped area. Most of the pre-monsoon and monsoon rice are grown in rain-fed condition. Wheat is the second most important cereal crop in the district and it is cultivated only in areas having irrigation facilities. Rape & mustard, and sesame are two important oil seeds grown in this district. Sesame is cultivated in all 3 seasons while rape & mustard is cultivated only in winter. Agriculture is largely dependent on monsoonal rainfall. Drought constitutes a major hazard in the district. Intermittent gaps in precipitation and moisture stress during the monsoon, gives rise to serious setbacks in production.

Weather and Climate[7]: Weather and climate of the district differs slightly between the upland section of the west and north-west and the plains section of the east and south east. However, in general the climate of the district may be called 'tropical sub humid continental'.

- **Rainfall:** It is paradoxical that though Bankura lies in sub-humid zone, it receives total Annual Rainfall of about 1,400 mm[8]. Average annual rainfall of the district is 1,385.9 mm. The amount varies from 1,310.8 mm at Susunia (Chhatna block) to 1575.3 mm at Taldangra which comes between 68.9 and 79.1 rainy days.
- **Temperature**: May is the hottest month when the average daily maximum temperature lies close to 40^0 C and January is the coldest month when average daily minimum temperature remains 11.5^0 C. The difference between the average temperature of the warmest and coldest months is 13^0 C.
- **Relative humidity**: Average morning (at local mean time 07-00 hrs.) and noon (at 14-00 hrs.) humidity varies from 82 – 91 and 49 – 57 per cent respectively.
- **Wind direction and speed**: Due to interior location, average wind speed at Bankura is fairly low.

[7] Detailed information in Annexure 1

[8] Indian Meteorological Department

- **Period of Bright Sunshine Hours**: Bankura records fairly large period of bright sunshine hours per day.
- **Amount of dew**: Dew plays a significant role as a secondary source of moisture during non-rainy period especially in such a dry region. The total amount varies from 41.6 mm to 131.5 mm within the district.
- **Water deficiency and surplus**: An analysis of monthly values of precipitation (P), potential evaporation (PE) of different stations of Bankura shows that there is a period of water deficit lasting for about 8 months and the amount of deficit at different stations varies from 591.7 mm to 873.4 mm. The amount of water surplus is quite encouraging. It varies from 592.3 mm to 808.6 mm although it lasts for 4 months only (June – September).
- **Seasons**
    1. **Cold weather season (December – February)**: Clear sky, bright sunshine, low temperature & humidity and gentle northwesterly or westerly wind are the normal weather features of the season. This is the driest period of the year contributing only 3.1 to 4.4 per cent of the average annual rainfall which varies from 40.8 mm to 69.9 mm in different parts of the district. Rainfall of the season mainly comes in association with the passage of western disturbances and suffers from high variability. The C.V. of rainfall of the season varies between 68 and 81 per cent. Moderate cold wave condition sometimes occurs in the rear of the western disturbances when the minimum temperature drops 6^0 C or more below its normal. The lowest temperature value reached below 5^0 C. January is the coldest month of the season when the mean daily temperature varies between 17.8^0 C and 18.1^0 C and average daily minimum temperature lies close to 11^0 C. Fog sometimes occur in the western disturbances. This season registers very high diurnal range of temperature which varies from 13^0 to 14^0 C.

    2. **Hot weather season (March – May)**: March to May is a period of rapid rise of temperature. Average daily temperature rises from 26^0 C in March to 32^0 C in May. March registers the largest diurnal range of temperature which varies between 14^0 C and 15^0 C and slowly decreases along with the progress of the season. Heat wave condition frequently occurs when the maximum temperature rises even above 47^0 C. Relative humidity of air steadily declines in consequence of rapid rise of temperature and onset of dry continental westerly or northwesterly wind especially during the daylight hours. Southeasterly wind during the evening and night sometimes gives relief after the mid-day heat. During noon in summer, flow of hot dry westerly or northwesterly winds brings down the relative humidity below 5%. Pre-monsoon thunderstorms during the afternoon and evening sometimes bring relief after the mid-day heat. This season contributes 9.0 to 13.8 per cent of the average annual rainfall which varies from 119.8 mm to 191 mm in 8 to 12 rainy days in different parts of the district. The amount of rainfall of the season suffers from the C.V. ranging between 41 and 44 per cent.

    3. **South west monsoon season (June – September)**: South west monsoon is the period of general rain contributing 75 to 80 per cent of the average annual rainfall. The amount varies from 1,014.6 mm to 1,224.6 mm in different parts of the district which comes between 50.2 and 57.9 rainy days. Monsoonal rainfall is more dependable than the rainfall of other seasons and the covariance varies from 17 to 23 per cent in different parts of the district. Monsoon rain usually starts by the end of the second week of June and continues up to the first week of October and characterized by alternately wet and dry spells lasting for 4-5 days to more than 10-15 days. Dry spells are usually longer than the wet spells. Maximum

temperature abruptly drops due to the appearance of monsoon cloud and onset of rain. Minimum temperature does not fall much resulting in a much shorter diurnal range. Both the maximum and diurnal range of temperature suddenly increases during the period of breaks. July and August are the peak monsoon months. From September the amount as well as incidences of rain gradually decreases along with the weakening of monsoon. The region occasionally receives heavy to very heavy rainfall persisting for 2 to 3 days in association with the passage of slow moving low pressure systems or depressions.

4. **Retreating monsoon (October – November)**: Retreating monsoon is the period of transition between the outgoing monsoon and advancing winter. The weather rapidly changes along with the progress of the season. South west monsoon usually withdraws by the second week of October. After its withdrawal, sky becomes gradually clear resulting in steady increase in the period of bright sunshine hours, amount of rainfall decreases and the incidences become few and far between. Minimum temperature begins to drop faster than the maximum temperature causing a gradual increase in the diurnal range. Deposition of dew increases. The season accounts for 6 to 9 per cent of the average annual rainfall amounting from 86.1 mm to 120.4 mm within 4.7 and 7.1 rainy days most of which comes within the first half of October. From October to November the change is more rapid. Amount of rainfall remarkably reduces and the temperature fall becomes more rapid. Cyclonic storms and depressions in the Bay of Bengal sometimes bring spells of cloudy weather, rain and gusty wind during the season.

Reasons for selecting **Chhatna** block for interventions through the project are[9]

- The trend of rainfall over fifteen year is declining.
- The trend in maximum and minimum temperature for the district of Bankura is on the rise.
- The dryness, lack of water, and rainfall aberrations are highest[10]
- Annual rate of water-level fluctuation is maximum in Chhatna, Ranibandh, Raipur, Bishnupur, Joypur, Indus and Kotulpur (4 m to 6 m)
- The dryness, lack of water, and rainfall aberrations are highest[11] (ref. climate data above)
- At Chhatna block, in the long dry season (December -- June) decrease in water level varies between 2 m to 3 m.
- Chhatna has the highest undulation as it has Sushunia hill which is the highest point of Bankura This falls under watershed CD-46, the most degraded one in the district
- Chhatna has the highest scheduled tribes (ST) population in the Bankura Sadar subdivision (Scheduled castes 27.4%, ST 21.8%)[12]
- People below poverty line make up 49.9% of the population, which is the second highest in the district

[9] All data in this paragraph is taken from District Human Development Index 2007 by UNDP
[10] Detailed information in Annexure 1
[11] Detailed information in Annexure 1
[12] The main scheduled tribes residing in the area are santals, oraon, munda

District profile of Purulia (Physical, Climatic[13] and Demography)

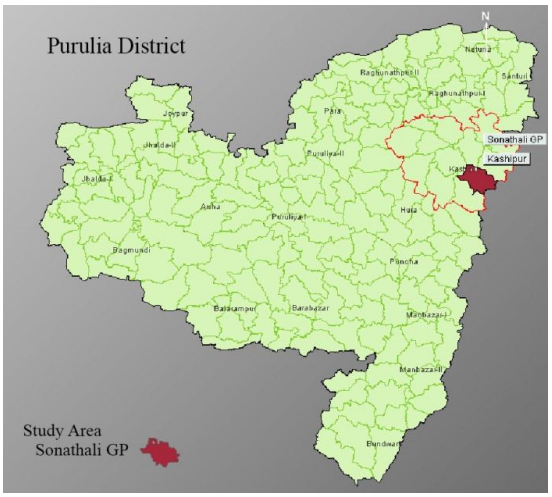


Figure 5. Targeted GPs in Purulia district

This district is between 22°42'35" and 23°42'0" north latitude and 85°49'25" and 86°54'37" east longitude. Out of the 2,468 rural inhabited mouzas[14] declared as backward.

Drainage[15]: The main rivers passing through or bordering the district are Kangsabati, Kumari, Darakeswar, Subarnarekha and Damodar. Soil erosion is the most prominent feature of this district resulting in huge deposition of fertile soil in the valley region. As a result, Purulia District is facing crisis due to depletion of fertile top soil and water loss.

Forest: As per Satellite Imagery data 52.5% of total area used for agriculture. 29.7% of the area is under forest coverage and 10.1% is identified as wasteland (14.1% as per Landsat Thematic Mapper/IRS LISS II/III data). The natural forests of the district are mostly of a mixed nature.

Ground Water: The district is a 'White Zone' in respect of ground water status (i.e. 60% of available ground annual recharge is in use). In general, during the rainy season the water table in the wells rises up to 1.00 to 3.50 m below ground level (bgl) till the end of October and gradually falls down to maximum of 6 to 14 m bgl during April-May.

Agriculture: The percentage of net-cropped area to cultivable area is 73.4%. Only 16.53% of the net-cropped area is under multi crop cultivation. 90% of the net-cropped area is under Aman paddy (rainfed) cultivation. Cropping Intensity is 117%. About 60% of the total cultivated land is upland. On the other hand out of the total operational holding, 72.68% belongs to small and marginal farmers (92% of the total number of holdings) having scattered and fragmented small holdings.

Irrigation: As per the Minor Irrigation Census 2001, 17.09% (considering gross cropped area as 391,390 hectare) of the gross cropped area is under irrigation. Contribution of surface flow irrigation source is 88.8%. Out of the total gross irrigated area 74.86% receives irrigation in Monsoon and 21.19% in winter. As per Minor Irrigation Census 2001, total number of Tanks in this district is 26491. Out of which, number of tanks used for irrigation is 18,426 and that for non-irrigation purposes is 8,065. Out of the 32 Medium Irrigation Schemes planned for the district, 23 are completed and 9 are in various stages of execution. There are 135 River Lift Irrigation (RLI) schemes with effective command area. The total irrigation potential created is for 13,500 acres. Irrigation Potential created by the 66 surface flow Minor Irrigation Schemes is 8,193 ha. out of which 6498 ha is in monsoon and 1595 ha in winter-summer. Number of Dug-wells constructed so far is 4218.

[13] Prepared as primary research by Dr. Swadesh Mishra.

[14] A mouza corresponds to a specific land area comprising of settlements in more than one contiguous villages, this is used in land documents for convenience of locating the area in government records

[15] Data of drainage and resources are from www.purulia.zp.in, www.purulia.gov.in

***Weather and Climate**:* Weather and climate of the district is mainly influenced by its continental location, undulating terrain with residual hills, porous soil with very poor moisture retentive capacity and absence of large water bodies or perennial rivers. In a general term the climate of the district may be called 'tropical sub-humid continental with prolonged dry season' (S. Mishra, 1991). The specifications are following.

- **Rainfall:** Purulia is known as the driest district in the state. Pattern of distribution of rainfall in the district is guided by its location with respect to the moisture laden monsoon wind coming from the south and south east and local relief. Average annual rainfall of the district is 1321.9 mm which varies from 1218.8 mm at Burrabazar in the south western part to 1426.6 mm at Bagmundi on the foot of Ajodhya Hill which comes between 66.1 and 74.1 rainy days. Co-efficient of variability of annual rainfall in the district is around 20%.
- **Temperature**: Purulia is one of the warmer districts of the state with high average daily temperature and very high diurnal and annual range of temperature. May is the hottest month when the average daily maximum temperature lies close to 40^0 C and January is the coldest month when average daily minimum temperature lies close to 12^0 C. The difference between the average temperature of the warmest and coldest months is as high as 14.2^0 C.
- **Relative humidity:** Since Purulia is the driest district of the state, the average relative humidity is comparatively low. Average daily morning (at local mean time 07-00 hrs.) and noon (at 14-00 hrs.) relative humidity values of are 79 and 50 respectively.
- **Wind direction and speed:** In Purulia, wind direction is mainly controlled by two principal seasonal pressure pattern of this subcontinent. Southeasterly wind is dominant from May to October, while during the rest part of the year northwesterly and westerly wind becomes important. Winds from other directions are relatively less frequent. Due to interior location, wind speed is low (4.7 km. per hour) which varies from 2.8 in December to 6.7 in May and June.
- **Average Period of Bright Sunshine Hours per day**: Since it is the driest district, the region registers the highest amount of bright sunshine hours per day. The average annual value is as high as 7.4 hrs per day.
- **Amount of dew:** Although not very large in amount but dew plays a significant role as a secondary source of moisture during non-rainy periods. Dew deposition starts from the end of the monsoon season and ceases in April with highest concentration between October and January. Nearly 40 mm of water is received in Purulia in the form of dew.
- **Water deficiency and surplus:** An analysis of monthly values of precipitation (P), potential evaporation (PE) of Purulia shows that there is a period of water deficit lasting for about 8 months and the amount of deficit is 700.2 mm. Although amount of water surplus lasts for 4 months only (June – September), its quantity is substantial -- 617.7 mm.
- **Seasons**
    1. **Cold weather season (December – February)**: Low temperature and humidity, clear sky, bright sunshine, and gentle northwesterly or westerly wind is the normal feature of weather of the season. This is the driest period of the year contributing only 2.9 to 3.8% of the average annual rainfall which varies from 38.8 mm to 53.6 mm in different parts of the district. Rainfall of the season is associated with the passage of western disturbances and the amount is highly variable from one year to the other. Co-efficient of variability of rainfall of the season is the highest and is around 90%. Moderate cold wave condition sometimes occur in the rear of the western disturbances when the minimum temperature drops suddenly 6^0 C or more below normal reaching the lowest value even up to 5^0 C. Average daily temperature of the season varies from 18.9^0 C in January to 21.8^0 C in February while the diurnal range varies from 12.7^0 C to 13.3^0 C.

2. **Hot weather season (March – May)**: March to May is usually a period of rapid rise of temperature and fall of barometric pressure. Average daily temperature rises from 26.9^0 C in March to 33.1^0 C in May with high diurnal range varying from 13.1^0 C to 14.2^0 C. Heat wave condition frequently occurs when the maximum temperature reaches 47^0 C or beyond. Humidity of the air steadily declines in consequence of the rapid rise of temperature and onset of dry westerly or northwesterly continental wind. During summer noon's flow of hot dry westerly and northwesterly wind bring the relative humidity below 5%. This phenomenon is known as 'loo' and is frequent during summer. Pre-monsoon thunderstorms during the afternoon or evening sometimes bring relief after mid-day heat. This season contributes 7.5% to 15% of the total annual rainfall which varies from 95.3 mm to 120.6 mm in 8 to 11 rainy days in different parts of the district. The amount of rainfall of the season, however, suffers from the co-efficient of variability ranging between 37% and 55%.
3. **South west monsoon season (June – September)**: This is the principal rainy season of the year contributing 79% to 83% of the total annual rainfall. The amount of average rainfall of the season varies from 970 mm to 1178 mm in different parts of the district which falls between 50 and 56 rainy days. The amount of monsoon rainfall is more dependable and suffers from low variability ranging between 21% and 25%. Monsoon rain usually starts by the end of the second week of June and continues up to the first week of October and characterized by alternatively wet and dry spells lasting for 4 or 5 days to more than 10 to 15 days. Maximum temperature suddenly drops along with the onset of monsoon rain. July and August are the rainiest months. From September rainfall gradually diminishes along with the weakening of monsoon. In September the region occasionally receives heavy to very heavy rainfall persisting for a couple days in association with the passage of slow moving low pressure systems or depressions.
4. **Retreating monsoon (October – November)**: This is a period of transition between the outgoing monsoon and incoming winter. As a result, the weather rapidly changes along with the progress of the season. South west monsoon usually withdraws from the region by the second week of October. After the withdrawal of monsoon, sky gradually becomes clear resulting in steady increase in the period of bright sunshine hours. Number of incidences of rain gradually decreases. Minimum temperature begins to drop faster than the maximum temperature causing a gradual increase in the diurnal range. Deposition of dew becomes important. The season accounts for 6% to 7% of the average annual precipitation amounting from 78.3 mm to 96.9 mm within 4 and 5 rainy days most of which comes within the first fortnight of October. From October to November the change is more rapid. Amount of rainfall remarkably reduces and the temperature fall is more rapid. Cyclonic storms and depressions in the Bay of Bengal occasionally bring a spell of cloudy sky with rain and gusty wind.

Kashipur block has been selected for the project intervention for the following reasons:

- The dryness, water unavailability, rainfall aberrations are very high[16] (ref. climate data above).
- According to the Rural Household Survey in 2005 to identify the BPL families based on a scoring method that has a 12 point criteria. From block level data we find that 35% of the population in Kashipur is living below the poverty line. Substantial inter-district variation in incidence of poverty is also observed in Kashipur.

[16] Detailed information in Annexure 1

- According to ranking of rural poverty, Kashipur (51.9%) scores 2nd highest poverty among 17 blocks.[17]
- Women's literacy rate is 42% and marginal worker/total worker is 47.8%.[18]
- According to human poverty index, Kashipur ranks 1. Landless agricultural labourers constitute 84.5% of the people living in this block. 42% of the families living in Kashipur do not have any homestead land and live on other's land with or without permission.[19]
- This is adjacent to project location in Bankura.
- Scheduled tribe population of Kashipur block is 54,316 and Scheduled Caste population is 55,024 (Census 2001)
-

1. The climate change Profile

The overall trend and projection as mentioned by State Action Plan on Climate Change (SAPCC) for the state is as follows:

Temperature: It is observed that the maximum temperatures are decreasing across the state the minimum temperatures are increasing. The maximum temperature has become less by 0.5^0C with respect to starting of the observation period (1970s) in the Lateritic zone; whereas, the minimum temperatures are increasing all across the state. In the lateritic zone, the minimum temperature has increased by 0.5^0C.

Precipitation: A recent report of the Indian Meteorological Department (IMD) indicates that there have been distinct changes in observed pattern of rainfall between 1901 and 2003 between the northern and southern regions of West Bengal. In winter and pre-monsoon seasons, rainfall has decreased in the southern region by -14.5 mm and -6.7 mm respectively. In the northern region an increase in rainfall in the pre-monsoon season by +10.5 mm has been observed during the same period, whereas a decrease in rainfall by -1.7 mm in the winter season has been observed over the same period. In the monsoon season the increase in rainfall in the southern region is about 91 mm and in the southern region the increase is approximately 57 mm. Post monsoon season continues to show an increase in rainfall by 25 mm in the southern region, but a decrease in rainfall is observed in the northern region (-5mm). In the monsoon period, the same analysis carried over for 1901-2003 indicates that the June rainfall has decreased by an amount of Precipitation has declined by -3.1% in the northern part of West Bengal and by - 0.9% in the southern part of West Bengal since the 1970s. There is no change observed in the July precipitation in the southern region, but in July there is a perceptible increase in rainfall by 4.5% in the northern region. In August there is an overall decrease of -0.2% and -0.1% in southern and northern parts of West Bengal, respectively. In September, though southern West Bengal shows an increasing trend (+2.5%), the northern part of the state shows a decrease in rain fall by -1.1%. An analysis of total annual rainfall for a recent time slice, between 1990 and 2008, for the 6 agro climatic zones in West Bengal, carried out using the rainfall statistics published in the district handbooks, indicates that there is an overall decrease in the total rain in 2008 with respect to 1990 in the Red and Laterite zone.

Onset of monsoon: Analysis of the dates of the onset of the monsoon for a period of 102 years over Gangetic West Bengal, reveals that the mean date is now 13thJune (previously it was 7th June). However, there has not been any substantial change in the date of withdrawal of the monsoon. These observations, therefore, clearly indicate a gradual reduction in the span of monsoon over this region.

[17] Rural health survey, 2005.

[18] Census 2001

[19] Final Report on "Poverty, Hunger and Public Action": An Empirical Study of on-going Decentralisation Initiatives in West Bengal – Lok Kalyan Parishad and Planning Commission of West Bengal.

Drought-prone: A study of drought for a period of 100 years (1901-2000) indicates that Gangetic West Bengal experienced the phenomena for 7 years during the first 50-year period but the frequency of drought increased by 12% during the second half of the last century.

Observed trend as per SAPCC in Climate in West Bengal

- Between 1969 and 2005, a net warming trend has been established in the annual average temperature
- Minimal decrease in maximum temperatures of the order of -0.25 to -0.5^{o} C in the 37 year period
- Perceptible increase in minimum temperatures has been observed with a range of between +0.25 to +1.5^{o} C within the same period
- Total amount of monsoonal rainfall, which accounts for more than 75% of total annual rainfall over the state, has not changed significantly between 1969-2005
- Tough high variability in inter-annual rainfall in time and space has been observed
- A clear positive trend in post monsoon (Oct-Nov-Dec) rainfall in nearly all the state has been observed during 1969-2005
- The intensity of extreme rainfall events has increased in West Bengal, as concluded by the IMD.

Projections of Climate Change as per SAPCC

Climate projections for the 2050s and 2100 have been derived from PRECIS (Providing Regional Climate for Impact Studies), which is a portable version of the HadRM3 model, developed to run on a PC with a grid resolution of 0.44° x 0.44° driven by the GHG emission scenarios - A1B which assumes a future world of very rapid economic growth, a global population that peaks in mid-century and declines thereafter, and assumes rapid introduction of new and more efficient technologies.

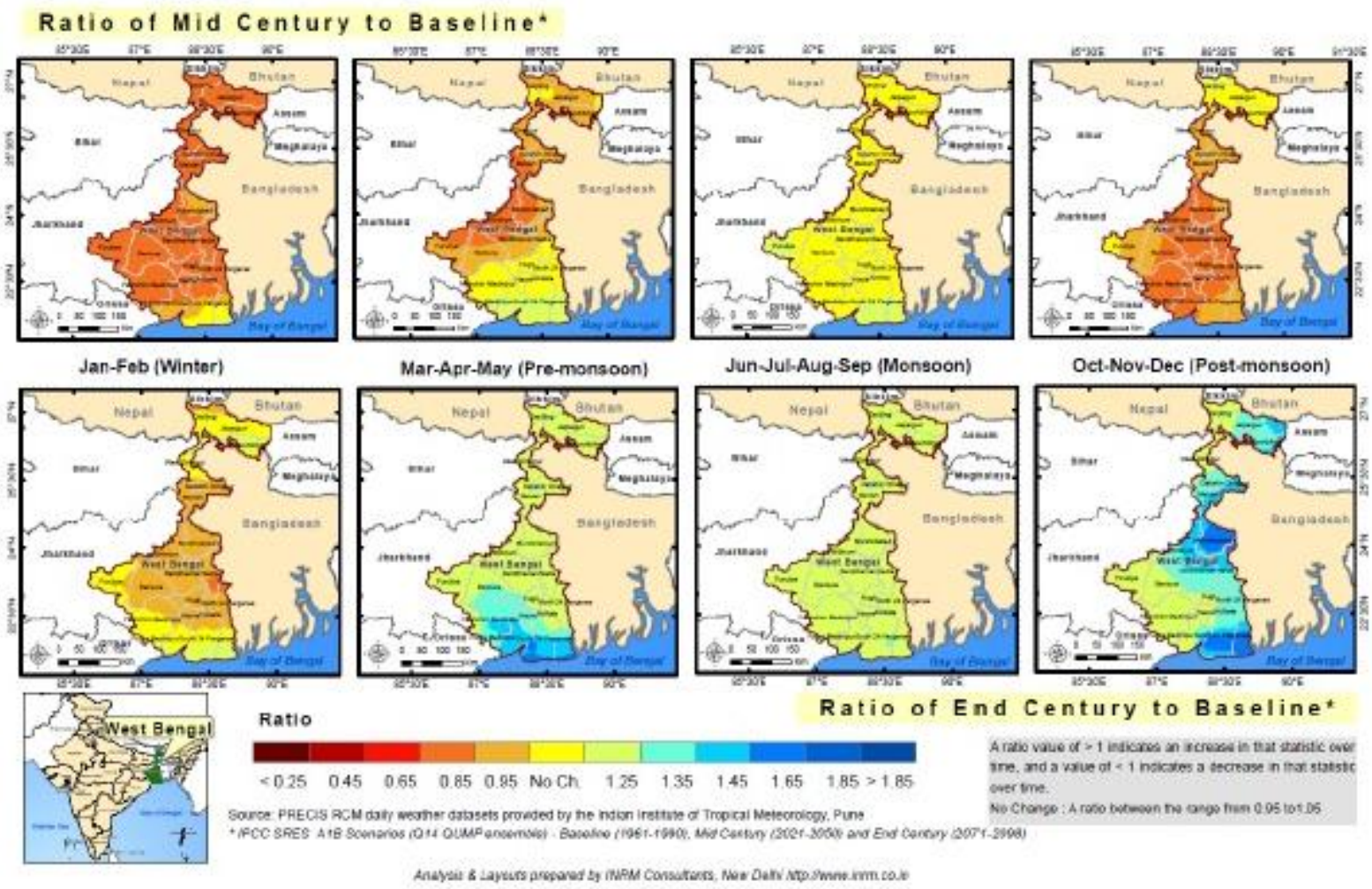


Figure 6. Projected changes in average rainfall during winter, pre-monsoon, monsoon and post-monsoon seasons in West Bengal in the 2050s (upper panel) and in 2100 (lower panel)

Rainfall: Projections of rain fall in West Bengal for midcentury i.e. 2050s (Figure 6, upper panel) indicates that there is no change in monsoon (June-July-August-September) rainfall in the entire West Bengal region in the midcentury, except for an increase that is indicated in the southern Sundarbans region of South 24 Parganas and in eastern part of Purulia. In the winters (October-November-December), however, the scenario changes, the rainfall decreases in most parts of southern Bengal, no change is seen in eastern parts of Purulia and in Coochbehar and Jalpaiguri. A slight increase in rainfall is projected for the northern tip of Darjeeling during the same period. Projections for January and February show an overall decrease in rain fall in entire West Bengal, except in the Sundarbans region where it is projected that there will be no change in rainfall. In summers, the rainfall is likely to decrease northwards in WB starting from Bankura, Purulia, Bardhaman, with no change in Paschim Medinipur, Hoogly, Howrah, and North 24 Parganas, and an increase in summer rainfall in the south 24 Parganas and Uttar Medinipur. However, rainfall will increase in the entire WB region by the end of the century, except in January-February period, when it is likely to decrease in the entire alluvial region from Dakshin Dinajpur in the North to Bankura, Howrah, Kolkata, and northern parts of North 24 Parganas and Paschim Dinajpur in the South.

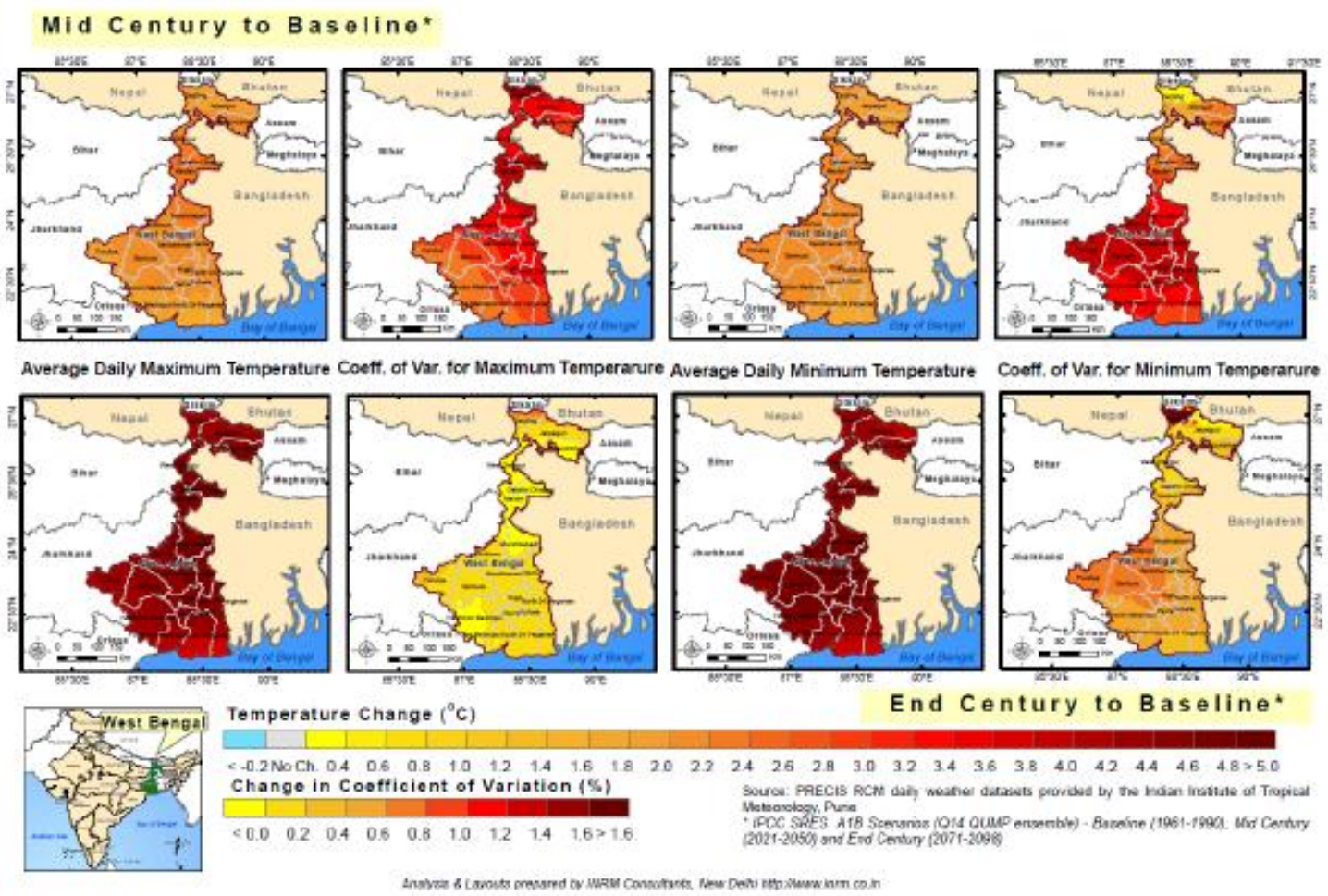


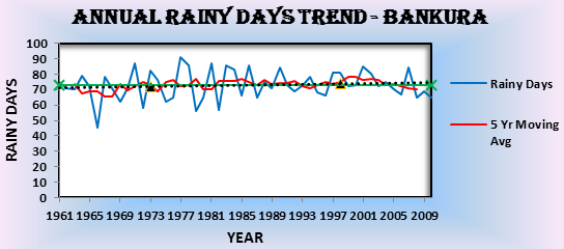
Figure 7. Projected changes in temperature in West Bengal in 2050s (upper panel) and in 2100 (lower panel)

Temperature: As regards temperature, in the 2050s, the average daily maximum and minimum temperatures are both projected to rise by 2.2°C in 2050s and by 2100, the temperatures are likely to rise by 3.6 to more than 5°C with respect to the base line i.e. 1960-1990 (see above Figure).

Location specific analysis for the selected districts and block[20]

Salient features of the long term trend[21]

Rainfall (1961-2010): An analysis of rainfall data of last 50 years using the technique of semi average trend shows the following facts:



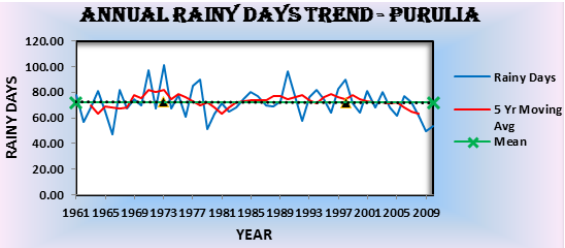
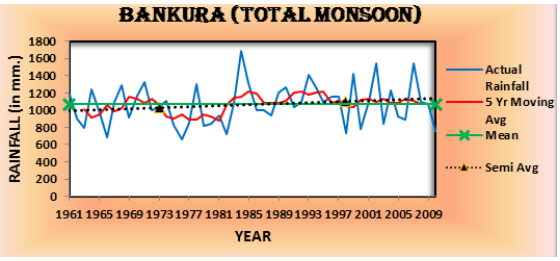


Table 3: Annual number of rainy days

Station	1961-2010 (X)	1961-1985 (X_1)	1986-2010 (X_2)	X_1-X_2	X_1-X_2 as % to X
Bankura	73.0	72.0	73.9	1.9	2.6
Purulia	72.2	72.4	72.0	-0.4	-

Monsoon rainfall trend (Jun-Sept)



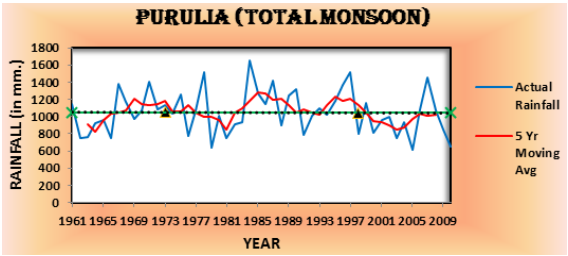
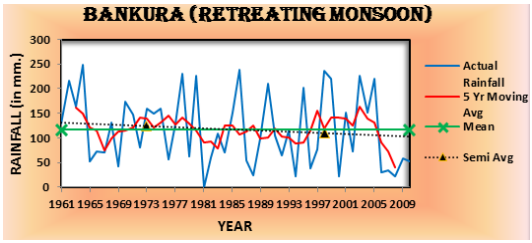
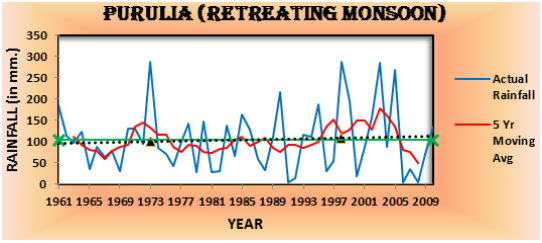


Table 4: Monsoon Rainfall

Station	1961-2010 (X)	1961-1985 (X_1)	1986-2010 (X_2)	X_1-X_2	X_1-X_2 as % to X	Remarks
Bankura	1065.8	1029.7	1101.9	72.2	6.8	Marginal increase
Purulia	1048.8	1052.7	1044.9	-7.8	-0.7	No appreciable change

Post monsoon rainfall trend (Oct-Nov)





[20]Prepared as primary research by Dr. Swadesh Mishra, Ex-Agricultural Meteorologist & Rainfall Registration Authority of West Bengal, based on data from Agricultural Meteorology Division, Directorate of Agriculture Govt. of West Bengal and India Meteorological Department, Govt. of India.

[21] See Annexure 1 for more detailed analysis

Table 5: Post Monsoon Rainfall

Station	1961-2010 (X)	1961-1985 (X_1)	1986-2010 (X_2)	X_1-X_2	X_1-X_2 as % to X	Remarks
Bankura	116.8	123.7	109.8	-13.9	-11.9	Moderate decrease
Purulia	104.2	100.2	108.3	8.1	7.8	Marginal increase

Temperature: Analysis of different components of temperature shows that average daily temperature is increasing almost everywhere. Average daily minimum temperature is rising faster than the average daily maximum temperature causing a reduction in the diurnal range. After 1970, increasing trend is well marked and more marked since the beginning of the present century.

Onset and withdrawal of monsoon (1905-2010): Normal date of onset of monsoon over Gangetic West Bengal now stands as on 13th instead of the 7th June. So the date of onset has been delayed by about a week, but the date of its withdrawal remains almost unchanged i.e., by 10th October causing a general reduction in the span or duration of monsoon in this part. However in recent years, delayed withdrawal is noticed.

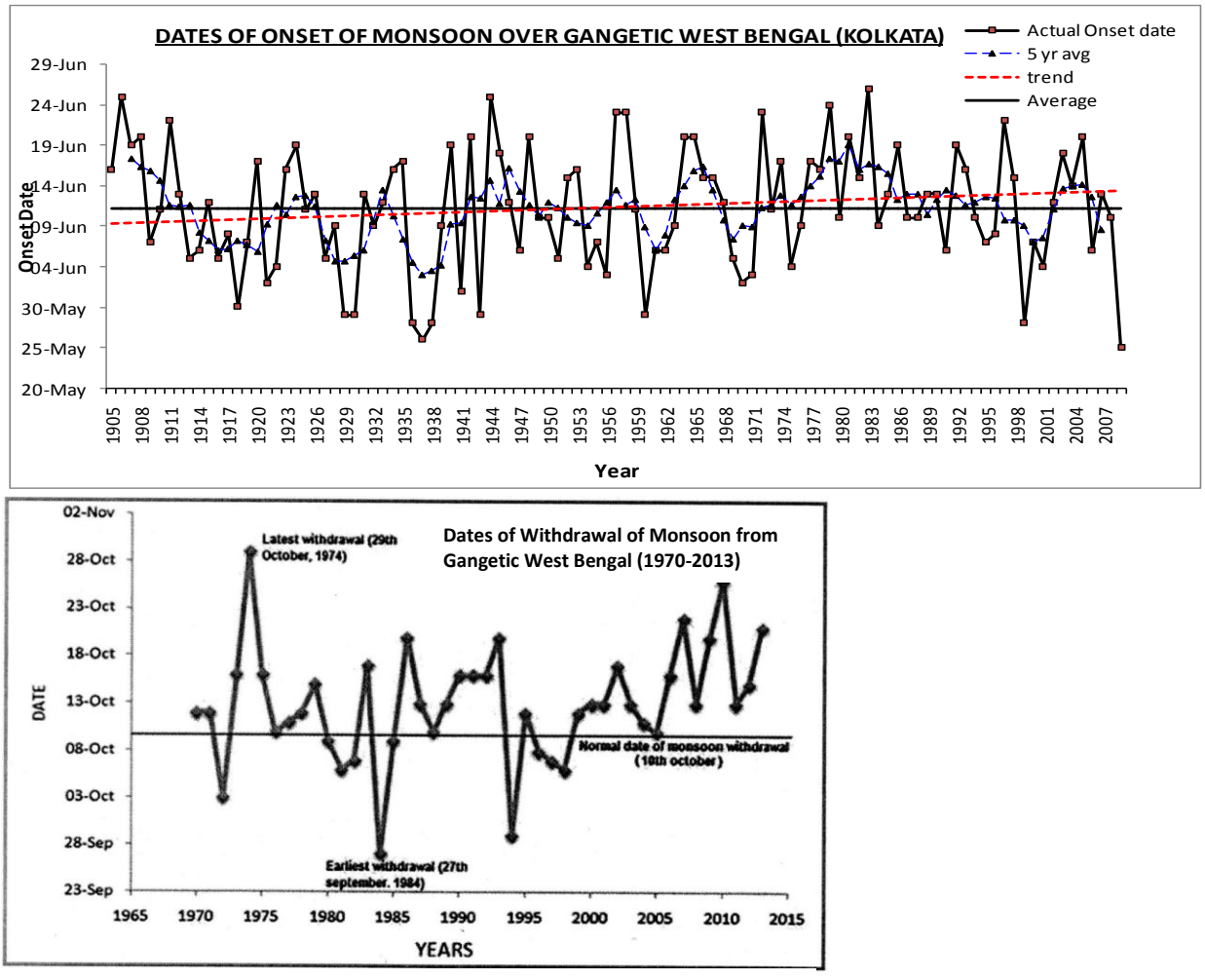


Figure 8: Charts showing Onset and Withdrawal of Monsoon

Incidences of Drought during monsoon (1961-2010): Although the area is well marked as 'drought prone' but the dryness is more due to poor moisture holding capacity of the soil rather than poor rainfall. However, the tendency of occurrence of drought during different phases of monsoon is shown in the following table.

Table 6: *Percentage number of years with drought during different phases of monsoon*

Station	1st half of monsoon (Jun-Jul)	Mid-monsoon (Jul-Aug)	2nd half of monsoon (Aug-Sep)	Total monsoon (Jun-Sept)
Bankura	20	22	32	14
Purulia	24	26	26	20

Recent or on-going trend of weather and climate in the target districts and blocks

In phase two, the study of recent changing trend of weather and climate has been made for a period of the last three and a half decade. The salient features are listed as follows:

- Deposition of dew is decreasing.
- Erratic nature in weather behavior is increasing.
- Typical seasonal character of weather is disappearing.
- Exceptional incidences are becoming the usual ones.
- In general winters are becoming shorter, warmer and drier.
- Summers are becoming longer.
- Post monsoon weather is becoming too uncertain and variable. In recent years wet spells are becoming longer even after withdrawal of monsoon.

Changes in winter weather

- Span of winter has reduced up to 7 days.
- Intensity of winter has decreased.
- Average daily minimum temperature is rising faster than the daily maximum temperature.
- January temperature has slightly decreased while average temperature of all other months is rising.
- In general average winter temperature is rising everywhere varying from 0.1^0 C to 0.5^0 C per one and a half decade.
- During winter intervention of warm spells have increased. On the contrary frequencies of cold spells are few and far between. Warm spells are usually longer than the cold spells.
- Winter rainfall is decreasing everywhere although not at the same rate.
- Completely dry winter seasons have become more frequent during the last 15 years compared to the previous period of the same span.
- Number of rainy days is also decreasing everywhere.

Monsoons are becoming more variable

- Onset of monsoon is being delayed while the withdrawal remaining almost the same causes a reduction in the span of monsoon.
- Variability of rainfall of the monsoon months has increased without causing much change in the total quantity of the season.
- Incidences of partial break in one region and heavy rainfall in the other causing partial drought and flood is on the rise.

Projected changes in climatic environment in the target districts and blocks

By 2050 the probable change of the climatic environment of these two western districts – Bankura and Purulia, will be as follows:

- Bankura will register a marginal increase in the amount of rainfall. The projected amount of average annual rainfall is likely to be around 1425 mm and will be characterized by large fluctuations from one year to the other
- In case of Purulia, the projected figure of average annual rainfall does not show any appreciable change and the annual rainfall value will remain around 1,340 mm
- Variability of rainfall will increase and the agriculturists will have to face more incidences of weather aberrations
- Frequency of drought will increase up to 30%
- Both the districts will register a rise in temperature
- Average daily maximum temperature will increase up to 0.7^0 C and the minimum temperature will rise up to 1.3^0 C from the present value
- Span of winter will be reduced up to two weeks
- Delayed withdrawal of monsoon will be more frequent

The perspective of the community on climate change, and its impact [22]

Based on the Participatory Vulnerability Assessment conducted by DRCSC some of the **sensitivity/preconditions identified**, which adds on to the vulnerability are

- Agriculture is mainly rain fed. Soil is poor in nutrient content
- Lack of technical knowledge of farmers due to loss of traditional knowledge for being overpowered by modern technology
- Deforestation and degradation of natural forest along with plantation of inappropriate plant species
- Undulating terrain, leading to soil erosion
- Ignorance about natural resources and common property
- No job opportunities locally, hence migration seen as a coping strategy
- Landlessness.
- Lack of quality seeds while seedbed is damaged due to untimely rainfall
- Poor access to credit society
- Pressure of money lenders

Participatory Vulnerability and Capacity Assessment

PVCA is a package of PRA tools, which practiced with the community to get to understand the perception of the community on Climate Change, its impact, coping mechanism and suggested adaptation. The tools used are the following:

1. Hazard Ranking – Matrix ranking of hazards
2. Time line of climatic changes - The 'time line' reflects a period of last 20 years starting from current year.
3. Climate Variability Factors – FGD to understand the climate variability factors, its magnitude and Impact on livelihood.
4. Climate Trend Analysis – FGD to understand the indicators of change, magnitude of change and impact.
5. Seasonal Livelihood Analysis – 'Seasonal calendar on scarcity' illustrates the scarcity of basic primary needs for livelihood sustaining

[22] Participatory Vulnerability and Capacity assessment done by DRCSC, see Annexure 2 for the report.

- No or little awareness about 'nutrition'
- Lack of awareness about their rights
- Poor or no linkage with local Govt.
- Less exposure to outer world
- No agricultural advice based on weather pattern.

The following areas of **concerns relating to climate change** have been identified.

- Rainfall is inherently scanty and is declining further, especially during last 5-6 years
- Temperature, both maximum and minimum, is rising
- Rainy days decreased
- Uncertainty of rainfall
- Summer prolonged
- Winters have shortened
- Foggy weather has increased
- Incidence of hail storms increased.

Impact of these

- The forest cover is vanishing gradually. Many food items that were previously collected are no longer grown in the forest. This zone is dominated by tribal people who are generally more dependent on non-timber forest products (NTFP).
- Lack of fodder and degradation of grazing land
- Water sources (wells, tube wells, ponds) are getting dried up quickly during summer causing acute scarcity of drinking water for both humans and cattle
- Winter crops, especially wheat are getting affected
- Soil moisture has reduced leading to more erosion and nutrient loss
- Fallow season and fallow lands have increased
- Surface water bodies drying up
- Major problem is 'uncertainty'. Now it is very difficult for farmers to anticipate the rains by calendar days /months (which they could do earlier). Earlier, for each seed variety, the farmers knew the dates of sowing, transplanting etc. Farmers say this has become 'a guessing game' affecting output
- Both total time period and intensity of fog have increased creating lot of damage to different crops (mainly vegetables and fruits).

2. Socio-Economic Context

Socio-economic profile of the select location based on sample survey is given in Table 7.

Table 7: Socio-economic profile of the selected location on the basis of a 10% sample[23]

	Chhatna, Bankura	Kashipur, Purulia
Demography and Literacy	The average household size: 5.68. The sex ratio: 778 (for age group 0-6 years - *alarming*), 993 (51-70 years) Literacy: 58 for females and 73 for males	The average household size: 5.56 Sex Ratio : 998 Literacy: 60.89 for female and 75.96 for male

[23] See annexure 3 for the detailed socio-economic study.

Livelihoods	1st three primary occupations are Labour - 51%, Farming - 33%, Service - 5% 1st three secondary occupations are Labour - 40%, Self-employment - 19.5%, MGNREGA - 19%	1st three primary occupations are Farming - 68%, Labour - 63%, Self-employed - 13% 1st two secondary occupations are Labour - 37%, MGNREGA - 49%
Infrastructure	Household: 72% Permanent katcha (mud walled thatched) structured houses, 19% pucca (brick-walled & concrete roofed) houses. Toilet: 91.3% belong to no toilet category. Electricity: 49.5% Electricity, 21% Kerosene Oven: 94% traditional chullah Fuel: 54% use firewood as fuel The 1st three sources of drinking water are: Tube-well - 84%, Tap - 9% and Well -7%. 37% faced scarcity of drinking water.	Household: 82% Permanent katcha structured houses. Toilet: 94% belongs to no toilet category. Electricity: 44.92%, 12.83% kerosene Oven: 97.33% traditional chullah Fuel: 96% use firewood as fuel The source of drinking water used by maximum people is Tube-well - 92%. 26% faced scarcity of drinking water.
Agriculture	20% have 'Patta' (registered ownership deed) for their land 17% are share croppers. Majority of land is medium high and upland. Major crops grown are: Paddy in Monsoon; Mustard, Vegetable, Potato in Winter and very few vegetables in pre-Monsoon. 50% sell their produce either to middleman or to outside the village. 88% use chemical fertilizers (DAP, Urea, 10:26:26). Organic manures are being used by 73% by only 87 kg/acre.	88% sell their produce either to middlemen or to people living in other villages.
Income	Monthly average income of Rs. 6,064/-. The average monthly expenses of households is observed to be Rs. 4,946/-. 27% said, they faced scarcity of food. 7% reported fodder scarcity. 21% reported to work outside to meet the shortage. 45% have worked outside for 50~90 days. 64% had worked as daily labour. 36% has taken loan, 60% of the loan in for agriculture.	Monthly average income of Rs. 5784/-. The average monthly expenses of households is observed to be Rs. 4507.44/-. 31% reported to work outside to meet the shortage. 16% faced food scarcity of 77 days on an average. 48% loan has been taken for agriculture.
Dependence on Natural Resources	The weighted average of dependence on natural resources are Food 39.23%, Fuel 74.71%, fodder 54.52%, income 17.45.	The weighted average of dependence on natural resources are Food 15%, Fuel 94%, fodder 60%.

Proposed Location and Beneficiaries[24]

The geographical focus will be 40 villages from Kashipur block of Purulia and Chhatna block of Bankura district[25]. These 2 blocks are representative of the red and lateritic soil semi-arid region of West Bengal. The project will focus on 5,000 households covering about 22,596[26] beneficiaries who belong to vulnerable small and marginal farming communities and communities dependent on natural resources as livelihood option. These households were selected on the basis of preliminary participatory rural appraisal and are the poorest inhabitants of the villages.

The demographic details[17] show that 49.6% of the targeted population belong to scheduled tribes, 31.6% to the scheduled castes and 5% belong to OBC and the minority communities. In so far as the economic status of these families are concerned, they form the most marginalized section of the country (66.26% live below poverty line; the rest 33.74% marked as APL have only the food to sustain them through the year) who are likely to be the most affected due to the impacts of climate change. Within the poor households the women happen to suffer the most although they take part in all kind of agricultural and other livelihood activities doing the household chores at the same time. Naturally they form the most vulnerable section in so far as climate change impacts are concerned.

Before formulation of the project, Participatory Vulnerability and Capacity Assessment (PVCA) was done with the project beneficiaries, whose composition, as detailed in the earlier paragraph, shows that it consists mostly of marginalized people (Scheduled Tribes & Castes and other backward communities). All the interventions were designed to address their problems as articulated by them in the PVCA exercise. (Please refer to PVCA Report in DPR, Annexure 3)

Primary consent from the community was taken for doing the interventions in the area. As all the interventions proposed will be controlled by groups and DRCSC will play the role of the facilitator only, all decisions have to be taken at the group level which will be ratified by the members of the beneficiary group, practically there is no possibility of their rights getting violated; because, DRCSC has been making the people conscious about their rights throughout its activities in the area.

DRCSC has been active in this area for over 15 years and working mainly with the tribal people ensuring that the rights of these people are safeguarded.

About 52% households have their own land[17]. Average land holding is little high in Purulia and landlessness is also low. As more areas are under double and triple crop, pond ownership and field well is also high in number, Purulia happens to be a bit improved in agriculture; whereas, Bankura is predominantly a mono-cropped situation. Paddy is the major crop that people grow during Monsoon, with very less vegetable, wheat and mustard are grown during Ravi.

Bankura, even if it is poor in agriculture, is more dependent on livestock with all families having cow, most of them having poultry and goat or ship. From the income pattern[17] of the beneficiaries, it is quite clear that people in Bankura have less faith on agriculture as a livelihood option and depend more on daily labour. Average income from daily wages is also more than agriculture. But in Purulia, people are more inclined to doing agriculture, which actually gives less income as compared to migration or labour. Livestock plays a poor role in the income pattern.

[24] The details are based on sample survey (10%) done in the project area, for details see Annexure 2
[25] Refer section 1b.1 and 1b.2
[26] Based on the household survey of beneficiaries done by DRCSC

5. Summary of problems and proposed strategies

As mentioned in the section **1, 2, 3, 4**, the summary of impacts are as follows

Issues which affect livelihood of small and marginal farmers	Economic Impact	Impact on Ecosystem	Social Impact	Impact on Development
Water availability	Falling of production and productivity due to water scarcity, lack of water for livestock and poultry	Loss of Biodiversity, Falling Ground water, lack of soil moisture	Inequitable distribution of irrigation water. Land becomes unproductive leading towards poverty. Increasing drudgery of women for bringing water	Lack of drinking water and water for household use and home garden, Water borne diseases in waterlogged area
Drought, long rain break	Falling of production and productive Land remains fallow	Loss of agro biodiversity	Migration, increasing scarcity of food, fodder, firewood and cash	Food and nutrition insecurity, malnutrition
Depleting Natural Resources	Loss of NTFP based livelihood, lack of fodder	Low productivity. Loss of buffer. Loss of diversity. Depletion of ground water.	Migration of landless.	Nutrition insecurity especially during stress period.
Uncertain climatic pattern	Uncertainty in production.	Loss of biodiversity, Pest and disease attack on crops and livestock.	More stress on women for livelihood related work.	More investments on relief rather than development.

Coping and adaptation strategies shared by the community[27]

Adaptation to climate change refers to adjustments in natural or human systems in response to actual or expected climatic effects. The adaptation process includes three essential stages (1) vulnerability assessment; 2) capacity building; and 3) implementation of adaptation measures.

The main implications for reducing the risk to livelihoods through adaptation measures are as follows:

[27]Annexure 2

- The crop-weather advisories will help to reduce the risks and damages caused by climate change. It will capacitate the farmers to take more effective decisions regarding farm management.
- The introduction of sustainable agriculture practices instead of the conventional chemical agriculture will impact the environment positively in terms of climate change. Integrated farming systems will help in reducing climate risk and cost of agriculture which will increase the adaptive capacity of the households.
- Rainwater harvesting measures will enhance the storage capacity to provide irrigation to the rainfed crop in spite of rainfall aberrations as well as the long dry periods and will help to extend the growing season beyond monsoon.
- Introduction of mixed cropping of heat tolerant and low water demanding crops will help to adapt to the rainfall variability and give a more or less sustainable production.
- The other livelihood option of livestock rearing, fishery, sericulture, horticulture etc will shift the over dependence on rainfed agriculture.
- Soil and water conservation measures will ensure ground water recharge which in turn will improve soil health, increase vegetative cover, check soil erosion.
- Grain and seed reserves will equip the community to adapt climate induced disasters.
- Appropriate technologies introduced will reduce the drudgery of women, atmospheric pollution, overdependence on natural assets like forests and fuel costs.

Coping and adaptation strategies shared by the community are given below:

- Rice varieties for the future - *Roghusal, Bhutmuri, Chadrakanta, Puja, Lalgutka, IR-36, LalSwarna, Lalat, Gorya -1, Manikkalma, Asanlaya, Talmari, Chandrakanta, Kashiful, Baiddhula(most are local)*
- Harvesting of rain water by excavation and renovation of ponds.
- Land shaping considering topography.
- Introduction of short duration paddy variety.
- Re-introduction of drought tolerant crops like bajra, jower, kodo, arhar etc.
- Cover crop to protect soil erosion.
- Formation of village youth group to protect and preserve natural resources.
- Use of organic soil nutrient management to increase moisture retention
- Exposure to options and alternatives
- Agri-advisory services.

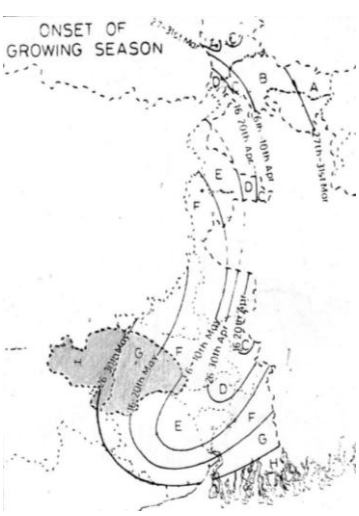
Adaptation strategies mentioned in SAPCC recommendations

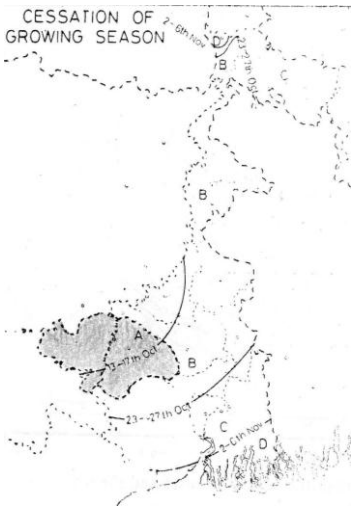
- Undertake special afforestation programmes to increase the run off infiltration ratio through joint forest management practices in identified regions
- Undertake extensive rain water harvesting through dug up pits or directing rain water to the recharge zones in the undulating slopes of the hills to increase the percolation of rain water and thus result in the recharge of ground water, reduce sediment load, and rejuvenate moribund rivers. Create small reservoir schemes such as check dams that intercept rivulets, Nalas, with canal system in this region.

- Encourage surface water schemes, through rain water conservation in ponds/dighis as hard rocks in the area do not provide access to deep aquifers which are free from fluoride.

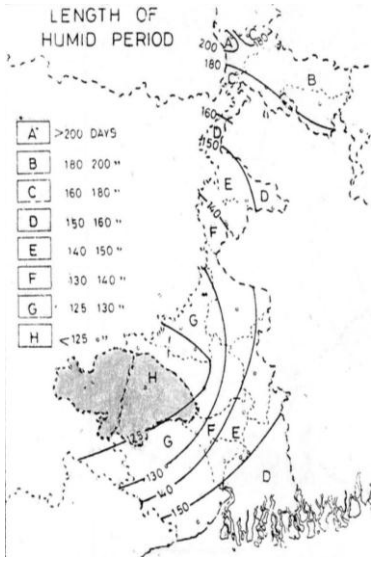
Adaptation to recent climate and climate variability according to climate trend[28]

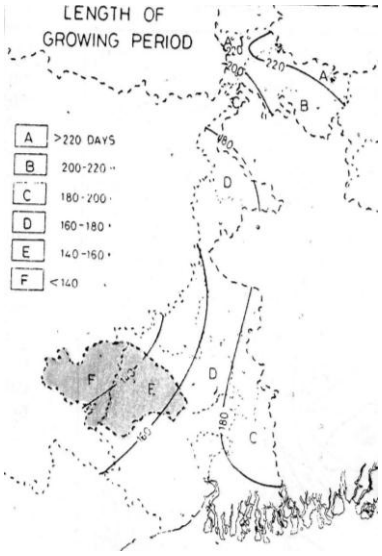
Rain fed agriculture should be limited within the growing period when the rainfall satisfies crop need. In Purulia the length of growing season is a little less than 135 days and in Bankura it varies from about 135 days to more than 160 days.





Purulia has a window of growing season between 26/30th May to 13/17th October. The project location of Bankura has a window of 16/20th May to 13/17th October, with a roughly 140 to 160 days in Bankura and less than 140 days in Purulia and less than 125 days of humid period.





[28] Annexure 1

Table 8: Mean Rainfall (MR) and Assured Rainfall (AR%) Values (mm) of Bankura and Purulia

Stations			Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
BANKURA	MR		15.1	24.4	27.4	33.9	82.4	233.1	313.9	303.3	216.2	98.1	15.2	3.3
	AR	50%	3.6	15.5	17.5	21.1	68.8	190.8	303.5	285.8	190.6	80.5	1.0	0.0
		60%	1.8	9.4	9.4	17.5	57.8	171.7	272.4	252.8	176.0	61.7	0.0	0.0
		70%	0.0	3.8	3.8	10.2	44.2	154.2	239.0	240.0	152.7	51.6	0.0	0.0
PURULIA	MR		16.9	28.2	23.6	26.8	58.1	208.3	310.1	321.1	239.2	88.9	17.6	3.4
	AR	50%	10.2	15.0	9.9	21.2	49.0	180.1	297.4	286.8	218.5	63.5	0.8	0.0
		60%	4.0	10.7	6.4	16.0	40.1	158.8	283.7	271.2	203.5	58.0	0.0	0.0
		70%	0.4	8.5	2.8	9.8	33.2	142.8	264.6	258.6	158.8	38.8	0.0	0.0

At least 60% assured rainfall values should be utilized for agricultural or crop planning in place of mean rainfall because its reliability is much less compared to the 60% assured rainfall values. Climate adaptation also involves rescheduling of crop calendar and crop combination of three main agriculture seasons utilizing.

The proposed strategies in light of the expected impacts and suggestions[29]

Expected Impacts	**Proposed Intervention**
Productivity of temperature-sensitive crops, especially Winter crop is decreasing. Incidences of crop failure are increasing.	Introduction of drought tolerant/resistant crop like millets, crops having less water requirement, local and traditional varieties of rice seeds keeping the humid period, actual rainfall capacity and crops suggested.
Water scarcity is increasing especially during summer and winter season. The rainy season rice fails because of delayed rain.	Rain Water Harvesting through pond excavation, ditch digging, dug well, Roof Top Rain Water Harvesting, River lift irrigation, check dam construction. Increasing soil moisture by application of organic carbon. Weather specific agro-advisory services.
Incidences of pests, diseases and weed are increasing.	Use of Bio pest-repellents, Integrated Pest Management, Mechanical instruments, management practice, mixed cropping etc.
Decomposition of organic material and fertilizer are becoming faster, also decomposition of roots is being noticed.	Mulching, improvement of drainage system, application of *Tricoderma viridi*. This also can be used for positive sense for quicker decomposition of composting material.
Length of growing season of summer crops is increasing due to late monsoon at the cost of the Winter season.	Development of irrigation structures for increasing area under irrigation, adoption of soil and water conservation techniques. Introduction of drought tolerant short duration crops with the window of growing season.
The forest cover and associated biodiversity is vanishing gradually. The collected food items are no longer grown in the forest. This zone is dominated by tribals, who are generally more dependent on non-timber forest products.	Development of social forestry. Plantation of horticulture plants, introduction of Sericulture in plants like *Ber, Arjuna*, sustainable land & water treatment measures.
Lack of fodder and degradation of grazing land.	Emphasis on fodder cultivation, selection and promotion of trees plantation for fodder purpose.
Increasing drudgery of women for bringing water and firewood.	Installation of biogas units, energy efficient ovens, roof top water harvesting etc.

[29] Refer Section 2

Increased migration and loss of livelihood assets.	Introducing allied agriculture activity, creation of opportunity for employment in the project villages to create non-climate dependent livelihood opportunities. improving Farm productivity through Integrated Farming System
Nutrition insecurity increases, especially during stress period.	Nutrition garden, animal husbandry, fishery, promotion of organic farming, grain bank.

Project / Programme Objectives:

List the main objectives of the project/programme.

Overall goal

Developing climate adaptive and resilient livelihood systems through diversification, technology adoption and natural resource management for small and marginal farmers associated with agriculture and allied sector in the Red and Lateritic Zone of West Bengal.

Specific Objectives

To enhance adaptive capacity of 5,000 vulnerable farm families in semi-arid regions of Purulia and Bankura districts of West Bengal by introducing measures to adapt to the adverse impacts of climate change on their food and livelihood security.

Main Outcomes

1. Communities adopt land and water use master plans with the help of Panchayats through better understanding of climate change related impact.
2. Farmers are better prepared for climate resilient agriculture and wastelands development
3. Livelihoods have become less vulnerable to climate change and achieve higher levels of productivity
4. Various types of materials on processes and techniques are published and measures are taken to upscale the interventions to improve climate resilience in the red and lateritic zone

Project / Programme Components and Financing:

Project/Programme Components	Expected Concrete Outputs	Expected Outcomes	Amount (US$)
1. Land & Water use master plan (LUP & WUMP)	Five Gram Panchayat -wise Land and Water use Master Plans are prepared	Communities adopt land and water use master plans with the help of Panchayats through better understanding of climate change related impacts	54,165
2. Reducing climate risks through timely and appropriate weather specific crop/agro-advisory services in local language (Bengali)	***2.1*** Automated Weather stations (AWS) at 6 locations (covering 10 sq.km each), 12 manual data collection centres (MDC) for collection of weather information ***2.2*** The expert group comprising of weather expert and agri experts analyzes the data collected through AWS and MDC and prepares the 5-days crop-weather advisories ***2.3*** A Climate Resource Centre	Farmers are better prepared for climate resilient agriculture and wastelands development	18,360 27,888 9,153

Project/Programme Components	Expected Concrete Outputs	Expected Outcomes	Amount (US$)
	located at the centre of the project area and 40 weather kiosks managed by climate volunteers for collection and dissemination of crop-weather advisories		
3. Climate resilient technology transfer for enhancing the adaptive capacity of the community	*3.1* Sustainable soil and water conservation measures (e.g. semi-circular bunds, check dams, gully plugs, infiltration ditches and agro forestry plantations) for various ecosystems introduced for improvement of agricultural productivity and environmental sustainability *3.2* Multilevel cropping systems & integrated farming practices are introduced mainly through popularizing a combination of drought tolerant field crops, fast growing & multipurpose perennials and small livestock *3.3* Disaster-coping mechanisms like community grain banks, local crop & trees seed banks, fodder banks developed in targeted villages *3.4* Climate resilient appropriate technologies like energy efficient cook stoves, bio-gas, low cost water filters and community based drinking water facility are promoted.	Livelihoods have become less vulnerable to climate change and achieve higher levels of productivity	745,390 901,813 28,330 201,840
4. Learning and Knowledge Management	*4.1* Production of technical and financial data analysis on processes to improve the resilience of the livelihood in red and lateritic zones of West Bengal	Various types of materials on processes and techniques are published and measures are taken to upscale the interventions to improve climate resilience in the	10,000

Project/Programme Components	Expected Concrete Outputs	Expected Outcomes	Amount (US$)
	4.2 Improved access to learnings from the project activities to be ensured through short films, dedicated website and other printed materials *4.3* Advocacy with National / State / Local Government and others (NGOs, CBOs, International organizations, climate activists/experts) on processes and practices adopted under the project	red and lateritic zone	64,084 52,200
5. Project / Programme Execution cost			**2,113,223**
Project Execution Cost			**201,162**
Project / Programme Cycle Management			**1,96,469**
Amount of Financing Requested			**2,510,854**

Projected Calendar:

Indicate the dates of the following milestones for the proposed project/programme

Milestones	Expected Dates
Start of Project/Programme Implementation	October 2014
Mid-term Review (if planned)	September 2016
Project/Programme Closing	September, 2018
Terminal Evaluation	June 2018

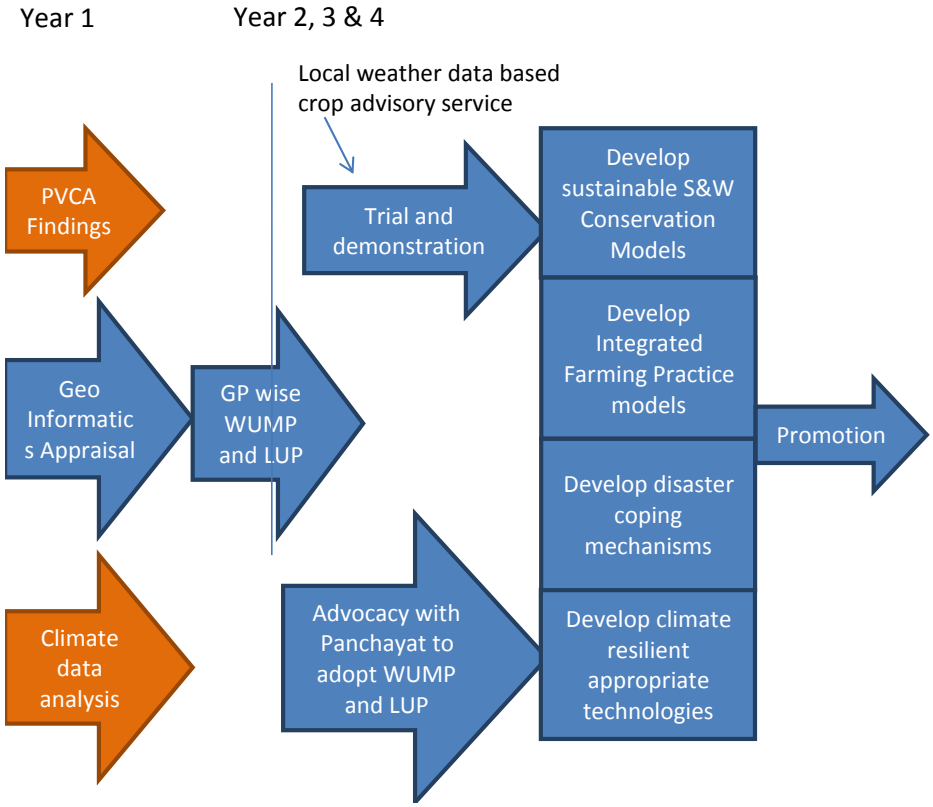
PART II: PROJECT / PROGRAMME JUSTIFICATION

A. Describe the project / programme components, particularly focusing on the concrete adaptation activities of the project, and how these activities contribute to climate resilience. For the case of a programme, show how the combination of individual projects will contribute to the overall increase in resilience.

The overall project plan

The components detailed below have been designed to provide an integrated solution to manage expected climate change risks and uncertainties in the red and lateritic soil zones under two districts of West Bengal. The components constitute a series of interlinked activities, which ultimately leads to enhance community's participation in the climate sensitive natural resource management plan and carrying out actions according to that. It will be supported by modern methods of GIS appraisal, local weather based crop advisory services and already practiced improved models. The community will also be assisted to share the learning outcomes with the larger communities. Models developed as part of the project will have the scope of getting up scaled in red and lateritic zones of the country through advocacy with appropriate authorities in the government at state and central levels for inclusion in state and national policies.

As a process, the entire project envisages a paradigm shift of existing top-down large scale planning process to a bottom up planning and action with support from benefits of science and technology. The entire project is described by the following process diagram, where the process box in orange indicates the processes that are already initiated.



Component 1: Land & Water Use Master Plan (LUMP & WUMP)

This Component proposes drawing of Land Use Plan and Water Use Master Plan considering the Geo-informatics appraisal, community perspective (PVCA report)[30] and climate data analysis[31].

Climate Change is envisaged to exacerbate the water stress in the western arid districts of Bankura & Purulia of West Bengal. In order to assess the vulnerability and the project activity impact with respect to water availability in this region, a holistic research involving **Geo-informatics Appraisal** and micro level planning in a GIS platform is necessary. This would be useful in developing a "Spatial Decision Support System" to reduce the risk to the vulnerable population and to assist in climate change adaptation in the proposed area and to check the efficacy of the planned activities.

Activity 1.1.1: GIS Mapping

To assess the decadal changes in Land Use, Forest and Vegetation Cover, Population GIS Mapping, Socio Economy, Spatial Shifting Pattern of Rainfall and Land Surface Temperature, Subsurface Water Availability and Uses, Water Stress, assessment of Agricultural Drought, identification of Water Bodies perennial and seasonal, shifting of Drainage Network, Elevation, Slope, Aspect Analysis, Catchment, Basin, Watershed Analysis etc

For conducting Geo-informatics Appraisal **School of Oceanographic Studies, Jadavpur University** has agreed to provide technical support to the project.

Till date the plans that the government has tried to implement to address the issue of climate change have been according to the plans done by NAPCC & SAPCC. So far involvement of the community has been limited. As a consequence, a sense of allienation has hindered the community from adopting these plans in their life and livelihoods. The project proposes to introduce a bottom up approach whereby the Land and Water Use Master Plans prepared on the basis ofgeo informatic appraisal, climate trend analysis and community perspective will be owned by the community.

Activity 1.1.2: Gram Panchayat level WUMP and LUP

The Geo-informatics Appraisal will be the guide to draw LUP and WUMPs in each of the targeted Gram Panchayats. Community perspective and community ownership of these plans will be ensured by usingParticipatory Rural Appraisal tools e.g. Village Transect, Social Maping, Resource Mapping, Wealth Ranking, Weather Trend, Instituional Analysis, Time Trend Analysis andSocial Decision Matrix.

The Land and Water Use Master Plans will also be validated with the 50 years' climate data[32]. The Climate Trend Analysis done during the project development phase has been conducted by an expert and the detailed report contains recommendations which will be taken into account during the preparation of the LUP & WUMP. Judicious use of all components like land, soil, water and weather and their proper manipulation and management will be ensured for obtaining optimum and sustainable return from land through agriculture. Variability in weather cycle due to Climate Change will be synchronized with the normal weather requirement of crop during different stages of its cycle in order

[30] Annexure 2 and 3
[31] Annexure 1
[32] Annexure 1

to get full advantage of the changes in weather and climate. Recommendation for crop selection will be made according to where and when it is best suited.

Land use and land cover maps with vegetation and agricultural changes of the study area will also be prepared with the help of multispectral and multi temporal satellite data. Surface water bodies and existing river/ canal network will be mapped with limited ground checking. Elevation data and ground water potential would be combined with the satellite data to arrive at a micro watershed analysis. Drought assessment will be undertaken with high spectral resolution data.

Finally, using all the available results, a Spatial Decision Support System (SDSS) with Land and Water Use Master Plan for climate change adaptation will be prepared. The GP-wise Land and Water Use Master Plans will be shared with the Panchayats. Advocacy will be done at the district, block and Panchayat levels for adaptation of these plans while drawing the Village Development Plans.

Evaluation at the end of Year 4 on all aspects mentioned in activity 2 will be done to validate the efficacy of the interventions done on the basis of LUP and WUMP.

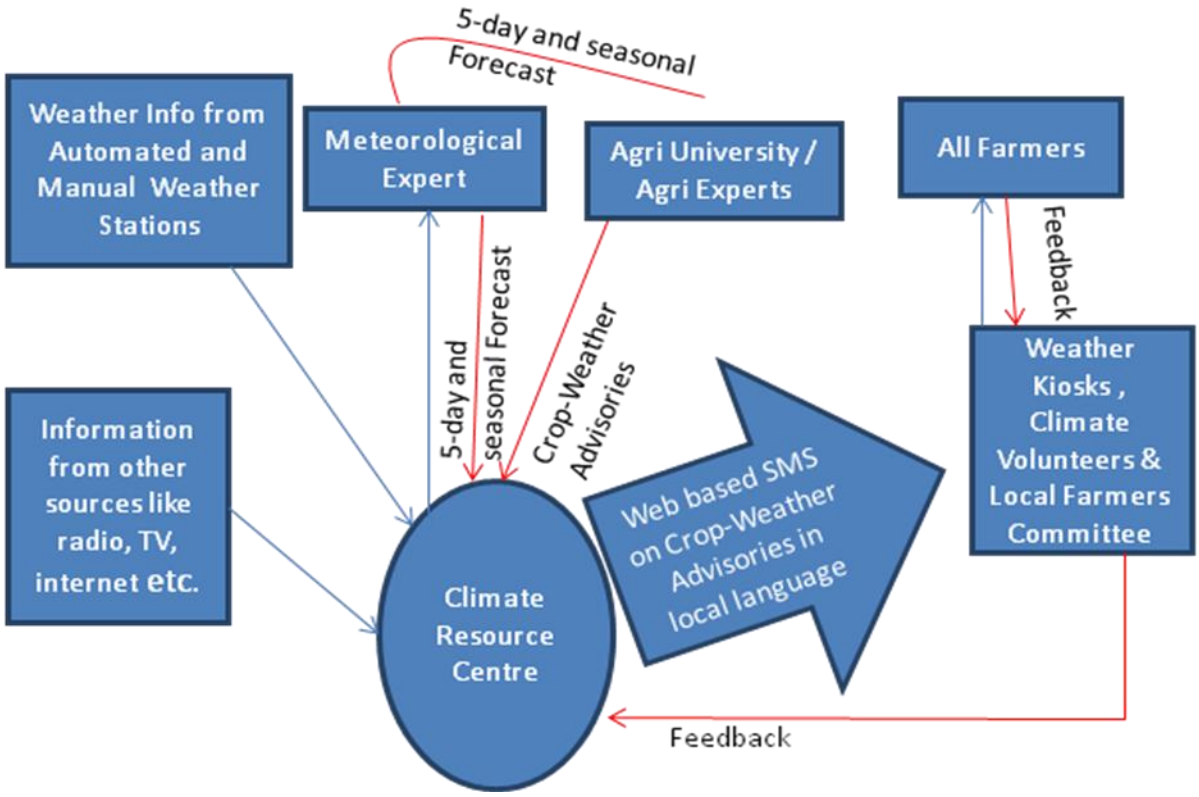
Component 2. Reducing climate risks through timely and appropriate weather specific crop/agro-advisory services in local language (Bengali)

Apart from extreme weather and climate events such as severe droughts, subtle changes like rainfall variability and temperature variations often shock the farming community, particularly in red and lateritic soil zones, leading to decline in agricultural production. In addition, farmers are expected to manage the more insidious effects of long term climate change that may now be occurring at an unprecedented rate. These existing pressures demand the development and implementation of appropriate methods to address issues of vulnerability to weather and climate. Timely Crop-Weather Advisories will assist farmers to develop their adaptive capacity further that will help them to make improved planning and better management decisions. Awareness of targeted farmer groups will be increased by adapting a participatory and cross-disciplinary approach to deliver climate and weather information.

Broad Spectrum of Crop-Weather Advisories

1. Sowing/ transplanting of monsoon crops based on onset of monsoon
2. Sowing of winter crops using residual soil moisture
3. Fertilizer application based on wind condition
4. Delay in fertilizer application based on intensity of rain
5. Prediction of occurrence of pest and disease based on weather
6. Prophylactic measures at appropriate time to eradicate pest and diseases
7. Weeding/Thinning at regular interval for better growth and development of crop
8. Irrigation at critical stage of the crop
9. Quantum and timing of irrigation using meteorological threshold
10. Advisories for timely harvest of crops

The overall plan of this component is explained through the following diagram



Activity 2.1: Installation of AWS and MDC

6 Automated Weather Stations (AWS), 12 Manual Weather Data Collection Centres (MDC) will be set up in various locations within the proposed project area to collect local weather data.

Activity 2.2: Preparation of Crop Advisories

Weather information collected from the AWS and MDC stationed in different points in the project area will be collected by Climate Resource Centre Manager. Then the data will be sent to an Expert Group comprising of Meteorological and Agricultural Experts. The Meteorological Expert will analyze the data with reference to a 30-year weather model (WRP 30 developed by National Centre Atmosphere, USA) of the area, Indian Meteorological Department data and global data. On the basis of the forecasts made Agricultural Experts will prepare crop advisories. The crop advisories SMS will be provided to the CRC for dissemination. The location specific and crop specific farm level advisories (short term and seasonal) containing description of prevailing weather, soil & crop condition and suggestions for taking appropriate measures is expected to minimize the loss of farmers and also optimize input and thereby its costs in the form of irrigation, seed, fertilizer or pesticides. The advisories will also serve as an early warning alerting producers regarding implications of various weather events such as extreme temperatures, heavy rains and strong winds.

The crop advisory services would require involvement of experts like meteorologist, agricultural experts, even after the project period. It is envisaged that the entire intervention of issuing crop advisory services

and associated costs including cost of expert group will be taken over by the local Panchayat. Towards this, discussion were held with the Panchayat officials and Block level officials were held during the consultative process and they were in principle in agreement with this arrangement. During the course of implementation it is proposed to obtain a commitment from the respective Panchayats in this regards.

Activity 2.3: Establishment Climate Resource Centre and Weather KIOSKs

One central level Climate Resource Centre (CRC) and 40 weather kiosks will be established in project villages. The community leaders from each group will be selected as the climate volunteers and their capacity building programmes will be undertaken. The CRC Manager will be responsible to translate the advisories in local language and disseminate to Climate Volunteers stationed in each of the targeted villages and also to the Weather Kiosks through SMS-based mobile services who, in turn, will spread the message to all farmers (targeted and beyond) through farmer groups and display boards in common places. The CRC will also share the advisories with the registered mobile numbers with it beyond our target beneficiaries. The climate volunteers will be responsible for disseminating Crop Weather Advisories, maintaining display boards in Weather Kiosks, physical monitoring and collecting feedbacks so as to know the number of farmers who have actually made changes in their farming activity according to the crop advisory provided and for quality control of the SMS provided. Regular awareness sessions will be organized so that all farmers groups in target areas can understand the implication of the terms used in crop advisories and have the tools to develop local adaptive strategies to safeguard livelihood assets.

DRCSC has motivated beneficiaries under many of the projects for such voluntary actions in the past. A few examples of such action undertaken are given below:

- Plantation on more than 100 km of common property was done with the voluntary participation of the community. The groups involved took the responsibility of protecting the trees and sharing the fruits, fodder and firewood equally among themselves.
- In at least 25 community-based plantation sites covering more than 75 hectares (in 3 villages of Paschim Medinipur, 16 villages of Purulia, 1 village of Bankura, 25 villages of Birbhum), the community leaders along with group members have undertaken the responsibility of protection and intercultural operations voluntarily which does not involve any remuneration or incentive.
- Throughout DRCSC operational area, there have been ample instances of donating personal land for building community assets like Community Training Centre, Common Facility Centre, Area Resource Training Centre and so on. (Saldiha in Purulia, Beriathol in Bankura, Rajnagar, Rautara and Maheshpur in Birbhum, Patharpratima in South 24 Parganas)
- Weather Data like rainfall, maximum-minimum temperature, relative humidity etc. is regularly maintained by volunteers at the village level in Patharpratima, South 24 Parganas.
- Bio-Diversity Registers of 46 villages of North & South 24 Parganas, East Medinipur, Nadia were produced by student volunteers.

The volunteers for this project will be members of beneficiary groups who will be deriving direct benefit out of the project interventions which will act as a motivation for them.

Component 3: Climate resilient technology transfer for enhancing the adaptive capacity of the community

Capitalizing on Component 1 that generates the land and water use plans, Component 3 focuses on transferring the sustainable technologies to the community for increasing their adaptive capacity. In accordance to the plan,

a) **Sustainable soil and water conservation measures** will be taken up with the utmost community participation in order to achieve sustainable management in the long run.
b) The community will be assisted in **diversifying their livelihood activities** away from only climate sensitive practices such as rain-fed agricultural production. The production system will be diversified by integrating various subsystems (crop, tree, aquatic flora-fauna, livestock) so that the produce is distributed over various seasons and space to make the system become more resilient.
c) **Disaster Coping Mechanisms** will be introduced to make the community more prepared to handle the climatic exposures.
d) Introduction of **climate appropriate technologies** will lead to increased resilience at household and community level.

The generic overall plan for the terrain would be like the following diagram, which will be more specified during LUP and WUMP preparation.

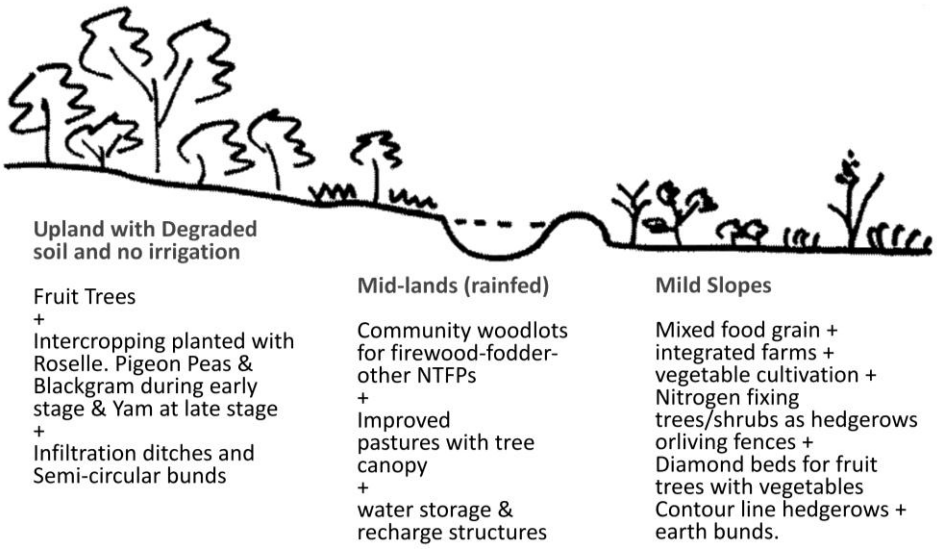


Figure 9: Generic plan for different lands along the gradient

In the red and lateritic soil districts of West Bengal, water availability is the single most important production and livelihood constraint. The PVCA done in the project villages suggest that there is a clearly articulated need to counteract the negative impacts of climate change on water resource-reliant development and livelihoods. It is also necessary to look at the efficiency of water use. Likewise the ability to cope with droughts is necessary in order to protect people, livelihoods and development.

Climate change is expected to have an impact on agricultural production by increasing pressure on water resources. With minimum irrigation facilities, agriculture in Purulia and Bankura is predominantly rain-fed. Maximum rainfall is received between June and September and soil moisture surplus is only found during these months. Both the onset and the cessation of the rains are irregular and the temporal and spatial variability is high.

Both the PVCA Report reflecting community experience and knowledge and Climate Data Analysis (Annexure 1) done by an expert suggest that in both the districts of Purulia and Bankura, a sizeable water surplus is generated after use of rainwater for monsoon crops (mostly paddy). Only a small portion of it gets stored in the surface water storage structures like ponds and ditches; part of it gets recharged in the underground aquifers (recharge is low due to high gradient without vegetative cover rendering low water-holding capacity of the soil and the impenetrability of the rocky layers) and the maximum amount flows down as run off carrying the valuable top soil along with it. High surface runoff rates during the rainy months result in silting up of water storage facilities, such as small dams and community dug-outs. High evaporation rates in the dry and hot season, and siltation driven by erosion and land clearing contributes to reduced water holding capacity, and rapid drying up of these dugouts.

A significant proportion of fallow land has soils with poor physical properties and low content of organic matter. Relatively good soils can be found only in lowland (*shole*). Soils from the top of the mound (*tnar*) to medium upland (*baid*) are highly susceptible to erosion because of the thin vegetative cover and torrential nature of poorly distributed rainfall. There is limited use of soil management practices (e.g. use of organic fertilizers, water management, mulching). This has resulted in low productivity in both crops and livestock.

In order to ensure a sustainable livelihood for the community with an aim to increase their adaptive capacity to withstand the vagaries of nature like erratic nature of rainfall and drought, the project proposes to undertake measures for collecting at least some portion of this water surplus generated during the monsoon and to check soil erosion in order to ensure the rain-fed crop, to increase growing season, to ensure better recharge of underground aquifers and to bring large area of barren land under vegetative cover. Geo informatics appraisal will guide us (ref. Component 1) to determine the ideal places for installing these structures, which will be chosen in consultation with the community that suits the nature of the terrain. After studying the PVCA Report and the suggestions forwarded by the expert through the Climate Data Analysis, the project proposes to install the following soil and water conservation structures in the project area. The implementing agency has a fairly large experience of installing similar structures with very positive results which have been described in the case studies annexed. Each structure has been explained below and justifications provided for making such structures which ultimately leads to building up the resilience and adaptive capacity of the community.

Activity 3.1.1: Step Pond

Small and marginal farmers will be organized into groups and motivated to excavate new **step ponds** and re-excavate old ones. The ponds will be excavated on the medium upland instead of upland where the runoff will be stored. The ponds will have a three to four tier design. Three to four broad steps will be made on all four sides to

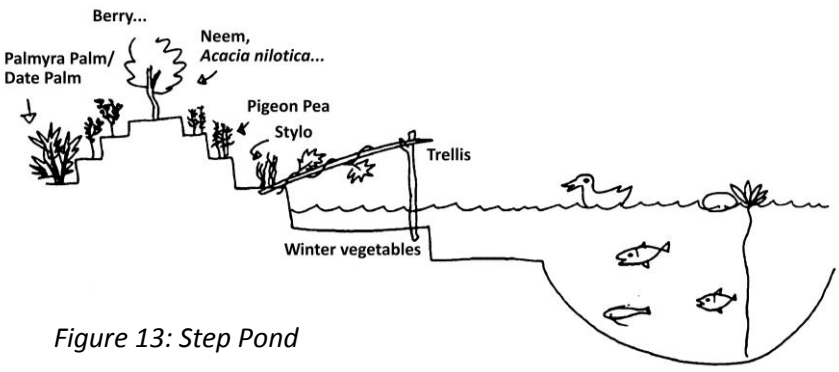


Figure 13: Step Pond

reach the centre. These steps will remain submerged during the rains. After the rainy season when the water level will recede, the residual moisture of the steps will be used to cultivate vegetables which again will add to the total production of the ecosystem. Apart from the rainwater directly falling in the pond, trenches will also be made to channel the run-off from the adjacent plots to the pond. From the bank on all four sides, trellis will be made hanging over the pond for supporting creepers yielding vegetables like pumpkin, bottle gourd, bitter gourd etc. The pond bank will be utilized for growing different vegetables, pulse crops like pigeon pea and seasonal, semi-perennial, perennial and multi-purpose trees. Pond water will be used for fish cultivation for additional income. It will also be utilized for irrigating fallows on both sides of it for growing a wide variety of vegetables in winter. The water may also be used for providing critical irrigation to a matured crop of paddy to counter erratic nature of rainfall. After assessing the total need of the group, yields from the pond, pond bank and newly cultivated fallows will be equally shared among the members of the group. In such step pond excavation, beneficiaries will be motivated to make the depth higher so that after rainy season water remains collected for more number of days, evaporation and seepage is less. 40 such ponds are being proposed.

Activity 3.1.2: Soil & Water Conservation Facilities[33]

Measures like **contour bunds, check dams, semi-circular bunds, and trenches/pits** are being proposed to resist run-off. Multi-purpose trees, cover crop and seasonal drought tolerant crops e.g. Roselle,

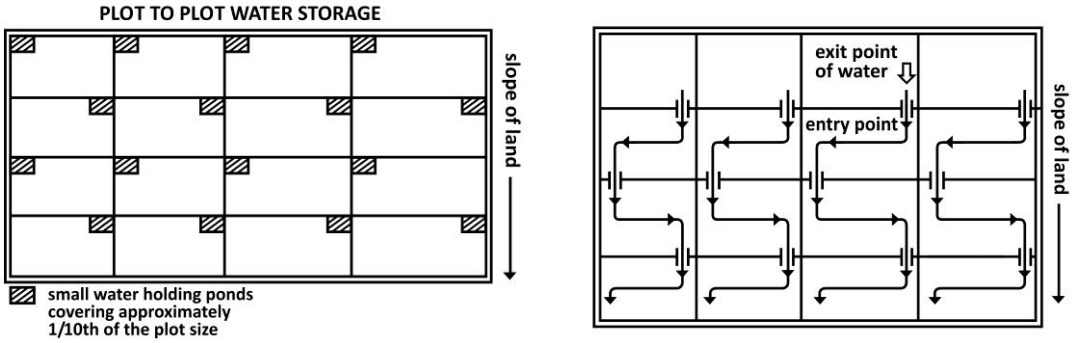


Figure10: Plot to Plot Water Storage

Figure 11: Check Dam

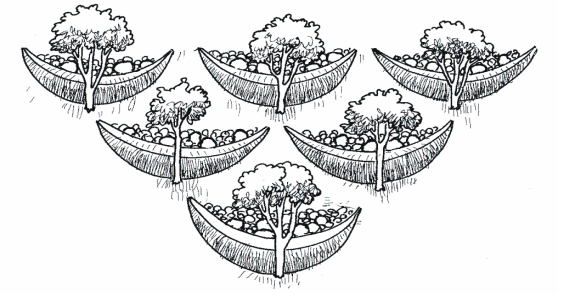


Figure 12: Semi circular bunds

Cowpea, Pigeon pea etc. will be grown to improve soil condition and supplementary income. On the unfertile barren lands, **Water Absorption Trenches** (WAT) would be constructed with dimensions of 3 m

[33] See Annexure 4 for the case studies of such models applied elsewhere

X 1 m X 0.67 m (depth). About 90 such WATs will be constructed per hectare with inter-space of 0.67 m. Stone bunding will be made where there will be a gully. Some semi-circular bunds will be constructed across the slopes. These bunds are arranged just like scales of fish so that the flow of water can be checked to facilitate recharge. Permanent plants (12-15 varieties) like Butter tree (*Madhuca indica*), Minjiri (*Cassia siamea*), Sisoo (*Dalbergia sisso*), Arjun (*Terminalia arjuna*), Subabul (*Leucaena sp*.), Wood apple (*Aegle marmelos*), Indian laburnum (*Cassia fistula*), Indian jujube (*Zizyphus mauritiana*), Margosa (*Azadiracta indica*) etc. will be planted at the back side of the bund. Some fruit trees, like Mango, Guava, Cashew nut, Lemon will also be planted. Water harvested through the bunds is generally utilized to raise the permanent plant, which is planted at the backside of the bund. Efforts will be made to cultivate 5-6 different drought-tolerant crops during the first 3-4 years after planting (when the trees have not grown to cast shade). Soil and Water Conservation measures will be introduced in about 300 hectares of the project area. It is envisaged that the barren land over which these structures will be made will help to make it productive in the long run thereby enhancing the capacity of the community to face climate exposures.

Activity 3.1.3: Plantation (Multipurpose village woodlots in common lands)

As a natural propensity of the tribals, the community residing in the project villages culturally tends to procure a good amount of their food, fodder, fuel and other livelihoods from the wild. With the shrinking of forest cover and degradation of commons, the families have lost their last cushioning option to fall back upon. The so-called 'social forests' created under government schemes encourage only the plantation of one or two types of non-browsable species such as Eucalyptus, Australian Acacia etc which are not at all suitable for meeting the livelihood needs of the people. With the onset of climate change the agricultural scenario has also become quite uncertain for them.

In view of the situation the project proposes to assist the community living in the project area to form groups and locate an unutilized common property (like fallow land, water bodies, river and pond banks, embankments of irrigation canals, roads and railway tracks etc). The groups (with 20-25 members) will be facilitated to make a 20-25 years lease agreement with the landowner (govt. or private), draw up a list of the assorted locally suitable plant varieties preferred by them.

The community will be motivated to select plant varieties as regular source of fodder, firewood and herbs. It may also include multipurpose perennial and semi perennial food and fruit trees, strategic crops etc. Fast growing, nitrogen-fixing and multipurpose trees will be planted to act as carbon sink, produce more fodder and consequently more green manure for preparing vermin-compost etc. which will reduce the need of chemical fertilizers that produce NO gases contributing to global warming.

The groups will be facilitated to raise seedlings and plant them on the land. It is expected that at least 12-15 varieties of trees & 6-8 types of shrubs/herbs will be planted. Some seasonal crops will be grown in the inter-space between trees to get some short term return in the early years of the initiative.

Members will ensure protection of the plantation & share the NTFPs harvested. In the long run, as 8-10 year old trees will be felled, 25-40% of the sale proceeds will be given to the village council/land owner and the rest will be shared equally among members. In the initial 2 years, each family is expected to get some return from the short term crop, fodder grass, firewood etc. The harvest of fodder and firewood is expected to increase gradually from year 3. Sericulture and fruit orchard options will also be tried.

These woodlots will help to increase the greenery, check soil erosion and act as a carbon sink. The biomass generated will help to improve soil fertility as well as water retention capacity of the soil. Livelihood options will be created and biodiversity will increase. The project will support such plantation on 250 hectares of land.

Activity 3.1.4: Check Dam

Many uncontrolled streams intersect this region. 4 check dams will be constructed on the way of these streams to collect the water which will be pumped to the neighbouring fields through a piped channel.

The irrigation facilities will help to reduce the dependence on only rainfed crop and will assure the 2nd and in some cases the 3rd crop also. This activity will directly help to increase the adaptive capacity of the households.

The soil and water conservation measures like step ponds, contour bunds, check dams, semi-circular bunds, plantation, trenches/pits will be done in fallow lands owned by the tribal community. The structures will be designed by qualified engineers as per the technical standards and approval for the same would be obtained from local Panchayat. These structures are small and will not involve any eviction of human settlements. Construction of these low cost structures like check dams does not require environmental impact assessment according to Indian law and regulations.

Activity 3.2.1: Capacity Building

The project proposes to build capacities of the community in reducing their dependence on rain-fed agriculture as their only means of subsistence by diversifying their livelihood activities. Beneficiaries will undergo training on locally suited practices that are not climate sensitive in order to replace rain-fed agricultural production. Farmers will be capacitated to design their production systems by diversifying and integrating various subsystems (crop, tree, aquatic flora-fauna, livestock) so that the produce is distributed over various seasons and space to make the system become more resilient. They will also be given training on basic issues like group building and sustainable agriculture techniques.

Activity 3.2.2: Model Integrated Farming Practices

The integrated farms that will be developed are based upon the first principle of ecology that all the components of nature, biotic and abiotic are interrelated. It is an established principle in ecology now that stability of a system is enhanced by higher connectivity among different biotic elements of a system. A stable system has:

i. Maximum resilience capacity
ii. Optimum productivity with maximum input use efficiency
iii. Higher sustainability

This has been illustrated amply by a number of experimental validations during the last two and a half decades. The basic principles to follow are

- Reduced tillage, biological tillage, mulch farming and other zero tillage systems to reduce the need of heavy machinery and consumption of petrochemicals.
- Mixed cropping of plants with different root depths& structures, resulting in optimal utilization of water & nutrient and higher resilience against environmental stress. Multi-storey agro-forestry extend growing season and reduce soil erosion, while enhancing carbon sequestration. Use of locally adapted plants, animals etc. reduce the need for high external inputs (water, synthetic feed, petrochemical by-products etc.)
- Biological soil inputs, which enhance capacity of soil to store water, carbon & nutrients reducing need for synthetic chemicals / soil nutrients.

- Soil & moisture conservation steps that improve stress tolerance, reduce soil erosion & siltation of water bodies and less groundwater pumping ensuring less petrochemical burning.
- Use of renewable energy resources for irrigation, crop drying, threshing etc. that reduces the need for petrochemicals.
- Varietal diversification of the major crops grown in the project area will be promoted. Traditional technologies which are beneficial in the present day context with respect to climate change adaptation will be emphasized.
- Seed production of major crops will be emphasized in order to make the project villages self-sufficient in seed supply.

Adaptation strategies/hypothesis for IFS:

a. **Time Management** to tackle erratic rainfall, longer dry spell and untimely rain
   - Preponing/postponing crops as preparedness and preventive activity.
   - Postponing crops as rehabilitative activity. Crops like lablab bean, mustard, coriander etc.

b. **Space Management** to introduce multiple production components and increasing diversity so the dependency on one component is reduced
   - By introducing ditch/canal/pond in the low land to drain out the water, and making the low land cultivable. The water can be used for aquatic system.
   - By adopting agro-forestry system to have tree-crop combinations together in the same space.

c. **Diversifying livelihood and production system by integrating various subsystems** (crop, tree, aquatic flora/fauna, livestock, poultry (preferably local variety poultry birds).So the produces are distributed over various seasons and space so that if one is lost due to disaster, others can support the livelihood. It is based on locally adopted crops and breeds, so adaptability and tolerance is high.

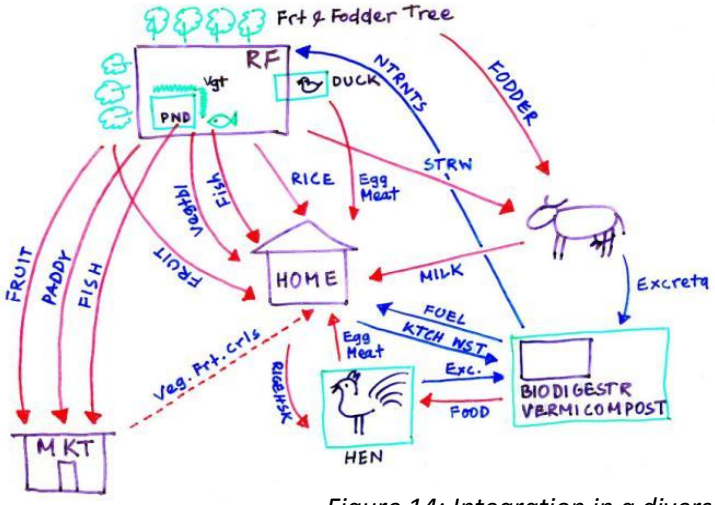


Figure 14: Integration in a diversified farming system

d. As the system is integrated, output of one subsystem is used as input of others, the cost of production is reduced – which in turn means more cash in the hands of beneficiaries.

i. Crops planted at a time, but harvested separately at different points of time by mixing companion crops of different families, root depth, height and fruiting time. Rain fed agriculture should be limited within the growing period when the rainfall satisfies crop need. In Purulia the length of growing season is a little less than 135 days and in Bankura it varies from about 135 days to more than 160 days.

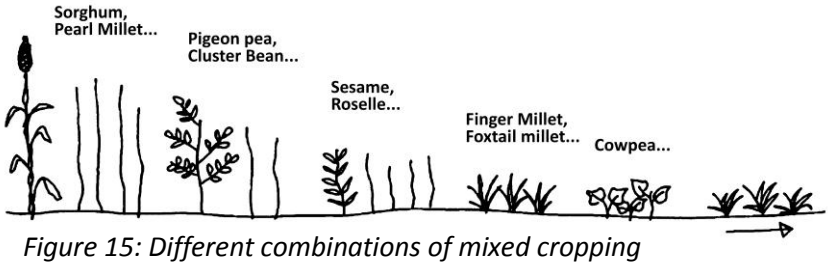


Figure 15: Different combinations of mixed cropping

ii. Season-wise planning with proper crop rotation so that moisture is properly used and soil health is maintained. Outside the rainy season, focus will be more on cultivating heat-tolerant, less water-demanding crops

	Rainy	Winter	Summer
Water stressed Land	Paddy + Black Gram or Maize + Soybean or Roselle + Pigeon Pea	Wheat + mustard + Chickpea or Chick pea + Linseed + Sesame or Grass-pea + Safflower + Linseed	Cluster Bean or Cassava + Groundnut
Low land	Jew's mallow or Water Spinach Bean + Radish Taro/Ginger	Pea or Field Bean or French Bean	Lady's Finger +Cluster Bean or Amaranth + Cowpea Elephant foot yam

iii. Focus more on local breeds of small animals and birds (rabbit, pig, chicken, duck, goat and sheep) for livestock integrated with fodder cultivation to reduce stress on agriculture and water

Integrated Farming Systems will equip farmers to have increased adaptive capacity to absorb shocks induced by climatic stress. Output of one subsystem will act as the input for the other which will ultimately reduce the dependency on market and hence will reduce the cost. Biodiversity and scope for collection of uncultivated food will increase.

Nutrition Garden[34]

In the project villages, each and every household will be encouraged to have their own small nutrition gardens on the homestead land area of about 40 m^2. At present, the families are in the practice of growing 2-3 types of crops in a scattered manner during the rainy season. Through interventions planned in this project, the beneficiaries will be able to harvest nutritious vegetables (leaves, fruits, roots, tubers, legumes etc.) for more than 9-10 months. There are number of edible weeds, unconventional fruits, unknown leafy vegetables which will also be conserved in the gardens. Tuber crops like elephant yam, cassava, *Diaschorea esculanta* etc. which, if not harvested, can be stored live under the soil. These can supply carbohydrate during and after stress period. The project will encourage

conserving these varieties in the nutrition gardens. This activity will be mostly done by the women and it is expected to reduce their nutritional deficiency.

3.2.3: Promotion of Sustainable Agriculture practices

Now it has been proved beyond doubt that irresponsible use of chemicals has over the years increased the compaction of land, reduced permeability and the fertility of soil[35]. The implementing agency's experience of working in the area suggests that climate change has impacted chemical farmers much more than the handful of organic farmers developed through years of intensive work done by the agency in the area.

The project proposes to introduce sustainable agriculture practices through training and motivation of farmers. They will be trained to produce **organic fertilizers and pest repellents at home** by recycling of organic wastes and also to make use of **Integrated Pest Management (IPM)** techniques. The following systems and techniques will be promoted to reduce the cost of agriculture, to increase the adaptive capacity of the farmers and to diminish the loss of soil fertility.

Cultivation without irrigation/zero tillage: A week or two before the rain-fed rice/main crop is harvested, seeds of drought-tolerant varieties of legumes/pulses/oil seeds e.g. linseed, lathyrus, lentil, mustard are broadcasted in the field. Residual moisture in the soil helps the second crop to germinate. Apart from the benefit that the farmer gets to have a second crop almost without any investment, the legumes fix nitrogen in the soil, thereby increasing its fertility. It also acts as a cover crop in the post-harvest days to retain soil moisture and reduces soil erosion.

System of Rice Intensification (SRI): Erratic nature of rainfall creates a situation for the farmers in the red and lateritic soil region, when they have a tendency of planting a bunch of aged saplings out of desperation to get more production which never happens. SRI is an alternative technique of sowing single rice sapling under controlled irrigation. The yield increases by 1.5 to 2 times and seed cost reduction is 80%. The project proposes to introduce this technique in the project area characterized by an undulated terrain, where the land is demarcated by its placement on the slope. The project aims to introduce this system in the medium uplands (*baid*) and medium lowlands (*kanali*) where the flow of rainwater can be controlled to an extent.

The regular **crop advisory service** will add an extra advantage as the farming community will have regular advisories regarding what to plant, when to harvest, when to irrigate etc.

The activity will help to extend the growing season and increase the availability of nutritious food and fodder round the year notwithstanding the vagaries of nature.

Activity 3.2.4: Irrigation Facilities

Ditches and Dug wells: Ditches will be constructed especially in medium lowlands and low lands to act as a harvesting structure during the monsoons which will also help to recycle sub-surface flow locally in the post-monsoon months. Lowland ditches will be made in a series so that the initial monsoon rains are better harvested and the sub-surface flow can be arrested and recycled better in the post-monsoon months. Erratic rainfall has serious impacts on cultivation of paddy which happens to be the main crop

[35]http://www.navdanya.org/climate-change/agriculture

of the area. Life saving irrigation with the stored rainwater can ultimately save an almost mature crop of paddy. Even if the ditches thus made is owned by an individual, at least 4-5 owners of adjacent lands who are also members of the group will have the right to make use of the water stored in the ditch to cultivate low water-demanding crops like mustard, linseed, wheat and vegetables in the winter. In case of scanty or no rainfall after fruiting stage, any one will be able to make use of this water from the ditch for saving his rainfed paddy. Size of the ditch will vary according to the extent of land. The project will support making 650 such ditches (9.1 mX 7.6 m X 3 m) and 150 dug wells (7.6 m depth X1.8 m dia).

There is no possibility of involuntary relocation of livelihood activities of the landowners since cultivation will, in no way, be disturbed by the project interventions. Activities like ditches (*hapa*), dug wells, etc., are small structures, requiring very less land area.

The check dams are small structures and will have dimensions of 20 m wide X 1.5 m high with a cost of INR 500,000/- i.e. US$ 8333. These will be erected on the course of small temporary streams caused by the run-off during monsoon. These structures will not have any negative effect on natural streams and ecosystem surrounding it. These streams do not include any critical natural habitats. In the entire red lateritic soil zone, the practice of erecting such small check dams is very common.

Lift Irrigation: A number of sub-soil rivers flow through this region. It is very difficult to access the river water as a source of irrigation for the lands situated at a higher point in the gradient. These lands are often left fallow or cultivated only during the monsoon. The project proposes to install River Lift Irrigation Systems (RLI) by constructing a well on the riverbed to collect river water which is then pumped up and distributed to the fields through piped channels. 5 such RLI systems will be installed as part of project intervention.

Activity 3.2.5: Animal Husbandry and Fishery

Livestock rearing is a normal practice for people living in the project area as this can be done with least investment because the animals can be reared by free grazing. With the diminishing of vegetative cover on fallows aggravated by the effects of climate change, this practice is also getting disturbed. The people in general have the tendency of rearing cattle for more benefits. In absence of a regular source of fodder, vaccination and other necessary measures for scientific animal rearing, the people are incurring regular losses.

The project will support and capacitate the women beneficiaries in rearing small animals e.g. sheep, goat (*Black Bengal*), rabbit, pig and small birds e.g. duck (*Pati Hansh*, *China Hansh*), chicken (*Mayur puccho*) etc. Local breeds will be chosen which have more tolerance. Beneficiaries will be trained in adapting scientific animal rearing practices like vaccination etc. Natural resource based feed production will also be undertaken. The livestock will be supported to 2750 households. Group based fish cultivation (Indian Carp and Mudfish) will be encouraged in the newly constructed water bodies for 500 beneficiaries.

The activity will diversify the income sources for the beneficiary families and will also act as a supplementary income to agriculture; thereby their adaptive capacity will increase.

Activity 3.3: Disaster-coping measures

Grain Bank: In view of the erratic nature of rainfall and the long drought spells over the area, the agricultural production is not secured. Most of the villages in the area do not have agricultural work during September-November and March- May. Naturally, hunger looms large over the poor families who earn their bread by working as agricultural labourers. In many cases they have to migrate to neighboring districts in search of work or have to take loans at a high rate of interest from local money lenders.

To combat this situation, community managed grain banks will be introduced at community level to save a portion of their produce for lean periods of agriculture caused by climate induced changes. The arrangements can be so done that the individuals will be able to take loan from the banks at the time of their need and return back the same with an agreed amount of interest after the next harvest. 40 grain banks will be established with project support.

Seed Bank: Farmers have become mostly dependent on markets for high yielding and/or hybrid seeds. These seeds show less tolerance to the effects of climate change. These seeds are usually not available at the right time and in sufficient quantities. Moreover the farmers cannot save these seeds for future use. Efforts will be made at the grass root level for collection and preservation of indigenous seeds which are more resistant to climatic stress. The groups will be motivated to maintain stock of native variety seeds (crops, trees etc) suitable for the area. Due to erratic nature of rain, crop damage is a common phenomenon. Conservation of indigenous seeds at the community level will help the farmers to overcome such situations. 5 community managed seed banks will be established through project support.

Fodder Bank: In FGDs done as part of the PVCA, it was revealed that availability of fodder has become very low in the region. The people in the project area show gross negligence towards fodder cultivation. The scope for collection of fodder from the wild has reduced with diminishing of forest cover caused by erratic rainfall, deforestation, longer summers, low soil moisture etc. Natural forests are being replaced by commercial plantations in the name of social forestry which do not allow sufficient vegetative growth on the forest floor.

In view of the above problem, the project will encourage plantation of fodder trees, so that in lean season, beneficiaries are able to feed green leaves to the livestock. Facilities for storing the agricultural wastes of the village will be made. Crop based fodder cultivation will also be promoted at individual household level. 5 fodder banks will be supported as part of the project.

The activity will act as a cushion to withstand climate stress and provide round the year supply of food for both humans and livestock without succumbing to the vicious cycle dominated by the money lenders etc. Market dependence of the farmers for inputs like seeds will be reduced which in turn will help them to become self-reliant and meet the challenges posed by the climate stress.

Activity 3.4: Introduction of Appropriate Technologies

Women spend much of their time sourcing basic resources for the household, such as firewood, water and fodder for animals. Their technical capacity and skill levels remain low. Within homes they also have to work in unventilated, smoke filled rooms. Lack of water within easy reach (10-15 minutes' walk from the home) and indoor smoke pollution increases drudgery and reduces quality of life. Sanitation remains poor due to lack of adequate water supply and facilities for bathing and washing.

This activity will introduce renewable energy systems to ease the burden on women and improve their socio-economic status. This includes providing tried and tested models of fuel efficient cooking stoves, biogas and rainwater harvesting structures.

These measures will have a positive impact on women's workload, due to a decrease in time currently spent in firewood gathering and fetching water from long distance. The activities will also reduce children's workload to support household chores and will contribute to increase the time children spend in schools. The saved time will be used for increasing the adaptive capacity of the households.

Energy efficient ovens: The households of the project area mainly use open stove (*chullah*) for regular cooking purpose. This increases the firewood consumption, and also has adverse effects on the health of women. To reduce the consumption of fuel and drudgery, the improved *chullah* will be installed at individual family level. The *energy efficient cook stoves* will have a hot water storage tank with the capacity of producing about 12 ltr of hot water besides cooking, using the same firewood. The experience has shown that the improved chullah will help to save at least 3 kg of firewood (on an average) per day. This will also help in reducing carbon emission (5.4 kg per family per day on an average). This may also be an opportunity for increasing their income through sale of saved firewood. The project proposes to cover 2400 poor families with this intervention.

Biogas: Poor and marginal families in the villages meet their fuel need by gathering firewood from the wild. But their sources of collecting firewood, dry leaves etc. are gradually getting limited due to a fast disappearing forest cover. As a result, they are compelled to make use of sun-dried dung cakes directly as fuel. On the other hand, cow dung is stacked in large pits on the ground which is kept in the open to dry and rot. This rotting mass produces methane gas and invites environmental problems. This sun-dried cow dung is less effective as a fertilizer. Bio-gas plants can be a solution for all these, installed with joint initiative of govt., implementing agency and the beneficiary concerned. Instead of using dung cakes directly as fuel, the dung produced in the cowshed is used as input for the bio-gas plant to generate the gas used for cooking and illumination. The bio-gas slurry is used as fertilizer in agriculture field, fishery etc. 250 bio-gas plants of 2 m^3capacity proposed to be installed under the project.

The promotion of biogas and energy efficient stoves will reduce the firewood consumption leading to reduced pressure and protection of common land as a buffer especially for food/fodder need during stress period. This will also help in reducing the drudgery of women and the saved time can be used for some alternative activities to enhance their adaptive capacity.

Adaptation benefit is derived from improvement of the quality of life of women in vulnerable households, and within the community. The social dimensions of adaptive capacity include status, health and mobility of women in a community. Increased income, use of clean energy will lead to increased resilience at household and community levels. Higher resilience will improve their ability to face climatic stresses and weather-related disasters.

Low cost water filter and community based drinking water facility

As PVCA report depicts, crisis of drinking water reaches the peak during periods of climate stress. During the longer dry spells, underground water levels are so low that the hand pumps or tube wells are unable to lift any water. People have to depend on ponds as the only source of drinking water. This results in a

spate of water-borne diseases e.g. amoebiosis, cholera, diarrhoea, e-coli, giardiasis, hepatitis A, dysentery etc. Moreover, the project area in Bankura belongs to Fluoride contaminated zone.

Use of Low-cost Water Filters for filtering water collected from tube wells and ponds will help in reducing these diseases during climate stress period. At the same time, 5 Community-based Drinking Water Supply Systems will be installed. The water supply will be ensured mainly during the stress period. Low-cost Water Filters will be distributed to 2500 families.
The supply of safe drinking water will help to check the water borne diseases among the community especially in dry season.

Barriers to be overcome by project interventions

Barriers for adopting the practices listed under the above component in the past, and how the project would seek to overcome those barriers are briefly discussed in the below given table:

Project Outputs	**Barriers to improving ecosystem management for climate change adaptation**	**Project activities and interventions**
3.1 Sustainable soil and water conservation measures (e.g. semi-circular bunds, check dams, gully plugs, infiltration ditches and agro forestry plantations) for various ecosystems introduced for improvement of agricultural productivity and environmental sustainability	• Ignorance about soil erosion and fertility loss of the soil • Lack of technical knowledge on soil and water conservation measures and absence of knowledge regarding groundwater recharge, runoff water storage and their associated benefits • Initial high cost of investments which are beyond means of the poor households in the project area • Inadequate support from Government in the proposed area • Non-organisation of farmers into groups for undertaking common activities. • Non-availability of institutional support for undertaking such activities	• Organize farmers in to common interest groups • Training to build the capacity of the project beneficiaries on soil & water conservation activities • Motivate beneficiaries by involving them in site selection for step pond, location of unutilised common properties for check dams/gully plugs, selection of appropriate species for agro-forestry etc. • Incentivise the poor farmers through financial support for the feasible investments
3.2 Multilevel cropping systems & integrated farming practices are introduced mainly through popularizing a combination of drought tolerant field crops, fast growing & multipurpose	• Traditional practice of mono-cropping that too for only one season (rainy). • Lack of awareness on the improved cropping systems • Non-availability of adequate water • Lack of knowledge on alternate irrigation facilities like ditch, RLI, dug well etc. • Out migration in the absence of suitable agri based activities for 4-5	• Capacity building on group formation, natural resource management and sustainable agriculture techniques covering organic farming, integrated farming system, integrated pest management, etc. • Developing alternate irrigation facilities (Ditch, RLI, dug well etc.) • Incentives for adoption through

perennials and small livestock	months in a year • Lack of capacity and resources for undertaking diversified activities .	financial support for inputs (seeds, biofertilisers, vermicompost etc), livestock , aquaculture etc • Development of model Integrated Farming practices
3.3 Disaster-coping mechanisms like community grain banks, local crop & trees seed banks, fodder banks developed in targeted villages	• Too much focus on Hybrid and HYV seeds which replaced the local and traditional varieties of seeds • Non-availability of traditional varieties of seeds with majority of the farmers • Lack of knowledge and appreciation of disaster coping capacities of suggested measures • Improper facilities for storage of grain and seeds • Subsistence nature of farming by poor households without much saving of surplus grains	• Supporting local drought resistant varieties of seeds • Capacity building and hand holdings of the farmers for production and storage of traditional seeds • Support for community based seed banks, grain banks and fodder banks with storage facilities stored at a central place
3.4 Climate resilient appropriate technologies like energy efficient cook stoves, bio-gas, low cost water filters and community based drinking water facility are promoted	• Lack of awareness on appropriate technologies • Non- availability of technical personnel for proper guidance • Lack of capacity of poor household to invest • Non availability of low cost water filters	• Project support for demonstrative models of technologies like energy efficient cook stoves, biogas, low cost water filter etc • Facilitate technical support from the Government agency • Training of beneficiaries on maintenance of these structures • Demonstrate the use of Community based safe drinking water supply facility

Component 4: Learning and Knowledge Management

Activity 4.1: Publications for Advocacy

Technical documents along with economic analysis will be produced on the successful interventions made as part of the project for sharing with development agencies particularly those working in the red and lateritic soil zones, scientific communities particularly those engaged in researches on climate change interventions, local level policy-makers and govt. authorities at village, block, district, state and national levels. 5 such documents will be produced and shared in course of the project.

One Policy Brief will be produced for advocating the models developed through the project to state and national governments for adoption in state and national policies.

Activity 4.2: Campaign & Awareness

Access to learning outcomes in the targeted villages as well as in public domain will be ensured through a dedicated website, printed materials (case studies, reports, scientific papers) and farmer meets. Mass awareness programs e.g. rallies, village fairs, graffiti, programs in schools and village camps will be organized and 5 short films will be produced in local language for creating awareness among illiterate or neo-literate community living in the project area.

Activity 4.3: Policy Advocacy

The red and lateritic soil zone covers 17.9% of the total geographical area of the country. This area has been found to be drought-prone with degraded soil structure. Vulnerability of the people living in this area is aggravated further by the impacts induced by climate change. The project will venture to advocate the successful models created to appropriate government authorities for adoption in state and national level policies so that they are upscaled to cover the entire red and lateritic soil zone.

The Policy Brief prepared as part of Activity 1 of this component will be one of the tools for advocacy. Two 30 min. films will be produced in English. For influencing policy decisions, 8 local level (Panchayat, Block, District), 3 state level and one national level workshops attended by PRI members, Block Development Officers, District Magistrates, Secretaries and Ministers in charge of government departments, POs, CBOs and climate activists/experts will be organized.

B. Describe how the project / programme provides economic, social and environmental benefits, with particular reference to the most vulnerable communities, and vulnerable groups within communities, including gender considerations. Describe how the project / programme will avoid or mitigate negative impacts, in compliance with the Environmental and Social Policy of the Adaptation Fund.

The project will target climate vulnerable and at-risk groups of people in two semi-arid districts, Purulia and Bankura. It will promote interventions that will help create better living opportunities for the small and marginal farming communities and communities dependent on natural resources. It is expected to deliver the interlinked economic, social and environmental benefits as well as serve as a model for future replication throughout the country.

The groups of people who are expected to be benefited from the project include:

Small and Marginal farmers and landless agricultural labourers

Rural families, who depend mainly on agriculture and natural resources for their livelihood, constitute the principal target group of this project. 49.6% of the targeted population belong to scheduled tribes in the proposed districts. The global phenomenon of climate change has affected the livelihood of these

beneficiaries more adversely. The interventions will help to create diverse income sources so that they have an alternative option to fall back upon.

Women

Among the rural households, women members happen to suffer the most although they take part in all kinds of agricultural and other livelihood activities doing the household chores at the same time. Their contribution to household economy is never taken into account. They form the most vulnerable section in so far as climate change impacts are concerned. The project proposes interventions that will help to reduce the drudgery of women and the saved time will be used for other livelihood activities that will help them improve their status in the family. Coming together to form groups will give them social identity and they are expected to gain in decision-making powers both within the family and outside.

The collection of fodder, firewood etc for livestock rearing and cooking remains the main responsibility for the women. With the decreasing forest covers the women have to travel far for collecting these materials. The soil and water conservation measures will help to increase the biomass production. There will be plantation of multipurpose trees from where women members can easily collect the firewood and the fodders and thus their productive time will be saved, the drudgery will be reduced. The women members will have the opportunity to use their saved time for income generating activities and thus the adaptive capacity will have social forestry and will also increase. The scope for alternative income generation activities will also be created like a grass will become available which can used for making brooms, sal leaves may become available so that sal leaf plates can be made which have a greater market also.

The water crisis also remains for 5-6 months in our project area. Women members have to go far to collect drinking water etc. The excavation of Step Pond will reduce the time spent. The vegetable cultivation on the steps and embankments will increase the availability of vegetables into their daily diet which in turn meet their nutritional need.

Normally the women members grow vegetables at the homestead and rear small animals and birds. Project support towards proper management and design of these gardens will help them to grow some surplus after meeting their daily needs. All the women beneficiaries will have year round production from their gardens. The rearing of livestocks will help 2750 women to earn additional income for the families.

The grain banks will directly benefit at least 1000 women beneficiaries.

The smokeless chullah and biogas will help to reduce the use of firewood. The health hazards of the women will be reduced. About 33% firewood use will be reduced per day per family. 2400 women will be benefited directly by using smokeless ovens and 250 women by using biogas.

The project will support for low cost water filters among 2500 families and will also demonstrate five community based drinking water facility so that they can have access to safe drinking water and the drudgery of the women can get reduced.

PRI Members

In spite of the SAPCC recommendations drafted at State level to address climate change impacts, PRI members need more sensitivity, awareness and capacity to link the activities with the schemes at local level. Inadequate micro-planning leads to results unachieved. The project will create a scope of making

micro plans with the Panchayats, so that economic, social and environmental benefits can be achieved at optimum level.

Children

Awareness about the climate change issue is lacking at community level. The project has a scope to create awareness among the children in schools so that the future generation can equip themselves to adopt climate change impacts.

Benefit Areas	Key benefits	Baseline scenario
Social	Small and marginal farmers face stagnant or irregular production due to erratic rainfall condition and drought like situation. The diverse income opportunities will help to create options for them so that in case failure in one, they can fall back upon the benefits from other livelihood options. This will **reduce migration and poverty.**	Small and marginal farmers are forced to migrate to other districts in search of work.
	The project will deliver both 'soft' support in terms of **awareness, planning capacity and technology transfer** and 'hard' or concrete adaptation actions that are expected to transform lives of communities at risk. Activities implemented through community participation will make certain of providing increased availability of livelihood resources and increase production, ensuring income and **food security** in the longer term.	Community planning and participation is lacking and people only come together for observing festivals.
	The project will create additional **livelihood assets owned by the community** like social forestry, community ponds, community farming etc. The largest share of investment will be in water management to improve water storage and maximize utilization in a variable rainfall regime. Improved irrigation will ensure that farmers have adequate water for cultivation in two / three cropping seasons in a year.	Vast tracts of land remain unutilised, and the water harvesting structures are not created considering the gradient of land resulting in dried up ponds and wells. No sense of ownership exists among the people for community assets.
	The project interventions will create scope for promoting **appropriate technologies to reduce the drudgery of women**.	Women and children bear the burden of collecting firewood, fodder, drinking water – the sources of which are rapidly diminishing.
Economic	Target beneficiaries will enjoy increased investment in agricultural production and farm diversification. The larger share of investment in water management, creation of water harvesting structures in common lands, farms and homes will **improve water storage and maximize utilization** in a variable rainfall	Unsecured and poor income of the small & marginal farmers and agricultural labourers due to climate variability.

Benefit Areas	Key benefits	Baseline scenario
	regime. Emphasis will also be given on using micro irrigation techniques and selection of water efficient crops so that cropping intensity increases. Intercropping and mixed cropping will also add to the **increase in cropping intensity**.	
	Changes in **income/earning of the small fish farmers** from fisheries is being addressed by developing a package of financial instruments comprising of **saving, credit and insurance** that will enable the farmer to cope with financial losses arising out of vulnerability from climate change	Poor insurance coverage and credit access to meet the required capital and recurring expenses.
	The project will focus more on rearing traditional breeds of small animals and birds rather than large animals so that **household income** does not have to depend only on agriculture and **may sustainably increase**.	Driven by the myth of getting more earning, people tend to rear foreign breeds of cattle and often have an income lower than their expectation because of high cost of feed and other management necessities. In case of sudden death of the animal, they fall into a debt trap.
	Market dependency of the farmers will be **reduced** with improved capacity of making organic composts and by saving local and traditional varieties of seeds.	Chemical intensive farming forces the farmer to depend more and more on market forces.
	Investment in disaster proofing measures and storage (buffer stock) of grain, seeds, fodder etc. will provide the beneficiary families with **income and food during lean agricultural seasons** also.	No such measures exist at present.
Environmental	Project interventions will contribute to increased water availability and irrigation potential through **ground water recharge and water harvesting**; **improved forest cover** through community forestry and agro-forestry; **improved soil and slope stability** through conservation techniques such as check dams, trenches, live fences and **improved biodiversity** in terms of plant, animal and microbial life in home gardens and community forests, pond ecosystems etc. These environmental benefits will improve the **integrity of the ecosystem** services that support community livelihoods.	Low moisture retention capacity of the soil and absence of vegetative cover cause the valuable top soil to flow down with the runoff resulting barrenness of the uplands and midlands.
	Heat tolerant, low water-demanding crop/animal species will be introduced that can	The survival rate of species in extreme weather conditions is

Benefit Areas	Key benefits	Baseline scenario
	adapt to climatic variability and yield optimally. This will **reduce vulnerability** and **improve adaptive capacity** of the farmer. The storage of indigenous seeds will regenerate the use of local seeds and will not impact the environment adversely. Protection and recovery of biodiversity with the use of native and adapted species.	reducing drastically.
	The promotion of organic farming, biopest repellents will help to **regain soil health** and **adapt to climate variability**.	Chemical farming is impacting soil health adversely.

The following table depicts component-wise social, economic and environmental benefits.

Activities	Key benefits (Direct)		
	Social	Economic	Environmental
Component 1: Land and Water Use Master Plan			
Geo informatics appraisal & Gram Panchayat wise planning	Micro planning involving scientists, community, Panchayat helps in building the ownership and realisation of the plan	Judicious use of natural resources, increased productivity, increased income	Assessment of existing resources, Water harvesting, improved use of seasonal and permanent fallows, adaptability to climate variability, increased surface water utilisation
Component 2: Reducing climate risks through timely and appropriate weather specific crop/agro-advisory services in local language (Bengali)			
Localised weather data collection, analysis and dissemination of crop weather advisories	Ensured crops will help the farmers to keep social commitments.	Reduced loss due to climate variability and hence increased income	Optimal use of available resources, input loss minimised
	Understanding and awareness of farmers about crop advisories and its relationship to weather will increase.		
Component 3: Climate resilient technology transfer for enhancing the adaptive capacity of the community			
Soil & water conservation work	Better management of land & water, vegetative cover increases, work opportunity created for the landless	Increased opportunity of income by increasing the cropping intensity by 200%	Soil erosion restricted, ground water getting recharged, plantations will also act as carbon sink
Capacity Building	Improved management skill and better understanding of adaptive	Dependence of farmers on market for procuring inputs reduced	

Activities	Key benefits (Direct)		
	Social	Economic	Environmental
	measures in natural resource management		
Construction of irrigation facilities	Rainwater harvesting structures increases the availability of water	Return from rain-fed agriculture assured, double even in some cases triple cropping made possible	Harvesting rain water minimises the use of ground water
Integrated farming models & promotion of organic farming	Sources of income diversified, employment opportunity created, engagement of women in home gardens and livestock rearing increases their contribution in the family thereby increasing their social status and decision-making power.	Risks and cost recovery will be distributed over various sub-systems, whereby the wastes of one will be used as input for the other. Total production of the farm will increase.	Methane emission from unprocessed manure is reduced through bio-digesters like bio-gas and vermi-compost pits. Vermi-compost and biogas slurry improves soil health.
Promotion of grain bank, seed bank, fodder bank	Opportunity created to conserve indigenous varieties of seeds that gives them the power to control agriculture.	Community reserves for lean periods increase. They do not have to pay exorbitant rates of interest to local moneylenders. Scope for enhancing group income through processing of grains is unleashed.	Free grazing will be reduced, thereby reducing the perennial problem of common lands getting denuded of vegetation inviting soil erosion.
Appropriate technology promotion	Reduction in drudgery of women promising better working atmosphere. Saved time can be used for other livelihood activities, hence vulnerability will get reduced.	Women members of the family increase their contribution in the family income.	Reduction in use of fossil fuel, timbers etc. will save the forests and the environment.
Component 4: Knowledge Generation and Management			
Preparation of financial and technical papers	Adaptation policies and plans recognise the social imperatives of the small and marginal farmers	Identification of areas of investment that will enable expansion of productive practices to other areas	Green practices identified and cases for replication developed
Mass awareness generation about climate change	Rural community, children, PRI members are better prepared about the climate change impacts Access to project learnings		Best practices of sustainable natural resource management identified for replication and scaling up.

Activities	Key benefits (Direct)		
	Social	Economic	Environmental
	are assured.		
Knowledge generation and dissemination	Recognition of the community as a key stakeholder in policy development for climate adaptation	Priority areas for economic investments identified	Contributes to the development of sustainable natural resource management practices and policies

From the very onset of the project, DRCSC will closely monitor all activities and outputs so that equitable sharing of all the project outputs is ensured.

Sharing of water: Ditch and dug wells will be constructed on the lands of individuals, but, apart from the landowner, the group members, as well as farmers in the vicinity, will have the right to use the water for providing life-saving irrigation to their crop in case of erratic rainfall, and also for extending growing season. The principle of sharing will remain the same in case of utilization of water from the step pond, check dam, RLI also. The decision of crop selection in all cases of water sharing will remain with the group, where it will be resolved that high water demanding crops cannot be cultivated. Fish reared in the ponds will be equally shared among the group members. This is a common practice in most of the DRCSC facilitated projects in West Bengal. The Committee for managing the Community Drinking Water Facility will make rules so that the villagers have equal access to the facility.

Sharing of produces from plantation: According to agreement with the landowner, an agreed share of the main produces (fruits, firewood, timber, silk cocoons etc.) will be given to the landowner and the rest will be equally shared among the members of the group. In case of grass, the members will have the right to procure it as and when required, provided they do not sell it.

Sharing of disaster-coping mechanisms (Grain Bank, Seed Bank, Fodder Bank): The group will frame separate rules for these facilities that will ensure equal rights of all members of the group.

C. Describe or provide an analysis of the cost-effectiveness of the proposed project / programme.

Sub-component	Current addressing mechanism and loopholes	How this project trying to address this	Cost effectiveness
LUP and WUMP	Water harvesting through IWMP, MGNREGA etc. hardly considers future climatic trends. Support for bore well, submersible pumps are causing more trouble.	Including climate perspective in the planning through WUMP and LUP, it is also considering reduction of water foot print, calculate water demand for future and predict suitable location through trend analysis. The focus is more on	When compared, the planning exercise is bringing invaluable climate resilience factor in the mainstream planning so that all the plans are converged and contextualized - which will make the

Sub-component	Current addressing mechanism and loopholes	How this project trying to address this	Cost effectiveness
		demonstrating some small irrigation measures and taking it to the mainstream planning. The demonstration of low water demanding local crops and small ruminants will also be taken up.	entire investment, from this project and other schemes by the mainstream, sustainable and usable in the longer run and address the water stress scenario.
Weather Station and CRC	Weather Crop advisory, which is most of the time not effective and timely.	SMS advice coupled with weather information for better and advanced planning of agriculture and other natural resource dependent livelihoods.	Timely advice related to agriculture and other natural resource dependent livelihood will reduce chances of greater cash loss due to shocks and disaster. Existing channels for information Dissemination would also be used.
Soil & Water Conservation Measures	Soil and water conservation is being taken-up under watershed programmes under Integrated Watershed Management Programme (IWMP). However, the same do not include climate concerns in the design and implementation mechanism.	Based on ecosystem wise micro planning the rainwater conservation structures will be made to store rainwater. Climate concern would form important part of the component design. This stored water will reduce the uncertainty of rain-fed farming, improve cropping intensity, productivity, aquaculture opportunity will be created and thereby the income opportunities will increase. Soil health will be improved, resulting in productivity improvement	Existing learning from community based soil and water conservation based projects / programmes would be incorporated. The stakeholders would be involved in planning, execution and monitoring, use of locally available material would be encouraged.
Sustainable Integrated Farming System	Efforts are not integrated and holistic. Location specific design are not popularized. Integration of climate concerns in farming systems is lacking	The skill and knowledge of farmers will be enhanced and they will be able to design their production system according to climatic situation.	Creation of demonstration models. Use of exiting extension channel and network is envisaged under implementation.
Disaster	Such measures are not	To mitigate with the disaster	The storage structures

Sub-component	Current addressing mechanism and loopholes	How this project trying to address this	Cost effectiveness
proofing measures like community grain banks, seed banks of local seeds, fodder banks	available due to which availability of seed as well as grain during stress periods is limited.	situation the grain, fodder will be stored at low cost at the time of harvest.	will be made using locally available materials so that those can be maintained locally. Farmers will themselves store seed and will be able to sow at proper time. The local methods, practices and materials will be combined with appropriate knowledge to reduce the cost in long term.
Appropriate technologies like energy efficient ovens, biogas, community based water harvesting and distribution	Penetration of improved cook stove and bio-gas very low in rural areas leading to indoor pollution. Efficiency of the system is poor. Poor quality drinking water particularly in monsoon season and low water availability period (summer) leads to increased number of water borne diseases	Energy security, clean energy, safe drinking water important for rural livelihood. The women drudgery will be reduced. The saved time (from collection of fuel, cleaning, cooking time etc.) of women can be used for other livelihood options.	Low cost, low technology based models will be developed. The energy saving devices will reduce the recurring expenditure for fuel. The local service providers will be able to maintain these products easily.
Advocacy and sharing of best practices	Limited or no Existing channels of knowledge dissemination related to climate change. Non- availability of location specific information related to climate resilient technologies	Information and knowledge dissemination material would be published and circulated. Training and network meetings would be conducted.	The wide range experience sharing will be made through circulation of low cost public education materials. Use of world wide web (www.) through creation of website. Existing extension channels would also be used.

Quantification of Cost Effectiveness

(Amount in INR)

Sl No	Particulars	Model for State Approved by NABARD	Project proposed
1	**Step Pond**		
a	Volume of the pond/ design capacity (m3)	630	18,572
b	Total Cost	44,200	799,980
c	Net cost per cum of earthwork	70.16	43.07
d	Net income from farm per cum of Earthwork	96.87	140.64
2	**Vermicompost tank**		
a	Capacity of the tank (cum)	4.05	2.6
b	Total Cost	19,962	5,000
c	Net cost per cum capacity of vermicompost tank	4,929	3,130
d	Net benefit per cum over a period of 5 yrs	3,341	7,290
3	**Micro irrigation facilities – Dugwell**		
a	Capital cost for Dugwell construction	36,200	26,340
b	Crop cultivation cost in a year per 1 Ha	38,500	38,500
c	Total cost (Dugwell + Crop cultivation) in a year per 1 ha	74,700	64,840
d	Total income in a year from 1 Ha	405,100	405,100
e	Net income per acre from 1 Ha	330,400	340,260
4	**Micro irrigation facilities (Ditch)**		
a	Capital cost for Ditch construction	48,614 (For 24,000 cuft cap.)	15,000 (For 7,500 cuft cap.)
b	Crop cultivation cost in a year	26500	13700
c	Total cost	75114	28700
d	Total income in a year	133350	67100
e	Net income per 1 acre	58236	38400
f	Net income per cuft of earthwork for ditch construction	2.43	5.12

Proposed benefit Derived from other Inventions		**(Amount in INR)**
5. Support for Livestock to Poor families		
SL No	**Particulars**	**Total Cost**
1	Goat (1)	1,000
2	Sheep/Pig/5 Rabbits 91 unit)	1,000
3	Chicks (5months old (10))	900
4	Duck (10)	900
5	Vaccines+Medicine	220
	Total	**4,020**

Income generated out of the Intervention after two years		
1	Goat (6)	12,000
2	Sheep/Pig/Rabbits (6)	9,000
3	Chicks (5months old) (50)	7,500
4	Duck (40)	8,000
	Total	**36,500**
	Net benefit after 02 years	32,480

6. Establishment of Lift irrigation Structure		**Amount (INR)**
1	Establishment cost of 01 LI Structure (Sufficient to irrigate 70 acre)	660,780
2	Crop cultivation cost in one season in a year in 70 acre with our irrigation for one season	406,000.00
3	Crop cultivation cost in 3 season in a year in 70 acre with irrigation for one season	2,563,000.00
4	Net Incremental benefit in a year from 70 acre	2,157,000
	Net Incremental benefit in a year from 1 acre	30,814

(2.5 acres = 1 hectare)

7. Storage of Food grain in the Grain Bank (Capacity : 30 Qtl)

Cost of construction (**INR**) 30,000.00

Year	**Paddy stored at the beginning of the year (Kg)**	**Paddy stored at the end of the year (Kg)**
1	650	900
2	1,600	1,900
3	1,900	2,200
4	2,200	2,600
5	2,600	2,900

8. Plantation of Horticulture Crop in 1 acre

(Amount in **INR**)

a	Establishment cost or 1st year	22,840
b	Maintenance cost of plantation up to 9th year (to be borne by the beneficiary)	40,000
c	Total cost of cultivation up to 09 year	62840
d	Net income per acre over a period of 09 years	90,5160

Viability of Proposed Solutions: DRCSC has been operating in the semi-arid region of West Bengal for the last 15 years. The tried and tested model of crop advisory service will be replicated for the area. The case studies are included for the reference.

D. Describe how the project / programme is consistent with national or sub-national sustainable development strategies, including, where appropriate, national or sub-national development plans, poverty reduction strategies, national communications, or national adaptation programs of action, or other relevant instruments, where they exist.

Key National Policy and Responsible Agency	Project elements consistent with policy
1. National Agriculture Policy	Irrigation water management, soil moisture conservation, soil conservation, land conservation in watersheds, organic agriculture, home gardening, integrated pest management and integrated plan nutrition systems, conserving agro-biodiversity and promoting tolerant species
2. National Disaster Management Policy	Early warning systems linked to community preparedness and risk assessment
3. National Forest Policy	Increasing tree cover in non-forest areas, reducing pressure on natural forests by supporting community woodlots, management of Multiple-use forests
4. National Environmental Policy	Restoration and conservation of ecological systems, conservation of native species and agro-biodiversity, water resources conservation and management, soil conservation
5. National Livestock Policy	Promotion of livestock farming to increase incomes and food security of rural farming households

Details on outcome-wise applicable national and sub-national plans are given below:

Project Outcome	National Action Plan on Climate Change – Priorities/Strategies	State Action Plan on Climate Change for West Bengal – Priorities/Strategies	12th Five Year Plan - Priorities/Strategies
Communities adopt land and water use master plans with the help of Panchayats through better understanding of climate change related impacts	The "National Water Mission" which is one of the missions identified under National Action Plan on Climate Change focuses on improving water storage capacity, creation of new water harvesting structures, soil moisture conservation structures etc.	Creation of Rain water harvesting structures in the undulating slopes of the Red and Lateritic soil area. Construction of check dam for harnessing surface water Implementation of special programme for planting forest trees or fruit plantation s as appropriate to increase the run off infiltration ration.	Watershed development and soil conservation investments have to be complemented with farming systems investments in a watershed-plus framework that takes into account the diversity of rain-fed agriculture.
Livelihoods have become less vulnerable to climate change and achieve higher levels of productivity	The "National Mission for Sustainable Agriculture" which is one of the missions identified under National Action Plan on Climate Change focuses on improving productivity of rain-fed agriculture by adopting suitable agricultural techniques.	Creation of Seed bank Enhanced livelihood of small and marginal farmers by introducing the concept of Integrated Farming System by pooling in their fields for practicing each element of the Integrated Farming System Up scaling of Resource Conservation Tillage Technologies Effective soil nutrient management Promote organic ways for combating weeds, insect, pest and diseases and nutrient management. Real time crop monitoring	There is a need to give emphasis on integrated farming systems, combining crops and livestock, including small ruminants, for different location-specific endowments Strengthening soil organic carbon (SOC) research, particularly on the quality of organic matter and microbial activity, physical properties of SOC, validation and refinement of models and SOC dynamics under different land uses and management

Project Outcome	National Action Plan on Climate Change – Priorities/Strategies	State Action Plan on Climate Change for West Bengal – Priorities/Strategies	12th Five Year Plan - Priorities/Strategies
		and weather forecasting Setting of Agra-Information Center in each of the state of West Bengal Feed and fodder development for livestock	regimes.
Various types of materials on processes and techniques are published and measures are taken to upscale the interventions to improve climate resilience in the red and lateritic zone	The "National Mission on Strategic Knowledge for Climate Change" which is one of the mission identified under focuses on creation of awareness on climate change adaptation among the farming community.	Appropriate crop diversification through training & capacity building of farmers Capacity building of farmers for effective adaptation to climate change Real time weather monitoring and forecasting	The need to increase total domestic energy production in order to reduce import dependence, combined with the need to move away from fossil fuels in the longer run in view of climate change considerations, points to the need for stronger efforts to increase the supply of energy from renewable. Capacity building of farmers for effective adaptation to climate change

E. Describe how the project / programme meets relevant national technical standards, where applicable, such as standards for environmental assessment, building codes, etc., and complies with the Environmental and Social Policy of the Adaptation Fund.

The list of applicable standards for various components proposed under the project are presented in the table below:

Activity	Applicable standards	Application to Project	Monitoring
1. Weather stations & Climate Resource Centres (CRCs)	Technical standards of the instruments to be installed in Automatic Weather Stations & CRCs	By DRCSC Project Management Unit	By DRCSC project Management Unit By District level Project Monitoring Committee By State level Project Monitoring Committee
2. Soil & water conservation measures	Technical standards for creation of Soil & water conservation works, plantation, Check Dam. Micro irrigation, Lift Irrigation as per Panchayati Raj & Rural Development, Water Resources Devt. Dept of the Govt. of West Bengal.	By DRCSC Project Management Unit in consultation with NABARD Regional Office in Kolkata District Panchayati Raj & Rural Development Dept. Water Resources Devt. Dept.	By DRCSC project Management Unit District Panchayati Raj & Rural Devt. Dept. District Water Resources Devt. Dept. State level Project Monitoring Committee
3. Livestock development	Standards applied by Animal Resources Development Dept. of the Govt. of West Bengal.	By DRCSC Project Management Unit in consultation with NABARD Regional Office in Kolkata By Animal Resources Development Dept.	By DRCSC project Management Unit Animal Resources Development Dept. State level Project Monitoring Committee
4. Integrated Farming System	Standards prescribed by Dept of Agriculture, Dept. of Fishery & Dept. of Panchayati Raj & Rural Development, Dept. of Animal Resources Development of the Govt. of West Bengal.	By DRCSC Project Management Unit in consultation with NABARD Regional Office in Kolkata District Agriculture Dept officer District Panchayati Raj &	District Agriculture Dept., District Panchayati Raj & Rural Devt. Dept., Dept of Animal resources Devt.

Activity	Applicable standards	Application to Project	Monitoring
		Rural Development Dept., Dept of Animal resources Devt. Dept of Fishery Dept. of Animal Resources Development	District level Project Monitoring Committee State level Project Monitoring Committee
5. Disaster coping mechanisms like community grain banks, seed banks of local seeds, fodder banks	Standards prescribed by District Agriculture Dept., Bidhan Chandra Krishi Viswa Vidyalaya (BCKV – Agriculture University),	By DRCSC Project Management Unit Dept of Agriculture	DRCSC Project Management Unit District Agriculture Dept District level Project Monitoring Committee State level Project Monitoring Committee
6. Appropriate technologies like energy efficient ovens, biogas, low cost water harvesting, community based drinking water facility	Standards prescribed by West Bengal Renewable Energy Development Agency (WBREDA)	By DRCSC Project Management Unit West Bengal Renewable Energy Development Agency (WBREDA)	By DRCSC project Management Unit By District level Project Monitoring Committee By State level Project Monitoring Committee

F. Describe if there is duplication of project / programme with other funding sources, if any.

The project target area is not the focus of any other climate adaptation initiatives. In fact, this is the first, focused effort to implement a climate adaptation project based on identified priorities on the ground. A number of NGO-led micro projects are field testing adaptive strategies on a much smaller scale. For example Christain Aid, UK and KKS, Germany supported projects for enhancing the food & livelihoods of backward poor people (mostly Scheduled Tribes and Schedule Caste) of some villages in Purulia. WHH, Germany has supported for developing the model of sustainable Integrated Farming System for dry-land among the tribal communities in only few villages of one Gram Panchayat of Bankura district. The lessons and practices of these micro projects have influenced the design of the activities, delivery/monitoring and assessment modality.

DRCSC has implemented the GIZ funded project in the riverbank erosion and waterlogged areas of Malda and Murshidabad districts. In practical terms, the project helps to design and implement integrated farming systems for individual farms so that farmers can rely on other sources of

livelihood in case of climate stress. The measures which can be useful in implementing the proposed project include:

- Land shaping, that is, the redesigning of farmland to permit the use of portion of land during waterlogged periods. Farm ponds, canals and ditches are dug to drain off water. The soil thus excavated is used to elevate beds. Diverse varieties of vegetables and trees are grown on these beds, providing food and fodder throughout the year.
- Introduction of local fish species in the ponds for household consumption and as alternative income generation opportunity
- Preponing the sowing of crops such as paddy and maize within the summer cropping season in preparation for the early monsoon

This project would be the first one to explicitly focus on improving the resilience of communities and preservation of ecosystems as an adaptation strategy. This project will complement on-going government programs that are being implemented to improve rural agricultural productivity, manage drought and landslides, irrigation and watershed management, and conservation of biodiversity.

Project	**Objectives**	**Complementarity**	**Geographical Coverage/Agency**
National Food Security Mission	To increase the production of rice by 10 million tons, wheat by 8 million tons and pulses by 2 million tons by the end of the Eleventh Plan (2011-12) in order to ensure food security.	The project proposes the transfer of sustainable technologies as also the distribution of improved local variety seeds for increasing the existing farm production thereby ensuring food security of the small and marginal farmers.	Dept. of Agriculture, GoI
Bringing Green Revolution to Eastern India	To rejuvenate the farm sector with Techno-managerial advancements to enhance the Productivity, Profitability & Sustainability of the major farming systems in different Agro-climatic regions, thereby attracting and retaining educated youth in farming and substantially improving the livelihood of the farmers of the state.	The project proposes to act as a complement to the programme in discouraging lifting of ground water and increasing growing season by developing micro watershed-based climate-adaptive sustainable agriculture.	7 states in Eastern India including West Bengal. Dept. of Agriculture, GoI
Integrated Scheme of Oilseeds, Pulses, Oil	To harness the best of production & productivity, processing and post-harvest	The project proposes to introduce indigenous varieties that are heat tolerant and less water	Dept. of Agriculture, GoI

Project	Objectives	Complementarity	Geographical Coverage/Agency
Palm & Maize (ISOPOM)	management technologies to accelerate self-reliance on Oil seeds and Maize.	demanding, low fertilizer demanding, soil fertility enhancing seeds as against hybrid varieties	
Dry land Farming programme	To increase the agricultural production and improve the economic condition of the dry land farmer through development of selected micro-watershed, use of improved drought-resistant seeds, fertilizers, improved implements and agro-forestry programme etc.	The project proposes to complement the objectives of the national program only with the exception of introduction of drought-tolerant indigenous variety seeds instead of HYVs and also an innovative crop selection	Dept. of Agriculture, GoI
Mahatma Gandhi National Rural Employment Guarantee Scheme	It is designed at improving the income protection of the people in rural areas by ensuring hundred days guaranteed employment in a financial year, to a rural family.	The project proposes to augment the income scenario of the rural families by making provisions for employment of at least 50 more days over and above the 100 days guaranteed by the govt.	National level programme implemented by the Panchayats
Rashtrya Krishi Vikas Yojana	To ensure the preparation of agriculture plans for the districts and the states based on agro-climatic conditions, availability of technology and natural resources. To ensure that the local needs/crops/priorities are better reflected in the agricultural plans of the states.	Through its actions, the project proposes to fill up the gaps between the actual need of the all-round development of the beneficiaries and the extent to which the national program fulfills it. Project support will be limited to the introduction of the components that are not supported by RKVY.	National level programme implemented by the Dept. of Agriculture, Govt. of West Bengal.

G. *If applicable, describe the learning and knowledge management component to capture and disseminate lessons learned.*

The entire project idea is based on preparing localized development plans involving both scientific knowledge and community experiences. The land and water use master plans generated will provide a scientific base during assessment phase based on which the community will be able to plan the interventions along with the Panchayat and local administration.

The transfer of knowledge generated through the project will be given the utmost priority. Component 4 of the project deals particularly with the knowledge management. The knowledge will include adaptation techniques at the farm level, best practices, crop-weather advisories, sustainable agricultural practices, and other policy recommendations and technical guidelines produced by the project.

The project will generate / record and disseminate both technical and financial knowledge which will be shared with different stakeholders during meetings, workshops and seminars and/or through publication. The audio visual media will also be used as a knowledge management tool so that best practices, evidences etc. can be shared at various level.

It is also envisaged that the project results will be able to influence the Government to adopt the successful models created through the project in the State and National policies so that they are up scaled in the red and lateritic soil zone spread over in different states of the country. The experiences of DRCSC will be documented and shared with Government institutions, Universities, Local Government as well as local. The Information Manager will be responsible for knowledge management and communication responsibilities.

The specific steps proposed for replication are:

1. Presentation of the tested methodologies in meetings of the State Steering Committee, which has membership from key departments of Government (Agriculture, Environment and Rural Development).
2. Developing Technical and Financial Papers highlighting cost effectiveness of the models
3. Developing documents on Best Practices as part of process documentation.
4. Sharing the documents on Best Practices with:
    i. members of State and District level Steering Committees
    ii. community of practitioners through the existing e-groups
    iii. other stakeholders- financial institutions
    iv. Civil Society networks involved in Natural Resource Management and/or Livelihood Enhancement and
    v. Presentation to Academic institutions

H. *Describe the consultative process, including the list of stakeholders consulted, undertaken during project preparation, with particular reference to vulnerable groups, including gender considerations, in compliance with the Environmental and Social Policy of the Adaptation Fund.*

The DRCSC head office and field staff met the villagers at project area for several times to assess the community's need and scope of the project. Based on the problem assessment and needs expressed by the community of the area, a draft project brief was prepared in consultation with Department of Environment and Forest (DoEF), West Bengal. The brief was presented before NABARD and through different consultation processes and the concept was finalised. In the process of preparing the final project various consultation processes with stakeholders were carried out which has been briefly shared in the following table.

Table: List of Consultative Processes

SN	Particulars	Date	Place	Stakeholders participated
1	Consultation with various stakeholders in Purulia	20th November 2013 20th May 2014	Sonathali, Purulia, WB Kashipur, Purulia, WB	Dept. of Agriculture, Horticulture, Sericulture, Fishery, LAMP Society, Block Administrative Office, Representatives from different banks, NABARD officials, LDM, Panchayat officials, DRDC, Scientists etc. and individual farmer, group & cluster representatives and other representatives from NGOs
2	Consultation with various stakeholders in Bankura	5th March 2013 18th December 2013 18th June 2014	Jhunjka Panchayat, Bankura, WB Panchayat Samity Hall, Bankura, WB BDCCB- Board Room, Bankura, WB	
3	Focused Group Discussion	22nd April 2014	Kroshjuri, Purulia	Villagers from the select villages
4	Focused Group Discussion	3rd May 2014	Beriathol, Bankura	-do-

The participatory vulnerability assessments were carried out in at least 5 villages (see Annex 3 for the report) to assess the current and projected vulnerabilities and the existing coping capacities of the community. Series of meetings and visits to similar regions of India were also undertaken as per the details given below:

Sl No.	Particulars	Date	Place	Participants
1	Visit to Gorakhpur Environment Action Group for learning about the crop advisory services	December 2013	Gorakhpur, UP	DRCSC Staff
2	Meeting with Jadavpur University,	7th May 2014	Kolkata	DRCSC Staff

	Department of Oceanographic Department			
3	Meeting with Dr. Kailash Pandey, expert meteorologist for learning more details on crop advisory services, data collection, data analysis etc	2nd & 3rd May 2014	Kolkata	DRCSC Staff
4	Meeting with Dr. Swadesh Mishra, Agro-climatologist regarding climate data analysis	1st may 2014	Kolkata	DRCSC Staff
5	Meeting with Mr. Richard Ewbank, representative of Christian Aid, UK regarding the automated weather station, crop advisories, climate data of West Bengal etc	19th April, 2014	Kolkata	DRCSC Staff
6	Meeting with Executive Committee of DRCSC	15th February & 18th April 2014	Kolkata	All executive members of DRCSC
7	Consultation meeting with Ministry of Environment and Forestry (MoEF)and GIZ	August, 2013	Kolkata	DRCSC staff, Dr. Debal Roy of MoEF, Representatives of GIZ
8	Series of consultancies with NABARD, West Bengal	On various dates starting from September 2013	Kolkata	DRCSC staff and NABARD officials

We conducted 5 Consultation meetings, 2 in Purulia and 3 in Bankura to discuss about the activities to be undertaken with respect to climate change. In the Consultations, different stakeholders, the beneficiaries, the Government Officials, Bank coordinators, representatives of other NGOs working in the area were present. A brief account of one of the Consultations conducted in BDCC- Board Room, Bankura on 18th June 2014 is given below:

Theme	Points Emerged	Resource Persons
Impacts of Climate Change on Agriculture	Paddy saplings cannot be transplanted at the right time due to late onset of monsoon. Fully mature standing crops of paddy are dying due to absence of rain in the late monsoon period. Winter crop is getting severely damaged due to the shifting of rainfall. Pest attack and disease of crops are on the rise. .	Dr. S. Bandopadhyay, DDM, NABARD Mr. Sagar Bandopadhyay, Asstt. Director of Agriculture, Dept. of Agriculture, Govt. of West Bengal Mr. Subodh Hansda, Local farmer
Possible Adaptation Strategies	Harvesting rainwater at village and household level , plantation, proper crop planning, organic fertilizer promotion, cultivating traditional varieties of paddy	Dr. S. Bandopadhyay, DDM, NABARD Mr. Sagar Bandopadhyay, Asstt. Director of Agriculture, Dept. of Agriculture, Govt. of West Bengal

	seeds which have high potential for export, exploring marketing opportunities, processing the produce for value addition, micro-planning, pest and disease management, conservation of traditional local varieties of trees and crops, awareness creation, diversification of livelihood.	Mr. Subodh Hansda, Local farmer Mr. Dipak Ghosh, Ex. District Officer of Khadi Village Industries Mr. Saradindu Banerjee, Secretary, Gandhi Vichar Parishad, Bankura
Possible assistance from Govt. departments and other institutions	Access the maps from MGNREG Cell. Agri Clinics of Agricultural Department to provide extension services. Farmers may be given Agricultural Loan from State Bank of India. Assistance in marketing of produce and organic certification From Department of Agriculture.	Mr. Sagar Bandopadhyay, Asstt. Director of Agriculture, Dept. of Agriculture, Govt. of West Bengal Mr. S. Ghosh, Resource Person, Bangiyo Grameen Bikash Bank Mr. Priyabrata Bandyoppadhyay, SBI District Cooridnator for Bankura and Purulia

During the design of the concept and even during the DPR design, several consultation processes and focus group decisions were held where we ensured the participation of women and representatives of the most vulnerable groups. The detailed household surveys were done for all the households of these two project areas and only the vulnerable households were selected who are poor and marginal and are affected by the climate change scenarios most.

The Participatory Vulnerability Capacity Assessment exercise emphasized the necessity to understand the climate change impacts on rural livelihood, associated risks and vulnerability of local communities inhabited in drought prone Plateau region, in particular, Chhatna and Kashipur block of Bankura and Purulua district respectively.

During PVCA, the tools like Venn Diagram, and a seasonality scarcity matrix were of particular use with the women's group. The separate focused group discussions were organized with these women groups, and they prioritized their problems, and shared their views. After designing and prioritising the activities, again consultations were made with the beneficiaries for obtaining feedback before finalizing the project interventions.

I. *Provide justification for funding requested, focusing on the full cost of adaptation reasoning.*

Component 1: **Land & Water use master plan (LUP & WUMP)**

Baseline scenario

In the project villages, farm families are highly exposed to climate change related livelihood insecurity with no definite clue to the reasons or the solutions. Vulnerability and capacity assessment was never done on behalf of neither PRI nor NGOs operating in the area. LUP & WUMP for the area is not available

with the Panchayat or any other Govt. dept. Thus Panchayat, MGNREGS Cell and individual households excavate water harvesting structures haphazardly without any consideration for the gradient of land or underground aquifers leading to dried up wells and ponds in most of the year. Agricultural production is gradually decreasing and also becoming more risky and less assured.

Adaptation alternatives

The Geo-informatics Appraisal will be the guide to draw LUP and WUMPs in each of the targeted Gram Panchayats. Judicious use of all elements such as land, soil, water and weather and their proper manipulation and management will be ensured for obtaining optimum and sustainable return from land through agriculture. Variability in the weather cycle due to climate change will be synchronized with the normal weather requirement of crop during different stages of its cycle in order to get full advantage of the changes in weather and climate. Recommendation for crop selection will be made according to where and when it is best suited. Community perspective and community ownership of these plans will be ensured by using Participatory Rural Appraisal tools. The beneficiary families will be able to understand the benefits of interventions derived on the basis of WUMP and LUP who will later place it before PRI through Gram Sabhas for inclusion in Village Development Plan.

***Component 2*: Reducing climate risks through timely and appropriate weather specific crop/agro-advisory services in local language (Bengali)**

Baseline scenario

Weather information is not sufficient and effective as information is given just before the incident happens, so most of the time the livestock, food stock and crops cannot be saved and the warning doesn't reach the interior. The system of warning, as it is now, works through a top-down way coming from district via block, police department and Panchayat, often lack the need for immediacy. The weather specific crop-advisory services does not exist in the project area at all. Now some information is available on the site but that is also not very location specific and the dissemination system does not exist.

Adaptation alternatives

The system which will be promoted through this project intervention, will be locally generated, monitored and transferred. Weather stations of high spatial resolution for weather data collection will be established at village level, data will be analyzed by Meteorologists, advisories prepared with the help of Experts from Agriculture Universities and the same will be disseminated to alert the farming community on weather related risks. Such timely crop-weather advisories would help farmers to make critical farming decisions for efficient crop management. The proposed system will provide various types of forecasts such as on time weather forecast, 5 days forecast and long term forecast, on-set of monsoon forecast etc. Crop advisories will be on choice of cultivar, time of cropping, likely crop diversification, type, method, time and quantity of farm inputs. ***Component 3*: Climate resilient technology transfer for enhancing the adaptive capacity of the community**

Baseline scenario

In rain-fed farming areas, rice can only be cultivated during the major cropping season that is mid-June – September, which depends on the quantity and temporal spread of rainfall. In the next season, which is winter season from October to February, other field crops (wheat, mustard etc) could be cultivated depending on water storage in village reservoirs, surface water and ground water availability. Cropping intensity in rain-fed farming areas and minor irrigated areas remain very low which indicated that even

one full season cannot be supported under current climatic uncertainties. The winter season in most rain-fed areas mean that farmers have to migrate out looking for employment or that they undergo severe food and livelihood insecurity and also they become deprived from social and cultural events which is very crucial for backward community. This is the main reason that keeps these families entrenched in poverty.

Without secure livelihoods, many rain-fed farming households engage in environment damaging practices- such as felling trees, stone quarrying, etc. These practices erode soil (mostly topsoil), cause downstream siltation, damage to irrigation structures, reduce water yields and storage in village reservoirs and, in turn, damage the ecosystem and livelihood assets upon which farmers depend so greatly.

Without the project, farm families will continue to face aggravated livelihood and food insecurity. Climate variability has increased livelihood insecurity of these communities. The shifting of rainfall pattern has a direct impact on rain-fed farming practice and storage in small reservoirs. In many cases, farmers are unable to cultivate the major season fully, leaving them bereft of the staple food crop. Longer periods of seasonal drought and intense rainfall, erodes the existing natural resource base on which farm livelihood is hinged- water and soil. There is a discernible worsening of the baseline situation due to climate variability and its associated impacts.

The poor families completely depend on forest and different areas (road side, canal side, and personal area) for collecting firewood. This is quite evident that excessive pressure is there on the forests and therefore deforestation is increasing rapidly. The work of firewood collection is mainly done by the children and women members of the families.

Adaptation alternatives

Soil and water conservation measures will be promoted to harvest the rainwater, reduce the soil erosion (top soil) through checking the run-offs. The harvested water will be able to increase the certainty of rainfed crop (mostly paddy).

The availability of food, fodder, fuel wood will also be increased through plantations (social forestry, orchard plantation, sericulture). The livelihood opportunities will also be created. During climatic stress period or extreme drought situation, families will be able to fall back on these community based assets (social forestry and orchard plantation sites).

Sustainable agriculture practices will be promoted which will help the farmers to integrate different subsystems (inter and intra) to increase the total varied production and productivity. The mono cropping will be replaced by mix cropping which will help to reduce the climate risk. Drought tolerant, nutritive crops will be cultivated on the permanent and/or seasonal fallows and backyard garden which on one hand will add to the total production and on the other hand it will help the families to have a balanced nutritious diet. Therefore the food and nutritional security will be enhanced. Seed savings both at individual and at community level will be encouraged which will help the farmers to become self-reliant and the dependency on market will get reduced. Even during the erratic situation, farmers will be able to sow the seeds for multiple times.

In the semi-arid region, livestock rearing will play an important role as part of the livelihood of the poor families. The project will support rearing of small ruminants and birds, which have capacity to tolerate

extreme climatic stress. Aquaculture in the water harvesting structures will also be promoted as an additional income generation activity for the families.

Energy efficient models, like installation of improved smokeless ovens, biogas will be ensured through this project. These will help to save at least Rs. 5000 per annum incurred for kerosene, firewood, cow dung cakes and coal, And thereby the pressure on natural resources will be reduced,. The drudgery of women will also be addressed through support of low cost water filter, community based rainwater harvesting etc. The women will be able to use their saved time for other income generation activities which will help to reduce the vulnerability due to climatic variability.

***Component 4*: Learning and Knowledge Management**

Baseline scenario

. For translating national and state policies into action, especially at Panchayat level, and decentralizing SAPCC objectives into local context, local level planning at Gram Sansad / Panchayat is very important. Currently the local level planning is not considering climatic threats in to consideration. The Programmes/projects of the Panchayat and other line Departments of Government are implemented without focus on climate related threats.

Adaptation alternatives

The project will take required steps for dissemination of the learnings/ outcomes from the project through films, dedicated website and other printed materials. Mass awareness generation among all the stakeholders including the school children through rallies, Graffiti, village fairs, farmers' convention, days celebration, awareness camps will be given priority. The documentation of best practices, and success stories will help to share the learnings at local, state and national level for wider adoption. Workshops at local, state and national levels will be organised with the participation of PRI members, Block/District/State level officials of different government departments, NGOs, and Scientists for large scale dissemination of the project outcomes. Technical and policy papers produced as part of the project as well as advocacy films shared in these workshops are expected to include similar approaches in the state and national plans so that the models evolved out of the project could be up scaled in the entire red and lateritic soil zone spread over different states of the country.

J. Describe how the sustainability of the project/programme outcomes has been taken into account when designing the project / programme.

Sustainability of Outcomes

. The participatory approach of the project will ensure the ownership of the project by the community, which is expected to ensure the sustainability. The project proposes a livelihood-based approach to adaptation, developing asset / capital base of individual / community in a participatory model. Four types of capital base will be created i.e. human capital, natural capital, physical capital and financial capital. The human capital will be formed through developing adaptive knowledge and skill base of farmers whereas physical capital will be in shape of water harvesting structures, micro irrigation facilities, integrated farming model, home gardens etc. The natural capital will be the scientific basis for drawing up the GP wise plan. This will positively impact on the financial capital of the farmer households. All these will lead to improvement in the adaptive capacity, both at household and

community level. Combined impact of these components will ensure sustainability of the outcome in the long run.

Environment Sustainability

The project proposes the transfer of sustainable technologies and also the promotion of indigenous varieties of seeds/breeds so that environmental sustainability can be ensured. The improved designs of water harvesting structures, plantation on permanent fallows, will help in soil and water conservation and groundwater recharge sustainably. The increased organic waste in the soil will help to regain the soil health and thereby sustainable increase in productivity.

Economic Sustainability

The land and water use master plans prepared on the basis of GIS mapping will give the community a proper scientific basis for planning interventions in future also. It will also save the community from making wrong investments. Economic gains from effectively planned interventions will give impetus to the community to continue the same activities in future also. The crop-weather advisories will help to stabilise the production. The soil and water conservation measures will help to improve the quality of the soil and its moisture retention capacity which will help in making the unutilised lands productive. It will also unleash the scope of alternative income. Introduction of sustainable agriculture practices and integrated farming system will help to reduce the cost of agriculture and increase the total farm production. The extension of growing season will increase the employment opportunity and thereby the income of marginalised farming families. Both seed, grain and fodder banks created as disaster coping mechanism may also be used as community income generation activities. The introduction of appropriate technologies will save the cost for fuel, the wastes can be recycled in the farm as organic input and will reduce the cost of manures purchased from the market. The livestock and fisheries will act as resources for generating supplementary income on a sustainable basis.

Social and Institutional Sustainability

Strengthened community based organisations will help in forming linkages with financial institutions, Panchayat and other stakeholders for accessing different schemes and services. The increased awareness among the community will help to choose the better adaptive options for their livelihood. Further ensuring that the capacity building is inclusive for men and women equally will lead to equal distribution of benefits from the project. These factors will impart social and institutional sustainability to the target communities and groups.

Interventions under Component 3 that need organizational management are the soil water conservation measures (step ponds, contour bunds, check dams, semi-circular bunds, plantation and trenches/pits), grain bank, seed bank, fodder bank and the community-based drinking water facility.

Methodology and Principles of Management

1. ***For Soil Water Conservation Measures*:** All these structures and facilities will be maintained by the groups both during and after the project. DRCSC already has experience of more than 15 years of building similar community assets and having these successfully maintained by the concerned groups till now. Hand-holding support from DRCSC will be provided during the project. After the project is completed, the basic incentive for maintaining these structures and facilities will be the benefits that the groups will derive from them.

The groups will be strengthened through training, exposure visits and regular meetings. Decision-making capacity of the group will also be enhanced through the above facilitations. The groups will also be helped to understand the worth of the community assets in improving their food and livelihood security.

The groups will be motivated to frame their rules and regulations so that the entire action during and after the project are regulated by certain laws; DRCSC will assist in achieving this during implementation.

In the event of any social conflict, the groups will be facilitated to resolve the conflict by holding discussions. For unresolved issues, the local Panchayat will be involved.

2. ***For Grain Bank, Seed Bank, Fodder Bank:*** The groups involved in management of seed bank, grain bank and fodder bank would be trained in these activities in terms of scientific management practices of these units. Here also, the principal incentive and motivation for sustaining all this infrastructure will be the benefits that the groups will be deriving from their use. Grain Banks and Seed Banks previously established by DRCSC in different parts of West Bengal are being managed by groups for over 15 years. In many of these areas DRCSC has now withdrawn its support, but these banks continue to function, as is evident from their books of records.

3. ***Community-based Drinking Water Facility:*** A Managing Committee will be formed from among the beneficiary community for managing the facilities. The Committee will decide on the monthly user fee which will be collected from the beneficiaries. The Committee will make use of the fund thus created for maintaining this infrastructure. In case of major technical faults, this fund will be utilized for hiring technical experts. Capacity building of the Committee members will be done by DRCSC.

A brief account of the sustainability measures against the expected concrete outputs is given below:

Expected Concrete Outputs	Sustainability measure
Five Gram Panchayat-wise Land and Water use Master Plans are prepared	Survey and mapping land plots will be done together with the Jadavpur University, PRI and local government officials. The beneficiaries will also be engaged in the process before finalization of the whole plan. The mix of top down and bottom up approach will ensure the ownership of all and hence will make it sustainable.
2.1 Automated Weather stations (AWS) at 6 locations (covering 10 sq.km each), 12 manual data collection centres (MDC) for collection of weather information ***2.2*** The expert group comprising of weather expert and agri experts for	The Climate Resource Centre (CRC) proposed to be set up in the project area can also be merged with Tathyamitra (Information Kiosk) being set up by State Government, thereby complementing the efforts of the Government. The activity will be implemented in close coordination with Panchayats so that after the withdrawal these can be maintained and used further by them in order to collect local

Expected Concrete Outputs	Sustainability measure
analyzing the data collected through AWS and MDC and preparing the 5-days crop-weather advisories ***2.3*** A Climate Resource Centre located at the centre of the project area and 40 weather kiosks managed by climate volunteers for collection and dissemination of crop-weather advisories	data and analyse. The CRC will definitely improve in the information dissemination system related to the weather, agriculture by adopting latest technology in the proposed project villages. Availability of local climate volunteers would help in maintaining the weather kiosks and sustaining it on a long term basis.
3.1 Sustainable soil and water conservation measures (e.g. semi-circular bunds, check dams, gully plugs, infiltration ditches and agro forestry plantations) for various ecosystems introduced for improvement of agricultural productivity and environmental sustainability	Proper repair and maintenance of the structures created under the project will be majorly done by project beneficiaries as well as community The convergence with MGNREG, Soil Conservation department will be made to create and maintain the structures suggested in the process
3.2 Multilevel crop arrangements & integrated farming practices are introduced which improve the total yield, reduce the need for external inputs & seeds as well as improve labour efficiency mainly through popularizing a combination of drought & heat tolerant field crops, fast growing & multipurpose perennials and small livestock	Direct involvement of Agriculture Department and its extension services ensures that farmer field trials are replicated in similar agro-eco zones. If technology and extension services are available, the level of adoption will be high among farm families.
3.3 Disaster-coping mechanisms e.g. community grain banks, local crop & trees seed banks, fodder banks developed in targeted villages	Community organizations and Gram Panchayat to take care of the systems created
3.4 Climate resilient appropriate technologies e.g. energy efficient cook stoves, bio-gas, low cost water filters, community based drinking water facility are promoted.	The intervention will help to reduce the drudgery of women (as they are mainly responsible for cooking, collecting drinking water in the households) and they will be able to invest their saved time for other livelihood activities. Therefore these cost effective structures will be in major demand. The local youth skilled technicians will help to maintain these in long run.
4.1 Production of technical and financial data analysis on processes to improve the resilience of the livelihood in red and lateritic zones of West Bengal	Media exposure and field visits to project sites would bring about longer term coverage. The exchange visits would encourage the replication interest in other communities. The technical and financial papers, best practices and policy briefings would enable Ministry of Agriculture, Ministry of Environment Forests and Department of National Planning to

Expected Concrete Outputs	Sustainability measure
4.2 Improved access to learnings from the project activities to be ensured through short films, dedicated website and other printed materials *4.3* Advocacy with National / State / Local Government and others (NGOs, CBOs, International organizations, climate activists/experts) on processes to identify strategies to adapt to climate change in red and lateritic zone	better target policy and development Interventions

Replication and Scaling up

The institutional arrangement for implementation of the project is based on the institutional capacity and its operational mandate given by State and National Government. This will help to synergise the outcome in future plan and policy of Government. Based on the data and analysis that will be undertaken during implementation, the viability, sustainability and replicability of the model will be tested. The detailed efficacy study will help to monitor the potential of the interventions so that these can be further replicated and expanded.

The inputs provided to the State Steering Committee and reflections of the Climate Change Observatory will create forums and opportunities for parking successful strategies for policy development and designing programmes. The process documentation and evidence based studies will provide the necessary academic support to capitalising these opportunities and enable wider replication of project impacts and successes.

Knowledge management components under the project such as short films, dedicated website and other printed materials coupled with advocacy with National / State / Local Government and others (NGOs, CBOs, International organizations, climate activists/experts) are proposed with the basic objective of replication of the successful models across the vast tracts of red and lateritic zones spread over in other States.

K. Provide an overview of the environmental and social impacts and risks identified as being relevant to the project / programme.

Check-list of eenvironmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance

Compliance with the Law	The project complies with Environment (Protection) Act, 1986 and Forest Conservation Act, 1980.	None
Access and Equity	The project provides fair and equitable access to the project beneficiaries and will not be impeding access to any of the other requirements like health clean water, sanitation, energy, education, housing, safe and decent working conditions and land rights.	None
Marginalized and Vulnerable Groups	The project is basically aimed at providing livelihood and income to marginalised community living in the project area and as such will not have any adverse impact on other marginalised and vulnerable groups	None
Human Rights	The project does not foresee any violation of human rights	None
Gender Equity and Women's Empowerment	The project will ensure participation by women fully and equitably, receive comparable socio-economic benefits and ensure that they do not suffer adverse effect.	None
Core Labour Rights	Payments to labour under the project will be made as per Government approved norms duly following minimum wage rate and hence ensuring core labor rights.	None
Indigenous Peoples	The project will ensure to comply with the rights of the indigenous people set forth by the UN declaration adopted by the Government of India.	None
Involuntary Resettlement	The project does not displace any community and hence no issue of resettlement	NIL
Protection of Natural Habitats	The project does not affect any of the natural habitats but will ensure the conservation and regeneration of biodiversity in the project area.	NIL
Conservation of Biological Diversity	The project does not affect biodiversity in any adverse way.	NIL
Climate Change	The project is basically for enhancing the adaptive capacity and is not expected to contribute to GHG emissions	NIL
Pollution Prevention and Resource Efficiency	Many activities suggested in the project will prevent pollution and improve efficiency of resource use.	NIL
Public Health	No adverse impact on public health related issues is envisaged.	None
Physical and Cultural Heritage	No adverse impact on cultural heritage related issues is identified	. None

Lands and Soil Conservation	Many activities proposed in the project will result in land and soil conservation. The project will not create any damage to land & soil resources.	None

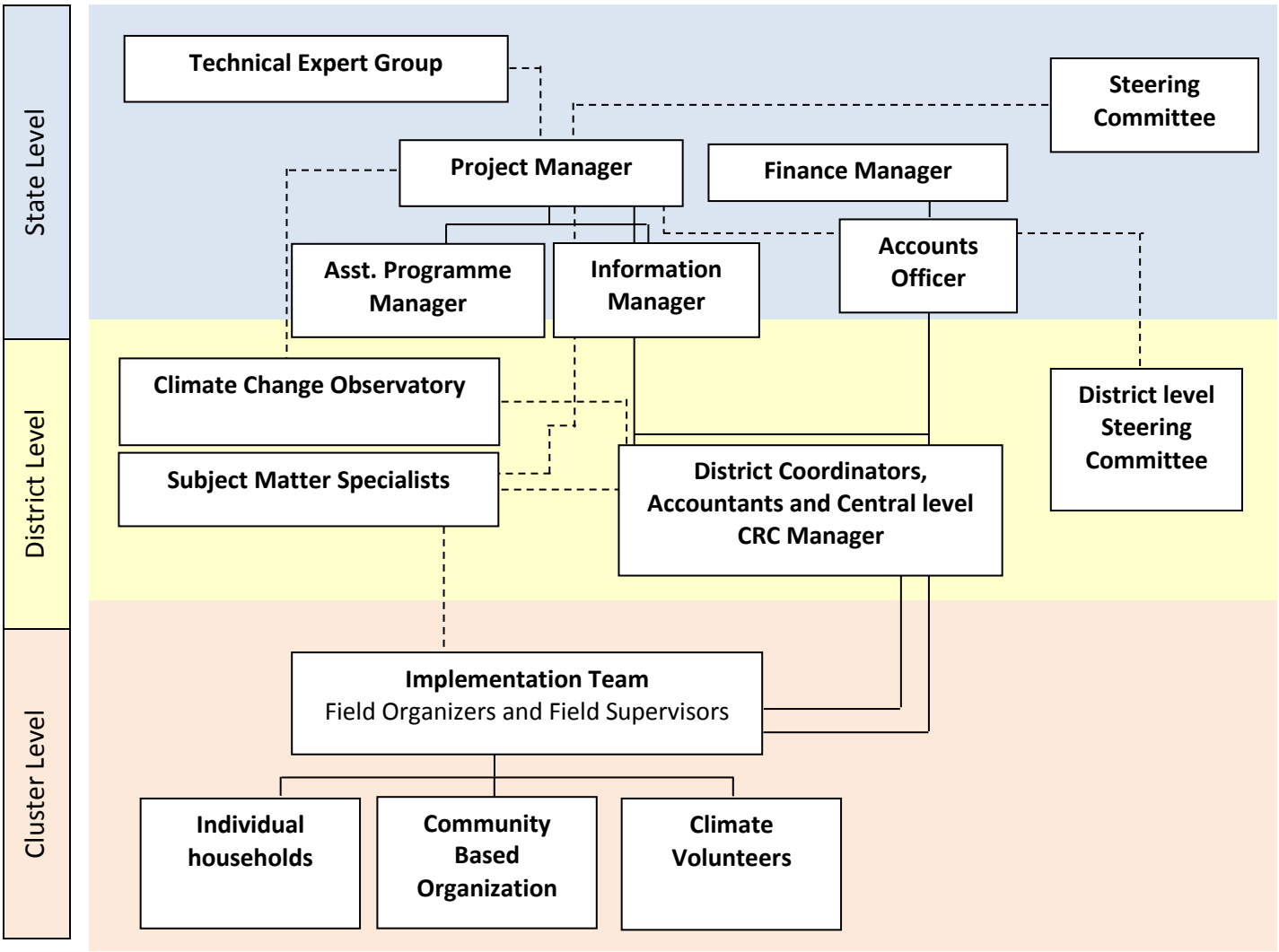
The AFB's Environmental and Social Policy (approved in November 2013) will be made available to project stakeholders and promoted through training and dialogue with implementing agencies to build a common understanding of the principles and practices that have been adopted to enhance development benefits and avoid unnecessary harm to the environment and affected communities. Any potential impacts on marginalized and vulnerable groups will be properly screened and considered by the implementing agencies.

PART III: IMPLEMENTATION ARRANGEMENTS

A. Describe the arrangements for project / programme implementation.

The overall strategy of the programme is people-centered, process-oriented and stakeholder based. The programme will be implemented with the support from Panchayat Raj Institutions under the overall supervision of DSCRC. The following is the process to be followed in programme planning and implementation.

Institutional Arrangement of the Project



Institutional arrangement for the implementation of the project and their role in the project is as follows:

Institutional Structure	Composition/Membership	Role and Responsibility
State Steering Committee	Comprising of membership from the Senior Government officials from the Department of Rural Development; Agriculture; Environment; Soil & water conservation; Fisheries; Panchayat; NGOs; NABARD and Project Manager of the Project Team. NABARD as NIE at the state level will be the Convener of the State Steering Committee.	• Facilitate involvement of Government departments in the implementation process of the project at the state and district level • Provide guidance and direction to the project activities to enable it to achieve its objectives • Monitor the progress of the project against the agreed time lines • Assess the relevance and feasibility of the project activities and impacts and identify policy level issues that can be fed to relevant departments for policy development
Technical Expert Group	Experts with qualification and Experience in: • Sustainable agriculture • Climate Change and development of Adaptation Strategies • Institution Development • Soil and water conservation • Alternative / Renewable Energy • PHE • Natural Resource Management • Fisheries • Livestock The Technical Expert Group will be constituted for the purpose of the project and will be convened by the Project Manager to draw upon the expertise of the Resource Persons from this group.	• Provide technical inputs to the central and district level team members. • Assess relevance and impact of the climate adaptive strategies • Make recommendation to the Project Team on technical matters to incorporate the same in the implementation plan
Project Team	Project team will have three layers: one, at the state level comprising of the Project Manager, Assistant Programme Manager, Information Manager, Finance Manager and the Accounts officer; second, will be at District level with two district coordinators along with 2 Accountants and a central level CRC Manager, and third, the Cluster Implementation Team comprising of Field	• Overall responsibility of the implementation of the project • Engage with external stakeholders to achieve project objectives • Responsible to the NIE and for fulfilling monitoring and evaluation activities under the project

Institutional Structure	Composition/Membership	Role and Responsibility
	organizers and supervisors located at the Panchayat level.	
District level Steering Committee	District level Steering Committee will be comprise of the membership of District Collectors, and district level officials from the department of Agriculture; DRDC, Cooperative banks, Line departments, Panchayat, DDM, Project Manager. The District Coordinator will be the Convener of the District level Steering Committee.	• Facilitate project implementation at the district level • Facilitate coordination between different departments for the smooth implementation of activities at the project level • Monitor the project activities and assess the benefit accruing to the project beneficiary • Provide guidance and direction to the project for the implementation of project • Assess the usefulness of climate adaptive strategies for the region
Climate Change Observatory	Invited members from Universities, Climate change cells, Experts from meteorological departments	• The Observatory will review data generated as part of the project's experiences, climate data from local and IMD sources, and data on adaptation practices in natural resource management from other places. • The meteorological experts and Universities will also help the project directly by analysing the locally collected data and helping in generating the crop-weather advisories and in carrying out the geo-informatics appraisal.
Community Based Organizations (CBO) / Climate Volunteers	The CBOs will comprise of the small and marginal farmers and landless who are directly involved in the natural resource management activities. The groups can be informal livelihood groups and/or Self Help Groups. These groups may be existing or may have been formed under the project. The group leaders or youth of the villages will act as climate volunteers.	• Participate in the project activities at the farm, cluster and district level • Work for the strengthening of activities related to natural resource management and adoption of climate resilient strategies • Participate in capacity building programmes • Adopt sustainable natural resource management techniques, practices and philosophy • Strengthen the organization base of the natural resource dependent community to provide institutional sustainability

The institutional set-up proposed at the field level by DSCRC for effective implementation and monitoring of the project are as under:

Position	Number	Months	Responsibilities
Program Manager	1	48	Coordination of overall programme, Continuous liaison with Technical Expert Group, State Steering Committee, organise workshops/meetings, procurement, budget control, compliance with regulatory laws and policies, organising capacity building events for cluster and district level implementation staff etc. He will also be responsible for the state and district level advocacy programmes.
Assistant Program Manager	1	48	Assist Programme Manager in regular work, follow-up & monitoring, project report preparation.
Information Manager	1	48	Documentation and communication will be the major responsibility. Will facilitate inputs from experts in developing the policy paper and will be responsible for publishing the technical and financial papers. Regular updation of work in websites, best practices and case studies preparation.
Finance Manager	1	48	Overall finance tracking & monitoring, budget control, procurement and liaison with finance person of Funding Agency, compliance with regulatory laws and policies, carrying out auditing process, etc.
Accounts Officer	1	48	Assist Finance Manager, monitoring District Accountants, regular book keeping, cash and bank handling.
Climate Resource Centre Manager	1	48	Data collection from AWS & MDCs, compilation, liaison with Meteorological expert on regular basis, disseminate the crop-weather advisories, collect feedback from the beneficiaries, liaison with government officials
District Co-ordinator (district wise)	2	48	District level overall co-ordination, organise meetings/workshops/trainings at district level, linkages with various stakeholders including Government officials, Panchayat, convening the district steering committee meetings, liaison with Central office, monitoring and providing technical support with the help of subject matter specialists, logistics and administrative work
Accounts Officer (district wise)	2	48	Day to day Accounts maintenance, book keeping, maintaining the processes for cluster level procurements, liaison with central office, helping in logistics and administrative support.
Field Supervisor	4	48	Support to District Co-ordinator and supervise the

Position	Number	Months	Responsibilities
(district wise)			implementation programme, identifying the needs of capacity building, provide support to the field organisers for implementation, linking beneficiaries with different schemes of Panchayats.
Field Organizer (3 in each district)	6	48	Mobilising the beneficiaries, Motivating, Group building, Implementation

Role of NABARD as NIE:

NABARD would be involved in periodic monitoring (on-site and off-site) of the project. Periodicity and structure of monitoring is given below:

1. On-site detailed monitoring would be done on six monthly basis jointly by NABARD Regional Office (West Bengal and Head Office. The frequency of monitoring would be increased if considered necessary.
2. District Development Manager I.e. NABARD officer stationed at the districts would be a part of the monitoring committee for implementation of the project at local level.
3. NABARD would be part of steering committee which would be meeting every six months. The committee would deliberate and review the progress of implementation.
4. Quarterly report submission formats would be designed for submission by executing entity for desk appraisal of progress. This will be structured as a part of the off-site monitoring surveillance system and would be designed to generate warning signals, if any.
5. Progress reporting would be done to AFB on periodic basis (half yearly or more frequently as per requirement of AFB).
6. NABARD would create platform for sharing and dissemination of knowledge at regional and national level.

B. *Describe the measures for financial and project / programme risk management*

Following are few risks associated with the project.

Risk	Risk Perception	Response Measure
Local Government fail to prioritize, sustain and upscale support for climate adaptive interventions in their strategies and plans	Medium	Climate change adaptation needs and priorities are reflected in State, National policies and plans, but a void remains at Gram Panchayat and block level. Inclusion of the learnings and best practices of the project in the future planning at Gram/Block level is proposed through effective implementation of knowledge management component.
Government officials and Panchayat representatives may change	Medium	The project will try to conduct awareness sessions continuously with the community as well as with Panchayat and block level officials and also share the project details with them to avoid any gap

Risk	Risk Perception	Response Measure
Few farmers may not use the crop-advisories	Low	The community will be involved in the process from the very beginning and proper training and awareness will be conducted on the ways to use the crop-weather advisories
Volunteers absenteeism	Low	In each village apart from the responsible volunteers there will be a panel of young people who will also attend the awareness sessions and will be apprised of the tasks of the climate volunteers so that incase of such absenteeism the gaps will be immediately filled by them
Demand for labour near or outside the project area leads to outmigration.	Low	The work opportunity will be created in the villages itself which will restrain the community from outmigration
Major price fluctuation of the recommended commodities	Medium	The project has provisions for mobilizing community contribution and converging with different government schemes to counter risks of major price fluctuations
Macro Planning remains in place but participatory planning at local level for adaptive measures is not taken	Medium	The advocacy done as part of the project will try to address the gap that exists between macro and micro plans and also endeavor to influence the Government both at state and national levels to take a bottom up approach
Policy makers and politicians prioritize economic benefits over sustainable and resilient ecosystems.	Low	The project will demonstrate cost-effective and economically sound models of adaptation and generate local demand, through communication strategies, to influence policy
Additional development (financial and marketing) support for alternate food and livelihoods are unavailable in the target Gram Panchayats at the required time	Low	The project has been designed to provide technology and inputs for such climate-resilient livelihoods, in line with the government's national programs for food security, poverty alleviation and village development. All these programs are active in the project areas, further liaison will be made between regular development programs and project objectives.
Groups have been formed but due to difference in economic, social status they are not effective.	Low	The project has been designed in such a way that more stress will be given towards strengthening of the groups. The quality of the leadership would be made better, so that they themselves will be able to resolve the social conflicts.
Lack of awareness among participating communities and local officials on CC and potential impacts	Low	The project aims at working with both the community and the officials. Various awareness and sensitization sessions will be carried out

C. Describe the measures for environmental and social risk management, in line with the Environmental and Social Policy of the Adaptation Fund.

Even though the project is classified as "Category C" project and is not envisaged to pose any risks indicated under Environmental and Social Policy of Fund, risks if any that may arise during the project implementation would be mitigated as indicated below:

- Project implementation teams would be sensitized on these aspects
- Project Advisory Committee would specifically review issues related to social and environmental risk during its periodical meetings
- NABARD Regional and Head Office would identify specific risks that may arise during implementation based on the monitoring of the project and built in reporting mechanism for the same
- Social audit that would be put in place would also help in mitigation of some of risk enlisted under Environmental and Social Policy of the Fund. Community would be sensitized on contents under Environmental and Social Policy of the Fund.

Mechanism of creation of awareness on Social and Environmental Policy of Fund would be on the following lines:

- Initial orientation during the inception of the project about the systems and procedures.
- Providing guidelines and orientation on the Environmental and Social Policy of the Adaptation Fund to the project team
- Grievance mechanism would be informed to community during the project inception workshop.
- As part of grievance mechanism, communication details of implementation entity co-ordinator and contact person would be available to direct beneficiaries as well as community at large through display of project information boards placed at prominent common places within the project area.

D. *Describe the monitoring and evaluation arrangements and provide a budgeted M&E plan.*

Monitoring components

Baseline**:** Geo-informatics appraisal done at the beginning of the project will give us a baseline picture of the project area. WUMP and LUP prepared on the basis of the geo-informatics appraisal will also act as a baseline to the project as well as a planning document. The progress of the project can be tracked through tracking WUMP and LUP by the community itself. Geo-informatics appraisal done at the end of the project will give an exact idea of the differences made by the interventions done as part of the project.

Monitoring Plan, Visits and Reports**:** In order to ensure accountability and transparency, a monitoring plan is developed at the beginning of the project by the Programme Manager and Information Manager in consultation with the Advisory Committee.

Community planning and Monitoring**:** The inclusion of the target groups in planning and monitoring of a project form a non-negotiable component. The project design itself with PVCA, WUMP and LUP ensure community participation from the beginning. The monitoring strategy details are presented in the table below:

Monitoring and Evaluation Plan			
Type of M&E Activity	**Responsible Parties**	**Budget (US$)does not include staff time**	**Time Frame**
Project Inception Workshop	Project Director / State NABARD	500	Within first three months
Inception Report	Project Director/ District level Project coordinator	150	One Month after IW
Half-yearly report	Project Director/ District level Project coordinator	1,500	End of every six months
Annual report	Project Director/ District level Project coordinator	2,400	End of each year
Project review & monitoring Meeting	Representatives of MOE/ Dept. of Govt /Project Director/NABARD	2,500	First after IW (Inception workshop) (monthly
Mid-term evaluation	External Evaluator/ Representatives of MOE/ Dept. of Govt / Technical Consultants/ Project Director	2,000	At mid-point of project execution (2nd year)
End term evaluation	External Evaluator/Representatives of MOE/ Dept. of Govt / Technical Consultants/ Project Director	5,000	At end of Project cycle
Final Report	Project Director/ District level Project coordinator	1,500	3 months after end of the Project
Total Amount		**15,550**	

NABARD will do the overall monitoring and district officials will closely monitor the programme.

The Programme Manager and senior management of DRCSC along with the management personnel of local partners will be responsible to monitor the programme on annual basis. The district level workshops will be conducted to review the programme and make necessary action plan for the next phase. Local administration representatives District Manager, ADO, BDO, Panchayat Pradhan, NABARD will be engaged in reviewing the programme followed by the Field Visits. Log Frame will act as a basic document to measure the impact.

For the monitoring of an adaptation project, the link to climate change needs to be monitored in addition to the output, use of output and outcomes. The adaptation hypothesis that explains how project activities address climate risks should therefore be part of the monitoring framework and be referred to throughout the monitoring phase. In addition, it should be explained how any one activity reduces or prepares for climate risks, or how activities enhance adaptive capacities.

E. Include a results framework for the project proposal, including milestones, targets and indicators.

Goal	Developing climate adaptive and resilient livelihood systems through diversification, technology adoption and natural resource management for rural small and marginal farmers associated with agriculture and allied sector in red and Lateritic Zone of West Bengal.				
	Indicator	**Baseline**	**Target**	**Means of Verification**	**Assumptions & Risks**
Objective: To enhance adaptive capacity of climate vulnerable families in red lateritic zone of Purulia and Bankura districts of West Bengal	Percentage of target population adopting risk reduction measures for livelihoods and energy consumption	Less than 5% of target 5,000 households (250 hh) practice climate risk reduction measures	80% of target 5,000 households (4000 hhs (19096 persons) — 9427 female and 9669 male beneficiaries) continue to practice at least one climate risk reduction measure introduced through project interventions	Household survey at the start and end of project	**Assumption:** Climate risk information and Livelihood demonstrations convince farm families to adapt at household and community level **Risk:** Local Government fail to prioritize, sustain and upscale support for climate adaptive interventions in their strategies and plans
Component 1: Land & Water Use Master Plan					
Outcome 1 Communities adopt land and water use master plans with the help of Panchayats through better understanding of climate change related impacts	Number of households able to take informed decisions about climate adaptive interventions Percentage of planned interventions included in Village Development Plans by Panchayat	Farm families highly exposed to climate change related livelihood insecurity having no definite clue about the reasons or the solutions No scientific information and participatory processes are involved in planning land and water use	At least 80% of 5,000 target households (4000 hhs (19096 persons) — 9427 female and 9669 male beneficiaries) are able to take informed decision about climate adaptive interventions. At least in 90% cases the interventions planned are included in Village Development Plans	Household survey at the beginning and end of the project. Dialogue with beneficiaries Checking of records, photographs etc Panchayat records	**Assumption:** All stakeholders will participate and contribute in the preparation of plans **Risk:** An all party consensus may not emerge
Output 1.1 Five Gram Panchayat -wise	LUP & WUMPs for the targeted GPs are in	LUP & WUMP for the area is not available	In all the GPs, communities and Panchayat consider land and	WUMP & LUPs for the target area	**Assumption:** Gram Sabhas are held

Land and Water use Master Plans are prepared	place	with the Panchayat or any other Govt. dept.	water use master plans at the time of making village development plans	Copies of Village Development Plan (VDP) available with Panchayat	regularly
Component 2: Reducing climate risks through timely and appropriate weather specific crop/agro-advisory services in local language (Bengali)					
Outcome 2 Farmers are better prepared for climate resilient agriculture and wastelands development	Percentage of farmers having ready access to and making use of crop-weather advisory in local language	Crop-weather advisory services are not available to the farmers in the project locations	More than 6,200 farmers (including 3720 women farmers) in target area receive crop-weather advisory in local language (Bengali)	Feedback from farmers Focussed Group discussions Project reports, evaluation reports	**Assumptions:** Farmers accept suggested changes in selection of crops/varieties/trees **Risks:** Few farmers may not use the crop-advisories
Output 2.1 Automated Weather stations (AWS) at 6 locations (covering 10 sq.km each), 12 manual data collection centres (MDC) for collection of weather information	Number of AWS & MDC are in place and operating effectively	No AWS installed for collecting village level weather data	AWS at 6 locations, 12 MDC installed for collection of weather information	Physical verification Data repository	**Assumptions:** Community shows interest in making use of weather data to reduce climate risks to their livelihoods
Output 2.2 The expert group comprising of weather expert and agri experts analyzes the data collected through AWS and MDC and prepares the 5-days crop-weather advisories	A committee comprising of 2-3 experts from agri universities and climate experts is formed Number of crop-weather advisories prepared per month	Weather reports are available at State and District level but no location specific crop-weather advisory services are available	Five to six crop-weather advisories are generated per month	Repository of weather advisories	**Assumption:** AWS are performing well without technical trouble and provides basic data continuously for generating advisories
Output 2.3 A Climate Resource Centre located at the centre of the project area and 40 weather kiosks managed by climate volunteers for collection and dissemination of crop-	Climate Resource Centre and Weather kiosks are in place Number of crop-advisory services disseminated	No system for regular dissemination of crop-weather advisories	1 climate resource centre at central location and 40 weather kiosks are in place 5-6 crop-weather advisories per month are disseminated to the entire community	Physical verification The SMS messages and display materials Record of feedback	**Assumption:** Farmers are using the information for crop planning. Community donate sites for kiosks **Risk:** Volunteers

weather advisories	A feedback mechanism for verifying efficacy of the advisory services is in place				absenteeism
Component 3: Climate resilient technology transfer for enhancing the adaptive capacity of the community					
Outcome 3 Livelihoods have become less vulnerable to climate change and achieve higher levels of productivity	Number of beneficiaries, particularly women, with diversified livelihoods Number of farmers achieving higher level of sustainable productivity Status of community with improved food-fodder-fuel reserve as a drought proofing measure	Most farm families under rain-fed conditions highly exposed to climate change induced livelihood insecurity Beneficiary farmers depend only on rain-fed farming Common properties as reserves are degrading fast Families face food-fodder-fuel crisis at least for 4 months in a year	All 5,000 (target Households of population 22810 [male : 11548 & female : 11262] have developed climate resilient livelihood strategy to diversify their sources of income Whole farm productivity is increased by 30% for at least 60% beneficiary families i.e. 3000 hhs Food-fodder-fuel reserve is ensured for 100% targeted families (which includes women population of 11262).	Field monitoring reports Household & market survey reports Group discussions & interactions End of project Survey Comparison with cost and profitability norms as originally anticipated	**Assumption:** Local government will provide access to commons and agree to negotiate with the groups. Marketing arrangements exist for all recommended commodities **Risk:** Demand for labour near or outside the project area leads to outmigration. Major price fluctuation of the recommended commodities

Output 3.1 Sustainable soil and water conservation measures (e.g. semi-circular bunds, check dams, gully plugs, infiltration ditches and agro forestry plantations) for various ecosystems introduced for improvement of agricultural productivity and environmental sustainability	Area brought under soil-water conservation structures Area under vegetative cover	Low water retention capacity of the soil, fertile top soil erosion Large area lying fallow (seasonally or perennially)	300 hectares of fallow land brought under soil-water conservation structures More than 250 hectares of area brought under vegetative cover and protected by live fences, hedgerows, aerodynamic windrows, boundary plantation & other agroforestry systems	SW Conservation structures, Muster Roll, Group Records, Internal & External Evaluation Reports, Project Progress Report	**Assumption:** PRIs agree to include SW conservation structures in Village Development Plan through convergence with mainstream schemes **Risk:** Overall plan is not developed in time
Output 3.2 Multilevel cropping systems & integrated farming practices are introduced mainly through popularizing a combination of drought tolerant field crops, fast growing & multipurpose perennials and small livestock	Hectares of land brought under cultivation Increase in cropping diversity & intensity Increase in cropping months and food availability Increase in self supply of seeds & inputs	Integrated Farming System is practised by 10 farmers in the target area. A very few target families have knowledge about sustainable agriculture techniques and practices	400 hectares of single crop land turned into at least double crop At least 4,000 target families enjoy an increase in income from diversified sources Food & nutrition security is ensured for at least 80% beneficiaries (9009 female and 9238 male beneficiaries) round the year. At least 4,000 target families have reduced their dependency on market for the inputs for agriculture	Household level survey before and after the project Periodic monitoring report	**Assumption:** Community shows eagerness to attend training and replace conventional agriculture with sustainable agriculture Risks: Farmers disinclination in adoption of recommended farming systems
Output 3.3 Disaster-coping mechanisms like community grain banks, local crop & trees seed banks, fodder banks, developed in targeted villages	Number of Grain Banks, Seed Banks and Fodder Banks established Number of families able to meet up their food, fodder, input (especially availability of seed) crisis	A very few community grain banks and no seed or fodder banks exist in the area.	40 grain banks, 5 seed banks and 5 fodder banks are established. The food/fodder/input crisis and emergencies met up for at least 1500 hhs through these interventions	Household level survey before and after the project Periodic monitoring report	Assumption: Farmers are convinced of the proposed interventions

	in emergencies				
Output 3.4 Climate resilient appropriate technologies like energy efficient cook stoves, bio-gas, low cost water filters, community based drinking water facility, are promoted.	No. of target families using energy efficient cook stoves, biogas, low cost water harvesting, low cost water filters, community based drinking water facility. Number of community based facilities established Number of target families accessing mainstream schemes for installation of climate adaptive structures	450nos. of target families use energy efficient cook stoves. 100 families have biogas units. 110 low cost water filters are in use. No community-based drinking water facility 1000 no. of target families access mainstream schemes for installation of climate adaptive structures	At least 2400 nos. of target families use energy efficient ovens, 250 biogas and 2500 low cost water filters (3200 female beneficiaries are directly impacted). At least 5 no. of community based drinking water facilities are established (At least 500 female beneficiaries are directly impacted by this intervention in terms of reduced labour, time and drudgery) At least 5000 families (11262 female and 11548 male beneficiaries) accessing mainstream schemes for installation of climate adaptive structures	Household and village survey before and after the project Periodic monitoring report	**Assumption:** Community eagerness to make use of climate adaptive structures and maintain them PRIs show promptness to help the beneficiaries in accessing mainstream schemes
Component 4: Learning and Knowledge Management					
Outcome 4 Various types of materials on processes and techniques are published and measures taken to upscale the interventions to improve climate resilience in the red and lateritic zone	Replication of the interventions in neighboring villages along with the project area Govt. adopted the climate resilient models in their policies	local level planning does not consider climate change related aspects Only few farmers practice ecological farming and livelihood practices	Climate resilient livelihood strategies adopted by other Gram Panchayats and Blocks The project learning documents aligned to the SAPCC are advocated for adoption with relevant government departments at both state and national levels	Government documents Interaction with the community External evaluation reports Reports and meetings	**Assumption:** Local Governments, State/National Governments convinced of the approach demonstrated through the project **Risk:** Unwillingness of Governments (local/state/national) to accept change in their planning approach
Output 4.1 Production of technical and	Number of technical reports published	Absence of location specific analytical	At least 5 technical reports & 1 policy paper published for wider	Reports	

financial data analysis on processes to improve the resilience of the livelihood in red and lateritic zones of West Bengal		reports	dissemination		
Output 4.2 Improved access to learnings from the project activities to be ensured through short films, dedicated website and other printed materials	Number of audio visual publications, awareness materials (e.g. folders, brochures, pamphlets, posters, newsletters, journals, IEC materials) published Dedicated website created and updated regularly Number of mass awareness generation measures (e.g. participation in village fairs, rallies, campaigns)	No appropriate awareness materials available, especially in vernacular No website at present Limited awareness generated through mainstream mass media e.g. television, radio.	At least 5 audio visual publications, 7 types of awareness materials published for wider dissemination in the state A web space is created for regular dissemination of project learnings At least 6 types of awareness generation activities to address the communities in and around the project villages	Printed and Audio Visual materials Photo documentation	
Output 4.3 Advocacy with National / State / Local Government and others (NGOs, CBOs, International organizations, climate activists/experts) on processes and practices adopted under the project	Number of Advocacy films prepared Number of workshops organised Number of stakeholders participated	No advocacy films are available No workshops organised involving the stakeholders	2 Advocacy films are prepared 8 local level, 3 state level experience sharing workshop and 1 national level advocacy workshops/seminar involving all stakeholders	Advocacy films Workshop proceedings and reports Photos and other reports	

F. Demonstrate how the project / programme aligns with the Results Framework of the Adaptation Fund

Project Objective(s)[36]	**Project Objective Indicator(s)**	**Fund Outcome**	**Fund Outcome Indicator**	**Grant Amount (USD)**
To enhance adaptive capacity of climate vulnerable families in red lateritic zone of Purulia and Bankura districts of West Bengal	Percentage of target population adopting risk reduction measures for livelihoods and energy consumption	Outcome 5: Increased eco-system resilience in response to climate change and variability-induced stress Outcome 6: Diversified and strengthened livelihoods and sources of income for vulnerable people in targeted areas	5: Ecosystem services and natural assets maintained or improved under climate change and variability-induced stress 6.2: Percentage of targeted population with sustained climate-resilient livelihoods	2,533,533
Project Outcome(s)	**Project Outcome Indicator(s)**	**Fund Output**	**Fund Output Indicator**	**Grant Amount (USD)**
Outcome 1: Communities adopt land and water use master plans with the help of Panchayats through better understanding of climate change related impacts	Number of households able to take informed decisions about climate adaptive interventions Percentage of planned interventions included in Village Development Plans by Panchayat	*Output 6:* Targeted individual and community livelihood strategies strengthened in relation to climate change impacts, including variability	6.1.1: Number and type of adaptation assets (physical as well as knowledge) created in support of individual or community-livelihood strategies	54,165
Outcome 2 Farmers are better prepared for climate	Percentage of farmers having ready access to and making use of	*Output 2.2:* Targeted population groups covered by	2.2.1. Percentage of population covered by adequate risk-reduction	55,401

[36] The AF utilized OECD/DAC terminology for its results framework. Project proponents may use different terminology but the overall principle should still apply

resilient agriculture and wasteland development	crop-weather advisory in local language	adequate risk reduction systems	systems 2.2.2. Number of people affected by climate variability	
Outcome 3 Livelihoods have become less vulnerable to climate change and achieve higher levels of productivity	Number of beneficiaries, women in particular, with diversified sources of income to reduce risk of dependency on only climate dependent livelihoods Number of farmers achieving higher level of sustainable productivity Status of community food-fodder-fuel reserve is improved as a drought proofing measure	*Output 6:* Targeted individual and community livelihood strategies strengthened in relation to climate change impacts, including variability *Output 5:* Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	6.1.1.Number and type of adaptation assets (physical as well as knowledge) created in support of individual-or community-livelihood strategies 6.1.2. Type of income sources for households generated under climate change scenario 5.1. Number and type of natural resource assets created, maintained or improved to withstand conditions resulting from climate variability and change (by type of assets)	1,877,373
Outcome 4 Various types of materials on processes and techniques are published and measures are taken to upscale the interventions to improve climate resilience in the red	The works are being replicated in neighboring villages along with the project area Govt. adopted the climate resilient models in their policies	*Output 7:* Improved integration of climate-resilience strategies into country development plans *Output 3*: Targeted population groups participating in adaptation and risk	7.1. Number, type, and sector of policies introduced or adjusted to address climate change risks 7.2. Number or targeted development strategies with incorporated climate change priorities enforced	126,284

and lateritic zone		reduction awareness activities	3.1.1 Number and type of risk reduction actions or strategies introduced at local level 3.1.2 Number of news outlets in the local press and media that have covered the topic	

G. Include a detailed budget with budget notes, a budget on the Implementing Entity management fee use, and an explanation and a breakdown of the execution costs.

Sl No	OUTPUT	Output wise Total (USD)	Component wise Total (USD)
Component 1: Land & Water use master plan (LUP & WUMP)			
1	5 Gram Panchayat -wise Land and Water use Master Plans are prepared	54,165	**54,165**
Component 2: Reducing climate risks through timely and appropriate weather specific crop/agro-advisory services in local language (Bengali)			
2.1	Automated Weather stations (AWS) at 6 locations (covering 10 sq.km each), 12 manual data collection centres (MDC) for collection of weather information	18,360	**55,401**
2.2	The expert group comprising of weather expert and agri experts for analyzing the data collected through AWS and MDC and preparing the 5-days crop-weather advisories	27,888	
2.3	A Climate Resource Centre located at the centre of the project area and 40 weather kiosks managed by climate volunteers for collection and	9,153	

Sl No	OUTPUT	Output wise Total (USD)	Component wise Total (USD)
	dissemination of crop-weather advisories		
Component 3. Climate resilient technology transfer for enhancing the adaptive capacity of the community			
3.1	Sustainable soil and water conservation measures (e.g. semi-circular bunds, check dams, gully plugs, infiltration ditches and agro forestry plantations) for various ecosystems introduced for improvement of agricultural productivity and environmental sustainability	745,390	**1,877,373**
3.2	Multilevel crop arrangements & integrated farming practices are introduced which improve the total yield, reduce the need for external inputs & seeds as well as improve labour efficiency mainly through popularizing a combination of drought & heat tolerant field crops, fast growing & multipurpose perennials and small livestock and fishery	901,813	
3.3	Disaster-coping mechanisms e.g. community grain banks, local crop & trees seed banks, fodder banks developed in targeted villages	28,330	
3.4	Climate resilient appropriate technologies e.g. energy efficient cook stoves, bio-gas, low cost water filters, community based drinking water facility are promoted.	201,840	
Component 4: Learning and Knowledge Management			
4.1	Production of technical and financial data analysis on processes to improve the resilience of the livelihood in red and lateritic zones of West Bengal	10,000	**126,284**
4.2	Improved access to learning from the project activities to be ensured	64,084	

Sl No	OUTPUT	Output wise Total (USD)	Component wise Total (USD)
	through short films, dedicated website and other printed materials		
4.3	Advocacy with National / State / Local Government and others (NGOs, CBOs, International organizations, climate activists/experts) on processes to identify strategies to adapt to climate change in red and lateritic zone	52,200	
	TOTAL		**2,113,223**
	Project / Programme Execution Cost		201,162
	Total Project / Programme Cost		2,314,385
	Project/Programme Cycle Management		196,469
	Amount of Financing Requested		**2,510,854**

The detailed budget note is annexed in Annexure VI.

Details on NIE cost:

The project management fee (8.5% of the total budget) will be utilised by NABARD, the National Implementing Entity, to cover the costs associated with the provision of general management support. Table below provides a breakdown of the estimated costs of providing these services.

Breakdown of costs for the project management fee Cost	**Amount US$**
Financial Management	29,772
Performance Management - Progress Monitoring- Field Monitoring	58,000
Information and Reporting (MIS etc)	39,697
Programme Support - Technical and Other to EE	69,000
Total	**196,469**

Notes:

1. **Financial Management:** This covers general oversight of financial management and budgeting and quality control. NABARD will:
   - Ensure compliance with standards and internal control processes, transparency.
   - manage, monitor and track AF financial resources including allocating and monitoring expenditure based on agreed work plans, financial reporting to the AFB and the return of unspent funds to AF;
   - ensuring that financial management practices comply with AF requirements and support audits as required;
   - ensuring financial reporting complies with AF standards; and

2. **Performance Management**. This includes:
   - Providing oversight of the monitoring and evaluation function of the Executing Agency
   - Undertake field monitoring of the project through District Development Managers, Regional Office (West Bengal) and Head Office officials.
   - Providing technical support in the areas of risk management, screening of financial and risk criteria;
   - Providing guidance in establishing performance measurement processes; and
   - Technical support on methodologies, TOR validation, identification of experts, results validation, and quality assurance.

3. **Information and Reporting Management**.

This includes maintaining information management systems and specific project management databases to track and monitor project implementation. Progress reporting to AFB and create platform for information dissemination.

5. **Program Support**. This includes:

- Technical support, troubleshooting, and support missions as necessary;
- Policy, programming, and implementation support services;
- Supporting evaluation missions and participating in briefing / debriefing;
- Providing guidance on AF reporting requirements;

H. Include a disbursement schedule with time-bound milestones.

S.No	Major Activity	Time line
1	Project Inception Workshop	0-2 months
2	GIS Mapping- Assessment, Implementation & Evaluation	2- 48 months
3	Gram Panchayat -wise Land and Water use Master Plans	2-12 months
4	Establishment of Automated Weather stations (AWS) and Manual Data Collection Centres (MDC)	2-6 months
5	The expert group comprising of weather expert and agri experts for analyzing the data collected through AWS and MDC and preparing the 5-days crop-weather advisories	6 -48 months
6	Establishment of Climate Resource Centre and Weather Kiosks	2-6 months
7	Capacity building of CBO, Pos, PRI & Networking	3-48 months
8	Sustainable soil and water conservation measures	6-45 months
9	Multilevel crop arrangements & integrated farming practices , Livestock, Fishery, Irrigation Facilities development, Organic manure production etc	7- 45 months
10	Disaster-coping mechanisms e.g. community grain banks, local crop & trees seed banks, fodder banks developed in targeted villages	9–39 months
11	Climate resilient appropriate technologies e.g. energy efficient cook stoves, bio-gas, low cost water filters, community based drinking water facility are promoted.	9- 46 months
12	Production of technical and financial documents – Printing & Audio visual materials	7- 45 months

13	Improved access to learnings from the project activities to be ensured through short films, dedicated website and other printed materials	7-48months
14	Advocacy with National / State / Local Government and others (NGOs, CBOs, International organisations, climate activists/experts)	8- 48 months
15	Programme Management activities	1 – 50 month
16	Reporting- Inception, biannual, annual	3- 48 months
17	Mid-term monitoring by stakeholder's team	24 months
18	Final Evaluation	**45 months**
19	**Final Report submission**	51 months

DISBURSEMENT MATRIX

	Year 1	Year 2	Year 3	Year 4	**Total**
Scheduled Date	Oct 14 – Sep 15	Oct 15 – Sep 16	Oct 16 – Sep 17	Oct17 –Sep 18	
Project Funds	347158	810035	810035	347158	2314386
Implementing Entity Fee	29470	68764	68764	29470	196469
Total	376628	878799	878799	376628	2510855

Time bound Milestones:

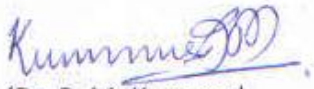
Project Implementation																
Component	Year1				Year 2				Year 3				Year 4			
	Qt 1	Qt 2	Qt 3	Qt 4	Qt 1	Qt 2	Qt 3	Qt 4	Qt 1	Qt 2	Qt 3	Qt 4	Qt 1	Qt 2	Qt 3	Qt 4
1.1 5 Gram Panchayat -wise Land and Water use Master Plans are prepared	15%	25%	35%	50%	45%	50%	55%	70%	65%	70%	75%	85%	85%	90%	100%	
2.1 Automated Weather stations (AWS) at 6 locations (covering 10 sq.km each), 12 manual data collection centres (MDC) for collection of weather information		40%	80%	100%												
2.2 The expert group comprising of weather expert and agri experts for analyzing the data collected through AWS and MDC and preparing the 5-days crop-weather advisories			18%	25%	31%	37%	43%	50%	56%	62%	68%	75%	81%	87%	93%	100%
2.3 A Climate Resource Centre located at the centre of the project area and 40 weather kiosks managed by climate volunteers for collection and dissemination of crop-weather advisories		40%	80%	100%												
3.1 Sustainable soil and water conservation measures (e.g. semi circular bunds, check dams, gully plugs, infiltration ditches and agro forestry plantations) for various ecosystems introduced for improvement of agricultural productivity and environmental sustainability			5%	10%	19%	28%	37%	47%	56%	65%	74%	85%	90%	95%	100%	
3.2 Multilevel crop arrangements & integrated farming practices are introduced which improve the total yield, reduce the need for external inputs & seeds as well as improve labour efficiency mainly through popularizing a combination of drought & heat tolerant fieldcrops, fast growing & multipurpose perennials and small livestock		4%	8%	12%	20%	28%	36%	46%	55%	64%	73%	84%	90%	95%	100%	
3.3 Disaster-coping mechanisms e.g. community grain banks, local crop & trees seed banks, fodder banks developed in targeted villages				10%	20%			40%	60%			85%	100%			
3.4 Climate resilient appropriate technologies e.g. energy efficient cook stoves, bio-gas, low cost water filters, community based drinking water facility are promoted.			6%	12%	21%	30%	39%	48%	57%	66%	75%	85%	100%			
4.1 Production of technical and financial data analysis on processes to improve the resilience of the livelihood in red and lateritic zones of West Bengal		2%	4%	7%	10%	13%	16%	20%	22%	24%	25%	26%	51%	76%	100%	
4.2 Improved access to learnings from the project activites to be ensured through short films, dedicated website and other printed materials		5%	10%	16%	24%	32%	40%	47%	54%	61%	68%	76%	82%	88%	94%	100%
4.3 Advocacy with National / State / Local Government and others (NGOs, CBOs, International organisations, climate activists/experts) on processes to identify strategies to adapt to climate change in red and lateritic zone		7%	14%	21%	26%	31%	36%	42%	48%	54%	60%	66%	74%	82%	90%	100%

PART IV: ENDORSEMENT BY GOVERNMENT AND CERTIFICATION BY THE IMPLEMENTING ENTITY

A. **Record of endorsement on behalf of the government** *Provide the name and position of the government official and indicate date of endorsement. If this is a regional project/programme, list the endorsing officials all the participating countries. The endorsement letter(s) should be attached as an annex to the project/programme proposal. Please attach the endorsement letter(s) with this template; add as many participating governments if a regional project/programme:*

Ravi Shankar Prasad, IAS, Joint Secretary, Ministry of Environment and Forest (MoEF), Government of India	Date:*14 August 2014*

B. Implementing Entity certification *Provide the name and signature of the Implementing Entity Coordinator and the date of signature. Provide also the project/programme contact person's name, telephone number and email address*

I certify that this proposal has been prepared in accordance with guidelines provided by the Adaptation Fund Board, and prevailing National Development and Adaptation Plans (National Action Plan on Climate Change) and subject to the approval by the Adaptation Fund Board, commit to implementing the project/programme in compliance with the Environmental and Social Policy of the Adaptation Fund and on the understanding that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project/programme.	
 *(Dr. R. M. Kummur)* *Chief General Manager* *NABARD, Head Office, Mumbai* *(Implementing Entity Co-ordinator)*	
Date: *September,01, 2014*	Tel. and email: +91 22 2653 0083, +91 7738175446 rm.kummur@nabard.org
Project Contact Person: Dr. P. Radhakrishan, General Manager, NABARD, Head Office, Mumbai	
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