Participatory Vulnerability & Capacity Assessments (PVCA)

Introduction

West Bengal is a multi-hazard state covering a range of agro ecological zones from hilly track at Darjeeling to deltaic zone at Sundarban and the Gangetic belt in Eastern part to the drought prone Plateau region in West.

The multi-hazard events due to vagarious nature of climatic behavior affect almost the entire state and eventually affected severely and make the inhabitants more and more vulnerable. Apparently, the climate change impact vary strongly in their extent and form around the state, resulting in a wide variation in vulnerability depending on different agro-climatic location, people's perception, their adaptive capacity and opportunity, socio-economic conditions, environmental factors, political (Local, State , National and International) motivations etc.

The present study (PVCA) emphasize on to understand the climate change impact 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.

The emphasis has also been given to understand how the communities perceive the 'felt' change and how they mitigate the situation at local level; and what else can be taken to strengthen the capacity.

Finally, the findings of the study will help and strengthen the capacity of the communities to plan, make decisions, and to take action towards improving their own situation.

Objectives

The primary objectives of the PVCA study is to

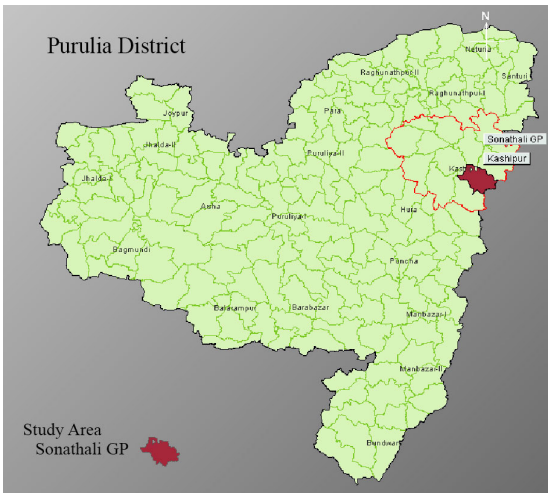
- identify the hazards and categorize those according to its impact on livelihood
- identify the key vulnerabilities of the communities.
- understand how community members perceive risks and threats to their lives and livelihoods
- analyze the resources (capacities) and opportunities available to them to tackle or minimize these risks
- help the community develop a climate resilient action plan

PVCA - Study Area

Jhunjka and Ghoshergram Gram Panchayat of Chhatna block under Bunkura district and Sonathali Gram panchayat of Kashipur block under Purulia district.

Two mouzas (Besora and Gopalpur) from Jhunjka Gram panchayat, and one mouza (Enari) from Ghoshergram Gram panchayat have been selected for study purpose while in Purulia five mouzas (Lara, Jagannathdih, Balarampur and Jamkiri) from Sonathali GP.

Picture 1



Picture 2

Methodology

Based on participatory approach involves collection of primary data as well as secondary. The primary data are exclusively retrieved by using several PVCA tools and focus group discussion. The secondary data are collected from DRCSC, Kashipur and Chhatna block office. Besides, data/pictures from various websites have been incorporated to supplement the present study.

Why PVCA ?

Participatory Vulnerability Capacity Assessment (PVCA) is a hazard-risk-reduction tool kit used in designing livelihoods or poverty-reduction projects. It is an initial and essential exercise for any poverty alleviation programme and considered as a 'bench mark survey' before project initiation.

This tool kit (a set of different tools) helps both community members and project implementing personnel to collect, analyze and systematize information about the vulnerability of a community in a structured way and enable them to conduct their own analysis and to design their action plan and act accordingly towards improving their livelihood.

Brief Profile of Study Area

The study area belongs to the Eastern Plateau region of Bankura and Purulia district and considered as one of the most poorest livelihood zone, inhabited mostly by scheduled tribe (31% in Bankura & 47% in Purulia) and scheduled caste (14% in Bankura & 40% in Purulia). Out of 328 HHs in Bankura, 148 HHs (45%) belongs to below poverty level (BPL) and 40 HHs (12 %) are landless. Livelihood mainly depends on daily wage (51%). If there is no work, *'dadan'* (loan from 'mahajan' with high interest rate) is the only means to survive. A good percentage (18%) of household are forced to migrate twice a year (during transplanting and harvesting period) outside the district for at least 2 to 8 weeks.

The scenario of Purulia is more or less same. Map shows (Picture 1 & 2) that both the blocks are contiguous. Most of the households (60%) belong to BPL category and 50% migrated HHs. Primary occupation is daily wage labor (50%). Though landless family is comparatively less (4%), but most of the landholding HHs have lands of *'baid', 'dungri'* and '*tanr'* category which are usually uncultivable rocky upland.

Drought is an inherent characteristic of this Plateau region. Annual precipitation ranging from 1100 mm to 1400 mm. Distribution is uncertain. Erratic behavior of rain results severe soil erosion. Temperature varies maximum 45 °C to minimum 10 °C normally. Land is undulated rocky and unfertile covered with thin forest. Soil is red and latté rite based, texture generally sandy loam to sandy. Soil reaction ranges from acidic in ridges and near neutral in valleys.

Overall, the area with its high risk, harsh environment, compounded with poor infrastructural facility, social inequity is predominantly inhabited by vulnerable rural communities, especially, landless daily wage labors.

Agricultural operation is based mainly on mono cropped *Aman* paddy. It is solely rain-fed. Chemical intensive farming is common among farmers who can afford it. Agricultural guidance is usually dictated by fertilizers/pesticides dealers or retailers.

Use of organic plant nutrients like farm-yard manure, compost is very little. Preparation of compost is unscientific. Few household have started vermi composting. They are supported and guided by DRCSC.

In case of paddy, high yielding variety (HYV) is very common than folk rice. The variety *Lal Swarna*, and *Lalat* are widespread. Most of the indigenous varieties are extinct from the locality which is reflected in venn diagram. Few traditional paddy varieties are reintroduced by DRCSC, Purulia.

Very few patches are grown 2nd crop with mustard and winter vegetables (hybrid) by better off farmers. Lifting water from nearby water sources is experienced by the study team.

Hybrid varieties, in case of vegetables, grabs over *'desi'* (indigenous). The traditional practice of seed multiplication and preservation is very rare. Farmers are totally depended on markets which are not reliable. Growing of vegetables in homestead area is rarely found, that too in unorganized way.

The farmers are not aware of 'crop rotation'. Very little knowledge regarding mixed, inter or relay cropping. System of rice intensification has not yet been introduced which would optimize the production

with fewer inputs, specially, irrigation (using 40 per cent less water than conventional methods resulting less Methane - a green house gas, emission).

Fallow land: Found in most study villages usually kept idle and uncared resulting severe soil erosion. Fodder crops can be grown on such fallow and make it a grazing land. Depending on topography, soil and water conservation measures should be taken. It will prevent soil erosion and thus enhancing soil moisture retention capacity and recharging of ground water. Plantation of food, fodder, fuel and medicinal plant species would be additional income sources for better livelihood.

Water-bodies: Ponds, tanks or *'happas'* are found in study area. Few are excavated/ re-excavated under MGNREGS. In most cases, the pond banks are undressed. After digging, soils are hipped and scattered. Proper management practice would able to fetch good return through an integrated approach.

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People are ignorant about common property resources (CPRs) like roadsides, school premises, holy places, '*Solo-aana pukur'* (ponds owned by whole village), river banks or vested lands which can be turn into productive. Access to CPRs by poor and marginal groups must be assured. Plantation of appropriate (indigenous species) crop varieties would not only be an alternative income source but also an approach to carbon reduction credits.

'Social forestry' as seen in the locality is absolutely based on plantation of '*Sonajhuri*' and Eucalyptus trees which gradually destroys the ecosystem. Neither any herbs nor shrubs can grow under these trees. No fauna is really found in 'social forest'. It is really funny to believe a forest having one or two plant species; and that too, claimed as 'social forest'!

Apart from crop husbandry, livestock raring prevails in the farming system. Small livestock like poultry birds, goatary, piggery is very common in dry zone. Cow and buffalo are usually maintained by comparatively better off households. Availability of fodder is crucial in this harsh environment.

Demography (Bankura)

Table 1 **Social Classes**

Sl.No.	Mouza (JL.no.)	Total HHs	Social class				Literacy %	
			ST	SC	OBC	General	Male	Female
1	Besora (56)	207	35	26	119	27	69	51
2	Gopalpur (59)	35	35	0	0	0	25	17
3	Ennari (57)	86	31	20	22	13	47	35
	Total (%)	328	101 (31%)	46 (14%)	141 (43%)	40 (12%)	-	-

Table 2 **Economic Classes**

Sl. No.	Mouza	HHs	BPL	APL	Land less	Migrated HHs	Primary occupation (%)		
							Cultivator	Daily Lab.	Artisan /Business/ Service / others
1	Besora	207	76	131	21	28	50	40	10
2	Gopalpur	35	31	4	4	3	10	90	-
3	Enari (Ghoshergram GP)	86	41	45	15	27	35	60	5
	Total	328	148 (45%)	180 (55%)	40 (12%)	58 (18%)	42	51	7

Demography (Purulia)

Table 3 **Social Classes**

Sl.No.	Mouza (JL. No.)	Total HHs	Social class				Literacy %	
			ST	SC	OBC	General	Male	Female
1	Lara (206)	525	189	278	57	1	70	60
2	Jibanpur (143)	74	72	0	0	2	70	60
3	Jagannathdih (134)	172	114	17	30	11	65	35
4	Balarampur(136)	22	22	0	0	0	60	40
5	Jamkiri (137)	174	60	89	0	25	60	40
	Total	967	457 (47%)	384 (40%)	87 (9%)	39 (4%)		

Table 4 **Economic Classes**

Sl. No.	Mouza	HHs	BPL	APL	Land less	Migrated HHs	Primary Occupation (%)		
							Cultivator	Daily Lab	Artisan / Business Service / Others
1	Lara	525	375	150	22	250	60	30	10
2	Jibanpur	74	9	65	5	60	70	25	5
3	Jagannathdih	172	63	109	8	65	60	25	15
4	Balarampur	22	21	1	0	10	50	50	-
5	Jamkiri	174	115	59	7	100	40	50	10
		967	583 (60%)	384 (40%)	42 (4%)	485 (50%)			

Infrastructural facility (Bankura study area – Source DRCSC, Bankura)

District HQ is at Bankura 13 km away from block HQ at Chhatna. Distance from Chhatna to Gram panchayat office is 12km connected with pucca road while village connectivity mostly of fair weather. Few hamlets are in remote places thus accessibility during monsoon is painful.

Housing conditions are of different types ranging *jhupri* to pucca building. Most of the inhabitants have poor shelter. These are, generally mud-house thatched with straw or plant-waste.

Education: Two primary school, one middle school and one higher secondary found.

ICDS: Four ICDS centers exist.

Bank/ Co-operative: No such facility is found. On emergency, loan is available from money-lender (*'mahajan'*) with high interest rate.

Club: There are 5 village clubs, out of which only one is registered.

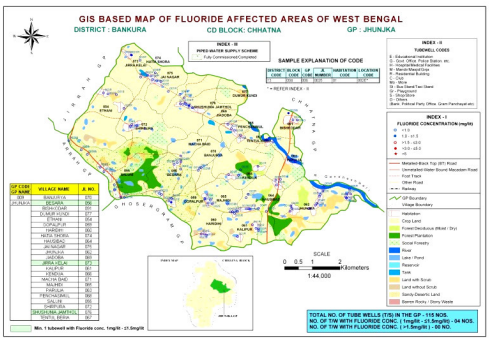
SHG/SGSY: All together nine groups exist.

Post Office: One Post office is at Besora.

Market: Regular market is at Khorbona and Jhatipahari. Weekly village market/ *hut* at Ghoshergram.

Amenities

Potable water: Eight tube-wells and six dug-wells. These are the main source of drinking water. During summer, crisis of water is acute as water level goes down. In Beriathol village tube-wells are not used for drinking purpose due to Fluoride contamination. They have to depend on dug-well.



Fuel: Most of the households use dry-leaves (Sonajhuri leaves), fire-woods and farm-waste for cooking purpose. Before monsoon these materials are collected and stored. Normally this job is assigned to women. Very few households in Besora village use LPG. Bio gas plants are in working which mostly supported by DRCSC.

Electricity: Most of the villages have the facility.

Infrastructural facilities (Purulia study area – Source DRCSC, Purulia)

Distance from district HQ to block HQ is 35 km and Gram panchayat office to block office is about 17 km. connected with pucca road. Village connectivity mostly by fair weather road.

Housing conditions are of different types ranging *jhupri* to pucca building.

Education: One SSK, eight primary schools, one middle school and one madhyamik.

ICDS: 16 - centers.

Bank/ Co-operative: One Co-operative Bank & One Gramin Bank at Sonathali

Club: There are 2 village clubs.

SHG: Eight SHG.

Post Office: Post office at Sonathali and at Lara.

Market: Daily market at Lara and Sonathali. Weekly village market at Kroshjhuri, Lara & Sonathali

Amenities

Potable water: 33 tube-wells and 70 dug-wells.
Fuel: Most of the households use fire-woods and few households use bio gas. Few HHs are using smokeless woven supported by DRCSC.

Electricity: Most of the villages have the facility.

PVCA Field Exercise, Findings and Analysis

Location of PVCA

Village: Beriathol Mouza: Besora GP: Jhunjka Block: Chhatna

Prior to start the exercise the study team, acted as facilitator, explained the objectives, and procedure of the PVCA exercise. It is also clarified that how PVCA helps in identifying the climatic hazards they usually face over the year and analyzing its variability factors, impact on their livelihood, self vulnerability assessment as well as capacity and finally helps in designing appropriate coping mechanism to secure a better livelihood.

1. Hazard Ranking

Village: Beriathol, Block: Chhatna

Hazards as villagers perceived: Five different climatic events have been marked as hazard which causes significant adverse impact on livelihood sustaining for different occupational groups. It includes – 'DROUGHT', 'UNCERTAINTY of RAIN', 'THUNDER STORM', 'HEAT WAVE' and 'FOG'. When the villagers were asked to rank those according to its adverse impact on livelihood, the villagers precisely expressed their views through pair ranking.

Hazards ranking: Comparing drought with other climate events DROUGHT causes maximum damage. In fact, except last year (2013), drought is an inherent characteristic of this region. Similar to drought, 'HEAT WAVE' affects considerably, though the magnitude of damage is less. The villagers believe that the seed beds and crops wilt due to heat wave. 'UNCERTAINTY of RAIN' is considered as hazard next to 'heat wave'. The respondents expressed that 'uncertainty of rain' results severe crop damage. For an example, they mentioned that delayed monsoon or 'uncertainty of rain' results late transplanting. Moreover, they added, during panicle initiation or flowering stage, seizing of rain causes total crop failure. Finally they consider 'DROUGHT' as one of the most hazardous climatic event and ranked it 1st. Next to drought 'HEAT WAVE' got 2nd and least damage by 'FOG' got 5th position.

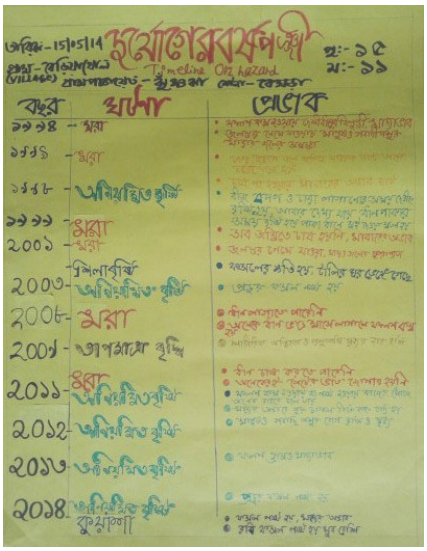
Table 5 **Hazards Ranking**

	Drought	Uncertainty of rain	Thunder storm	Heat wave	Fog	Rank
Drought	X	Drought	Drought	Drought	Drought	**1**
Uncertainty of rain	X	X	Uncertainty of rain	Heat wave	Uncertainty of rain	**3**
Thunder storm	X	X	X	Heat wave	Thunder storm	**4**
Heat wave	X	X	X	X	Heat wave	**2**
Fog	X	X	X	X	X	**5**
Score	**4**	**2**	**1**	**3**	**0**	

2. Time Line on Climate Change

Village: Beiathol, Block: Chhatna

This exercise helps in looking behind in the context of climate change and its respective impact on rural livelihood. It's a tool for critically review the past events (climatic) with respective consequences and thereby stimulates thinking to step forward towards judicial management practice.



The 'time line' reflects a period of last 20 years starting form current year (May 2014).

The chart depicts that during last winter mustard and potato crops were spoiled by foggy weather which causes food crisis. Though in 2013, on set of monsoon was in time but heavy shower during harvesting time spoiled the ripen crops.

2008 to 2012 - was the drought years. Most of the *'Aman'* fields were kept fallow. Fodder crisis was acute. People were forced to sell the cattle. Acute food crisis in every household. Even, yield from lowland (Bohal) was not as expected. Crisis of potable water due to depletion of ground water.

In 2003, hailstorm severely affected both field crops and shelters. Roof tiles were badly cracked and Brocken.

1994, 1998, 1999 and 2001 was also affected either by drought or uncertainty of rain. Consequence was miserable. Delayed monsoon caused late planting, hindering crop growth, more diseases and pest attack, depletion of ground water etc etc. Over all the communities were in acute crisis period.

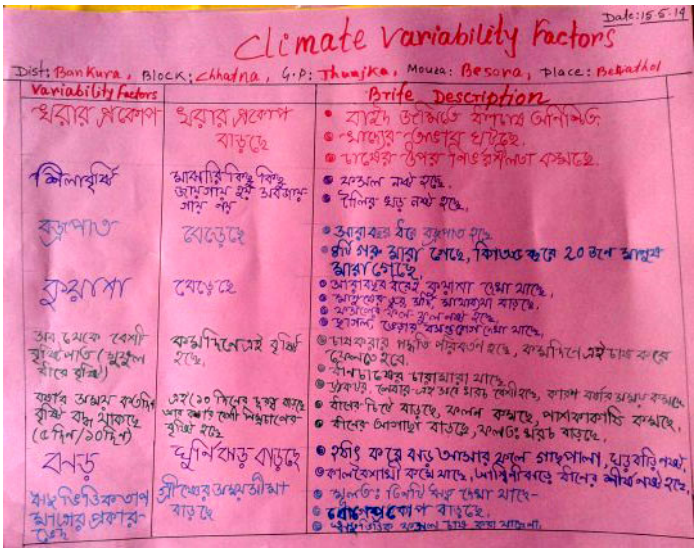
The chart (shown below) reveals that drought and uncertainty of rain is very common since last few years. They consider it as one of the most damaging climatic events affects their livelihood.

Time line

Year	Events	Impact on Livelihood
1994	Drought	* Severe crop damage * Food insecurity * Depletion of ground water
1998	Abnormality of rain	* Delayed transplanting * Precipitation during harvesting.
1999	Drought	* Crop lands kept fallow * Food crisis
2001	Drought/	* Depletion of ground water. * Scarcity of potable water.
	Hailstorm	* Winter crops damaged * Roof tiles cracked/destroyed
2003	Abnormality of rain	* Crops damaged severely
2008	Drought	* Failed to cultivate / Late planting – poor yield
2009	Heat wave	* Dehydration/Less work ability. Disposal of livestock
2011	Drought/ Abnormality of rain	* Paddy field kept fallow. Starvation / half meal
2012	Abnormality of rain	* Poor yield.
2013	Abnormality of rain	* Crop damage
May 2014	Abnormality of rain/Fog	* Crop damage specially winter crops * Food crisis

3. Climate Variability Factors

Village – Beriathol, Block: Chhatna



The climate variability factors and its magnitude assessed by the villagers reveal that factor like 'incidence of high intensity rain fall' is decreasing but total of precipitation are occurred in fewer days which indicates erratic rain. This climatic change makes the farmers to alter their cultivation practice. Due to shortening the ploughing time (i.e. land preparation), the labor is becoming very scarce resulting higher labor-cost.

'Dry spell during monsoon' is prolonged which affects paddy growers resulting chaffy grain, less tiller number, excessive weeds damage etc. More labor is needed for weeding.

Number of 'incidence of storm' is increased and it appears like *'Ghurnijhar'* (like Tornado) which damages trees and houses. Storm damages paddy flowers during autumn. The 'Kalbaisakhi' is very uncommon since last few years. The villagers presume that in future it will vanish.

'Variation of Seasonal temperature' is significantly noticed by the villagers. They confidently expressed that summer period is now prolonged. Three seasons instead of six are now noticeable. Seasonal cropping pattern has changed dramatically.

'Incidence of drought / Uncertainty of rain' are very common. Magnitude of damage and its frequency is increasing. Impact on livelihood is miserable. Transplanting on upland is uncertain. Hunger / half meal period is extended. Farmers cannot depend on agriculture for livelihood sustaining.

'Incidence of hailstorm' is moderate. In fact entire locality is not affected by hailstorm. Where it happen the growing crops is damaged. Roof tiles are cracked.

'Incidence of thunder storm' - Increased and happens throughout the year. Impact - 20 casualties in this locality during last 5 years. Death of cattle.

'Incidence of fog' – Foggy days are increased. Common in every season. Premature flowers and fruits are falling. Cough and cold is common. Pox disease found in livestock.

Table 6 **Climate Variability Factors**

Village – Beriathol, Block: Chhatna

Sl, no.	Climate Variability factors	Magnitude	Impact on livelihood
1	Incidence of high intensity rainfall	Decreased (Qnty. of rainfall same within shorter span)	• Changing the cultivation practice. Entire job has to finish within a short period. • Paddy sapling are spoiled. • Labour crisis due to high demand (Short period) –expensive.
2	Dry spell during monsoon	Prolonged (more than 10 days)	• Chaffy grain – Less yield- number of effective tillers reduced • Excessive weeds in paddy field – more weeding – more cost.
3	Incidence of storm	Increased (like Tornado)	• Damage of trees and houses • *'Kalbaishakhi'* (Storm-cloud during 'Baishakh') is very rare. • Storm during autumn spoils paddy flowers.
4	Variation of Seasonal temperature.	Summer period prolonged	• 3 seasons can be noticed instead of 6 • Seasonal cropping pattern is gradually changing
5	Incidence of drought / Uncertainty of rain	Increased/ unpredictable	• Transplanting on upland is uncertain • Food crisis • Farmers cannot depend on agriculture for livelihood sustaining
6	Incidence of hailstorm	Moderate (not at entire area)	• Growing crops severely affected • Damage of roof (tile)

7	Incidence of thunder storm	Increased and happens throughout the year.	• 20 casualties in this locality during last 5 years. • Death of cattle is very common
8	Incidence of fog	Increasing	• Seen in most season. Cough and cold / headache is very • Pre-matured flower and fruits falling, spoiled • Pox disease found in livestock (Goat and lamb)

4. Climate Trend Analysis

Village – Beriathol, Block: Chhatna

'Climate trend analysis' helps the community in critically analyzing the present and thereby assists in emerging a climate resilient action plan.

Villagers' comments are shown in table below -

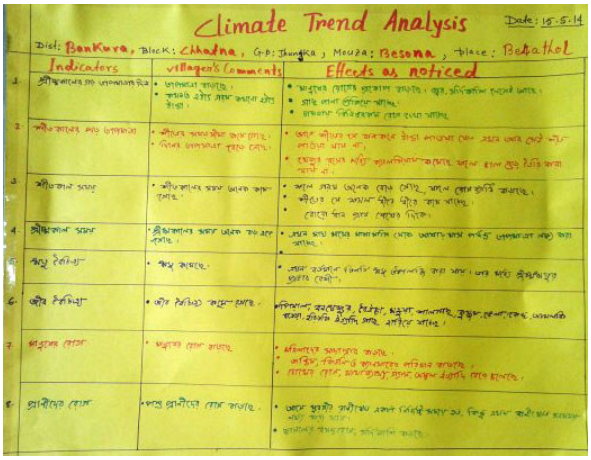


Table 7 **Climate Trend Analysis**

Village – Beriathol, Block: Chhatna

Sl, no.	Indicators	Villagers' comments	Effects as community perceived
1	Average day temperature during Summer	Increased / Fluctuating	• Human disease (cough and cold) increased • Wilting of field crops /trees • Skin disease
2	Average day temperature during Winter	Day temperature rises Cold pinching not as earlier	• Winter period shorten • Quality of molasses (from date palm) is falling.
3	Winter period	Reduced	• Wheat cultivation considerably reduced.
4	Summer period	Increasing	• Temperature rises and continues from

			Middle of Magh (February) to Ashar (Middle of July).
5	Seasonal diversity	Reduced 6 Seasons reduced to 3	• 3 seasons are noticeable. Among all Summer is more scorching.
6	Bio diversity	Reduced	• Plant species like Piyal, Bankhejur, Bainchi, Mahua, Saal, Kusum, Vela, Kendu, Amlaki, Bahera, Haritaki are extinct. • Animal species like Hural, Nekre, Kheksiyal, Corui, Finge, Gosap, Darash are no more.
7.	Diseases	Increasing	• Diseases both for human and livestock are increasing.

5. Seasonal Livelihood Analysis

Village- Beriathol, Block: Chhatna

The poor and marginalized rural people are reluctant to sustain their livelihood on a single approach, they have to depend on multiple activities which may includes crop based activity, livestock raring, fisheries, collection of NTFP (Non timber forest produce), handcraft, small business on daily wage within or outside village. The 'Seasonal livelihood analysis' reflects the same as shown in chart.

The chart depicts that there are thirteen different seasonal activities performed by the communities for their livelihood sustaining ranging from crop based activity to daily wage labor under MGNREGS activity.

The chart also specifically highlighted gender wise activities. It reveals that women are involved mostly on livestock raring. Besides, they are doing few additional income generating activities like leaf-plate making, broom making, *'bel mala'* making during their leisure period.

The crop based activity is usually a joint effort. Molasses preparation though done by men, but supported by women family members. Small business, carpentry and meson work is done by men.

The livelihood analysis chart has illustrated the specific time period (month) against each activity and broken line indicates poor and unstable attachment (shown below).

Table 8 **Seasonal Livelihood Analysis**

Village – Beriathol, Block: Chhatna

Occupation/Month	Ap/ Ma	Ma /Ju	Ju/ Jul	Jul/Ag	Ag / Se	Se/ Oc	Oc/ No	No/ De	De/ Ja	Ja/ Fe	Fe/ Ma	Ma/ Ap
Crop based activity (Male & female)		←	—	—	→		←	—	→			
Daily wage (male & female)	←	—	—	—	—	—	—	—	—	—	—	→
NGRES (male & female)	←	→									←	→
Livestock (female)	←	—	—	—	—	—	—	—	—	—	—	→
Carpenter (male)	←	→								←	→	
Meson (male)	←	→						←	—	—	—	→
Small business (male)	←	-·-	-·-	-·-	-·-	-·-	-·-	-·-	-·-	-·-	-·-	→
Molasses (Khejur)							←	—	→			
Broom making (female)					←	→						
Molasses (Palm) (male)	←	→										
Mat (Khejur leaves) (female)			←		←							
Bel mala (female)	←	—	—	—	—	—	—	—	—	—	—	→
Leaf plate (Saal/Palash) (female)	←	→										

6. Seasonal Calendar on Scarcity

Village: Beriathol, Block: Chhatna

The chart 'Seasonal calendar on scarcity' illustrates the scarcity of basic primary needs for livelihood sustaining over the year [i.e. Baisak (mid April to mid May) to Chaitra (mid March to mid April)].

Food crisis: The chart depicts food crisis continues for 3 months. Peak crisis period during August-September, precisely till harvesting of *'Aman'* paddy.

Fodder crisis: Fodder crisis occurs in two months (Baisakh-Jaistha) due to dry spell. Again the crisis arises during monsoon as because there is very little space for grazing. The area are then

under paddy cultivation. The cattle are then confined in rocky upland. Stall feeding which is laborious and expensive for maintaining livestock.

Crisis of drinking water: Scanty of potable water in this drought prone area is very common. During dry season the water table goes down. The crisis lasts for 4 months (Chaitra to Ashar). If monsoon delays the period may extend. More over the area belongs to Fluoride contaminated zone. The Beriathol people are not using tube-well water. They solely depend on dug well. They have to fetch water from distance point which is mostly done by women.

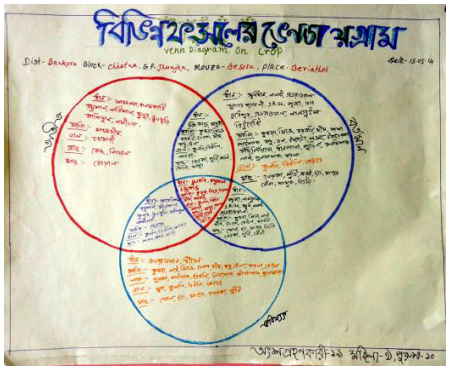
Irrigation water: Similar to drinking water, irrigation is also a major problem. The area is completely based on rain-fed. Since the drought and uncertainty of rain is a common phenomenon, and the water bodies dries up gradually the villagers are in great problem to growing any crops. The acute crisis period is from Pous to Jaistha. The rest 6 months depends on rain. If rain declines, there is no scope of live-saving irrigation.

Job opportunity: No job opportunity during Fulgun to Jhaistha nor with in village nor outside.

Migration : They used to migrate outside village. Usually they migrate in month of Baisakh and Pous- Magh.

7. Venn Diagram

Village: Beriathol, Block: Chhatna



This tool creates lots of interest among participants. When they recall the past, many interesting facts related to plant species were come out. Such as folk rice they cultivated earlier are now extinct from the locality. They can now realize that though the yield potentiality of those varieties are less than varieties grown today, still those varieties have an inherent capacity to drought tolerant and resistant to pest and diseases attacks. Moreover those have tremendous capability to survive against all natural calamities. Finally, the villagers identified few varieties which they wish to reintroduce in their farming system and requested the study team to find out and collect those varieties for promoting widely.

The plant species identified and categorized by the villagers are as follow –

Era	Paddy
Past	Asanlaya, Kalamkathi, Raghusaal, Lathisaal, Jhunur, Bhutmuri, Kashiful, Lakshidaya
Past + Present	Chandrakanta, Masuri
Present	Lal Swarna, Lalat, Gorya-1, Supershymali, IR-36, Puja, 1017, Dudheswar, Lalgutka, B-20
Present + (expected Future)	Lal Swarna, Lalat, Gorya -1, IR-36, Puja, Lalgutka
Expected Future	Gorya-1, Dhiren
Expected Future + Past	Kankrisaal, Raghusaal, Sitasaal, Jhulur, Bhutmuri, Kashiful, Asanlaya
Most Sustainable Zone (Past+Present+Future)	Roghusal, Bhutmuri, Chadrakanta, Puja, Lalgutka, IR-36, Lal Swarna, Lalat, Gorya -1

8. Focus Group Discussion

Village: Beriathol, Block: Chhatna

Interaction with villagers revealed that a drastic change in climate pattern is noticed since last 10 years. The villagers irrespective of gender, expressed that the cultivation practice has significantly changed. For an example, they mentioned, formerly the paddy seeds were usually sown on 'Rohini' a fixed date of 'Jaistha' i.e. 13th and the others related activities were scheduled accordingly. But since last few years (about 10 to 12 years) this schedule is not followed as because of uncertainty of monsoon. Now the onset of monsoon is shifted at least 15 to 20 days ahead. Moreover, they added, the rain is now unpredictable. Seizing of rain during panicle initiation or during flowering stage results severe crop damage. Very often, the entire field crops are attacked and spoiled by 'dhasa' (blast) due to this climate variation. "We are now in great trouble" they concluded.

The number of rainy day has considerably reduced and the intensity is too high which causes soil erosion. The summer span is elongated and the day temperature rises at the same fluctuating while winter shorten. All these climatic behaviors invite so many unwanted consequences like pest and diseases attack to crops, children are suffered from cold and cough and livestock are attacked by unknown diseases.

Since the respondents are of tribal community and mostly forest dwellers, they exposed their observations. They told - "since we the poor tribal community depends mostly on forest, 'hunting' is not only a passion to us, it's a means of livelihood sustaining. We get food by hunting. Now we are not getting food from forest as earlier. The forest is now degraded. We lost our preys. Birds, bats and few small animals are now lost. Few helpful birds like crow, vultures and eagle are rarely found in our locality. Predator birds like owl is about to extinct. Earlier, field crops were protected from rat by owl. Now owl is very uncommon.

Previously the crop sequence was designed in a way so that a continuous flow of food availability is secured. Unfortunately, to-day mono cropped approach is widespread.

To-day, as they told, field bunds ('*ails*') are not covered with grasses which causes fodder crisis.

In the context of coping mechanism, the villagers reacted that in fact "we are in puzzle. No such measures have yet been made by us except digging of *hapa*". But as DRCSC is working here since last few years, the villagers are quite aware of few mitigation measures. Accordingly, they suggested –

- Harvesting of rain water by excavation and re-excavation of ponds.
- Land shaping considering topography.
- Introduction of short duration paddy variety.
- Re introduction of traditional rice.
- Promoting 'Lutni sarshe' (mustard).
- Re introduction of drought tolerant crops like bajra, jower, kodo, arhar etc.
- Cover crop to protect soil erosion.
- Mixed cropping.
- Use of organic plant food like 'tral saar', vermin compost etc.
- Use of organic pesticides.

PVCA at Purulia

Location : Jhagradih, Mouza : Lara, GP: Sonathali Block: Kashipur

1. Hazards Ranking

Village: Jhagradih, Block: Kashipur

The villagers from five different mouzas of Sonatali GP came and actively involved in the PVCA exercise held at Jhagradih village. All together they identified 10 climatic hazards which they think most influenced their daily life. These are – i) thunder storm ii) uncertainty of rain iii) hail storm iv) less rainfall v) rain with storm vi) fog vii) cloudy weather viii) drought ix) rise of temperature (heat wave) and x) less dew. After listing the hazards, the respondents were asked to rank those by pair ranking method. The table below shows detail of scoring and thereby ranking. It reveals that the 'DROUGHT' affects highest to their livelihood. According to their scoring, the hazards are ranked as follow –

Hazards	Rank
1. Drought	1st (highest impact)
2. Less (insufficient) rainfall	2nd
3. Uncertainty of rain	3rd
4. Rain with storm	4th
5. Fog	5th
6. Hail storm	6th
7. Rise of temperature (heat wave)	7th
8. Thunder storm	8th
9. Cloudy weather and	9th
10. Less dew	10th (least impact)

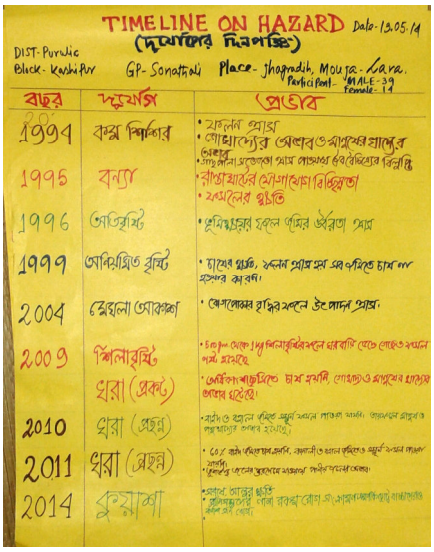
Table 10 **Hazard Ranking**

Village: Jhagradih, Block: Kashipur

	Thunder storm	Uncertainty of rain	Hailstorm	Less rainfall	Rain with storm	Fog	Cloudy weather	Drought	Rise of Temp.	Less Dew	Rank
Thunder storm	X	Uncertainty of rain	Thunder storm	Less rainfall	Rain with storm	Fog	Cloudy weather	Drought	Rise of Temp.	Thunder storm	**8**
Uncertainty of rain	X	X	Uncertainty of rain	Less rainfall	Uncertainty of rain	Uncertainty of rain	Uncertainty of rain	Drought	Uncertainty of rain	Uncertainty of rain	**3**
Hailstorm	X	X	X	Less rainfall	Hailstorm	Fog	Hailstorm	Drought	Hailstorm	Hailstorm	**6**
Less rainfall	X	X	X	X	Less rainfall	Less rainfall	Less rainfall	Drought	Less rainfall	Less rainfall	**2**
Rain with storm	X	X	X	X	X	Rain with storm	Rain with storm	Drought	Rain with storm	Rain with storm	**4**
Fog	X	X	X	X	X	X	Fog	drought	Fog	Fog	**5**
Cloudy weather	X	X	X	X	X	X	X	Drought	Rise of Temp.	Less Dew	**9**
Drought	X	X	X	X	X	X	X	X	Drought	Drought	**1**
Rise of Temp.	X	X	X	X	X	X	X	X	X	Rise of Temp.	**7**
Less Dew	X	X	X	X	X	X	X	X	X	X	**10**
Score	2	7	4	8	5	5	2	9	3	1	

2. Time Line

Village: Jhagradih, Block: Kashipur



The 'Time line' (shown above) unfolds the past facts related to climate change and its impact on livelihood of rural communities of Purulia study area.

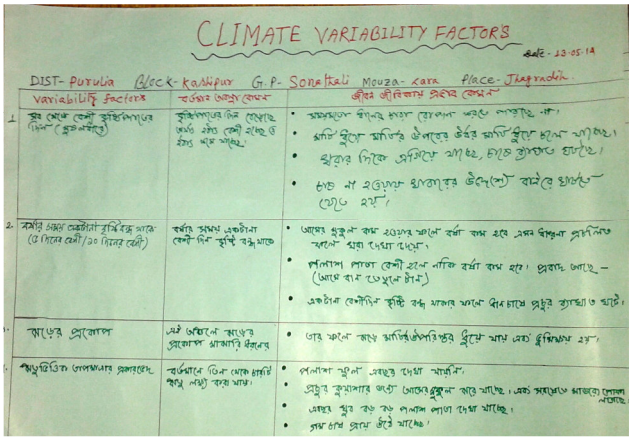
Year wise climatic events and respective impact as community faced are stated below.

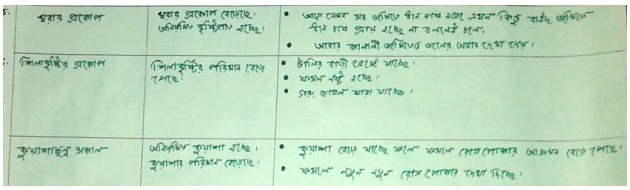
Time line

Year	Events	Impact on Livelihood
1994	Less dew	* Hampers winter crop growth * Less yield in winter crops
1995	Flood (Darakeswar river)	* Severe crop damage* Food insecurity * Communication disrupted
1996	Erratic rain	* Soil erosion * Reduced soil fertility
1999	Delayed & vagarious nature of rain	* Delayed transplanting * Pest & disease attack in Aman paddy * Less vegetation leads fodder crisis * Hinders crop growth resulting poor yield.
2004	Cloudy weather	* Diseases and pest attack in winter crops – less production
2009	Severe drought	* Most of the Aman fields kept fallow * Fodder crisis
	Hailstorm	* Damage of Ravi crops * Damage of shelters
2010	Drought (less precipitation)	* Paddy yield from Low (Bohal) and Mid land (Kanali) not satisfactory.
2011	Drought	* 60% of upland kept uncultivated. Even, yield from lowland (Bohal) not as expected. * Crisis of potable water due to depletion of ground water.
May 2014	Fog	* Mustard and potato damaged by 'Jab poka' (Aphids) and 'Dhasa' (Blast disease) respectively. * Children and livestocks suffer from un known diseases.

3. Climate variable Factors

Village: Jhagradih, Block: Kashipur





Climate variability assessment was judged by the communities by identifying few climate variability factors, its magnitude and impacts on their livelihood which is shown in table below.

Table 11 **Climate Variability Assessment**

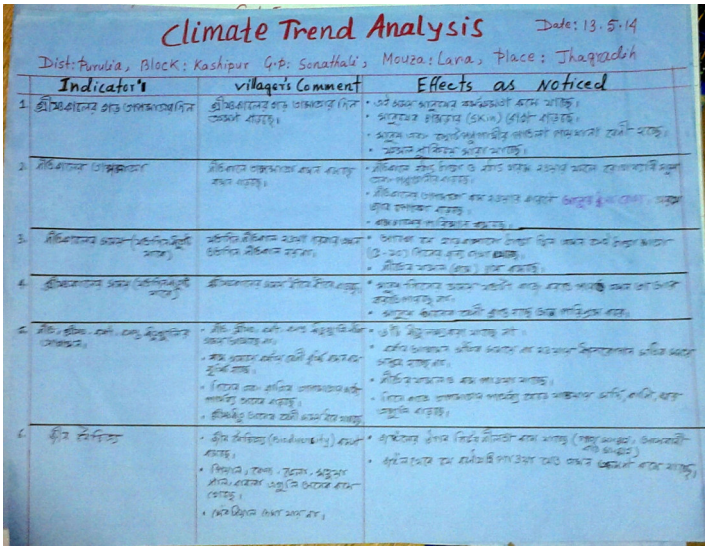
Village: Jhagradih, Block: Kashipur

Sl, no.	Variability factors	Magnitude	Impact on livelihood
1	Incidence of high intensity rain & vagarious n	Increased/ unpredictable	• Transplanting in time is not possible • Soil erosion results loss of fertile soil/organic matter eventually turn to barren land • Less production • Migration
2	Continuous dry spell during monsoon	Number of incidence increased and duration prolonging gradually	• Growing crops severely affected • Poor or no yield if happens in panicle initiation /flowering stage.
3	Incidence of storm surge	Moderate	• Soil erosion (top soil)
4	Incidence of Drought	Increasing	• Up lands are kept fallow. • Mid lands (‘kanali’) also suffer from water stress
5	Incidence of hailstorm	Increased	• Damage of roof tiles • Crop damage • Death of cattle
6	Foggy weather	Uncertainty/ density increased (less visibility)	• Disease /pest attack increased in ravi crops. • Crop damage by unknown (new) pest/diseases

7	Variation of Seasonal temperature	6 seasons reduced to 4	• No flowering in Palash • This year (2014) Palash leaf size is significantly larger. • Mango inflorescence are dropped down due to excessive dew • Wheat cultivation is almost withdrawn due to shorten of winter spell and higher temperature.

4. Climate Trend Analysis

Village: Jhagradih, Block: Kashipur



The exercise 'climate variability assessment' helps the communities to analyze the climate trend. The table below reveals the climate trend analysis in details.

Table 12 **Climate Trend Analysis**

Village: Jhagradih, Block: Kashipur

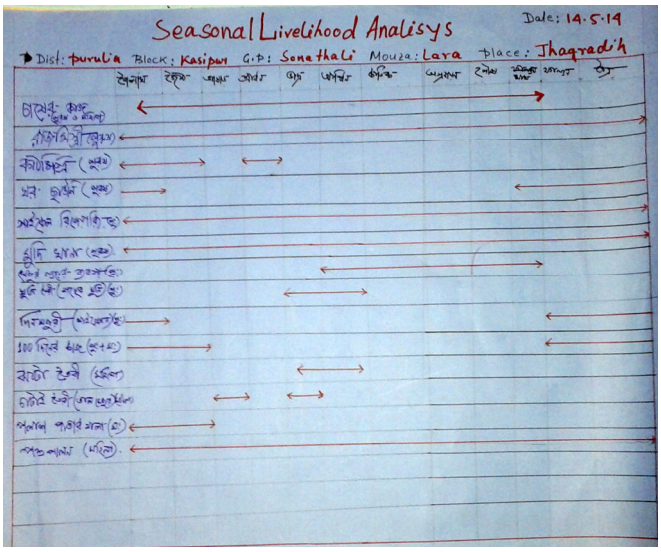
Sl, no.	Indicators	Villagers' comments	Effects as community perceived
1	Day temperature during Summer	Increased	• Work efficiency considerably reduced • Different types of skin disease • Children suffer from Diarrhea, same in case of cattle • Crops wilt
2	Day temperature during Winter	Winter temp. rises and winter period shorten	• Fluctuation of temp. causes diseases • Yield of potato decreased, diseases like 'dhasa' (blast) increases, size of potato

			reduced. • Wheat cultivation significantly reduced • Number of irrigation, in case of mustard, is now higher than earlier
3	Winter period	Reduced	• Pinching cold as earlier, is very uncommon • Typical winter crops are not grown now
4	Summer period	Increasing	• Difficult to work • Very soon people are becoming tired / exhausted
5	On set / seizing of each Season	Fluctuated/ unpredicted Annual rain fall reduced Day temp. rises while night temp. is reduced	• Cannot differentiate the seasonal variation • Winter crop damage • Unknown diseases both human /livestock
6	Bio diversity	Mahua, Saal is disappearing. Pial & kend extinct. significantly reduced in fauna like Sasa, kheksiyal	• Reduced NTFPs • Bio diversity lost

5. Seasonal Livelihood Analysis

Village: Jhagradih, Block: Kashipur

'Seasonal livelihood analysis' chart depicts what type of activity / activities is usually done by the poor and marginalized people. The gender wise work division, if any, is precisely clarified in the chart. Over the year, how many months / weeks they engaged in each activity is clearly illustrated by both end arrow line. The table below illustrates in details.



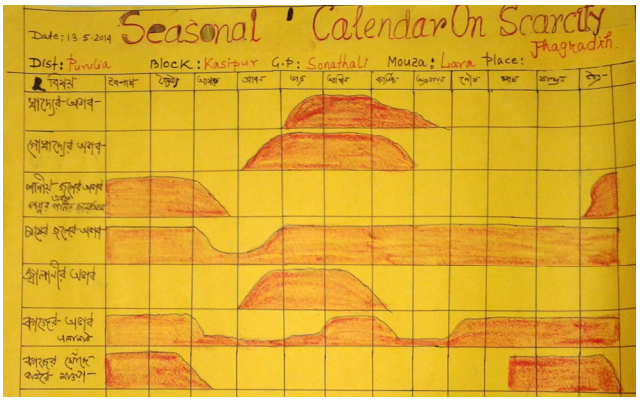
6. Seasonal Livelihood Analysis

Village: Jhagradih, Block: Kashipur

Occupation/Month	Ap/ Ma	Ma /Ju	Ju/ Jul	Jul/Ag	Ag / Se	Se/ Oc	Oc/ Nov	No/ De	De/ Ja	Ja/ Fe	Fe/ Ma	Ma/ Ap
Crop based activity (male & female	←									→		
Meson (male)	←											→
Carpenter (male)	←	→		←	→							
Roof thatching (male)	←	→								←		→
Cycle repairing (male)	←											→
Grocery shop (male)	←											→
Molasses (Khejur) (male)						←				→		
MGNREGS (male & female)	←	→								←		→
Broom making (female)					←	→						
Mat (Khejur leaves) (female)			←		←							
Leaf plate (Saal/Palash) (female)	←	→										
Livestock raring (female)	←											→

7. Seasonal Calendar on Scarcity

Village: Jhagradih, Block: Kashipur



'Seasonal calendar on scarcity' chart prepared by the community reveals that the community is lacking basic requirements of livelihood sustaining.

Food crisis: Starts from Bhadra (August) and continues till paddy harvesting/threshing (i,e. Agrahayan). September-October the peak crisis period. About 60 % of total household belongs to this category. They have to borrow food grain at higher interest rate. During this four months women members are in great pressure.

Fodder crisis: During crop growing period the cattle are not allowed to free grazing. Cattles are then confined in shelter or in rocky upland. Usually, during this period (Sravan to end Kartick) fodder crisis severe.

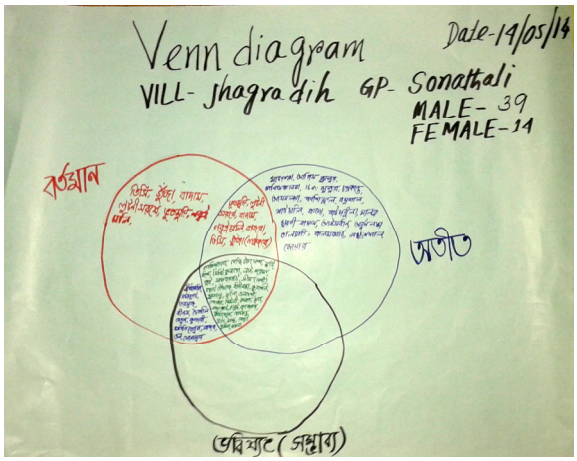
Crisis of drinking water: About 3 to 4 months (Chaitra to Ashar) acute crisis. Women family members are responsible for this job. Normally, during stress period they have to fetch water from distance water sources.

Fire woods: During rainy season (Sravan to mid Kartick) crisis of fire woods arises. The community has to collect and store their requirements prior to onset of monsoon. The collection of fire wood usually done by women. For better energy efficiency, smokeless 'chulli' has been introduced by DRCSC, Kroshjhuri project, Purulia since last few years. The villagers accepted and use smokeless 'chulli'.

8. Venn Diagram

Village: Jhagradih, Block: Kashipur

This exercise helps in recalling the past in the context of crop varieties that were grown 15 to 20 years back and the crop varieties are growing now. Is there any crop variety fading now gradually or totally disappeared? Why? The Venn diagram impinges in mind to critically analyze its consequences and helps in predicting future, eventually suggests appropriate crop variety compatible to climate resilience farming system.



This tool creates lots of interest among participants. When they recall the past, many interesting facts related to plant species were come out. Such as folk rice they cultivated earlier are now extinct from the locality. They can now realize that though the yield potential of those varieties are less than varieties grown today, still those varieties have an inherent capacity to drought tolerant and resistant to pest and diseases. Moreover those have tremendous capability to

survive against all natural calamities. Finally, the villagers identified few varieties which they wish to reintroduce in their farming system and requested the study team to find out and collect those varieties for promoting widely.

The diagram shows that the farmers lost number of folk rice like Manik kalma, Asanlaya, Talmari, Chandrakanta, Kashiful, Baiddhula etc. Lal swarna and Lalat is now wide spread. But both the varieties, as the villagers told, are susceptible to pest and diseases. Moreover, if any climatic stress, the varieties cannot survive. But in case of folk rice, their resistance power is too high. They can survive even in dry spell. Though the yield potentiality of folk rice is less yet it never demands high input cost. The villagers are now too much eager to re introduce those folk rice which now extinct in their farming system.

9. Focus Group Discussion

Village: Jhagradih, Block: Kashipur

An interactive session with participants from 5 mouzas of Sonathali GP was held at village Jhagradih. The participants were mostly from tribal community. The participants, irrespective of male or female, interacted spontaneously to share their experience, views and opinions regarding the dynamics of climate change and the impacts they faced on their livelihood.

The community as commented –

Drought is very frequent in this region. Like drought, inadequate rainfall or uncertainty of rain causes adverse impact on our daily life. We are living in a harsh environment. Geographically our land is undulated terrain. Soil is unfertile. No irrigation facility. All together, this vulnerable zone combined with vulnerable community like us are in great threat to exist. In addition, this climatic trend threats to our future generation.

We have noticed that Day temperature is gradually increasing. Summer spell extended where as winter period is curtailed. Cold is not pinching as previous. This type of climatic pattern creates awful incidence like crop damage to health hazards, loss of flora and fauna eventually imbalance of eco-system.

They suggested few adaptation and mitigation measures to encounter the situation. These includes –

- Harvesting of rain water – excavation and re-excavation of pond/hapas
- Plantation of indigenous plant species.
- Drip irrigation / pitcher irrigation in case of homestead area
- Introduction of drought tolerant crop varieties.
- Introduction of smokeless ‘chulli’ (oven)
- Use of bio plant nutrients instead of chemical.
- Use of bio pesticides
- Formation of village youth group to protect and preserve natural resources.

Action Plan

The climate resilience action plan for vulnerable communities in drought prone areas of Bankura and Purulia district is carried out with the help of analytical reports emerged though intensive PVCA exercise and frequent interaction with village people irrespective of age, caste and gender. The entire process is based on participatory manner and facilitated by the study team.

In the light of climate change, several issues and challenges need to be prioritized considering the vulnerability and capacity of intended communities and analyzing the local situation, the action plan is designed.

Principally the idea is to allow the climate resilience mechanism in the direction of low emission of green house gases (GHG) or less "carbon intensive" approaches which are eventually responsible for climate change.

Highlighting on two major aspects - the 1st one is "Carbon offset credits" which precisely mean depending on renewable energy and the 2nd one is "Carbon reduction credits" i.e. collection and storage of carbon from our atmosphere through forestation / reforestation.

A. Sustainable Livelihood through Farm Integration

Objectives	Issues identified	Action plan (Climate Resilient Adaptation & Mitigation measures)
Basic requirements for livelihood sustaining - Food security Availability of Fodder Availability of drinking water Availability of fire wood	• Drought – water stress-crop-field kept fallow/ food/ fodder /drinking water crisis. • Uncertainty of rain-delayed planting-crop damage. • Rainy days decreased - erratic rain- soil erosion-poor soil fertility. • Rise of temperature-crops wilt & damage. • Summer prolonged-pest attack/hinders crop growth. • Winter shorten- damage winter crops/wheat cultivation decreases. • Foggy weather-pest & diseases- crop damage • Depletion of ground water-water bodies dries up • Convergence of bio-diversity- imbalance of ecosystem • Lack of technical knowledge	✓ Introduction /reintroduction of appropriate crop varieties compatible to farming system. ✓ Adaptive trials on crop and livestock managements. ✓ Trial on SRI (System of Rice Intensification) for low emission of GHG (Methane). ✓ Introduction of mixed cropping/inter cropping and relay cropping (food availability all over the year). ✓ Suitable crop rotation (considering land situation) incorporating at least one legume crop for enhancing soil fertility. ✓ Use of organic plant nutrients for enhancing soil moisture retention capacity. ✓ Recycling of farm waste to nutrient rich plant food. ✓ Practice of mulching (in situ water conservation) ✓ Promoting strategic crop varieties. ✓ Awareness on bio pesticides. How to prepare and use. ✓ Promoting smokeless 'chulli' (oven) as energy efficiency measure. ✓ Generation / regeneration of grazing land. ✓ Need based training.

B. Soil & Water Conservation

Objectives	Issues identified	Action plan (Climate Resilient Adaptation & Mitigation Measures)
Assured irrigation. Availability of drinking water. Maintaining soil fertility. Recharging of ground	• Deforestation. • Degradation of forest (natural). • Soil erosion. • Degradation of soil. • Depletion of ground water. • Plantation of inappropriate plant species ('*Sonajhuri*' &	✓ Identification of micro watershed zone. ✓ Harvesting of rain water. ✓ Earth work as needed (e.g. land shaping, contour bunding , stagger trench, 5% model, 30/40 model etc.). ✓ Check dam using locally available materials (no hitech) ✓ 3-tire plantation of indigenous species (combination of tree , herbs/ shrubs and creepers). ✓ Generation or regeneration of forest with indigenous plant species. Make it a 'food forest' as buffer food stock.

water	Eucalyptus). • Ignorant about natural resources	✓ Need based training

C. Access to Common Property Resources (CPRs)

Objectives	Issues identified	Action plan (Climate Resilient Adaptation & Mitigation Measures)
Access to Common Property Resources (CPRs) by poor and marginal people.	• Ignorance about CPRs • CPRs are kept idle • CPRs are degrading	✓ Identification of CPRs ✓ Group based activity (cultivation of food crops, plantation of indigenous plant species which will provide food, fodder and fire woods). ✓ Need based training.

D. Alternate Income Source

Objectives	Issues identified	Action plan (Climate Resilient Adaptation & Mitigation Measures)
Provision of alternative income source like - Livestock raring. Handcraft. Small business.	• No job opportunity. • Landless. • Migration.	✓ Technical and financial support for livestock raring. ✓ Fisheries. ✓ Mushroom cultivation. ✓ Lac cultivation on Palash and jujube tree. ✓ Bamboo craft. ✓ Broom making (fromlocally avaiable 'Jurgunda'or 'kharang ghuchi' grasess). ✓ Rope making from *'babui'* grass (particularly in Purulia project). '*Baui'* grass may be grown on fallow lands. ✓ Leaf plate making (from Saal and Palash leaves). ✓ Need based training.

E. Village Resource Management

Objectives	Issues identified	Action plan (Climate Resilient Adaptation & Mitigation Measures)
Identification of village resource both for i) natural & ii) human Conservation and preservation of natural resources Judicial use of natural resources	• Ignorance about village resources. No or less use of village resources. • Misuse and over use of village resources. • Diversified ecosystems are in threat. No resiliency is there.	✓ Identifying and registering the village resources (natural and human) at regular interval at micro level. ✓ Community action to protect and preserve those natural resources. ✓ Ensure judicial use of natural resources and sharing the benefits at equity basis. ✓ Percolating traditional knowledge and wisdom from resource persons (e.g. elderly persons, village doctor, dai, artisan, weather predictor, skilled cultivator etc) to their kin or interested individual. ✓ Need based training.

F. Disaster Proofing

Objectives	Issues identified	Action plan (Climate Resilient Adaptation & Mitigation Measures)
Community Grain Bank Community Seed Bank	• Lack of quality seeds while seedbed is damaged due to climatic hazards • Poor access to credit society • Pressure of money lenders	✓ Establishment of community Grain Banks. ✓ Establishment of community Seed Banks ✓ Formation of savings and credit groups ✓ Need based training.

G. Health and Hygiene

Objectives	Issues identified	Action plan (Climate Resilient Adaptation & Mitigation Measures)
Nutrition awareness Provision of balanced diet. Sense of hygiene.	• No or little awareness about 'nutrition' • Malnutrition • Poor sanitation • Lack of motivation • Lack of infrastructural facilities.	✓ Establishment of 'nutrition garden' at every household to get fresh and toxic free balanced diet. ✓ Nutrition garden at school premises to supplement 'Mid day meal'. ✓ Awareness and motivation camp to use low cost latrine. ✓ Organizing Vaccine / Immunization camp ✓ Linkage with ICDS

H. Institutional Strengthening / Human Resource Development

Objectives	Issues identified	Action plan (Climate Resilient Adaptation & Mitigation Measures)
Empowering/Strengthening village communities.	• Lack of village institution /youth group • Children are not properly looked after • Peoples are not aware of their rights • Harassed and cheated by money lender • Poor or no linkage with local Govt.	✓ Identifying/setting up of Social institute. ✓ Formation of Youth Groups for i) Mother & Child care (linkage with ICDS) ii) Immunization / vaccination camp (linkage with medical team) iii) Regular contact with pachayat iv) Provision of information regarding Govt, schemes/circulars. v) Linkage with Disaster management Dept. ✓ Need based training of Youth Groups.

I. Advocacy and Net Working

Objectives	Issues identified	Action plan (Climate Resilient Adaptation & Mitigation Measures)
Linkage with Govt./ Non Govt. Organization & Civil Societies.	• Less exposure to outer world. • Poor or no linkage with local Panchayat / Govt. Depts. • No/ less access to print media.	✓ Conducting village fair/exhibition at village level. ✓ Conducting meeting, seminar etc. with local Panchayat/Govt. Depts./ other agencies at regular interval. ✓ Mass communication through wall writings/posters etc. ✓ Distribution of leaflets/booklets on technical issues. ✓ Disseminating weather reports /forecast well ahead. ✓ Involvement of local media for disseminating the facts (regarding work progress)

Conclusion

The study indicates that the communities are, in all respects, in vulnerable situation. They are quite conscious about climate trend and its impacts on their livelihood. In fact they have very little to combat the situation.

The scientists (IPCC) predicts that during the next decades, billions of people, particularly those in developing countries, will face changes in rainfall patterns that will contribute to severe water shortages or flooding, and rising temperature that will cause shift in cropping pattern and growing seasons.

This changing pattern of climate thus, calls for reviewing the existing coping mechanism for a particular zone and finding out the best possible survival strategies (agricultural) tuned with prevailing farming system. The most important aspect of survival, in particular, agricultural strategy, in Bankura and Purulia, would be to evolve heat resistant varieties of crops and to introduce short duration crops varieties mixed with other drought tolerant crops to minimize risks as well as steady flow of food availability all over the year. Another important aspects would be "the soil and water management" & "weather based crop management" to cope up with the changing climate.

Hence, take it as 'joint venture' of a multidisciplinary team and to organize series of awareness campaigns and skill trainings at all levels to ensure a climate adaptive and resilient livelihood of small and marginal farmers of Bankura and Puruli districts of West Bengal.