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# Adaptation Strategies under Climate Induced Natural Disasters in Coastal Areas of Odisha

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**Climate induced natural disasters (CINDs) like drought, flood and cyclone have become serious problems for the economy of coastal state like Odisha. This paper describes the climate induced natural disasters affecting the study areas and adaption strategies with respect to livelihoods and economic activities. It is found that in most years, adjustment in household activities combined with relief works provides the minimal succours (employment, food, etc). However, occasionally the situation gets worsen like the case in coastal Odisha since late 1990s. The study undertaken by WTCER (Presently ICAR-IIWM) revealed different coping mechanisms to climate induced natural disasters by different sections of the people and the management of natural resources also differ in different villages. The study focuses on coping strategies of the people to drought, flood and cyclone vulnerability in coastal Odisha. Rural people's perception and attitudes about natural disasters are also reported. For the study, a simple random sample was adopted and interviews were carried out through questionnaire and Focus Group Discussions. From the study a picture of coping responses (matrix) was built up. The common perception of rural households in the study area was that climate has changed for the worse with increased frequency as well as intensity of CIND events in recent years. Different adaption strategies with respect to crop, land and water are practiced in study areas.**

*(**Key words**: Climate change, Natural disaster, Coping strategy, Vulnerability)*

Climate is the prime decider of economic condition of any country or state. The history of Odisha economic condition is replete with climate induced upswings or down swings depending upon the nature of events. Climate induced natural disasters (CIND) like droughts, floods, and cyclones have been determining the shape of the agro economic condition of the state. Odisha's economy is shaped by monsoonal variability and the aberrations are quite often in the periodicity and intensity of the precipitation that often results in severe flood, drought or cyclone. The agriculture has become real gamble in the monsoon. It has been observed that there has been either a flood or a drought or a cycle in every alternate year during last 130 years of observation.

The impact of the CIND has been severe on the agro economic and socio economic conditions of the people. Already poverty riddled population has become more vulnerable to these CINDs especially those living in high risk coastal areas. The farmers and fishermen who are the traditional food producers living in such fragile environment are ecologically, geographically and economically marginalized. However, people living under such fragile risky environment, where natural disasters become a part of life have developed certain coping mechanisms and adaptive strategies over time to reduce drought, flood and cyclone vulnerability. The management of natural resources for developing coping mechanism has been first adaptive mechanism in CINDs in India and Odisha. In the background of above, a study was undertaken to assess the coping strategies of the people to natural disasters in different villages of coastal districts of Odisha.

## MATERIALS AND METHODS

The study was carried out in two districts of Kendrapara and Khurda in coastal Odisha as the two districts used to experience natural disasters frequently. The basic information on how households and rural communities respond to CINDs, how do they manage the available natural resources to cope, escape or mitigate the impact has been collected through questionnaire interview methods and focus group discussions. The coping strategies that rural households use in responding to various CIND events were assessed through household survey in Kendrapara, a regular climatic hazard affected district and Khurda (Control) districts of Odisha. Kendrapara district, forming a part of coastal Odisha, is characterized by fragile environment, prone to flood and cyclone, highly variable rainfall, high water deficiency during *Rabi*, frequent rainfall failure, and of late also emerging as a drought prone district. The area is

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intersected by a network of rivers and creeks with Bay of Bengal on the eastern side making it flood prone. Kendrapara is also one of the worst cyclone affected districts in Odisha.

Four sample villages (Nuagaon and Gobardhanpur from Rajnagar block; Naladiapara and Raghunathpur from Mahakalapara block) were selected randomly for the study purpose. The two blocks, Mahakalpara and Rajnagar were purposively chosen because of their proximity to sea and high degree of vulnerability to CINDs. These two blocks lie on the delta and floodplain of the four major rivers Brahmani, Baitarani, Dhubri and Salandi and hence are influenced by sea level rise. Both the blocks are vulnerable to a number of natural hazards, but most particularly flooding both from the rivers and storm surges (cyclone).

## RESULTS AND DISCUSSIONS

The state of Odisha used to experience either cyclone or drought or flood in every alternate year or within the same year which affect the states agro economy severely. The frequency of natural disasters during the year 1965 to 2001 has been depicted in the Table 1. It is evident from the table that almost every year the state has been affected by natural calamity. The villages selected under the study in the district of Kendrapara have experienced CINDs in the same period but the severity of the impact have been different in different years depending on the intensity and duration of the extreme climatic events. The water resource scenario, the socio economic conditions of the study villages have been depicted in the Table 2 and 3. The socio economic profile and employment profile of the sampled farmers have been depicted in Table 4. The preference for different cropping sequence has been depicted in the Table 5 and the climate risk response is depicted in Table 6. Table 2 depicts that the irrigation availability is low in two study blocks and the dependence on rainfall in *Kharif* is high. The demographic features of the study villages depict that the general caste dominate the population with skewed sex ratio in favour of male household heads. Most of the population are within age group of 12 to 60 years. Agriculture is the dominant occupation of the people in the study area with more than 50% engaged in agriculture as main occupation. The paddy-fallow-fallow crop sequence is the most prevalent one in the study villages as irrigation availability is almost negligible in the area. With respect to risk management in agriculture (Table 6), varietal selection, use of pesticides and insecticides, use of implements and fertilizer use for yield enhancement are preferred methods. Sumer ploughing is most preferred method to counter drought situation.

### Description of adaptation strategies under climatic aberrations in some study villages

The Focused Group Discussion (FGD) with the villagers revealed interesting facts on coping strategies of the people in the event of natural disasters. Natural resources are prime mover for a society for sustainable growth and development. The coastal economy is more prone to its control due to enormous contribution it makes to livelihoods of the people. The villages Naladiapalda under Mahakalpara block and Belpala of Rajnagar block in Kendrapara distrcts of Odisha, the perpetual victim to the climatic aberrations testified this. The study team carried out FGD with the people of

***Table 1.*** *Increasing incidence of natural calamities in Odisha*

| Drought | | Flood | | Cyclone | Hailstorm Whirlwind Tornado | Whirlwind Tornado |
|---|---|---|---|---|---|---|
| **1965** | 1984 | 1967 | **1980** | 1967 | 1978 | 1981 |
| 1966 | **1987** | 1968 | 1981 | 1968 | | |
| 1972 | 1992 | 1969 | **1982** | **1971** | | |
| **1974** | 1996 | 1970 | 1985 | 1982 | | |
| **1976** | 1998 | 1971 | 1990 | **1999** | | |
| **1979** | **2000** | 1972 | 1992 | | | |
| 1980 | **2002** | 1973 | 1994 | | | |
| 1981 | | 1974 | 1995 | | | |
| **1982** | | **1975** | **2001** | | | |
| | | 1977 | | | | |

Note: Bold letter represents severe incidence of drought/flood/cyclone during that year; the bold represents the occurrence of more than one natural calamity during that year. Underlined letter represents deviations in rainfall of 20% or more than the normal (Source: Selvarajan *et al*., 2002).

***Table 2.*** *Irrigation Potential (ha) in Study Blocks of Kendrapara and Khurda*

| Irrigation Sources | Blocks | | | | | |
|---|---|---|---|---|---|---|
| | Rajnagar | | Mahakalapara | | Khurda | |
| | Area (ha) | | Area (ha) | | Area (ha) | |
| | Kharif 2002 | Rabi 2002-03 | Kharif 2002 | Rabi 2002-03 | Kharif 2002 | Rabi 2001-02 |
| Canal | – | – | 3007 | 2350 | 1336 | 72 |
| Govt. lift points | – | – | – | – | 480 | 198 |
| Private lift points | 300 | | 75 | - | 8 | 8 |
| Shallow Tubewells | – | 160 | – | 60 | – | – |
| Dug wells | – | – | – | – | 425 | 76 |
| Other sources | 1500 | 800 | 1200 | 500 | 1087 | 728 |
| **Total** | **1925** | **960** | **4282** | 2865 | **3336** | **1082** |

***Table 3.*** *Selected sample villages and households*

| Categories | Kendrapara district | | | | Khurda district |
|---|---|---|---|---|---|
| | Rajnagar block | | Mahakalapara block | | Khurda block |
| | Nuagaon | Gobardhanpur | Naldiapalda | Raghunathpur | Somanathpur |
| Landless | 1 | 0 | 2 | 1 | 0 |
| Marginal | 2 | 3 | 2 | 3 | 2 |
| Small | 5 | 8 | 8 | 9 | 4 |
| Medium | 3 | 2 | 1 | 3 | 2 |
| Large | 1 | 2 | 0 | 0 | 1 |
| Total | 12 | 15 | 13 | 16 | 9 |

***Table 4.*** *Demographic feature of sample farmers*

(Households in percentages of total)

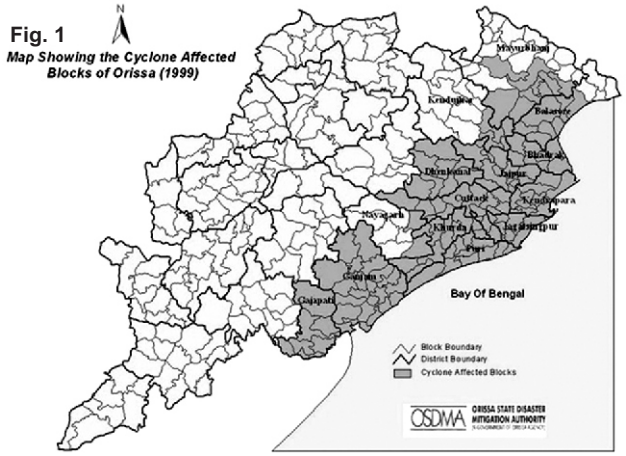
| Villages | Social Group | | | Head of Family | | Age of Family Members | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SC | ST | Gen/Others | Man | Woman | Below 12 yrs. | | 12-60 yrs. | | Above 60 yrs. | |
| | | | | | | M | F | M | F | M | F |
| Nuagaon | 11.43 | 51.51 | 37.06 | 93.85 | 6.16 | 7.69 | 8.72 | 36.95 | 29.66 | 9.17 | 7.8 |
| Gobardhanpur | 5.67 | 46.91 | 47.42 | 98.97 | 1.03 | 13.89 | 12.11 | 38.2 | 31.61 | 2.23 | 1.96 |
| Naldiapalda | 16.6 | 0 | 83.4 | 97.2 | 2.8 | 11.2 | 10.6 | 37.4 | 35.2 | 2.5 | 3.1 |
| Raghunathpur | 16.68 | 57.65 | 25.67 | 89.58 | 10.41 | 14.17 | 9.09 | 48.51 | 25.15 | 1.68 | 1.4 |
| Somanathpur | 11.02 | 46.61 | 42.37 | 95.76 | 4.24 | 7.84 | 9.49 | 36.31 | 32.87 | 7.98 | 5.5 |

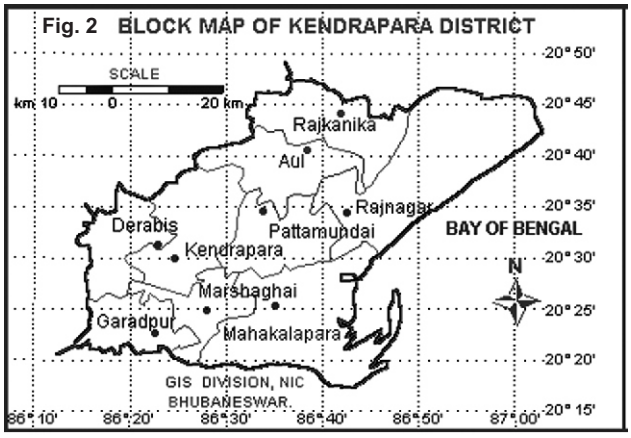
| Villages | Agriculture | | Wage | | Salary | | Self Employed | | Contractor ship etc. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Main | Sub | Main | Sub | Main | Sub | Main | Sub | Main | Sub |
| Nuagaon | 76.29 | 25.77 | 3.89 | 16.63 | 0.78 | 0.05 | 1.76 | 1.23 | 1.13 | 0.48 |
| Gobardhanpur | 73.4 | | 7.91 | 34.82 | 1.02 | 0.26 | 0.38 | 1.79 | 0.13 | 2.93 |
| Naldiapalda | 54.76 | 39.3 | 36.9 | 11.1 | 4.37 | 5.56 | 1.98 | 3.17 | 3.18 | 0.4 |
| Raghunathpur | 78.19 | | 11.39 | | 2.87 | | 7.79 | | 0.74 | |
| Somanathpur | 66.80 | 16.50 | 10.93 | 16.50 | 2.19 | 0.99 | 2.58 | 1.99 | 1.99 | 1.99 |

***Table 5.*** *Crop rotation followed by the farmers*

| Issues | Villages from Kendrapara | | | | Village from Khurda |
|---|---|---|---|---|---|
| 1 crop rotation | Naldiapalda | Raghunathpur | Gobardhanpur | Nuagaon | Somanathpur |
| Paddy-vegetable-fallow | 10.5% | 21.2% | 15.9% | 12% | 10.8% |
| Paddy-fallow-fallow | 72% | 71.1% | 89% | 85% | 84% |
| Paddy-paddy-fallow | 17.5% | 7.7% | 12.6% | 10.8% | 11.5% |

Note: Figures indicates the percentage of farmers adopting the crop rotation.




different age groups to ascertain the symbiotic relationship of natural resources within the coastal ecosystem and the livelihoods of the people. The response of the people to the trend in different climatic hazards is depicted in Table 7. From the table it is evident that the frequency and duration of CIND have increased as per perception of the people in study area. The responses of the people on coping strategies revealed that the contingent planning was prevalent with respect to land, water and crop management in the event of a natural disaster. The initial discussions with the villagers revealed that the soil and vegetation of yester years were no more reassuring to make up whatever loss was caused to the people due to floods and droughts in the villages. The elderly people recalled their memory that with little or no application of fertilizer, the paddy and groundnut yields were bumper in *kharif* and post *kharif* respectively. There were floods, but the duration of floods was less due to large spread area of the Paika river which was narrowed down on either side with construction of embankments. The river was also flowing almost round the year and severity of salinity was not there till mid April or month of May. The people were mostly using "*Janta*" for water lifting from the river and the traditional "*Chua*" or water hole in the riverbeds was a permanent source of fresh water. However, the control of Mahanadi water at different places like Hirakud, Naraj barrage at Munduli and Jobra barrage in Cuttack intensified the woes of villagers due to reduced lean flow of the river and resulting salinity intrusion in as early as month of March. The dug wells used to supply water round the year. The villages had a good part of area under forest, which used to supply fuel woods and minor forest produce for daily livelihoods of the people. The land, water resources and vegetation endowment in the village that took care of immediate needs of the livelihoods had dwindled with the progress of time.

**Dynamics of land resource management**

With respect to the query on quality of land resources, the villagers reacted that the land in the village had become less fertile over the years. Earlier they used to get 30 to 40 quintals of paddy per hectare of land put under *kharif*, which declined with the passage of time, and presently they used to get hardly 12 to 15 quintals of paddy. Even the productivity of HYV paddy was also declining. The villagers opined that the land resources under private and common property management were low productive due to top soil washout in floods or drought, which were common in the village. The soils had low water holding capacity. The private holdings were fragmented and distributed in 4 to 5 parcels in some cases. The general perception of the villagers towards management of natural resources especially land was that there was little scope for any contingent measures to prevent flood and drought as the problem was so severe

***Table 6.*** *Risk Management in the event of disasters*

| Yield Risk Management | Villages from Kendrapara | | | | From Khurda |
|---|---|---|---|---|---|
| How to minimize risk in the event of yield risk | Naldiapalda | Raghunathpur | Gobardhanpur | Nuagaon | Somanathpur |
| 1. Choice of variety | 33% | 23% | 35.5% | 43.6% | 25.8% |
| 2. Shifting of sowing time | 13.4% | 15.2% | 12.2% | 27.3% | 17.8% |
| 3. Control of insects and pests by resistance variety and biological control | 47.5% | 51.3% | 41.6% | 47.6% | 44.6% |
| 4. Use of improved implements | 41% | 43.5% | 42.5% | 28.5% | 16.9% |
| 5. Fertilizer use | 55.9% | 58.7% | 72.8% | 85.9% | 69.8% |
| In the event of drought | | | | | |
| 1. Dug well excavation | 12.8% | 3.8% | 3.82 | 1.5% | 3.5% |
| 2. Raising the bund height | 1.4% | 2.1% | 1.6% | 3.5% | 0% |
| 3. Summer ploughing | 74.5% | 82.3% | 73.6% | 74.1% | 82.5% |

***Table 7.*** *Peoples' perception about recent trends in CINDs*

(% of respondents)

| Frequency/Events | | Increased | No Change | Decrease |
|---|---|---|---|---|
| Drought | Frequency | 92 | 6 | 2 |
| | Intensity | 90 | 7 | 3 |
| Flood | Frequency | 57 | 23 | 20 |
| | Intensity | 17 | 48 | 35 |
| Cyclone | Frequency | 26 | 56 | 18 |
| | Intensity | 54 | 39 | 7 |

that, human endeavor was not strong enough to prevent it. As per the villagers perception, around 70% of land was under low land category in the Tikhiri Gram panchyat. The villagers opined that upland counted for more than 40% in Naladiapalda village alone. Rest of the land resources came under medium and low land category. The uplands suffered maximum in the event of a drought. The low lands did not get ready for a second crop due to unfavourable edaphic condition. When the fields were ready, irrigation facilities were not available for the crop. Around 10% of land was perpetually in saturated condition in the village, indicating problem of waterlogging. The villagers used to grow local waterllogging tolerant varieties of paddy like "*Baunsa Gaja*", *Rajamalli* and *Dhuruva Khuda*, which were low, productive but water logging resistant. The degradation of land over the years had forced some farmers to penury and out migration as no other sources were available for livelihoods in the village. The villagers were of the opinion that due to application of fertilizer the soil natural productivity decreased.

Scientific land management in the monsoon had little scope except putting some land under paddy and backyard vegetables. The local varieties like *Baunsa Gaja, Rajamalli, Dhuruva khuda, Pakhira* were popular local varieties practiced in *kharif* in low and medium lands. The lowland paddy cultivation was called "*Sarada"* in the local area. The average yields varried from 0.5 t $ha^{-1}$ to as high as 1.5 t $ha^{-1}$ for the local paddy. In the event of waterlogging and flooding *Raja Malli* and *Dhuruba khuda* performed better and gave 30-40% of potential yields even if flooded for 15-20 days. In relatively uplands the people took Khandagiri (HYV), which gives a yield of 1.5 to 2.0 t $ha^{-1}$. The short duration pure upland paddy cultivation called "*Biali* " in local parlance, which was highly susceptible to droughts. Almost all the farmers used broadcasting method of seed sowing in *Kharif* and transplanting for *rabi* "*Dalua*" crop where ever taken up. Only 10% of land was put under transplanting (medium lands) in *Kharif*. The concept of intercropping or strip cropping, crop diversification, which were considered drought hedging land management practices were not prevalent in the area. The

farmers viewed that yields got affected due to intercropping. Early sowing was also not possible due to hard soil condition in the month of May.

**Decrease in wetland area**

The villagers reported that the wetlands that were around 20% - 25% of total geographical area decreased over the years due to encroachment for agriculture and habitation**.** The wetlands used to modulate heat waves in the extreme summer and lot of birds and reptiles were seen that was conducive for maintenance of ecosystem. However the wetlands reduced to less than 10% over the years**.**

**Impact of climatic hazards on land resources**

When asked about impact on land, a middle aged villager reported a grim picture of natural hazard that forced him almost to penury. He faced crop loss for 3 years consecutively out of last 5 years either due to flood or drought. In 2001 there was severe flood. In 2002 there was drought and again in 2003 there was flood. River Paika proved to be sorrow of Naladiapalda village. The embankment had worsened their plight. The 26 households caught outside the flood embankment were worst sufferers. One interviewed farmer reported that he lost 2.5 acres of land to sand casting in the super cyclone. In the 2003 floods he lost 100 % of crop of 2.5 acres of land. The floods usually came in the months of July and August and most of the land used to be put under *Kharif* paddy by then. The flood not only affected the crop but also washed away field bunds and sometimes the topsoil was also affected. However the huge silt load also helped in improving soil quality due to sediment deposit which sometimes prompts the farmers to apply less fertilizer. The duration of flood sometimes lasted for a month that completely destroyed any sort of land based enterprise. Black gram or groundnut was taken up after flood instead of paddy wherever irrigation was available otherwise the field was left fallow. Black gram was considered as best as the post flood crop as it required little irrigation and fertilizer application was almost negligible due to improved soil condition because of siltation. In the event of flood coming in the maturity stage of the crops, farmers used to cut top portion of the paddy and leave the rest in water. In the event of drought, the common land management practice was to strengthen bunds to prevent runoff and close rat holes in the fields. The quality of soil was generally good as perceived by the farmers due to repeated flooding and siltation. However sometimes due to washout of topsoil under high velocity flood current, the yields did not commensurate the potentials of the soil, which was compounded by low fertilizer use. Land management had little relevance for land less categories of population except some economic activities like grazing in common lands (which was scanty) and digging for mud wall construction. However they were indirectly affected in terms of availability of wage employment that got affected due to flood or drought. The leasing in system though prevailed in the area, the landless people seldom went for it due to high rental fixed for produces. The landless people who constituted around 20% of the population in the village migrated in the event of severe drought and flood.

**Traditional water resource management**

Some old villagers recalled that river Paika had been meeting their water requirements almost in all season and the current salinity problem in the month of April to June was not there some fifty years back. The village did not have a community irrigation pond and the private ponds were scarcely used for irrigation purpose as the ponds were shallow and got dried by February leaving little scope for irrigating a second crop. In total 5 shallow tube wells owned by private individuals were in operation in the village that irrigated around 60 to 80 acres of land in *Kharif* and 30 acres in *Rabi* through diesel pumps. Around 40-50 people were water users from private tubewells. The common method of irrigation in ayacut under private tubewell was through field channels and the scheduling of irrigation was mutually decided among the beneficiaries. Large distance conveyance channel was not economic due to unleveled field conditions. As little common land was available in the villages, community pond system was conspicuous in its absence. As the river Paika is nearby, pond water gets emptied by January due to lower riverbed. The traditional water lifting devices in the area were *"Janta*" or "*Sena*" for small and marginal farmers for surface water. Bund raising was practiced in the event of an imminent drought. They know the utilization of dew for blackgram and green gram as they termed it "*Kakar pani"* for crops. They traditionally knew *insitu* water harvesting system through maintenance of bunds. But repair and maintenance of field bunds were costly and got little attention by the farmers. Mulching, as a method of soil and water conservation was known to the people and sometimes practiced for vegetable cultivation to reduce ET. The people opined that large investment in river lift system using Paika river could irrigate around 500 acres of land and people were ready to form *Pani Panchyat* for the same. However the river water got saline by April and

hence summer crop was also constrained in the absence of assured irrigation. The drinking water problem was severe due to drying up of existing sources and salinity ingress due to over drafting in tube wells. Most of the hand pumps were defunct or dried due to non-maintenance. The absence of a strong water market prevented private investment on water resources. The water market was at nascent stage.

**Recycling of drainage water**

The villagers used to recycle drainage water for life saving and supplemental irrigation when the crops were stressed especially in *Kharif*. The quality of recycled drainage water was not bad as perceived by the farmers. In the *Rabi*, the fields nearby the surface drainage system used to have vegetables or summer paddy by utilizing drainage water. Sometimes the community used it for sanitary purpose also.

**Dwindling vegetation**

The village had around 10%-15% of land under forest cover 50 years back in community as well as private lands. The fuel wood requirement was met from the forest. Though the forest was not dense, the people were meeting the requirement of traditional forest species for religious functions and the bamboo was major species that was contributing to the household requirements. The timber species were not available in the forest. Rampant cutting of bamboo and other trees denuded the forest cover and exposed them to repeated grazing by cattle. The shrubs also dwindled in the process. The flower species like "*Champak*" etc were no more available in the area. The private forest plantations were also becoming rare. A species of wood apple that was plenty is hard to get now. The smell of "*Kadamba*" a traditional forest species was extinct now. Earlier people used to plant these in the common forest land and private lands. The most preferred species was "*Chakunda*" in private lands due to its speedy growth and use of log for fuel woods. The preference had also shifted to *Eucalyptus* due to economic reasons. But plantation activities were not common in the area. Cashew nut plantation in private lands was seen in backyards of some farm family. Organized orchards were not generally available in the area.

**Common property resource management**

Earlier the village used to have small area under village forest, which dwindled with the passage of time. The villagers used to gather minor forest produce and fuel woods from the forest. However the forestlands were no more in existence and encroachments had taken the toll of forestlands. The community pond system was also not prevalent in the village. The publicly provided drinking water tube wells were mostly defunct due to ill maintenance and drying up of source. Previously the forestland used to be a grazing land for the cattle. With decreasing forestland, the grazing was a big problem for the cattle. Community pasture land was not available in the village and the cattle were set free in *Rabi* for open grazing in fallow private lands. The stalk feeding was practiced in *kharif* only.

**Coping mechanism**

Relief anticipation is immediate behavioral pattern in the event of a flood or drought. The common approach to any imminent flood was to provide higher basement for grain storage and leave the crops to destiny. Some farmers used to cut down in inputs from the beginning anticipating drought and/or flood. The seed rate was lower than recommended doses and fertilizer use was also minimal. If flood came in the month of August or September, the *Kharif* paddy used to get destroyed and people did not go for paddy again. Instead they used to sow black gram and groundnut after receding of the flood and the field was ready edaphically. However, some farmers (10% of the interviewed farmer) used to go for transplanted paddy by procuring saplings from Marshaghai or Kujanga (Nearest block headquarters) if flood receded in last week of August. Land draining in the event of excess rainfall was commonly practiced by constructing "*adinallaha".* No other conservation method was practiced. Varietal choice was not much influenced by calamities. However the preference was always for HYV due to promise higher yields even though cultivation of these was risky in the absence of irrigation. The people were of the opinion that due to destruction of plantations and village forests, the severity of floods was more. Preparing land for vegetable cultivation after flood or drought were common crop management practices.

## CONCLUSIONS

Recurring droughts, floods, and cyclones in the coastal villages of Odisha have made the rural population extremely vulnerable. To minimize the losses in such exigencies, it is necessary that a system should be created for increasing preparedness at all levels i.e. government, civil society and community. Different coping mechanisms are practiced to counter the damaging impacts of the natural disasters like drought, flood and cyclone to reduce CIND vulnerability. The adaptation mechanism provides them with greater flexibility to reduce CIND risk. Also the field level experience shows

that CIND vulnerability is a part and parcel of coastal Odisha, and cannot be totally escaped. But household's vulnerability to various CIND events can be managed and its effects can be reduced to certain extent with different adaptation strategies and coping mechanism that have been practiced from generations.

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