AGRICULTURAL EXTENSION JOURNAL
AEXTJ
ISSN 2521 – 0408

Available Online at www.aextj.com
Agricultural Extension Journal 2018; 2(1):13-16

REVIEW ARTICLE

Mitigation Strategies for Climate Change in Indian Subcontinent

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Received: 20-11-2017; Revised: 30-12-2017; Accepted: 10-01-2018

ABSTRACT

The empirical investigation of the study found that the study areas are losing land gradually and decrease the non-timber fiber product such as honey and wax. Side by side farmers who cultivated crops, migrated to the cities and town to generate employment as because the climatic condition is not suitable for cultivation. To mitigate the effects to climatic change, short-term strategies such as avenue plantations, construction of major and medium projects, and soil and water conservation measures may serve to minimize the climatic hazards. Paddy is the main crop for the farmers in Aman/Kharif season. Matla, Hamilton, No nasal, Nona bokra, Kumargor, Getu, etc., are salinity tolerant varieties known to the farmers for many years. These varieties were practiced earlier, but due to low yield, people shifted to HYVs. People must be trained to develop their capability toward preparedness and mitigation measures.

Key words: Agriculture, climate change, mitigation

INTRODUCTION

Agriculture plays an important role in the social and economic life of people in India and will continue to do so in the foreseeable future. About 70% of the total population engaged in agriculture. Nowadays agriculture faces important challenges in India due to environmental degradation, deforestation, global warming, increasing population, nuclear explosions, air pollution, etc. Currently, almost 46% of India's geographical area is under agriculture. A large percentage of this land falls in rain-fed regions generating 55% of the country's agricultural output, providing food to 40% of the nation's population. More than 80% of the farmers are smallholder producers, with very poor capacity and resources to deal with the vagaries of weather and changes in climate. The Intergovernmental Panel on Climate Change report of 2007 predicts an increase in rainfall over the Indian subcontinent by 6–8%.[1] Goswami *et al.*[2] predict a substantial increase in hazards related to heavy rainfall over Central India in the future.

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Causes of climate changes

Overall in India, some physical impacts of climate change will be seen as: (1) Increase in the average surface temperature by 2°C–4°C; (2) changes in rainfall (distribution and frequency) during both monsoon and non-monsoon months; (3) decrease by more than 15, in the number of rainy days; (5) increase in the intensity of rain by 1–4 mm/day; and (6) increase in the frequency and intensity of cyclonic storms. It is predicted that for every 2° rise in temperature, the gross domestic product will drop by 5%. Climate assessments of the agriculture sector, however, focus on the impacts of crop yields, while little emphasis is given to the interconnected sub-systems of the agriculture production systems as a whole. Fisheries in rivers and sea are the second major occupation of the respondents in the study area. Close proximity to the sea and regular tidal waves bring good fishing opportunity to the people and provide gainful employment all the year round. Saline water gushed in through breaches in the river dykes and inundated pond and sea. Due to cyclone, about 2196 ha shrimp had destroyed.[3]

Occupational scenario in the study area

Agriculture is the primary occupation in each Gram Panchayat. Secondary occupation includes fisheries, wild shrimp, seed collection, small business, and service and transport sectors. Some of the population migrated to different parts of India in search of jobs. Other professionals are van pullers, crab catchers, honey collectors, etc. The livelihood is dependent on agriculture 70–85%. About 30–40% of the population in each selected Gram Panchayat migrated for job. Fishery operation and fish catching in rivers and sea are the second major occupation of the inhabitants in the study areas. Close proximity to the sea and tidal rivers bring this opportunity to the people lacking gainful income all the year round. Even the cultivators and agricultural laborers are taking this occupation during lean season of agricultural operation for earning additional income in spite of natural and occupational hazards in this sector. Actually, farm is a synergy - A teamwork of different natural resources available in that particular area. What people have in their surroundings must be considered first and managed.[4]

Impact of disaster on agriculture

Agricultural production system was totally hampered after disaster due to high salinity and PH condition of soil. Paddy, Wheat, Sugarcane, Chili, and Pulses production were highly destroyed. Mainly two types of paddy were cultivated in this region. One is Aman paddy which cultivated in monsoon season, and another is Boro paddy which is cultivated in winter season. Before disaster Average production of Boro Paddy was 34671 kg/hectare in 2008–09, which reduced to 20833 kg/hectare in 2012–13 and Aman paddy production reduced from 28004 kg/hectare in 2008–09 to 14525 kg/hectare in 2012–13.

Impacts: Effects of factors

- The study area is losing land day by day due to disaster. In the past 80 years, it has lost about 250 sq km. Four islands have been completely wiped out.
- The area is also loosing agricultural land due to rising population as well as mismanagement and change in land use.
- Soil salinity has increased because of sea water ingress and retention (largely due to the cyclonic activities), thereby reducing the productivity of the agricultural land.
- Land loss, soil salinity, and land fragmentation have all resulted in reduced agricultural output.
- Fishing resources are dwindling because of a combination of over-exploitation and climatic changes. Fish density in shallow waters has reduced, and the catches of commercially important fish have declined.
- Decrease in the yield of Non-timber forest product such as honey and wax.
- Today, the resource base of areas is not able to sustain the lives and livelihood of people. The population of areas is, therefore, migrating to survive.

Suggestion based on the findings

- Construction of embankments or sea walls to prevent ingress of surge water.
- Construction of disaster resistance houses.[5,6]
- In general, ponds of 0.02–0.1 ha with 1.0–1.5 m depth are used for small-scale fry production while areas up to 0.5 ha can be used for large-scale production of carp. At least 2 crops can be easily harvested from such ponds in one season. Congenial condition of the rearing environment needs to be ensured and adequate natural fish food organisms before release of spawn for high survival to achieve stocking density of spawn 3–5 million/ha must be present.
- Carp culture has enough potential of meeting the ever-increasing demand of the domestic sector.
- Fish varieties like metro plus (paira chanda), catfish such as Shingi, Magur, Koi, Pabda, and Tangra local fish like parse - in other words those that can survive in both saline and fresh water can be cultivated. Central Institute of Brackish Water Aquaculture, Kakdwip Research Centre supply the seeds of these species and varieties.
- Omnivorous, herbivorous fish that can grow in intensive culture method is also suitable.
- Indian major carp can also tolerate salinity if raised during fry to ling stage with controlled salinity.[7]
- Bhetki is also suitable, but its feed is very costly. It will be unjustified to suggest rearing of Bhetki to the resource-poor farmers affected by cyclone Aila.

- Pond management with fish-duck-vegetable on the scaffold-azolla is important now.
- Plankton population can be raised in the hollow of bamboos packed with cow dung and oil cakes.
- Indigenous knowledge, wisdom can be documented.
- Seeds should be collected from government sectors.
- Azolla culture should be encouraged, as it is a nutritious fish feed.
- Ducks can be reared along with fish. Duck dropping which is a slow release nutrient is good for the growth of fish.
- Snails are an excellent feed for catfish.
- The farmers themselves should prepare the feed. Homemade feed is much better than those sold in the market. A 2-day training on feed frequency, feed strategy, etc., must be arranged for the farmers.
- In rice-fish cultivation, catfish is the ideal component.
- In this period of crisis, fish seed business may be a good livelihood option.[8]
- After cyclone and flood, the livestock becomes susceptible to various bacterial and viral diseases. To combat this, Rafoxamite 10 mg/kg (large animal) and 15 mg/kg (small animal) can be administered. Herbal dewormer Helmex is also used for this purpose.
- Traditional preventive and curative measures may also be adopted. Water in which betel nuts had been kept soaked for some time, Ghentu leaf juice, etc., can be tried as de-wormer, but the dosage must be carefully maintained.
- Selection of new livestock should be need and situation based. Sufficient provision of feeds, fodders, and water must be ensured before introducing new livestock. Other essentials for biological substances must be secured. Sufficient care must be taken to restrict the introduction of animals from other affected area.

CONCLUSIONS

Rice cannot be cultivated solely where drainage system is poor. Some local varieties, which can be cultivated in the coastal areas are Kumargor, Patnai 23, Getu (CSR-2), Damodar (CSR-1), Sadamota, Kalomota, Bhasamanik, Rupsal, Damal (CSR-3), and Dudheshwar. For rabi (winter) season rainwater must be harvested and stored in ponds. For Boro paddy cultivation short-duration varieties must be selected. Sesbania can be cultivated as relay crop. Sunflower, cotton, watermelon, and chili can be grown in Rabi season. For improving the livelihood of the poor people, proper livestock management is required. Food (fodder) is very important for rearing livestock. So for supplementary food, saline resistant fodder varieties such as Coix commonly known as Kara, Gargara should be cultivated. Low-cost technologies must be adopted in a way that does not affect the socioeconomic condition of the poor, underprivileged people.

Lands are decreasing day by day due to soil erosion.

Trees were uprooted after the disaster

Cyclone struck the Bay of Bengal causing widespread damage, loss of life and rendering agricultural land barren from excess saline content

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