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Dissemination of outcome of climate resilient agricultural technologies in a tribal village of Tripura

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ABSTRACT

North Pulinpur a water stress village with 100 per cent tribal farmers is under undivided West Tripura district. Cropping system is mainly rainfed rice based mono-cropping. Unavailability of irrigation water in the area has forced the farmers towards practice of Jhum cultivation. Considering this some climate resilient agricultural technologies were disseminated through a village climate risk management committee (VCRMC) guided by KVK, West Tripura during the financial year 2011-2014. Main objectives of the study were to develop required skills of the tribal people for alternate agricultural and allied livelihood adoptions against shifting climate. Under this approximately 1,75,000 ft^3 rainwater was harvested by construction of four community water reserves, two farm ponds, two Jalkunds and rejuvenation of fifteen old silted ponds all of which provided life saving irrigation during Kharif dry spell as well as during Rabi summer season covering an area of about 50 ha. A total area of 1.0 ha wasteland was converted to cultivable land using water from newly created community water reserves. Farmers could develop their skills with huge success to utilize Kharif paddy fallow land with less water requiring potato var HPS II/67, short duration vegetable pea var Arkel 1, draught tolerant lentil var WBL 77, bitter gourd var Jyoti Bolder with straw mulching, maize var HQPM and its inter-cropping with paddy straw mulched bitter gourd, watermelon var Sugar Baby as various alternative second crops. Harvested water was also utilized for integrated duck cum composite fish culture. The cropping intensity was raised from 115 to 135 per cent. The pond embankment was utilized scientifically by growing broad bean, drumsticks, banana, coconut and arecanut. All these interventions based on harvested rainwater ultimately have resulted as live model of integrated farming system (IFS) under climate resilient agriculture. Benefited women farmers of the area are also earning through rearing of improved poultry birds, scientific pig rearing, vermicomposting etc.

Keywords: Tribal farmers; climate resilient agricultural technology; VCRMC; water reserves

INTRODUCTION

Climate change impacts on agriculture are being witnessed all over the world but country like India is more vulnerable in view of the high population depending on agriculture, excessive pressure on natural resources and poor coping mechanism. The warming trend in India over the past 100 years was estimated to be 0.60ºC (Arunachalam 2011). It is astonishing to know that agricultural activity

also contributes to global warming. The agriculture sector emitted 334.41 million tons of carbon dioxide in 2007. Estimates of green house gas emissions from the agricultural sector arise from enteric fermentation in livestock, manure management, paddy cultivation and agricultural soils and on field burning of crop residue (Singh et al 2012). Climate change is also affecting Tripura in a big way. Its impacts are many and serious like erratic monsoon, spread of pests and diseases, floods, storms, increase in temperature etc. Therefore small and marginal farmers will be more vulnerable to climate change. Making the farming systems of rural poor of Tripura less vulnerable to climate change is imperative. Managing the connections among agriculture, natural resource conservation and the environment must be an integral part of using agriculture for development.

North Pulinpur is one of the drought prone villages of West Tripura district. There are no perennial streams or rivers in the entire village. Cropping system is mainly rice based mono-cropping which is purely rainfed. Agriculture is the mainstay of the people of here. Rice is cultivated in the lowlands whereas local maize and vegetables are cultivated in the hills. Important livestock pig, cows, poultry, duck and goat and fishery also contributes to family income. Water scarcity and unavailability of irrigation facilities forced the farmers towards practice of Jhum cultivation which lead to high rate of erosion with rapid loss of top soil and reduction in agricultural area due to more area being utilized for rubber plantation. The Network Climate Resilience Project of ICAR entitled National Initiative on Climate Resilient Agriculture (NICRA) was started at village north Pulinpur of West Tripura district in 2011. The project is aimed at enhancing resilience of Indian agriculture to climate change and climate vulnerability through strategic research and technology demonstration. The research includes adaptation and mitigation of cover crops, livestock, fisheries and natural resource management (Venkateswarlu et al 2012a).

METHODOLOGY

Work village profile

The tribal village north Pulinpur of Tripura is located at 50 km from state capital Agartala and 25 km from KVK, West Tripura campus. The total geographical area of the village is 950 ha whereas cultivable area is 250 hectare. There are no perennial streams or rivers in the village. Prevailing temperature ranges from 16°C to 37°C. The soils are classified as hill red loam to plain sandy loam. Annual rainfall ranges from 2,050 to 2,550 mm. Agriculture is the mainstay of the people and about 85 per cent of them are engaged in agriculture and allied activities. There is a galaxy of scope for integrated faming approach for overall agricultural development of the village which ultimately can contribute to the state.

RESULTS and DISCUSSION

The following climate resilient agricultural interventions were considered for demonstration in farmers' fields during the period 2011-2014:

Dissemination with outcome of climate resilient technology under natural resource management (NRM)

Rain water harvesting structures including community bunds, Jalkunds and farm ponds were constructed to minimize water scarcity. Community bunds in between two hillocks were meant for harvesting water in rainy season and utilizing for fish cultivation as well as crop cultivation in other seasons. Rooftop water was channelized and collected in Jalkunds for the utilization of water in the off-rainy season. Ponds were constructed to store water. Rejuvenation of ponds was done to maximize water retention and economic utilization even during dry spell of the year. Approximately 1,75,5000 ft^3 rainwater was harvested by construction of 4 community bunds, 2 farm ponds, 2 Jalkunds and rejuvenation of 15 old ponds all of which provided life saving irrigation for vegetables during Kharif dry spell as well as during Rabi summer season covering an area of about 50 ha. In addition to this a total area of about 1 ha wasteland was converted to cultivable land using water from community bunds. Ponds were also used for composite fish culture with average yield of 2.5 tons/ha/ year.

Vermicompost as organic manure was produced from different farm wastages like cow dung, leaves and young stems of vegetables, banana leaves and other easily decomposable materials of plants or animals. KVK, West Tripura demonstrated vermicompost production technology along with its application and benefits at NICRA adopted north Pulinpur village. Under this twenty five vermicompost units (paired) were developed. After successful adoption of the technology each beneficiary is now harvesting on an average around 3 quintal vermicompost along with 15 litre vermiwash/chamber (2 m x 1 m x 0.6m x 2)/cycle. The adopted farmers are regularly using the vermicompost and vermiwash as biofertilizer in their agricultural land and also selling to other farmers. They are acting as a source of earth worm for other villages also.

Dissemination with outcome of climate resilient technology under crop production

Introduction of row paddy transplanter

Demonstration on row paddy transplanter (RPT) was done covering an area of 2.08 ha of 13 farmers with an aim to timely planting of paddy as well as to reduce cost of cultivation. Kharif paddy was grown as rainfed crop in the village which faced erratic rainfall. Farmers faced the problem of managing sufficient labour to transplant the paddy in short time that lead to late transplanting of Kharif paddy

causing below optimum yield of the crop. It was revealed that the cost of production per hectare was less by around rupees three thousand and five hundred with 10 to 15 per cent more yield in case of RPT than conventional manual transplanting. The participating farmers also got more net profit by reducing cost of cultivation and increased yield from paddy.

Utilization of Kharif paddy fallow land through introduction of true potato seed (TPS) as second crop

KVK conducted a case study followed by demonstration on TPS presently known as hybrid potato seed (HPS) technology as second crop since it required less irrigation after Aman paddy with the provision of irrigation from the rejuvenated ponds or new excavated ponds under NRM intervention of NICRA. It covered an area of 1.68 ha with 19 framers. Benefit/cost ratio for the farmers was calculated that was found on an average 7.8:1. The F1 tuberlets from TPS were kept in cold storage and in the next potato season the farmers harvested good amount of ware potato from the stored F1 tuberlets.

Introduction of nutritional garden

Demonstration of nutritional garden was done on 0.20 ha covering 16 farm women to provide self-produce supplemental horticultural crops nutrition to farm families with considerable protection against the bad effect of weather conditions. The technology has been horizontally adopted by forty six families who are growing horticultural crops with organic inputs only.

Introduction of water saving SRI paddy cultivation with short duration variety Gomoti

Most of the farmers preferred to grow Kharif paddy variety Ranjit having duration of about 150 days under rainfed condition through conventional method. It has become a problem for the farmers to transplant this variety of paddy within the month of July. Demonstration on SRI paddy cultivation using high yielding short duration variety Gomoti having 130 days duration was done covering an area of 1.0 ha which helped 9 farmers to overcome the problem of water scarcity due to less water requirement in SRI practices as well as shorter duration of the variety. Yield (5.0 tons/ha) performance of Gomoti was quite satisfactory and it was almost equal to Ranjit. On the other hand second crop for winter season after Kharif paddy could also be grown earlier or in time.

Crop intensification through introduction of maize (var HQPM 1), lentil (var WBL 77), bitter gourd (var Jyoti Bolder), watermelon (var Sugar Baby) and pea (var Arkel 1)

The village comes under rainfed area where agriculture is based only on mono-cropping of Aman paddy. After Aman rice they used to keep the land fallow for the next Aman season. Maize (var

HQPM 1) was introduced covering an area of about 0.76 ha including 9 framers to utilize Kharif paddy fallow land as sole crop in the area where it has been possible to provide live saving irrigation from the water structures created under NRM interventions. The participating farmers gained momentum for maize cultivation as second crop after Aman paddy wasteland with a net profit of more than rupees 1.0 lakh per hectare. Moreover demonstration on intercropping of maize (var HQPM 1) with straw mulched bitter gourd crop covering an area of 0.32 ha including 4 farmers was also done successfully that gave more net profit than their sole cultivation.

The more or less similar interventions were taken up on pea var Arkel 1 (1.48 ha) as short duration variety and lentil var WBL 77 (0.48 ha) as relatively drought tolerant variety with optimum yield. The farmers could build up their practical confidence for growing second crop with less irrigated vegetable pea and lentil by utilizing their fallow land after rainfed Kharif paddy. Demonstration was also given on straw mulching as moisture conservation technology in bitter gourd and watermelon covering an area of about 0.4 ha each. Farmers earned average net return of around Rs 2.5 lakhs in bitter gourd and Rs 3.0 lakhs in watermelon per hectare.

The cropping intensity of the village has been raised from 115 to 135 per cent by utilizing monocropped Kharif paddy fallow land with second crop such as potato, maize, lentil, bitter gourd and watermelon.

Dissemination with outcome of climate resilient interventions under livestock and fishery

Introduction of improved poultry, improved pig with housing management (pigsty) and composite fish culture were meant for nutritional security as well as alternative livelihood strategies to adjust with shifting climate. Poultry farming on large scale was not possible in the adopted village due to high cost of feed and maintenance. Therefore Kuroiler breed of bird was introduced under backyard poultry rearing system. Each beneficiary was given a target to maintain a flock size of 50 to 100 from initial 10 number of birds. The distributed birds started laying eggs and were sold to other farmers for brooding and some were utilized by the farmers themselves for brooding by using Deshi broody hen and they also generated income (Rs 500.00/ month/beneficiary) by selling of eggs. For piggery three SHGs comprising of 10 members each were selected. Each SHG was given 5 improved cross breed of piglet of LWYS x LR. Pigsty were formed to provide shelter and to protect them from extreme weather condition. Demonstration on composite fish culture was conducted in four farmers' ponds covering 0.32 ha water area.

Institutional intervention

Village Climate Risk Management Committee (VCRMC) with custom hiring centre

For grounding the four major modules under NICRA project Kami Humkrai Climate Risk Management Committee (KHCRMC) has been formed and which has been functioning well since 2011. The committee has also given responsibility to operate a custom hiring centre (CHC) equipped with modern farm machineries and implements like pump set (2), power tiller (1), row paddy transplanter (1), sprayer (10), cono weeder (8), water cane (25), power thresher (1), wheel hoe (1), weed cutter (1), Khurpi (25), hand transplanter (25), hand fork weeder (25), digital balance (1), soil and water testing kit (2), sickle (16) and rake (2). These are meant for early coping up with climatic hazards, reduction in drudgery and decrease in cost of cultivation through farm mechanization, scientific crop management, timely agricultural operation and achieving more work efficiency. The resource poor tribal farmers of the area are using above mentioned mentioned machineries and implements on hiring basis. The most significant outcome of this village based custom hiring centre is that a sum of Rs 40,048 has been generated as revenue through hiring the above mentioned farm machineries and implements. Apart from this with the assistance of KHCRMC the KVK, West Tripura has also completed bench mark survey of 100 farm families, collected soil sample from 100 locations with GPS record and collected data for inventory of organic resources of Village.

Capacity building

Farmers' skill and knowledge upgradation were done through various training programmes, group discussions, meetings, exposure visits etc. Various awareness programmes were conducted in the village to make the people conscious about climate change with its effect on agriculture and ways to combat the problem. During 2011-2014 forty seven training programmes including one vocational training for women on weaving were conducted under NICRA covering 997 beneficiaries. Apart from this other extension programmes such as farmer-scientist interaction (2), exposure visit (2), farmer to farmer interaction (1), animal health camp (1), group discussion (6), TV programme (1), convergence cum awareness workshop (1), method demonstration (5), field day (2) and diagnostic visit (22) were also conducted covering 692 beneficiaries for their further skill development on climate resilient agriculture during this period. All the above mentioned interventions and their outcomes corroborate directly or indirectly with earlier documentation done by Venkateswarlu et al (2012b).

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