Study No.-160

STUDY ON IMPACT EVALUATION OF NATIONAL WATERSHED DEVELOPMENT FOR RAINFED AREAS ENVISAGED AS WARSA JAN SAHBHAGITA DURING TENTH PLAN (2002-2007) (West Bengal)

EXECUTIVE SUMMARY

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1.1 Introduction

Development, promotion and management of appropriate watershed technologies in dry land regions have been viewed as major priorities to ameliorate the problem of natural resource degradation. This results in multiple benefits such as ensuring food security, enhancing viability of farming and restoring ecological balance (Reddy, 2000). The present strategy of watershed development programme is to protect and sustain the livelihoods of resource poor farmers who are experiencing production constraints in addition to problems created by soil erosion and moisture stress. Watershed development is to ensure the availability of drinking water, fuel wood, fodder and helps in raising income and employment for farmers and landless labourers through improvement in agricultural productivity and production (Rao, 2000).

In view of the above, this study has been undertaken to assess the long-term economic impact on agriculture productivity, land use and cover, groundwater recharge watershed system and sustenance of watershed technologies/practices in West Bengal. The broad perspective of aspects which have been covered in the report are (1) community organisation and institutional aspects, (2) planning aspects, (3) implementation aspects, (4) environmental aspects, (5) social aspects, (6) economic aspects, (7) institutional aspects, (8) indirect benefit, (9) overall impacts and sustainability and (10) people's reaction.

1.2 Data Base and Research Methodology

According to the latest estimate, 18 districts in West Bengal and 21,91,300 hectare of non-forest area of these eighteen districts have been affected by land degradation problems. Firstly, these districts have been sub-divided into two

groups on the basis of occurrence of land degradation i.e. below and above the average land degradation of West Bengal. Thus, among these districts twelve districts fall under below and rest six districts under above groups. Four districts (two from each group) i.e. Cooch Behar and Birbhum (from below) and 24-Parganas (North) and 24-Parganas (South) (from above) have been selected randomly. There are six sub-watersheds in Cooch Behar, four in Birbhum, two in 24-Parganas (N) and twelve in 24-Parganas (S) (Table 2.1). In the second stage, one watershed from each selected district has been selected randomly. Phulbari Watershed (Block : Dinhata-I) from Cooch Behar; Kanduri Watershed (Block : Rampurhat-I) from Birbhum; Hizta (Part-II) Watershed (Block : Hasnabad) from 24-Parganas (North) and Masjidbati Watershed (Block : Basanti) from 24-Parganas (South) have finally been selected for in-depth study.

1.3 Main Findings

It is evident that there is no uniformity in family size in between the selected watersheds. The literacy rate is higher among males (82.29 per cent) than females (64.47 per cent). In non-watershed (NWP) area literacy rate is lower for both male and female at 71.41 per cent and 55.38 per cent, respectively. The size of land holding is 1.02 hectares and 0.77 hectares in WP and NWP, respectively. It has been found that the farmers in NWP are somehow well equipped with tractor and sprayer than WP.

The average size of holdings in WP is 1.02 hectares comprising of cultivated (operational), cultivable fallow, permanent fallow, home stead, irrigated and non-irrigated area. In NWP, the average size of holding is 0.77 hectares. It indicates that the size of holdings is lower in WP than NWP. Total cultivated area of the sample farms in watershed area is 100.96 hectares, out of which 22.14 per cent is under pond irrigation followed by 1.88 per cent under canal irrigation, 8.40 per cent under STW, 1.23 per cent under other wells and 3.41 per cent under other

sources. The non-irrigated area in WP is 62.95 per cent. In NWP, the total cultivated area is 87.42 hectares of which 26.66 per cent of area is irrigated under different irrigational sources followed by 73.34 per cent under non-irrigation. It indicates that the WP area is well irrigated in comparison to NWP area. This could be attributed to impact of watershed on groundwater augmentation in watershed area.

It has been observed that there is no difference in adoption of other recommended technologies in between WP and NWP farmers. It has been worked out that the overall adoption ratio of recommended watershed/agronomic technologies by WP and NWP farmers are 32.95 per cent and 27.68, respectively.

The contribution of watershed as reflected in gross returns from rainfed crops was considered as the dependent variables, since the watershed impact is direct and implicit. Accordingly, gross returns from rainfed field crops in 2007 was regressed on dry land cropped area in hectares (X_1), human labour (X_2), bullock labour (X_3), seeds in Rs. (X_4) and fertiliser in Rs. (X_5). The adjusted R^2 for the watershed and non-watershed area was 87 per cent and 94 per cent which indicate adequacy of fit of the model.

The regression coefficients are the estimates of the elasticity of production with respect to the independent variables. In WP, elasticity coefficient for human labour, bullock labour and fertiliser are0.02, -0.01 and -0.03, respectively, and are statistically significant at 5 per cent. For land, the elasticity coefficient is 1.01 and significant at 5 per cent. The coefficient for seed is -0.03 and is not significant.

In NWP, variables land and seed are significant and their elasticities are 0.93and 0.07. For human labour, bullock labour and fertiliser, the elasticity coefficients are 0.06, -0.03 and 0.01, respectively and significant at 5 per cent. The returns to scale are 1.01 and 1.04 in WP and NWP areas, implying constant returns to scale. This shows that the production technology used in watershed and non-watershed is scale neutral.

The geometric mean levels of gross returns for WP and NWP sample farms are Rs. 11500.83/- and Rs. 11764.65/-, respectively. The geometric level of inputs land, human labour and bullock, seed, fertilisers are computed both watershed and non-watershed sample farms as 0.49, Rs. 2300.87/-, Rs. 413.75/-, Rs. 172.43/- Rs. 612.60 and 0.48, Rs. 2302.69/-, Rs. 418.49/-, Rs. 163.07/- and Rs. 617.26/-, respectively in that order.

In watershed area, the major source of irrigation is groundwater from tank/ponds. All tanks were excavated before watershed development programme. The impact of WDP is assessed based on number of irrigation ponds. Another measure of impact of WDP is the increased water yield in the ponds. However, the average yield of ponds is not available. Out of the 65 total ponds in the selected watersheds, only 4 ponds are non-functional, whereas in NWP area 3 ponds are non-functional out of the 29 ponds. Average water area of the pond in WP area is 0.12 hectare, whereas it is 0.17 hectare in NWP area. The average command area and average depth of the tank in WP area is higher than that of NWP area.

Average age of pond is 38.75 and 45.75 years in case of WP and NWP area, respectively. The shorter life of pond in WP could be attributed to water harvesting structures. The impact of WDP on groundwater recharge enabled farmers to take advantage of the increased life and age in the selected watershed areas to extract higher volume of groundwater. This may result in reduced investment on additional irrigation structures and the associated investment in irrigation.

Most of the soil and water conservation measures serve the purpose of conserving rain or runoff water and it is difficult to separate them and analyse their contribution to groundwater recharge. However, we can broadly divided them into (1) measures that increase in-situ water availability and (2) measures that increase availability of applied water stored off-farm or below the ground. The ubiquitous check dams and nala bunds, diversion channels and all their variants store water

on surface or enhance subsurface storage. However, the use of farm ponds is for protective irrigation. The total investment on soil and water conservation structures in the selected watersheds is Rs. 35,52,403/- . The increased availability of groundwater due to WDP manifests in decreased irrigation cost. The net returns per farm has been observed to be Rs. 189.68/-, Rs. 518.48/- and Rs. 1057.91/- for marginal, small and medium farms, respectively. It has been observed that the cropping intensity decreases with the increase in size of holdings. This may be due to less irrigated area in higher holdings. It has been observed that the decrease in cost of irrigation and corresponding increase in net returns in WP is due to impact of WDP.

A large number of farmers in WP are rearing livestock on a small scale after the WDP. Farmers expressed during the discussion that due to availability of fodder on farm and common lands, the number of bullocks, cows, buffaloes, sheep, goat has increased. The net return from livestock per farm and per acre are Rs. 24.12/- and Rs. 38.22/-, respectively in WP area and Rs. 21.42/- and Rs. 5.15/- in NWP area.

The equity in the distribution of income among different categories of farmers due to WDP has been analysed using Gini coefficients. Gini coefficients are computed for marginal, small and medium farms. Gini coefficients for WP and NWP areas are 0.44 and 0.41 for all farms, respectively. This indicates a fairly equitable distribution of income in WP area than that of NWP area.

The target and achievement with regard to physical and financial components and the expenses in four selected watersheds indicating financial aspects bring in to home that success has been up to the mark in case of entry point activity. The performance indicators of the selected watersheds show that more or less cent per cent of the targeted area has been developed and there has been encouraging number of man days have been generated in all the selected watersheds. The additional area brought under cultivation also indicates a growing

trend. Similarly, there are also positive performance with regard to irrigation. A substantial additional areas were brought under supplementary irrigation.

A comparative analysis of the productivity and the area under major crops has also shown a positive trend in all the selected watersheds. Thus, it has been established that watershed development programme has been able to regenerate natural resources including land, forest and water to a large extent and it is playing a crucial role in augmenting agricultural growth, productivity and cropping pattern in West Bengal.

1.4 Suggestions for Policy Implications

In view of the above, the following suggestions are made for policy implications.

(1) Watershed development programme intervention in natural resource conservation resulted in diversified land use and cover. Therefore, for sustainability of the programme other incentive augmenting rural development programmes could be linked in watershed development programme in phased manner. In the aggregate, the watershed development programme can be considered as an appropriate rural development strategy by implementing all land based rural development programmes under the concept of watershed development programme.

(2) Dry land horticulture component increased and stabilised the net farm returns by improving the socio-economic conditions of marginal and small farmers. Hence, higher budgetary allocation in watershed development programme could be given to dry land horticulture development to maintain the environmental economic goal of maximized net farm income of marginal and small farmers together conserving the ecosystem.

(3) Promotion of local institutions through training and education of members for maintenance of water harvesting structures is crucial for sustainability of the watershed development programme.

(4) Construction of water harvesting structures through watershed development approach enhanced groundwater recharge. Proximity of irrigation ponds to water harvesting structures played a complimentary role in augmenting yield, age and life of ponds. Hence, a large proportion of water harvesting structures preferably located closer to cultivated lands to realize greater economic impact on irrigated farms.

(5) Policy guidelines for institutional mechanisms for management of groundwater as well as assets created under watershed need to be developed.