CHAPTER – I

INTRODUCTION

1.1 Background

India has 2.4 per cent of the world's geographical area and 0.5 per cent grazing area but supports over 16 per cent of the world's population and over 18 per cent of world's cattle population. Agriculture is the most important business of Indian economy. Although its share in Gross Domestic Product (GDP) has declined from over half at Independence to less than one-fifth (19.6%) in 2005-06 at 1999-2000 prices, agriculture remains the predominant sector in terms of employment and livelihood with more than half of India's workforce engaged in it as the principal occupation. India's agricultural sector has an impressive long term record of taking the country out of serious food shortage despite population increase. Food grain production in the country crossed 217 million tones in 2006-07 from 51 million tones in 1950-51. This production accrues from 142 million hectare (MH) of cultivated area.

It is estimated that 37.00 per cent of the cultivated area (52.54 MH) is irrigated which contributes 55.00 per cent of total food grain production, whereas 63.00 per cent of rain fed (89.46 MH) accounts for only 45.00 per cent of the output. Going by the past trends the average spread of irrigation is around @4 MH/5 years. Extrapolating this trend, it is projected that additional 20 million hectare are likely to be brought under irrigation in the next 25 years, which will still leave 69 MH, nearly half of the cultivated area under rain fed conditions. Rain fed supports 87.00 per cent pulses and coarse cereals, 77.00 per cent oilseeds, 66.00 per cent cotton and 45.00 per cent cereals. On the other hand, rain fed areas are home to majority of our rural poor and marginal farmers, have suffered neglect in the past in not having received differentiated technological, institutional, infrastructural and investment support.

These areas are characterized by high incidence of poverty, low education and health status, high distress in the farming sector, distress migration, low employment opportunities and vulnerability to a variety of risks. Apart from these conditions, the population in these areas also suffers from various exploitative social structures and practices, poor attention by government departments, poor quality of service delivery and so on. Repeated water scarcities leading to large scale droughts have severely affected livelihoods of these rural people. The challenge, therefore, is to improve rural livelihoods through participatory watershed development projects, reinforced by an integrating farming system approach that would increase productivity in a sustainable manner and contribute to livelihood security (11th Plan document).

During 1985-95, rain fed regions witnessed higher agricultural growth rate of 4.01 per cent compared to 2.90 per cent in the irrigated areas. However, during the post 1995 liberalization, the growth in rain fed agriculture decelerated to almost zero, as against that of the irrigated region to 2.07 per cent (Sharma, 2009). The challenge before Indian Agriculture is to transform rain fed farming into more sustainable and productive systems and to better support the population dependent upon it. It is therefore imperative on the government to focus on watershed development in rain fed areas.

Watershed development refers to the conservation, regeneration and the judicious use of all the resources --- natural (like land, water, plants, animals) and human – within the watershed area. Watershed management tries to bring about the best possible balance in the environment between natural resources on the one side and man and animals on the other. Since it is the man which is primarily responsible for degradation of environment, regeneration and conservation can only be possible by promoting awakening and participation among the people who inhabit the watersheds.

1.2 Evolution of Watershed Development in India

The earlier pre-independence incarnation of the present day watershed development consisted of preventing oil erosion in the catchments of River Valley Projects (RVPs) and various schemes on dry land agriculture, soil and moisture conservation. The objectives were empirical, thematic, commodity centric and lacked comprehensiveness of generating income, employment, equity, livelihood, and integrated as well as sustainable use of natural resources including the soil capital. The community participatory process of developing all inclusive resources within a natural geo-hydrological unit of a watershed is being experimented since 1974 by different research and development endeavors. After 1982, NGOs, governmental organizations and donor driven resources also jumped on the bandwagon of refining the watershed development projects. Centrality of the role of gender, poverty, landless, asset less, labour, indigenous technical knowledge, artisan, craft, local skills, resources and tribal people were recognized. Post 1989, the Union Ministry of Agriculture, (MoA), Ministry of Rural Development (MoRD) and Ministry of Environment and Forests (MoEF) invested in integrated natural resources management in watersheds with the aim of enhancing productivity, income employment and environmental externalities. These ministries devised their own norms and guidelines with a common philosophy of participation of the community. The Hanumantha Rao Committee (1994) nailed down the principles of transparency by operating joint accounts, contributions for meaningful people' participation, role of Gramsabha (eligible voters), women, landless or asset less, NGOs, self-help groups, users' groups and other innovative alternative institutions. It was a significant step to rechristen the role of the Government as a service provider and accommodative to Panchayati Raj Institutions. The Haryali Guidelines issued by the MoRD made Panchayats the Project Implementing Agencies.

1.3 Watershed Development Programmes

The MoA, MoRD and MoEF along with their respective departments in the States, are the three main ministries in charge of watershed development programmes in

the country. Each programme focuses on different aspects and activities within the ministry's development criteria.

The MoA has worked in Watershed development since the 1960s and mainly deals with issues, including erosion prone agricultural lands, optimizing production in rain fed areas and reclaiming degraded lands. The Department of Agriculture and Co-operation and the Department of Agricultural Research and Education of the MoA are involved in all aspects of watershed development. They are supported by two autonomous bodies; the Indian Council of Agricultural Research and the National Institute for Agricultural Extension and Management. The MoA is currently implementing several schemes/programmes, including the National Watershed Development Project for Rain fed Areas, Soil and Water Conservation in the Catchments of RVPs and Flood Prone Rivers Watershed Development Project in Shifting Cultivation Areas, Reclamation of Alkali Soil, Watershed Development Fund and Externally Aided Projects (EAPs).

The MoRD has been implementing watershed development projects only since the late 1980s. It deals with non-forest wastelands and poverty alleviation programmes having components of soil and water conservation. The key department in MoRD is the Department of Land Resources. Two organizations support the MoRD the National Institute of Rural Development and the Council for Advancement of People's Action and Rural Technology. The former provides advice on policy matters about watersheds, while the latter deals with the voluntary sector. Watershed programmes implemented by MoRD include the Drought Prone Areas Programme, Desert Development Programme, Integrated Wastelands Development Programme, and EAPs.

Since 1989, the MoEF has been implementing the National Afforestation and Eco-development Project, with the intention of promoting afforestation and development of degraded forests within an integrated watershed approach.

Up to the 10th Plan (2002-07), nearly 51 mha has been developed on watershed basis. The MoRD accounted for 63.00 per cent of the treated area, spending nearly 50.00 per cent of the total funds and the MoA developed the remaining 37.00 per cent of the area, but used slightly more than 50.00 per cent of the total funds. The MoEF and Planning Commission had only limited involvement.

Watershed development programmes are implemented by different Departments at the Centre, and in the States. The Department of Agriculture and Co-operation implements the National Watershed Development Projects for Rainfed Areas (NWDPRA). The watershed approach has been adopted in other schemes like development of catchment areas of River Valley Projects and flood prone areas and control of shifting cultivation in North-Eastern Regions. The Ministry of Rural Development implements DPAP and DDP as also the Integrated Wasteland Development Programme (IWDP). Besides, several externally aided projects are also under implementation. The Ministry of Environment and Forest is implementing an Integrated Afforestation and Eco-development Scheme to promote the development of degraded forests. The Planning Commission also follows a similar approach to implementing special area development programmes like Western Ghats Development Programme (WGDP) and Hill Area Development. In addition to the above Centrally Sponsored Schemes several State Governments are also implementing schemes for soil and moisture conservation on watershed lines. Maharashtra, Karnataka, Andhra Pradesh and Madhya Pradesh have made great strides in this regard. Orissa and Rajasthan have also taken the initiative. Table No. 1.1 highlights the development status of the programme up to 10th Five Year Plan.

Table No. 1.1: Watershed Development Programmes up to 10th Five Year Plan (2002-07)

(Area in Lakh ha and expenditure in Rs. Crore)

SN	Ministry/Scheme and Year of Start	Progress since Inception		Progress in 10th Plan (2002-07)		Total since inception up to 10th Plan	
		Area	Expenditure	Area	Expenditure	Area	Expenditure
A	**Ministry of Agriculture (D/o Agriculture & Co-operation)**						
1.	National Watershed Development Project for Rainfed Area (1990-91)	69.79	1877.74	23.30	1147.82	93.09	3025.56 (3250)
2.	River Valley Project & Flood Prone River (1962 & 1981)	54.88	1516.26	9.98	727.98	64.86	2244.24 (3460)
3.	Watershed Development Project for Shifting Cultivation Area (1974-75)	2.58	166.27	1.35	129.31	3.93	295.58 (7521)
4.	Reclamation of Alkali Soil (1985-86)	5.81	76.39	1.30	45.35	7.11	121.74 (1712)
5.	Watershed Development Fund (1999-00)	0.00	0.00	0.59	26.02	0.59	26.02 (4410)
6.	Other Externally Aided Projects	13.35	2039.81	4.80	1927.54	18.15	3967.35 (21858)
	Sub total	**146.41**	**5676.47**	**41.32**	**4004.02**	**187.73**	**9680.49 (5157)**
B.	**Ministry of Rural Development (D/o Land Resources)**						
1.	Drought Prone Area Programme (1973-74)	68.95	3284.74	68.32	1557.76	137.27	4847.50 (3528)
2.	Desert Development Programme (1977-78)	33.56	797.38	45.17	1152.50	78.73	1949.88 (2477)
3.	Integrated Wasteland Development Programme (1988-89)	37.34	616.51	62.22	1821.64	99.56	2438.15 (2449)
4.	Other Externally Aided Projects	1.40	18.39	3.60	274.28	5.00	292.67 (5853)
	Sub total	**141.25**	**4717.02**	**179.31**	**4806.18**	**320.56**	**9523.20 (2971)**
C.	**Ministry of Environment & Forests**						
1.	National Afforestation and Eco Development Project (1989-90)	0.70	47.53	0.00	0.00	0.70	47.53 (6790)
	Grand Total (A+B+C)	**288.36**	**10441.02**	**220.63**	**8810.20**	**508.99**	**19251.22 (3782)**

Source: 11th Five Year Plan (2007-2012), Planning Commission, Government of India.

It revealed that a large number of projects for productivity enhancement are being implemented based on watershed approach. The largest project in terms of scope and extent is the National Watershed Development Project for Rainfed Areas (NWDPRA), being implemented by the Ministry of Agriculture; NWDPRA was launched in 1991 in 25 states and two union territories and continues to be implemented during 10th Five Year Plan. The broad objectives of the NWDPRA are as follows:

1. *Conservation, development and sustainable management of natural resources including their use.*
2. *Enhancement of agricultural productivity and production in a sustainable manner.*
3. *Restoration of ecological balance in the degraded and fragile rainfed eco-systems by greening these areas through appropriate mix of trees, shrubs and grasses.*
4. *Reduction in regional disparity between irrigated and rainfed areas.*
5. *Creation of sustained employment opportunities for the rural community including the landless.*

Impact evaluation studies both on the ground and through remote sensing techniques have shown that watershed development programme to a large extent able to regenerate natural resources including land, forest and water and play a crucial role in augmenting agricultural productivity, cropping intensity and cropping pattern. After three years of implementation of NWDPRA, a technical committee headed by Prof. C. Hanumantha Rao in 1993 was appointed to review the guidelines prepared at the time of introduction of NWDPRA. This committee was directed to appraise the impact of the work done under DPAP and DDP. The Hanumantha Rao Committee came with the following observations that The Programme have been implemented in a fragmented manner by different departments through rigid guidelines without any well designed plans prepared on watershed basis by involving the inhabitants. Except in a few places, in most of the programme areas the achievements have been dismal. Ecological degradation has been proceeding unabated in these areas with reduced forest covers, reducing water table and a shortage of drinking water, feed and fodder.

Thus, a complete different picture is visible in the committee report antagonizing the earlier findings of the impact evaluation of various watershed development programmes. The watershed projects undertaken by MoRD from 1994-2001 followed the Hanumantha Rao Committee Common Guidelines of 1994. The Ministry of Agriculture revised its guidelines for NWDPRA as more participatory, sustainable and equitable. There has been a radical shift of top down management approach to

bottom-up line management system in organizing the watershed areas. This bottom up approach with revised guidelines of NWDPRA i.e., **WARASA-JAN SAHBHAGITA** with full participation and consensus of the participants provides for decentralization of procedures, flexibility in choice of technology and provision for active involvement of the watershed community in planning, execution and evaluation of the programme so that the programme becomes sustainable and growth oriented.

It is now mandatory for the watershed development mentioned earlier to be planned, implemented, monitored and maintained by the watershed community themselves. Moreover, to bring about uniformity in approach among the watershed based programme being implemented by various agencies, the revised guidelines of NWDPRA are in conformity with the common approach for watershed development, jointly formulated and adopted by Ministry of Agriculture and Ministry of Rural Development.

1.4 Review of Literatures

The literature on watershed development in India is growing rapidly, but most of it is confined to qualitative descriptions of success stories. Some of these contain excellent insights into the social processes that contribute to successful watershed development, but there is little frank discussion of less successful projects. The few quantitative studies available tend to be based on a small number of heavily supervised projects, with no information about long term effects. Benefits after the first year or two were typically assumed, and, not surprisingly, cost benefit findings were almost always favourable. At the same time, the vast majority of projects were never evaluated, and there were good reasons to suspect that most of them had little impact (Kerr & Sanghi, 1992).

In fact, watershed development projects are designed to harmonize the use of water, soil, forest and pasture resources in a way that conserves these resources while raising agricultural productivity, both by conserving moisture in the ground and increasing irrigation through tank and aquifer based water harvesting. Watershed

projects have become widespread in rainfed areas in recent years, with a current annual budget from all sources that exceeds US $ 500 million (Farrington, Turton & James, 1999). A study (Sastry et. al; 2002) on watershed development programmes, which were taken up in large scale in Kupam constituency area in Chittor district of Andhra Pradesh revealed that many water harvesting structures such as check dam cascades, percolation tanks and farm/sunken ponds were constructed to augment water resources in addition to canopy development. Thus, groundwater recharge has increased tremendously. As a result many bore wells have been dug in the area and highly value added and exportable quality vegetables (Jerkin, baby Corn, etc.) have been introduced and grown in this area under drip/sprinkler irrigation system. Non-land based activities such as dairy, goatry, sheep rearing, poultry, duckery, mushroom cultivation; SHGs etc. were supported in watershed programme village with some support. The subsidy based activities had a set back after withdrawal of watershed programme. However, there are some activities that have been continuing even today (Reddy et. al, 2002). Sastry et. al (2003) in their study found that the sustainability of agriculture is possible by harnessing rainwater and improving the ground water, which is possible through soil and water conservation measures. Farmers also reported that soil erosion can be minimized and irrigation potential can be improved through soil and water conservation structures. A study conducted by Policy and Development Initiatives (2001) indicated that the employment benefit is the most favourable impact of the watershed programme. This was indicated by 90.00 per cent of households in all watershed areas. Equally important is the perception regarding improvement in ground water condition overwhelmingly reported by 85.00 to 100.00 per cent of households across all watersheds. The land owning households have overwhelmingly mentioned that the project will also increase crop production.

The participatory process of planning and implementation was the cornerstone in the linkage between the community's felt needs and the watershed programme intervention, as revealed in a study undertaken in 15 villages of Jharkhand. The benefits accrued from the watershed development strengthened the livelihood of the

village community. In addition to this, the watershed programme intervention created a spirit of collectivization of resources (ponds, check Dams etc.) among the villagers (Mishra, 2007). It has not only helped in making the social ecology of the community congenial rather whole ecosystem and socio economic scenario has been changed. Innovative approaches are being evolved. A watershed of 1004 ha in Adhithali–Myllanhalli village of Hassan district in Karnataka after the implementation of farm pond based watershed development project during 1996 to 2000, whole ecosystem and socio economic scenario has been changed in the area. Availability of water for drinking and agriculture activities and creation of local self employment are some visible impacts. This watershed approach has been already adopted by at least 10-12 other organizations in Karnataka and is being replicated in their respective areas (Kakade et. al, 2001).

Moreover, watershed's development components include livelihood support system. A livelihood perspective does not mean watershed development has to start something new but rather encourages a closer look at people's coping strategies, decision making and the connection to the outside world. This change of perception may help to reflect low watershed development affects people's lives. There should actually no separation of the terms watershed development and livelihood intervention because the watersheds as the biophysical environment are the basis of livelihoods for all villagers (felix.gnetm@idaemail.ch).

As regards the socio economic impact of the NWDPRA, a study in Kanpur Dehat district of UP (Babu et. al, 2004) found that implementation of watershed development project has resulted in area expansion, increase in livestock population and improvement in crop productivity. Besides, the project could help arrest degradation of both arable and non-arable lands. All these have enhanced farmer's capability, income and employment opportunities at the local level lowering migration. Small holders have been benefitted the most from watershed development. Arneja & Khara (2005) concluded that watershed development can be the most effective approach in not only mitigating the environmental crisis but also in increasing the employment opportunities. The need is to upgrade the

programmes launched so that whole community participates and the benefits are distributed. We have the glaring instances of droughts, lowering water table and water sharing conflicts both at the state and individual level. This approach is, thus, the need of the hour to meet social, economical, environmental and other community goals.

There are a few marvelous projects, which have earned name and fame for themselves. But it is important to examine and address the weaknesses so that the programme achieves its objectives and the nation gets full value of time, money and priority being accorded to different major and minor projects (Seth, 2000). In fact community integration is a natural outcome of the project. Development is understood in terms of how the whole village or area can best support itself with the resources it already has (http://www.ifpri.org). Mishra & Mishra (2009) found that watershed management suffers from major constraints like lack of funds, insufficient manpower especially at the professional level, poor co-ordination among government organizations, low mobility and insufficient equipped field staff, lack of data and research for continuous improvement and other socio-economic institutional and policy constraints. It is to be pointed out here that mere implementation of activities for land water management does not have the potential to meet the diversified needs of the villagers. In this context the implementation of a number of livelihood support activities have the potential to meet the livelihood need of the households, who are untouched by the implementation of land and water management. Mishra (2009) said that in the last decade the emergence and practice of watershed plus integration of watershed development and livelihoods support activities in the programme is known as watershed plus as an inclusive development strategy has broadened the scope of the watershed development programme as an intervention to improve the living standard of the tribal households, of Koraput district in Orissa.

Planning Commission's Working Group on Natural Resource Management (2007) has noted that in spite of spending about Rs. 192510 million (US $ 4500 million) for watershed development in the rainfed region of India, the results are invisible and

treated areas have reverted to their original status. Clearly the development processes require a through examination.

It is clear from the discussion above that implementation of watershed development programmes have both potential benefits and challenges. Hence, a situation specific assessment needs to be done at the regular intervals so that corrections could be made in continuation of the programmes. Of course, the assessment should be done in context of larger objectives of the programme. It is perhaps due to this fact the Directorate of Economics & Statistics of Ministry of Agriculture, Government of India has assigned an impact evaluation study on "*Impact Evaluation of Revised National Watershed Development Projects for Rainfed Areas (NWDPRA) during 10th Plan*" to its Agro-Economic Research Centres. Accordingly the AER Centre for Bihar & Jharkhand, T M Bhagalpur University, Bhagalpur has undertaken this study in Bihar.

1.5 Objectives of the Study

The main objective of this study is to evaluate progress, achievements and problems in project implementation so as to provide critical and timely information and guidelines to the project management for decision support. The basic aims of the Mid-Term Evaluation are to determine whether the project objectives, set in terms of expected output and criteria/indicators are being achieved.

The basic objectives of the present Mid-Term Evaluation are as follows:

1. *To assess the qualitative performance of the programme.*
2. *To cross-examine the information furnished by States on implementation of the programme.*
3. *To assess the impact of the programme.*
4. *To ensure implementation of the programme in accordance with the revised guidelines.*
5. *To have suitable policy implications, if need be.*

1.6 Methodology

The study is based on both secondary and primary data. As far as secondary data is concerned the study has used the data collected from the nodal department of the

programme at the state level i.e., Directorate of Soil Conservation, Dept. of Agriculture, Government of Bihar and its district offices and other published and unpublished data of the government, 11th Plan document and various other sources. The primary data was collected from various units through canvassing structured schedules viz., village schedule and household's schedule. The village schedule was administered in micro watersheds villages and the household schedule amongst the beneficiaries and non-beneficiaries of the programme. A sample of 320 village households was selected for the purpose of study. The sample was drawn on the basis of a multistage stratified sampling method. In the first stage four districts were selected on the basis of larger physical and financial achievements under the projects/schemes. These districts are Nawada, Kaimur, Aurangabad and Rohtas. In the second stage one micro watershed from each of the selected districts was selected on the basis of the same criteria as adopted in case of selection of the districts. Thereafter lists of beneficiaries and non-beneficiaries from each of the selected watershed areas/villages were prepared and classified in 5 categories of households viz., landless, marginal (1 ha), small (1-2 ha), medium (2-4 ha) and large (4 ha and above). A total of 40 households each from beneficiary and non-beneficiary groups in each selected watershed areas were randomly selected without replacement for in-depth enquiry. Thus, 80 households form the size of sample in each district, taking together into account 320 households form the size of the sample for the study. The details of the sample and area are as below in table No. 1.2.

Table No. 1.2: Distribution of the Sample Area and Respondents

SN	Districts	Block	Name of the Sample Watershed	No. of Beneficiaries Households	No. of Non-beneficiaries Households	Total
I.	Nawada	Roh	Nata Nala M/W-B	40	40	80
II.	Kaimur	Adhora	Khamkala M/W-K-5	40	40	80
III	Aurangabad	Madanpur	Narkapi Machani M/W-K-8	40	40	80
IV.	Rohtas	Nauhatta	Jayantipur M/W Sone-2-I	40	40	80
	Total			**160**	**160**	**320**

1.7 Reference Period

In order to have a comparison in the changes of situational study variables, 'Before and After' approach of evaluation has been followed. For this purpose information

has been gathered/collected for two different time periods coinciding before and after the introduction of WARSA JAN SAHBHAGITA. Thus, there are two different reference periods viz., 2001-02 and 2006-07 respectively for the purpose of the study.

CHAPTER – II

A DETAILED PROFILE OF THE WATERSHED AREAS

In this chapter an attempt has been made to describe the physical and social characteristics of the sample watersheds, so as to understand the background and the factors that might affect specific impact. In last chapter, the names of the sample watersheds and corresponding sample districts are already mentioned. The sample watersheds are funded by the nodal agency i.e., District Soil Conservation Office from the centrally sponsored WARSA-JANSAHBHAGITA NWDPRA (National Watershed Development Project for Rainfed Areas). NGOs are involved in the execution of this programme. Under this programme, a PIA is provided with a maximum fund of Rs. 20 lakh to develop land area of 500 ha @ Rs. 4000 per ha on watershed basis involving all the inhabitants/families. Only in exceptional circumstances, more area (above 500 ha) and fund (above Rs. 20 lakh) are allowed.

Before describing the magnitude and types of land resources developed and got affected and the social characteristics for the sample watersheds a brief look on the state's profile shows that the agricultural economy of Bihar is extremely important not merely because 90.00 per cent of its population earn their livelihood from this sector, but it is this sector wherein lies the great potential of its economy. Being situated in the Middle Gangetic Plains, Bihar is endowed with both extremely fertile soil and abundant water resources. Because of its geographical location, the state is also endowed with high bio-diversity and consequently the farmers here are capable of growing a large number of crops. It has a geographical area of 93.60 lakh hectares. According to the soil quality and climatic conditions of the relevant areas, the state has been classified in 3 agro-climatic zones: North-West Alluvial Plane (Zone-I), North-East Alluvial Plane (Zone-II) and South-Alluvial Plane (Zone-III), the last being further classified in two sub-zones 3A and 3B. The sample lies in Zone 3B

(Western Sub-Zone), which receives about 990-1240 mms. of average annual rainfall and has a variety of soils--- sandy loam, clay loam, loam and clay.

2.1 Demographic Features of the Sample Districts

The details of demographic and some other important features of the four sample districts are summed up in table No. 2.1. As is evident from the table that the total geographical area of the district ranging between 2.65 per cent to 4.09 per cent of the state's total area. The population in the districts is 1.55 per cent to 2.95 per cent to the total population of the state. A very low number of the population is urban. The percentage of Scheduled Caste population in all the four sample districts is higher than the state's average (15.7%). The literacy rate is also higher compared to the state's figures in the sample districts accept a bit lower in Nawada district. The work participation rate in the districts is around 30.00 to 37.00 per cent. About 90.00 per cent of the workers are engaged in agricultural occupations. The rainfall data indicate that all the four districts receive an average annual rainfall of about 1000 mm. The per capita gross district domestic product (GDDP) at 1999-2000 prices in 2004-05 in all the four districts are lower to the state's figures (Rs. 7168).

Table No. 2.1: Area, Population, Workers, etc of Sample Districts

SN	Particulars	Nawada (WS-I)	Kaimur (WS-II)	Aurangabad (WS-III)	Rohtas (WS-IV	Bihar
1.	Total Geographical Area (Sq. kms)	2494 (2.65%)	3362 (3.57%)	3305 (3.51%)	3851 (4.09%)	94163 (100.00)
2.	Population	1809696 (2.18%)	1289074 (1.55%)	2013055 (2.43%)	2450748 (2.95%)	82998509 (100.00)
3.	Density/Sq km	726	382	607	636	880
4.	Rural Population (%)	92.60	96.80	91.60	86.70	89.50
5.	Sex Ratio	946	902	934	909	919
6.	% of SC Population	24.10	22.20	23.50	18.10	15.70
7.	% of ST Population	0.10	2.80	0.10	1.00	0.90
8.	% of Minority Population	11.30	9.50	9.70	10.10	16.60
9.	Literacy (%)	46.80	55.10	57.00	61.30	47.00
10.	Male Literacy (%)	60.60	69.70	71.10	75.30	59.70
11.	Female Literacy (%)	32.20	38.80	41.90	45.70	33.60
12.	Total Workers (%)	37.36	34.41	33.74	30.48	33.88
13.	Cultivators (%)	40.09	33.86	35.66	34.37	29.17
14.	Agril. Lab (%)	40.58	49.02	43.25	39.18	48.18
15.	Workers in Hh Industry (%)	3.67	3.34	4.00	3.69	3.87
16.	Other Workers (%)	15.66	13.77	17.09	22.76	18.78
17.	Annual Rainfall (In mm) 2007	1133.10	1045.60	1092.70	977.10	1506.10
18.	Per capita GDDP (Rs.), 2004-05 at 1999-00 prices, (rank in the state)	4857 (34)	5766 (14)	5463 (19)	7056 (06)	7168

Source: Census 2001 & Bihar through figures – 2003, Directorate of Statistics & Evaluation and Economic Survey – 2008-09, Govt. of Bihar.

NB: In parenthesis percentage figures are shown.

2.2 Land Resources of the Sample Districts

The total geographical areas of the sample districts are 250 to 400 thousand ha. Forest areas are almost non-existent in Aurangabad district and in remaining three districts it is 17.00 per cent to 34.00 per cent of the total area. Net sown areas or the agricultural land areas as percentage of total geographical areas are significantly higher in two districts viz., Aurangabad (60.30%) and Rohtas (64.96%) as compared to the same in Nawada (44.98%) and Kaimur (44.73%) districts. The cropping intensity figures indicate it is higher than the state's average (138.98%) in Aurangabad (143.72%) and Rohtas (140.55%) districts whereas that of lower in Nawada (135.71%) and Kaimur (120.92%) districts (table No. 2.2).

Table No. 2.2 Land use Classification of Sample Districts 2002-03 *(In '000 ha)*

SN	Classification of Land	Nawada (WS-I)	Kaimur (WS-II)	Aurangabad (WS-III)	Rohtas (WS-IV	Bihar
1.	Total Area	249 (100.00)	342 (100.00)	330 (100.00)	391 (100.00)	9360 (100.00)
2.	Forest	64 (25.70)	113 (33.04)	13 (3.94)	67 (17.14)	616 (6.58)
3.	Barren and Uncultivable Land	11	19	17	17	436
4.	Land put to non-agi. uses	35	33	54	47	1643
	Sub-total	**110 (44.18)**	**165 (48.25)**	**84 (25.45)**	**131 (33.50)**	**2695 (28.79)**
5.	Permanent Pasture & other Grazing Land	1 (0.40)	0 (0.00)	1 (0.30)	0 (0.00)	18 (0.19)
6.	Cultivable Waste other than Fallow land	1	1	2	1	46
7.	Land under Miscellaneous trees & Groves not including in NAS	0	1	1	3	237
8.	Other Fallow Land	3	6	7	1	133
9.	Current Fallow	22	16	32	1	499
	Sub-total	**26 (10.44)**	**24 (7.02)**	**42 (12.73)**	**6 (1.53)**	**915 (9.78)**
10.	Net Area Sown	112 (44.98)	153 (44.73)	199 (6030)	254 (64.96)	5726 (61.18)
11.	Area Sown than Once	40	132	87	103	2232
12.	Gross Cropped Area	152	185	286	357	7958
13.	Gross Area Irrigated (%)	124 (81.58)	149 (80.54)	229 (80.06)	329 (92.16)	4571 (57.44)
14.	Cropping Intensity (%)	135.71	120.92	143.72	140.55	138.98

Source: Bihar through Figures, (2003), Directorate of Statistics & Evaluation, Govt. of Bihar. In parenthesis percentage figures are shown.

2.3 Characteristics of Sample Watersheds

The data presented in table No. 2.3 show the households and population details along with its social groups across the sample households. It revealed that there are

Table – 2.3: Information regarding Village Population under Selected Watersheds

Name of the communities	Watershed – I (Nawada Dist.)				Watershed – II (Kaimur Dist.)				Watershed – III (Aurangabad Dist.)				Watershed – IV (Rohtas Dist.)				Over all			
	No. of H.H.	Male	Female	Total	No. of H.H.	Male	Female	Total	No. of H.H.	Male	Female	Total	No. of H.H.	Male	Female	Total	No. of H.H.	Male	Female	Total
General	168	590	513	1103	109	371	311	682	135	343	331	674	125	361	326	687	**537 (61.37)**	**1665**	**1481**	**3146 (60.42)**
SC	32	120	99	219	28	91	96	187	85	217	208	425	46	152	138	290	**191 (21.83)**	**580**	**541**	**1121 (21.53)**
ST	-	-	-	-	-	-	-	-	-	-	-	-	05	18	11	29	**05 (0.57)**	**18**	**11**	**29 (0.56)**
OBC	48	173	140	313	27	99	90	189	15	41	34	75	52	179	155	334	**142 (16.33)**	**492**	**419**	**911 (17.49)**
All Total	**248**	**883**	**752**	**1635**	**164**	**561**	**497**	**1058**	**235**	**601**	**573**	**1174**	**228**	**710**	**630**	**1340**	**875**	**2755**	**2452**	**5207**
%	-	*54.0*	*46.0*	*100.0*	-	*53.02*	*46.97*	*100.00*	-	*51.19*	*48.81*	*100.00*	-	*52.58*	*47.02*	*100.00*	**100.00**	***52.91***	***47.09***	***100.00***

Figures given in parenthesis are percentage

Source: Field Survey

Table – 2.4: Educational Status of the Villagers of Sample Watersheds

Sl. No.	Educational Status	1			2			3			4			5			6
		General			Schedule Caste (SC)			Schedule Tribe (ST)			OBC			Total			
		Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	%
I - Dist. Nawada																	
1.	**P. G.**	20	-	20	-	-	-	-	-	-	02	-	02	22	-	22	1.35
2.	**U. G.**	27	07	34	-	-	-	-	-	-	14	03	17	41	10	51	3.12
3.	**H. S.**	50	29	79	10	-	10	-	-	-	18	04	22	78	33	111	6.79
4.	**M. P.**	120	66	186	20	04	24	-	-	-	25	37	62	165	107	272	16.64
5.	**VIII Standard**	153	183	336	24	11	35	-	-	-	44	43	87	221	237	458	28.01
6.	**Literate**	170	142	312	20	15	35	-	-	-	62	34	96	252	191	443	27.09
7.	**Illiterate**	50	86	136	46	69	115	-	-	-	08	19	27	104	174	278	17.00
Total		**590**	**513**	**1103**	**120**	**99**	**219**	**-**	**-**	**-**	**173**	**140**	**313**	**883**	**752**	**1635**	**100.00**
%		36.08	31.38	67.46	7.34	6.05	13.39	-	-	-	10.58	8.57	19.15	54.00	46.00	100.00	-
II- Dist. Kaimur																	
1.	**P. G.**	02	-	02	-	-	-	-	-	-	02	01	03	04	01	05	0.47
2.	**U. G.**	19	05	24	-	-	-	-	-	-	15	02	17	34	07	41	3.88
3.	**H. S.**	68	29	97	04	-	04	-	-	-	21	08	29	93	37	130	12.29
4.	**M. P.**	101	77	178	10	05	15	-	-	-	22	18	40	133	100	233	22.02
5.	**VIII Standard**	75	61	136	13	05	18	-	-	-	18	09	27	106	75	181	17.11
6.	**Literate**	82	109	191	27	07	34	-	-	-	17	49	66	126	165	291	27.50
7.	**Illiterate**	24	30	54	37	79	116	-	-	-	04	03	07	65	112	177	16.73
Total		**371**	**311**	**682**	**91**	**96**	**187**	**-**	-	**-**	**99**	**90**	**189**	**561**	**497**	**1058**	**100.00**
%		35.07	29.39	64.46	8.60	9.07	17.67	-	-	-	9.35	8.52	17.87	53.02	46.98	100.00	-
III- Dist. Aurangabad																	
1.	**P. G.**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2.	**U. G.**	02	05	07	-	-	-	-	-	-	03	01	04	05	06	11	0.94
3.	**H. S.**	05	08	13	02	-	02	-	-	-	11	06	17	18	14	32	2.73
4.	**M. P.**	05	05	10	04	08	12	-	-	-	05	09	14	14	22	36	3.07
5.	**VIII Standard**	12	08	20	12	12	24	-	-	-	02	06	08	26	26	52	4.43
6.	**Literate**	125	94	219	80	92	172	-	-	-	14	08	22	219	194	413	35.18
7.	**Illiterate**	194	211	405	119	96	215	-	-	-	06	04	10	319	311	630	53.65
Total		**343**	**311**	**674**	**217**	**208**	**425**	**-**	**-**	**-**	**41**	**34**	**75**	**601**	**573**	**1174**	**100.00**
%		29.22	28.19	57.41	18.48	17.72	36.20	-	-	-	3.49	2.90	6.39	51.19	48.81	100.00	-
IV-Dist. Rohtas																	
1.	**P. G.**	01	-	01	-	-	-	-	-	-	-	-	-	01	-	01	0.07
2.	**U. G.**	03	04	07	01	-	01	-	-	-	17	04	21	21	08	29	2.17
3.	**H. S.**	10	07	17	03	-	03	-	-	-	41	09	50	54	16	70	5.22
4.	**M. P.**	19	10	29	08	05	13	-	-	-	12	21	33	39	36	75	5.60
5.	**VIII Standard**	27	21	48	12	05	17	-	-	-	55	27	82	94	53	147	10.97
6.	**Literate**	143	120	263	30	46	76	05	-	05	30	69	99	208	284	492	36.72
7.	**Illiterate**	158	164	322	98	82	180	13	11	24	24	25	49	293	233	526	39.25
Total		**361**	**326**	**687**	**152**	**138**	**290**	**18**	**11**	**29**	**179**	**155**	**334**	**710**	**630**	**1340**	**100.00**
%		26.94	24.33	51.27	11.34	10.30	21.64	1.34	0.82	2.16	13.36	11.57	24.93	52.98	47.02	100.00	-

Source: Field Survey

altogether 875 households in the selected watershed areas constituting 61.37 per cent general caste, 21.83 per cent scheduled caste, 16.33 per cent other backward caste and 0.57 per cent scheduled tribe. The population figures indicate that at the overall level it is 5207 persons. Out of it 60.42 per cent belonged to general caste, 21.53 per cent scheduled caste, 17.49 per cent other backward caste and 0.56 per cent schedule tribe.

The data on educational status indicate divergent trends across the sample watersheds while higher percentage of illiteracy was found in WS– III & IV (53.65 & 39.25%) respectively whereas that of lower in WS-I & II (17.00 & 16.73%) respectively. About 2-4 per cent found graduate and Post-graduate level of education across the watersheds (table 2.4). The land resources of the sample watersheds (table No. 2.5) indicates that the total area of watersheds 533 ha and the forest area is just 12.57 per cent of that at the overall level. The cultivable areas are reported to 83.63 per cent of the total area. The land holding status indicates that in all about 63.66 per cent are marginal farmers, 25.03 per cent small farmers, 7.09 per cent medium farmers and only 4.22 per cent big farmers. The percentage of irrigation to the total area is 57.80. However, there is also a distinct trend across the sample watersheds.

Table No. 2.5: Description of Land Resources in Selected Watersheds *(Area in ha)*

SN	Particulars	Nawada (WS-I)	Kaimur (WS-II)	Aurangabad (WS-III)	Rohtas (WS-IV	Overall
1.	Total Area	560 (100.00)	521 (100.00)	507 (100.00)	544 (100.00)	533 (100.00)
2.	Forest	100 (17.85)	74 (14.20)	--	26 (4.78)	67 (12.57)
3.	Cultivable Area	417 (74.46)	432 (182.91)	443 (87.38)	494 (90.81)	446 (83.68)
4.	Land Holding Status					
a.	% Marginal Farmers	80.24	64.63	52.34	56.58	63.66
b.	% Small Farmers	10.89	21.34	40.85	26.75	25.03
c.	% Medium Farmers	5.24	7.93	3.83	11.84	7.09
d.	% Big Farmers	3.63	6.10	2.98	4.82	4.22
5.	% Irrigation to total area	51.73	50.88	65.09	41.69	57.80

In parenthesis percentage figures are shown.
Source: Field Survey

2.4 SHGs and UGs in the Selected Watersheds

Self Help Groups (SHGs) include those who are landless or have marginal size of land holding. They are motivated to get organized into small homogenous groups based upon their livelihoods, social affinity, compatibility, credit and thrift activity are also used for organizing them into groups. Likewise User Groups (UGs) include those members who are land owners with the watershed area. In selected watershed area there are 06 SHGs in WS-I, 03 in WS-II, 05 in WS-III and 04 in WS-IV. The number of UGs is 22 in WS-I, 27 in WS-II, 21 in WS-III and 20 in WS-IV. All the SHGs and UGs are found involved in watershed activities. On an average the contribution of SHGs found for watershed management is only Rs. 2350. However, the fund available is Rs. 147792 at the overall level (tables 2.6 & 2.7). As regards to the occupational status of SHG and UG beneficiaries the data presented in table No. 2.8 reveals that the total number of beneficiaries in WS-I is 99, 101 in WS-II, 107 in WS-III and 104 in WS-IV. Majority of the beneficiaries are found engaged in agriculture followed by landless labour and other agricultural and allied activities in almost all the watershed areas. There is also a bit distinct trend found with regard to the social groups. The share of general caste is found higher in all the watershed areas except in WS-I (46.46%), followed by scheduled caste. The share of women among the beneficiaries is different. It ranges around 15.00 to 39.00 per cent across the watershed areas.

Table – 2.6: Information regarding Self Help Groups (SHGs) and User Groups (UGs) of the Villages under Selected Watersheds

Sl. No.	Particulars	Watershed – I (Nawada Dist.)		Watershed – II (Kaimur Dist.)		Watershed – III (Aurangabad Dist.)		Watershed – IV (Rohtas Dist.)	
		S.H.G	U.G	S.H.G	U.G	S.H.G	U.G	S.H.G	U.G
1.	Total No. of SHGs/ UGs in the village	06	22	03	27	05	21	04	20
2.	No. of SHGs/ UGs are involved in watershed management	06	22	03	27	05	21	04	20
3.	No. of SHGs/ UGs framed by women only	04	-	02	-	03	-	04	-
4.	No. of SHGs/ UGs framed only by women are involved in watershed management	04	-	02	-	03	-	04	-

Source: Field Survey

Table – 2.7: Information regarding Contribution to the Fund (in Rs.) by the Self Help Groups (SHGs) of the Villages under Selected Watersheds

Sl. No.	Particulars	Watershed – I (Nawada Dist.)	Watershed – II (Kaimur Dist.)	Watershed – III (Aurangabad Dist.)	Watershed – IV (Rohtas Dist.)	Overall
1.	Contribution of SHGs framed for the other activities					-
	i) Only men	-		-	-	-
	ii) Only women	-		-	-	-
	iii) Total	-		-	-	-
2.	Fund available by sources				-	-
	i) Bank	-		-	-	-
	ii) Govt. Sector	-		-	-	-
	iii) Others	-		-	-	-
3.	Contribution of SHGs framed for watershed management only					
	i) Only men	1500.00	1000.00	1000.00	1000.00	1125
	ii) Only women	1000.00	1200.00	1500.00	1200.00	1225
	iii) Total	2500.00	2200.00	2500.00	2200.00	2350
4.	Fund available by sources					
	i) Bank	-	-	-	-	-
	ii) Govt. Sector	1,25,000.00	1,50,000.00	1,49,684.00	1,67,000.00	1,47,792
	iii) Others	-		-	-	-

Source: Field Survey

Table – 2.8: Information regarding Occupational Status of the SHG and UG Beneficiaries of the Villages under Watersheds

I (Dist. Nawada, No-99)								
SN	Occupational Group	Total no of Groups	Tot Beneficiaries	SC	ST	General	Minorities	Woman
1.	Agriculture	21	48	06	-	42	-	04
2.	Poultry	03	13	13	-	-	-	13
3.	Dairy	-	-	-	-	-	-	-
4.	Business	-	-	-	-	-	-	-
5.	Rural Artisan	-	-	-	-	-	-	-
6.	Service	-	-	-	-	-	-	-
7.	Landless labour	04	38	34	-	04	-	12
8.	Others	-	-	-	-	-	-	-
Total		**28**	**99(100.00)**	**53(53.54)**	**-**	**46(46.46)**	**-**	**29(29.29)**
II - Dist. Kaimur, No-101								
1.	Agriculture	20	46	04	-	42	-	03
2.	Poultry	02	20	14	-	06	-	04
3.	Dairy	-	-	-	-	-	-	-
4.	Business	-	-	-	-	-	-	-
5.	Rural Artisan	01	08	05	-	03	-	03
6.	Service	-	-	-	-	-	-	-
7.	Landless labour	07	27	05	-	22	-	05
8.	Others	-	-	-	-	-	-	-
Total		**30**	**101(100.00)**	**28(27.72)**	**-**	**73(72.28)**	**-**	**15(14.85)**
III - Dist. Aurangabad, No-107								
1.	Agriculture	22	70	08	-	62	-	-
2.	Poultry	01	10	10	-	-	-	-
3.	Dairy	-	-	-	-	-	-	-
4.	Business	-	-	-	-	-	-	-
5.	Rural Artisan	01	11	04	-	07	-	-
6.	Service	-	-	-	-	-	-	-
7.	Landless labour	02	16	10	-	06	-	16
8.	Others	-	-	-	-	-	-	-
Total		**26**	**107(100.00)**	**32(29.91)**	**-**	**75(70.09)**	**-**	**16(14.95)**
IV – Rohtas, No-104								
1.	Agriculture	22	81	10	-	71	05	20
2.	Poultry	01	10	10	-	-	-	10
3.	Dairy	-	-	-	-	-	-	-
4.	Business	-	-	-	-	-	-	-
5.	Rural Artisan	-	-	-	-	-	-	-
6.	Service	-	-	-	-	-	-	-
7.	Landless labour	01	13	05	-	08	-	10
8.	Others	-	-	-	-	-	-	-
Total		**24**	**104(100.00)**	**25(24.04)**		**79(75.96)**	**05(4.81)**	**40(38.46)**

Source: Field Survey

Table 2.8 (a) Occupational Status of the Non-Beneficiaries under Selected Watersheds.

Occupations	WS-I	WS-II	WS-III	WS-IV
Agriculture	18	21	16	24
Service	2	--	3	--
Agricultural Labourers	9	9	6	2
Rural Artisans	2	3	2	2
Business/Trade	8	7	8	9
Others	1	--	5	3
Total	**40**	**40**	**40**	**40**

Source: Primary Data

2.5 Respondents' Status

The sample respondents also included beneficiaries and non-beneficiaries' groups. A household is considered beneficiary if it is a member of the watershed association (WA) and if it has accordingly contributed to the watershed development fund created/arranged at the watershed level. Although all households in a watershed village(s) are supposed to be the members of WA, many of them, especially the landless and a few of the land holding households who didn't get equitable share in the process of disbursement of development activities, are found to be non-beneficiaries. Table 2.9 shows the distribution of such beneficiary and non-beneficiary among the sample respondents. As discussed earlier, 160 households from the size of beneficiaries respondents and 160 households non-beneficiaries respondents.

The data in above referred tables suggest that among the beneficiary respondents 84 (52.50%) belonged to general caste, 40 (30.63%) other backward caste, 25 (15.62%) scheduled caste and 2 (1.25%) scheduled tribe at the overall level. The total population in the category of beneficiary respondents is 1037 persons (6.48 persons/household). Likewise among non-beneficiaries respondents 79 (49.37%) belonged to general caste, 41 (25.62%) other backward caste and 40 (25.00%) scheduled caste at the overall level. The total population in this category is 1086 persons (6.79 persons/household).

Table – 2.9: Information regarding Sample Households under Selected Watersheds

Sl. No	Name of the communities	Watershed – I (Dist. Nawada)				Watershed – II (Dist. Kaimur)				Watershed – III (Dist. Aurangabad)				Watershed – IV (Dist. Rohtas)				**Overall**			
		No. of H.H.	Male	Fe-male	Total	No. of H.H.	Male	Fe-male	Total	No. of H.H.	Male	Fe-male	Total	No. of H.H.	Male	Fe-male	Total	**No. of H.H.**	**Male**	**Fe-male**	**Total**
Beneficiary																					
1.	General	21	79	51	130	17	57	44	101	27	89	73	162	19	63	54	117	**84**	**288**	**222**	**510 (49.18)**
2.	SC	05	22	19	41	08	24	29	53	06	23	24	47	06	22	21	43	**25**	**91**	**93**	**184 (17.74)**
3.	ST	-	-	-	-	-	-	-	-	-	-	-	-	02	07	06	13	**02**	**07**	**06**	**13 (1.26)**
4.	OBC	14	53	41	94	15	51	47	98	07	31	20	51	13	45	42	87	**49**	**180**	**150**	**330 (31.82)**
Total		**40**	**154**	**111**	**265**	**40**	**132**	**120**	**252**	**40**	**143**	**117**	**260**	**40**	**137**	**123**	**260**	**160**	**566**	**471**	**1037**
In %		25.00	14.85	10.70	25.55	25.00	12.73	11.58	24.31	25.00	13.79	11.28	25.07	25.00	13.21	11.86	25.07	**100.0**	**54.58**	**45.42**	**100.00**
Non-Beneficiary																					
1.	General	22	77	55	132	17	61	56	117	19	81	48	129	21	67	62	129	**79**	**286**	**221**	**507 (46.69)**
2.	SC	12	50	46	96	08	33	26	59	16	73	58	131	04	15	12	27	**40**	**171**	**142**	**313 (28.82)**
3.	ST	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**	**-**	**-**
4.	OBC	06	22	20	42	15	49	44	93	05	17	15	32	15	53	46	99	**41**	**141**	**125**	**266 (24.49)**
Total		**40**	**149**	**121**	**270**	**40**	**143**	**126**	**269**	**40**	**171**	**121**	**292**	**40**	**135**	**120**	**255**	**160**	**598**	**488**	**1086**
In %		25.00	13.72	11.14	24.86	25.00	13.17	11.60	24.77	25.00	15.75	11.14	26.89	25.00	12.43	11.05	23.48	**100.0**	**55.06**	**44.94**	**100.00**

Source: Field Survey.

CHAPTER – III

IMPACT OF THE PROGRAMME

This chapter presents the analysis of the impact of NWDPRA, more appropriately WARSA-JANSAHBHAGITA on land use pattern, availability of irrigation and drinking water, water level, functioning of recharging devices, cropping pattern, production cost, yield of the crops, etc. In fact evaluation of watershed projects requires baseline and monitoring data for comparison of conditions in the watershed before and after the project. The present analysis of the impact is also based on above approach.

In Bihar, the work activities commenced in 2002-03 and got completed in 2006-07. The details of activities carried out and expenditure incurred in the state are described in table 3.1. Land and water resource development activities constitute the primary areas of intervention in the state. Broadly the project constitutes two components viz., management and development. The expenditure on management components constituted about 18.38 per cent of the total expenditure. It included expenses on administration, community organization and training programmes. About 81.62 per cent of total expenditure is incurred on development components, which includes natural resource management (51.64%), farm production system for land owning families (20.58%) and livelihood support system for landless families (9.10%).

Natural Resource Management (NRM)

As per the guidelines, the 50.00 per cent fund for natural resource development is to be utilized for conservation and development of natural resources namely land and water. For conservation and development of these resources a minimum contribution of 10.00 per cent for individual oriented activities and 5.00 per cent for community oriented activities would be collected from the users or User Groups (UGs). The contribution for SC/ST would be a minimum of 5.00 per cent for

individual oriented as well as community oriented activities. As stated above 51.64 per cent of the total expenditures have been made on this account. Most of the activities covered under the programme are on private lands. It is due to the fact that most non-arable lands in the study area are managed either as government revenue lands (particularly of Mining Department) or Forest Department land. While the Forest Department heavily restricts access to its lands, access to government revenue land is typically open to all users. Protecting it requires village level management institutions based on widespread commitment for improvement of this resource. Similar is the case of water conservation. The main drainage line is where sun off water concentrates. It is highly vulnerable to soil erosion. The drainage line is also on government land, which tends to be managed poorly compared with privately operated land. Thus, the major problem in management of natural resources under the watershed areas was government lands causing hardship in proper treatment of the areas.

Farm Production Systems (FPS)

Improved management of farm production systems for land owning families include activities like; establishing nurseries, producing seedlings, testing and demonstration of new technologies, diversification of production systems and of course the adoption of new technologies. As per the guidelines, 20.00 per cent fund is to be used for above sub-components of FPS. As stated above, 20.58 per cent of the total expenditure has been made on this account. In regard to the impact of different sub-components on rainfed agriculture, the quantitative analysis has also been made in this chapter.

Livelihood Support System (LSS)

The promotion of sustainable livelihoods is one of the ways of development agencies to poverty reduction. As per the NWDPRA guidelines, 7.50 per cent fund for livelihood support system (for landless and marginal farm households) is to be used for improving income, nutrition and food supplement from existing livelihoods as well as for adoption of new micro-enterprises. The choice of livelihood support and technologies are made by the concerned members of the SHGs. As stated earlier,

9.10 per cent of the total expenditure has been made on this account. So far as the impact of investment is concerned, the quantitative analysis has been made in following sections.

Table No. 3.1: Allocation of Funds in Different Components of the Project (2002-07)

SN	Particulars			Rs (In Lakh)	% of Exp.
A.	Management Component			246.36	18.38
B.	Development Component				
I.	Natural Resource Management				
	a.		Arable Land		
		i.	Soil and moisture conservation activities	97.472	7.27
		ii.	Contour bunding/field building executed	---	---
		iii.	Agronomic conservation practices	46.272	3.45
		iv.	Others	30.67	2.29
	b.		Non-Arable		
		i.	Run-off management structures/Check Dams	40.00	2.98
		ii.	Water harvesting structures/SDD	87.40	6.53
		iii.	Dry land horticulture	88.528	6.60
		iv.	Conservation and development of biomass	63.885	4.77
		v.	Others	32.212	2.40
	c.		Drainage Lines		
		i.	Upper reaches	49.372	3.68
		ii.	Middle reaches	51.575	3.85
		iii.	Lower reaches	108.722	8.12
			Total	**696.108**	**51.94**
II.	Farm Production system for land owning families				
	a.		Establishment of nurseries and production of seedlings	44.95	3.35
	b.		Testing and demonstration of new technologies/demonstration	90.95	6.78
	c.		Diversification of production system	60.787	4.54
	d.		Adoption of proven technologies (organic farming, use of bio-fertilizers, integrated pest management, on-farm management, development of micro irrigation system, etc.)	53.547	4.00
	e.		Livestock management	25.67	1.91
	f.		Others	---	---
			Total	**275.904**	**20.58**
III.	Livelihood Support system for landless families				
	a.		Household production system	24.758	1.85
	b.		Bio-mass based rural industry activities	25.083	1.87
	c.		Dairy, sericulture, goat breeding, beekeeping, mushroom cultivation, commercial poultry, etc.	27.731	2.07
	d.		Livestock management	23.558	1.76
	e.		Others	20.778	1.55
			Total	**121.908**	**9.10**
			Sub-total – B	**1093.92**	**81.62**
			Grand total (A+B)	**1340.28**	**100.00**

Source: Directorate of Soil Conservation, Bihar, Patna.

3.1 Impact on Land Use

The watershed activities discussed above have not significantly the agricultural land in almost all the watersheds thereby benefitting only the land owning households. In WS-I, the area under private wasteland decreased by 16.67 per cent after the project indicating development of waste lands by way of plantations, etc., the benefit from which would also be available to the non-landholders. Similarly in WS-II, the area under government waste land and private waste land decreased by 15.00 per cent and 22.22 per cent respectively after the project, which reveals that community as well as private plantations have also been made in the area. In WS-III & IV, decrease in government and private wasteland by 21.92 per cent and 21.43 per cent and 31.44 per cent respectively have been found, clearly indicating increase in community and private plantations in the areas (table 3.2).

Table – 3.2: Information regarding Land of the Villages under Selected Watersheds

Sl. No	Nature of land	Watershed – I (Nawada Dist.)			Watershed – II (Kaimur Dist.)			Watershed – III (Aurangabad Dist.)			Watershed – IV (Rohtas Dist.)		
		Area in ha		% change in area	Area in ha		% change in area	Area in ha		% change in area	Area in ha		% change in area
		2001-02	2006-07		2001-02	2006-07		2001-02	2006-07		2001-02	2006-07	
1.	Govt. waste land	20	20	0.00	10.00	8.50	-15.00	-	-	-	12.79	10.05	-21.43
2.	Private waste land	06	05	-16.67	2.25	1.75	-22.22	64.04	50.00	-21.92	10.21	7.00	-31.44
3.	Common grazing land	-	-	-	-	-	-	-	-	-	-	-	-
4.	Forest land	100	100	00.00	73.10	74.95	2.23	-	-	-	24.50	26.50	8.16
5.	Agricultural land	417	417	00.00	432.50	432.65	0.035	442.96	443.25	0.065	493.00	494.79	0.36
6.	Others if any	17	18	5.00	3.15	3.15	-	-	-	-	03.50	3.50	00.00
Total		560	560	00.00	521.00	521.00	00.00	507.00	493.25	-2.71	544.00	541.84	-0.39

Source: Field Survey

3.2 Effect on Irrigation Development

Raising the water table to promote irrigation development is one of the major objectives of the watershed development programme. The projects seek to raise the water table through soil and water conservation and re-vegetation measures, which facilities rain water to infiltrate into the soil, gradually augmenting groundwater. This section examines the impact of the projects' efforts to promote irrigation

development. The change in irrigational status of agricultural land in 2006-07 over 2001-02 of the watershed area, as shown in table No. 3.3 indicated marginal increase in irrigated area in all the selected watersheds and almost in all the crop seasons. This may be due to increase in number of water harvesting structures. These structures are mainly tanks, checks dams, ponds, etc. The data presented in table No. 3.4 showed that the number of tanks, check dams and ponds have significantly increased in all the selected watersheds. These structures have not only increased the water table but to some extent made available the irrigational water particularly in rabi crops. Besides, respondents' perceptions of projects' effects on irrigation development revealed that the respondents are keenly aware that water harvesting structures in the drainage line can raise the groundwater level, thus promoting irrigation development. In the villages they indicated that water levels in open wells had risen visibly following the construction of water harvesting structures. However, some have reported that certain water harvesting structure have no water due to low rainfall and leakages making them ineffective. On the other hand, some projects are not designed with water harvesting in mind, which may be due to smaller budget mainly for vegetative or lose structures. Respondents are found keenly aware of these differences. In fact, they did not perceive that the NWDRA's work had much impact. Further irrigational benefit have also been examined in terms of percentage of land irrigated in 2006-07 over the year 2001-02 across the farms, which may be shown in table No. 3.5. The data revealed that there is marginal increase in irrigated area particularly of big farms which showed that perceived benefits are concentrated on large farms. Of course, it is not a new concern for distribution of benefits of any development programmes. In fact, it needs group owned water harvesting structures in real sense rather jointly owned by own relatives, neighbours or raiyets. The approach to sharing the benefits of water harvesting structure among the resource poor farmers is to develop well, which has also been found important sources for irrigating the fields in the selected watershed areas (table 3.5 a).

Table – 3.3: Irrigation Status of Agricultural Land of the Villages under Selected Watersheds (in ha)

Sl. No.	Year	Particulars	Watershed – I (Nawada Dist.)		Watershed – II (Kaimur Dist.)		Watershed – III (Aurangabad Dist.)		Watershed – IV (Rohtas Dist.)	
			Irrigated	Un-irrigated	Irrigated	Un-irrigated	Irrigated	Un-irrigated	Irrigated	Un-irrigated
1	2001-2002	Kharif	187.65	229.35	199.00	233.50	230.35	212.61	226.78	266.22
		Rabi	100.26	316.74	66.09	366.41	99.67	343.29	120.79	372.21
		Summer	1.80	415.16	-	432.50	-	-	-	493.00
2	2002-2003	Kharif	187.69	229.31	199.10	233.40	230.41	212.55	227.78	265.22
		Rabi	100.26	316.74	66.20	366.30	99.69	343.27	120.78	372.22
		Summer	1.85	415.15	-	432.50	0.50	442.46	-	493.00
3	2003-2004	Kharif	188.50	228.50	199.32	233.18	230.90	212.06	228.16	264.84
		Rabi	100.32	316.68	66.20	366.30	99.75	343.21	122.02	370.98
		Summer	1.86	415.14	-	-	0.72	442.24	0.25	492.75
4	2004-2005	Kharif	189.75	227.25	199.72	232.78	231.00	211.96	229.25	263.75
		Rabi	100.35	316.65	66.50	366.00	99.90	343.06	123.22	369.78
		Summer	1.88	415.12	0.25	432.25	0.75	441.25	0.25	492.75
5	2005-2006	Kharif	190.77	226.23	200.50	232.00	231.22	211.74	230.00	263.00
		Rabi	100.50	316.50	67.22	365.28	100.00	342.96	123.92	369.08
		Summer	1.90	415.10	0.28	432.22	0.75	442.21	0.34	492.66
6	2006-2007	Kharif	190.80	226.20	203.90	228.60	231.25	211.71	232.19	260.81
		Rabi	101.00	316.00	67.79	364.71	100.00	342.96	124.20	368.80
		Summer	1.90	415.10	0.30	432.20	0.76	442.20	0.38	492.62

Source: Field Survey

Table – 3.4: Number of Water Harvesting Structures in the Villages under Selected Watersheds

Sl. No.	Type of Structure	Watershed – I (Nawada)			Watershed – II (Kaimur)			Watershed – III (Aurangabad)			Watershed – IV (Rohtas)		
		Total no.of working		% change of working	Total no.of working		% change of working	Total no.of working		% change of working	Total no.of working		% change of working
		2001-02	2006-07		2001-02	2006-07		2001-02	2006-07		2001-02	2006-07	
1.	Tanks	03	05	66.67	03	04	33.33	02	03	50.00	03	04	33.33
2.	Check Dams	-	02	-	-	02	NA	-	03	NA	-	01	NA
3.	Nalla plugs	-	-	-	-	-	-	-	-	-	-	-	-
4.	Weirs	-	-	-	-	-	-	-	-	-	-	-	-
5.	Farm Ponds	01	06	500.00	01	07	600.00	01	08	700.00	01	04	400.00
6.	Diversion	01	01	00.00	01	01	00.00	-	-	-	-	-	-
7.	Submersible Check Dams	-	-	-	-	-	-	-	-	-	-	-	-
8.	Percolation Well	-	-	-	01	02	00.00	-	-	-	01	01	00.00
9.	Any other	01	01	00.00	01	03	200.00	01	01	-	01	01	00.00

Source: Field Survey

3.3 Impact on Area and Production of the Crops

The land development and creation of new water harvesting structures in all the watershed areas have not much effectively brought some additional areas under the important crops both in kharif and rabi. The relevant data collected from the sample farmers (table No. 3.6) indicate that paddy and maize are important cereals grown in kharif along with some pulses. In the rabi season, pulses, wheat and oilseeds are dominant crops in all the selected watershed areas. After the project, with a little improvement in soil moisture regime and availability of irrigation water from newly created water resources, there is preference for growing maize and pulses in both the seasons and for wheat in rabi season. We discussed with the sample farmers to find out if at all there was any overall increase in cropped area since the commencement of Watershed Development Programme. The responses of the beneficiary farmers are shown in table 3.6 indicate there is increase in the area under paddy crops from 0.64 per cent to 4.37 per cent across the selected watersheds whereas that in wheat crop from 0.77 per cent to 6.47 per cent, maize 0.65 per cent to 3.37 per cent, pulses 0.99 per cent to 2.08 per cent and oilseeds up to 1.85 per cent. Of course, there is increase in area of important crops but it is not much appreciable. The reason for this slight increase may be others also like good rainfall etc. Almost similar increase has been indicated by the sample farmers of non-beneficiary category, which may be seen in table 3.6.

Table – 3.5: Information regarding Changes in Irrigation of the Villages under Selected Watersheds

Sl. No	Category of farmers	Watershed – I (Nawada Dist.)				Watershed – II (Kaimur Dist.)				Watershed – III (Aurangabad Dist.)				Watershed – IV (Rohtas Dist.)				**Over all**			
		No. of H.H.	% of land acquired	% of land irrigated		No. of H.H.	% of land acquired	% of land irrigated		No. of H.H.	% of land acquired	% of land irrigated		No. of H.H.	% of land acquired	% of land irrigated		**No. of H.H.**	**% of land acquired**	**% of land irrigated**	
				2001-02	2006-07			2001-02	2006-07			2001-02	2006-07			2001-02	2006-07			**2001-02**	**2006-07**
1.	Big	09	45.54	31.9	32.4	10	56.23	47.67	47.71	07	30.78	25.00	25.90	11	33.91	28.00	29.71	**37**	**41.67**	**33.00**	**33.25**
2.	Medium	13	9.28	24.0	23.8	13	9.98	26.57	27.10	09	27.10	26.50	27.00	27	15.46	23.00	23.50	**62**	**11.64**	**25.20**	**25.29**
3.	Small	27	9.64	29.1	29.25	35	13.44	18.04	18.10	96	37.86	19.00	20.20	61	26.88	17.50	18.20	**219**	**20.55**	**21.00**	**21.08**
4.	Marginal	199	35.53	28.0	28.65	106	20.35	28.65	29.66	123	24.26	20.00	21.50	129	23.75	15.00	15.25	**557**	**26.14**	**18.00**	**18.85**

Source: Field Survey

Table – 3.5A: Information regarding Gross Irrigated Area by Sources of the Villages under Selected Watersheds

Sl. No.	Type of sources	Watershed – I (Nawada Dist.)			Watershed – II (Kaimur Dist.)			Watershed – III (Aurangabad Dist.)			Watershed – IV (Rohtas Dist.)		
		Area in ha.		% change in area	Area in ha.		% change in area	Area in ha.		% change in area	Area in ha.		% change in area
		2001-02	2006-07		2001-02	2006-07		2001-02	2006-07		2001-02	2006-07	
A.	Irrigated land (Govt.)												
	Tank	103.20	103.20	00.00	42.50	42.65	00.35	49.60	49.95	00.71	40.10	42.00	4.74
	Tube well	-	-	-	-	-	-	-	-	-	-	-	-
	Well	12.80	13.05	01.95	08.15	09.05	11.04	21.70	23.05	06.22	28.70	30.10	4.88
	Others	74.96	76.15	01.59	26.00	29.22	12.38	67.30	67.65	00.52	45.38	47.60	4.89
	Total	**190.96**	**192.40**	**00.75**	**76.65**	**80.92**	**05.57**	**138.60**	**140.65**	**1.48**	**114.18**	**119.70**	**04.83**
B.	Irrigated land (Pvt.)												
	Tank	30.12	30.40	01.00	67.15	70.50	04.99	72.40	78.40	08.29	88.25	88.47	00.25
	Tube well	28.40	24.70	(-)13.03	-	-	-	-	-	-	-	-	-
	Well	07.15	10.50	46.85	18.20	20.07	10.27	32.15	38.09	18.48	23.70	25.45	01.75
	Others	33.08	35.70	07.92	103.09	100.50	(-) 02.51	86.87	74.87	(-) 13.81	121.44	123.15	01.41
	Total	**98.75**	**101.30**	**02.58**	**188.44**	**191.07**	**01.39**	**191.42**	**191.36**	**(-) 0.03**	**233.39**	**237.07**	**01.58**
Gr. Total (A+B)		**289.71**	**293.70**	**01.37**	**265.09**	**271.99**	**02.60**	**330.02**	**332.01**	**00.60**	**347.57**	**356.77**	**02.64**

Source: Field Survey

Table – 3.6: Information regarding Important Crop Cultivated Area (in ha) of the Sample Farmers under Selected Watersheds

Sl. No.	Name of the Crop	Watershed – I (Dist. Nawada)			Watershed – II (Dist. Kaimur)			Watershed – III (Dist. Aurangabad)			Watershed – IV (Dist. Rohtas)		
		Cultivated Area (in ha)		% Change in area	Cultivated Area (in ha)		% Change in area	Cultivated Area (in ha)		% Change in area	Cultivated Area (in ha)		% Change in area
		2001-02	2006-07		2001-02	2006-07		2001-02	2006-07		2001-02	2006-07	
Beneficiary													
1.	Paddy	78.25	78.75	0.64	68.55	71.55	4.37	85.00	86.55	1.82	87.00	89.17	2.49
2.	Wheat	22.00	22.17	0.77	15.10	15.28	1.19	17.00	18.10	6.47	17.40	17.83	2.47
3.	Maize	13.78	13.88	0.72	08.00	08.27	3.37	12.20	12.28	0.65	10.22	10.52	2.93
4.	Pulses	09.12	09.22	1.10	10.05	10.15	0.99	12.00	12.25	2.08	11.25	11.38	1.15
5.	Oilseeds	05.00	05.00	-	06.10	06.10	-	07.00	07.10	1.42	8.10	08.25	1.85
All		**128.15**	**129.02**	**0.68**	**107.80**	**111.35**	**3.55**	**133.20**	**136.28**	**3.08**	**133.97**	**137.15**	**2.37**
Non-Beneficiary													
1.	Paddy	62.78	62.80	0.03	55.25	56.28	1.86	70.82	70.99	0.24	71.82	72.48	0.92
2.	Wheat	11.30	11.30	-	12.00	12.20	1.67	14.00	14.16	1.14	14.64	14.75	0.75
3.	Maize	07.00	07.15	2.14	05.10	05.20	1.96	05.54	05.70	2.89	06.72	06.78	0.89
4.	Pulses	09.25	09.25	-	02.65	02.72	2.64	03.19	03.21	0.62	04.10	04.14	0.98
5.	Oilseeds	01.00	01.00	-	01.75	01.75	-	02.10	02.12	0.95	02.00	02.04	2.00
All		**91.33**	**91.50**	**0.19**	**76.75**	**78.15**	**1.82**	**95.65**	**96.18**	**0.55**	**99.28**	**100.19**	**0.92**

Source: Primary Data

The production level of major crops before and after the project, as shown in table No. 3.7 indicate that as the pre project, production were lower except in oilseeds in WS-I, the percentage increase in production appear higher, though it is not much. The findings indicate production of paddy increased 1.11 per cent to 4.87 per cent across of the selected watershed areas, in case of wheat the increase has been recorded 1.25 per cent to 6.97 per cent, maize from 2.28 per cent to 6.61 per cent, pulses from 1.24 per cent to 3.97 per cent and oil seeds witnessed negative growth. The findings also indicate that the production increase is higher in rabi season for wheat, pulses and oilseeds across all the watersheds and this indicates the overall effectiveness of the watershed activities. Because of higher moisture availability in rabi season, farmers found increased production of the crops. Similar trend was almost indicated among the crops of non-beneficiary respondents. It seems that the benefits are not centered around the beneficiaries only rather it has been shared with non beneficiaries also. The above production data is based on farmers' recall of 2001-02 figures of production level, the year of launching of the programme.

3.4 Impact on Cost of Cultivation

It is presumed that if the facilities are extended to the farmers, the cost of the production of the crops will come down provided the prices' of all inputs are constant. But here the case is different. Neither the cost has fallen nor are the prices of any of the inputs constant. We have tried to collect the cost of cultivation of some of the important crops in the watershed areas. The data shown in table No. 3.8 indicate that the cost of cultivation of the crops at overall level has increased in all the selected watershed areas. Among the beneficiary farmers it has rose at the overall level to 8.16 per cent in WS-I, 5.54 per cent in WS-II, 4.38 per cent in WS-III and 13.08 per cent in WS-IV in 2006-07 over the year 2001-02. Similarly the cost of cultivation of the entire important crop has increased across the selected watersheds. Among the non-beneficiary farmers, the cost of cultivation of the crops at overall level increased to 8.53 per cent in WS-I, 12.36 per cent in WS-II, 12.39 per cent in WS-III and 5.16 per cent in WS-IV. It revealed that increase in cost of cultivation is mainly due to increase in prices of the inputs like fertilizer, irrigation, seeds etc. The watershed development programme could not slash to the cost of production. The reason is obvious lesser the impact of the programme

Table – 3.7: Information regarding Crop Production (in Qnt.) of the Sample Farmers under Selected Watersheds

Sl. No.	Name of the Crop	Watershed – I (Dist. Nawada)			Watershed – II (Dist. Kaimur)			Watershed – III (Dist. Aurangabad)			Watershed – IV (Dist. Rohtas)		
		Production (in qnt.)		% Change in production	Production (in qnt.)		% Change in production	Production (in qnt.)		% Change in production	Production (in qnt.)		% Change in production
		2001-02	2006-07		2001-02	2006-07		2001-02	2006-07		2001-02	2006-07	
Beneficiary													
1.	Paddy	1643.25	1661.63	1.11	1439.55	1509.70	4.87	1827.50	1882.46	3.01	1922.70	1984.03	3.19
2.	Wheat	396.00	410.15	3.57	265.61	268.93	1.25	289.00	309.15	6.97	313.20	324.68	3.73
3.	Maize	179.14	183.22	2.28	104.00	109.25	5.05	164.70	170.57	3.56	143.08	152.54	6.61
4.	Pulses	76.50	78.55	2.69	82.91	83.94	1.24	97.20	101.06	3.97	101.25	104.13	2.84
5.	Oilseeds	25.00	24.00	(-)4.00	30.50	30.80	1.00	34.30	35.35	3.06	41.31	42.24	2.25
All		**2319.89**	**2357.55**	**1.62**	**1922.57**	**2002.62**	**4.16**	**2412.70**	**2498.59**	**3.56**	**2521.54**	**2607.62**	**3.41**
Non-Beneficiary													
1.	Paddy	1318.78	1321.94	0.24	1146.44	1181.88	3.09	1490.76	1497.89	0.48	1544.13	1578.61	2.23
2.	Wheat	179.11	180.80	0.94	204.00	209.23	2.56	239.40	243.27	1.62	266.45	269.19	1.03
3.	Maize	94.50	99.03	4.79	71.91	73.79	2.61	73.41	76.64	3.04	97.57	98.99	1.45
4.	Pulses	74.00	74.19	0.25	20.91	21.76	4.06	25.72	25.97	0.97	32.80	33.95	3.50
5.	Oilseeds	05.00	05.00	-	08.75	08.78	0.40	10.50	10.62	1.14	10.00	10.24	2.41
All		**1671.39**	**1680.96**	**0.57**	**1452.01**	**1495.44**	**2.99**	**1839.79**	**1854.39**	**0.79**	**1950.95**	**1990.98**	**2.05**

Source: Primary Data

Table – 3.8: Information regarding Cost of Cultivation (in Rs./ha) of the Sample Farmers under Selected Watersheds

Sl. No.	Name of the Crop	Watershed – I (Dist. Nawada)			Watershed – II (Dist. Kaimur)			Watershed – III (Dist. Aurangabad)			Watershed – IV (Dist. Rohtas)		
		Cost of Cultivation (in Rs.)		% Change in cost of cultivation	Cost of Cultivation (in Rs.)		% Change in cost of cultivation	Cost of Cultivation (in Rs.)		% Change in cost of cultivation	Cost of Cultivation (in Rs.)		% Change in cost of cultivation
		2001-02	2006-07		2001-02	2006-07		2001-02	2006-07		2001-02	2006-07	
Beneficiary													
1.	Paddy	5100.00	5361.90	5.14	5255.70	5489.06	4.44	4972.80	5175.00	4.07	4412.75	4818.00	9.18
2.	Wheat	5042.50	5362.74	6.35	4717.15	5011.25	6.23	4221.10	4671.00	10.66	4417.20	4690.10	6.18
3.	Maize	6080.00	6325.00	4.03	5390.50	5915.19	9.73	4912.75	5070.60	3.21	4885.15	5117.19	4.75
4.	Pulses	2187.00	2212.00	1.14	2288.00	2436.00	6.47	2611.10	2942.92	12.71	2913.27	3115.22	6.93
5.	Oilseeds	2538.00	2749.00	8.31	2942.00	3011.50	2.36	2217.18	2419.27	9.11	2692.50	3351.15	24.46
All		**4823.30**	**5217.00**	**8.16**	**5392.25**	**5691.15**	**5.54**	**4725.00**	**4932.17**	**4.38**	**5120.70**	**5790.60**	**13.08**
Non-Beneficiary													
1.	Paddy	5030.12	5568.70	10.71	4639.15	5218.65	12.49	4372.50	4979.00	13.87	4072.00	4491.80	10.31
2.	Wheat	4972.30	5125.90	3.09	4731.85	5029.25	6.29	4215.70	4594.40	8.98	4218.42	4362.00	3.40
3.	Maize	4798.50	4952.17	3.20	3992.10	4101.70	0.03	4213.10	4431.70	5.19	4010.00	4292.00	7.03
4.	Pulses	2412.15	2672.75	10.68	2591.20	2881.00	11.18	2892.81	2911.50	0.65	3217.45	4012.50	24.71
5.	Oilseeds	2319.40	2517.15	8.53	2615.60	2939.00	12.36	3481.00	3912.25	12.39	3790.14	3985.75	5.16
All		**4615.00**	**5420.00**	**17.44**	**5020.00**	**5715.00**	**13.84**	**3990.00**	**4828.00**	**21.00**	**4919.00**	**5420.00**	**10.18**

Source: Primary Data

3.5 Impact on Disposal of Produce

The impact of the programme has also been assessed on disposal of the produce. Usually farmers used to dispose off their surplus produce after keeping the quantity for home or domestic consumption intact. In our study area the disposal for all the crops level in WS-I is lower in 2006-07 compared to 2001-02 among the beneficiary households however it is a bit higher among the non-beneficiary may be farmers. The reason behind low disposal may be lower production. Among the beneficiary households, the percentage of disposal is comparatively higher in 2006-07 across all the three watersheds viz., by 34.47 per cent in WS-II, 18.82 per cent in WS-III and 19.86 per cent in WS-IV. Similar is the case among the non-beneficiary households. The percentage of disposal in 2006-07 over the year 2001-02 is higher by 0.39 in WS-I, 6.46 in WS-II, 17.15 in WS-III and 21.93 in WS-IV, as shown in table No. 3.9. It revealed that the volume of disposal has increased in 2006-07 over 2001-02 across all the watersheds and households. It may be due to distribution of benefits amongst all the households/villagers.

3.6 Impact on Income

An attempt has also been made to estimate the income of the beneficiary and non-beneficiary farmers before and after the project. The main purpose is to asses the degree of equality or inequality in the income distribution process. The analysis has been made on beneficiary and non-beneficiary farmers both on the basis of receiving tangible and recurring income from different sources like agriculture, service, business and other sources. In table No. 3.10 showed the average annual income of both the group of farmers across the selected watersheds area. Table No. 3.10 revealed that the total average income of beneficiary group has increased after the project in all the selected watersheds but it is higher in WS-III 25.24 per cent followed by WS-II 19.22 per cent, WS-IV 11.30 per cent and WS-I 0.31 per cent. If we examine the source wise increase it is highest 29.29 per cent from agriculture in WS-III and lowest 1.29 per cent from business source in WS-I except two negative growth (-) 30.00 per cent from other sources in WS-I and (-) 3.26 per cent from business in WS-IV. The data suggest that the watershed activities have benefitted them in the form of land and crop improvement in agricultural management. Besides agricultural activities the average income from other sources has also increased, which may be due to support of primary sector or increase in income generating activities. Almost similar is the case of so called non-beneficiary group. The overall average income in all watershed area has increased after the watershed activities. However, the increase is higher in WS-IV 23.18 per cent, followed by WS-I 14.72 per cent, WS-II 5.13 per cent and WS-III 2.56 per cent, which may be seen in table No.3.10.

Table – 3.9: Information regarding Disposal of Yield (in Qnt.) of the Sample Farmers under Selected Watersheds

Sl. No.	Name of the Crop	Watershed – I (Dist. Nawada)			Watershed – II (Dist. Kaimur)			Watershed – III (Dist. Aurangabad)			Watershed – IV (Dist. Rohtas)		
		Disposal of Yield (in qnt.)		% Change in disposal of yield	Disposal of Yield (in qnt.)		% Change in disposal of yield	Disposal of Yield (in qnt.)		% Change in disposal of yield	Disposal of Yield (in qnt.)		% Change in disposal of yield
		2001-02	2006-07		2001-02	2006-07		2001-02	2006-07		2001-02	2006-07	
Beneficiary													
1.	Cereals	552.87	465.75	(-)15.61	230.23	321.52	39.65	482.78	582.66	20.68	689.08	833.63	20.97
2.	Pulses	21.00	21.60	2.86	41.46	46.17	11.36	56.38	60.64	7.55	58.73	64.56	9.93
3.	Oilseeds	13.75	08.40	(-)38.91	15.50	18.48	19.23	17.15	17.68	3.09	22.72	25.34	11.53
All		**587.62**	**495.75**	**(-)15.63**	**287.19**	**386.17**	**34.47**	**556.31**	**660.98**	**18.82**	**770.53**	**923.53**	**19.86**
Non-Beneficiary													
1.	Cereals	404.67	397.14	(-)1.86	385.20	410.39	6.54	508.39	598.82	17.79	373.87	460.09	23.06
2.	Pulses	37.00	46.00	24.32	12.54	14.14	12.76	16.46	17.08	3.77	20.61	22.07	7.08
3.	Oilseeds	03.25	03.50	7.69	06.13	05.44	(-)11.26	06.28	06.27	(-)0.16	06.00	06.14	2.33
All		**444.92**	**446.64**	**0.39**	**403.87**	**429.97**	**6.46**	**531.13**	**622.17**	**17.15**	**400.48**	**488.30**	**21.93**

Source: Primary Data

Table – 3.10: Information regarding Average Annual Income (In Rs.) of the Sample Farmers under Selected Watersheds

Sl. No.	Name of the Occupation	Watershed – I (Nawada)			Watershed – II (Kaimur)			Watershed – III (Aurangabad)			Watershed – IV (Rohtas)		
		Annual Income (in Rs.)		% Change in annual income	Annual Income (in Rs.)		% Change in annual income	Annual Income (in Rs.)		% Change in annual income	Annual Income (in Rs.)		% Change in annual income
		2001-02	2006-07		2001-02	2006-07		2001-02	2006-07		2001-02	2006-07	
Beneficiary													
1.	Agriculture	25500	27350	7.25	39000	45500	16.67	24948	32417	29.94	40124	44965	12.07
2.	Service	--	--	--	--	--	--	--	--	--	322	615	91.00
3.	Business	5045	5110	1.29	12800	16254	26.98	1342	1467	9.31	1290	1248	(-)3.26
4.	Others	6000	4200	(-)30.00	--	--	--	4932	5219	5.82	2512	2419	3.70
5.	**Total**	**36545**	**36660**	**0.31**	**51800**	**61754**	**19.22**	**31222**	**39103**	**25.24**	**44248**	**49247**	**11.30**
Non-Beneficiary													
1.	Agriculture	20185	22765	12.78	28912	32310	11.75	41742	44387	6.34	36671	44931	22.52
2.	Service	317	412	29.97	404	92	(-)77.23	1309	687	(-)17.52	--	--	--
3.	Business	221	303	41.18	1205	985	(-)18.26	442	389	(-)3.68	605	540	10.74
4.	Others	765	942	23.14	540	320	(-)40.74	1217	392	(-)67.79	342	865	+152.92
5.	**Total**	**21288**	**24422**	**14.72**	**32061**	**33707**	**5.13**	**44710**	**45855**	**2.56**	**37618**	**46336**	**23.18**

Source: Primary Data

3.7 Impact on Livestock Holding

In order to further explore the aspect relating to holding of livestock, we have collected information from the selected watersheds to know whether there has been reduction or induction in the number of stall fed animals (cow/buffalo) and open grazing animals (goat/sheep). The villager reporting possession of these livestock before and after the project, are shown in table No. 3.11. The data presented in table suggest that in all watersheds milk and meat generating animals/birds are kept by a large number of families to supplement their food items and cash resources, while cows/buffaloes are kept for sourcing domestic milk consumption of children and of course for generating income. In all the selected watershed areas the total number of livestock increased in number in 2006-07 over 2001-02. It has been increased as much as 73.00 per cent in WS-I, 30.74 per cent in WS-IV, 21.32 per cent in WS-III and 10.78 per cent in WS – II. It reveals that the project has facilitated the villagers in keeping larger number of livestock. But in absence of a clear and agreed livestock holding and grazing practices there can not be a favourable long term impact on conservation of common land resources.

3.8 Impact on Quality of Life

The sample households were asked about what they felt were the main impacts of the watershed programme in their villages. The responses of the households indicating their perceptions in regard to change in 2006-07 over 2001-02 in quality of life are described in table No. 3.12. The perceptions of beneficiary farmers indicate that positive changes have taken place in recharging of groundwater and qualitative aspects of livelihood by about 15 to 20 per cent across watershed areas. Next in importance are irrigation, afforestation and availability of irrigation, which have changed positively to the tune of 17.50 per cent across the watershed areas. Absorption of women in various activities (7.50 to 15.00 %), production (10.00 to 15.00%), cropping intensity (7.50 to 10.00 %), etc. have also changed significantly. As both the beneficiaries and non-beneficiaries have got benefits directly or indirectly in all watersheds so non-beneficiaries perceptions have also been presented in table No. 3.12. It is important to note that the non-beneficiaries, irrespective of their landholding status across all watersheds, have indicated the positive change of the programme on improvement in groundwater conditions (7.50 to 15.00%). About 5.00 to 12.50 per cent positive change in qualitative aspect of livelihood has also been indicated across the watershed areas. Next are positive change in production (2.5 to 7.5 %) and availability of irrigation (5.00 to 15.00%). The above analysis reveals that there is a general improvement in quality of life but in overall sense, the impact of the programme in these watersheds has been somewhat lower.

Table – 3.11: Information regarding Live Stock of the Villages under Selected Watersheds

Sl. No.	Type of Live Stock	Watershed – I (Nawada)			Watershed – II (Kaimur)			Watershed – III (Aurangabad)			Watershed – IV (Rohtas)		
		Number		% Change	Number		% Change	Number		% Change	Number		% Change
		2001-02	2006-07		2001-02	2006-07		2001-02	2006-07		2001-02	2006-07	
1.	Bullocks	01	02	50.00	188	207	10.11	207	228	10.14	90	115	27.78
2.	Cows	180	300	66.67	190	215	13.16	210	235	11.90	165	220	33.33
3.	Cow calf he/ she	60	80	33.33	210	290	38.10	285	315	10.53	103	111	7.77
4.	Buffalo	300	500	66.67	40	48	20.00	267	290	8.61	80	103	28.75
5.	Buffalo calf he/ she	170	240	41.18	28	41	46.43	272	310	13.97	72	85	19.06
6.	Goat	490	800	63.27	366	442	20.77	817	1012	23.87	414	574	38.65
7.	Sheep	-	-	-	-	-	-	480	675	40.63	-	-	-
8.	Camel	-	-	-	-	-	-	-	-	-	-	-	-
9.	Others	-	-	-	-	-	-	215	275	27.91	-	-	-
10.	**Total**	**1111**	**1922**	**73.00**	**1122**	**1243**	**10.78**	**2753**	**3340**	**21.32**	**924**	**1208**	**30.74**

Source: Field Survey

Table – 3.12: Direct Impact of Watershed in changing quality of life of the Sample Farmers under Selected Watersheds

Sl. No.	Particulars	Watershed – I (Nawada)		Watershed – II (Kaimur)		Watershed – III (Aurangabad)		Watershed – IV (Rohtas)	
		Since Inception to Completion (2001-02 to 2006-07)		Since Inception to Completion (2001-02 to 2006-07)		Since Inception to Completion (2001-02 to 2006-07)		Since Inception to Completion (2001-02 to 2006-07)	
		Changed Positively*	Same	Changed Positively*	Same	Changed Positively*	Same	Changed Positively*	Same
Beneficiary									
1.	Production	10.00	90.00	15.00	85.00	12.50	87.50	10.00	90.00
2.	Cropping intensity	7.50	92.50	7.50	92.50	10.00	90.00	10.00	90.00
3.	Irrigation	12.50	87.50	17.50	82.50	15.00	85.00	12.50	87.50
4.	Quality of land	-	100.00	-	100.00	-	100.00	-	100.00
5.	Recharging of ground water	20.00	80.00	17.50	82.50	20.00	80.00	15.00	85.00
6.	Availability of irrigation	10.00	90.00	12.50	87.50	17.50	82.50	15.00	85.00
7.	Other agro-allied activities	-	100.00	-	100.00	-	100.00	-	100.00
8.	Labour absorbing	10.00	90.00	-	100.00	-	100.00	-	100.00
9.	Out migration	-	100.00	-	100.00	-	100.00	-	100.00
10.	Absorption of women in various activities	7.50	92.50	15.00	85.00	15.00	85.00	10.00	90.00
11.	Enhancement of female labour absorption	-	100.00	-	100.00	-	100.00	-	90.00
12.	Changes in forestry and Afforestation	12.50	87.50	17.50	82.50	15.00	85.00	12.50	87.50
13.	Change in livestock	-	100.00	-	100.00	12.50	87.50	5.00	95.00
14.	Increase in CPRS	-	100.00	-	100.00	-	100.00	-	100.00
15.	Change in literacy	-	100.00	-	100.00	-	100.00	-	100.00
16.	Change in qualitative aspects of livelihood	15.00	100.00	20.00	80.00	10.00	90.00	12.50	87.50
Non-Beneficiary									
1.	Production	2.50	97.50	5.00	95.00	5.00	95.00	7.5	92.50
2.	Cropping intensity	-	100.00	-	100.00	-	100.00	-	100.00
3.	Irrigation	-	100.00	5.00	95.00	5.00	95.00	15.00	85.00
4.	Quality of land	-	100.00	-	100.00	17.50	100.00	-	100.00
5.	Recharging of ground water	10.00	90.00	7.50	92.50	5.00	82.50	15.00	85.00
6.	Availability of irrigation	7.50	92.50	2.50	97.50	-	95.00	2.5	97.50
7.	Other agro-allied activities	-	100.00	-	100.00	-	100.00	-	100.00
8.	Labour absorbing	-	100.00	-	100.00	-	100.00	-	100.00
9.	Out migration	-	100.00	-	100.00	-	100.00	-	100.00
10.	Absorption of women in various activities	-	100.00	-	100.00	-	100.00	-	100.00
11.	Enhancement of female labour absorption	-	100.00	-	100.00	-	100.00	-	100.00
12.	Changes in forestry and Afforestation	-	100.00	-	100.00	-	100.00	-	100.00
13.	Change in livestock	-	100.00	-	100.00	-	100.00	-	100.00
14.	Increase in CPRS	-	100.00	-	100.00	-	100.00	-	100.00
15.	Change in literacy	-	100.00	-	100.00	-	100.00	-	100.00
16.	Change in qualitative aspects of livelihood	5.00	95.00	7.5	92.50	12.50	87.50	5.00	95.00

** Attributes given in percentage responsiveness of the households*

Source: Primary Data

3.9 Training and Formation of UGs and SHGs

As part of the watershed development programme, the PIAs are required to organize training camps in the watershed areas to improve the technical knowledge of WC (Watershed Committee) and WA (Watershed Association) so as to facilitate decentralized management and improved land management practices. The training programmes are also needed to help villagers in the formation of SHGs with specific reference to formation and activation of group enterprises for non-beneficiaries, women and other weaker sections that are not part of the on-going development programmes. In this context 3 to 4 training programmes relating to know-how of the programme and land management practices organized and UGs and SHGs formed in our sample watershed areas, which are shown in table No. 3.13. The table shows that in the initial years of the programme particularly in the year 2002-03 and 2003-04 no user groups (UGs)/Self Help Groups (SHGs) could be formed in any of the sample districts. It is due to delay in launching of the programme. However, SHGs formed by landless and women particularly of Scheduled Castes in these watersheds have received sewing machines, she-goats, leaf plate making machine, dhankutti machine, etc. for undertaking non-farm group enterprises. But due to poor skill and low level of maintenance, these assets could not be able to support the livelihood of the beneficiary members. There is also no rotation of funds in the SHGs. The member, once advanced did not return back the money rather tensions have been created in repayment.

It would not be out of place to mention here that formation of SHGs and UGs was exclusively meant for the purpose of disbursing the subsidy amount to SHG members and to fulfill the requisite papers for taking up the watershed activities respectively. The focus on formation of SHGs that match a 'maturing revolving fund' to a micro-plan proposed by the concerned households (landless families) for livelihood support such as dairy, goatry, sheep rearing, poultry, duckery, mushroom cultivationu7, micro enterprises, etc. was almost not found. Virtually the subsidy based activities had a set back after the completion of watershed projects. SHG members were simply fond of regular assistance rather inclined to enhance

livelihood capabilities and undertake activities required for a means of living. Similar was the case of UG members who simply manage to get the benefits directly at the cost of inclusion of his/her names in the groups. In fact, the members of UGs and SHGs have not taken the activities to a mission mode to go about the watershed development.

3.10 Operational Effectiveness

We have shown details of watershed areas and their specific impacts. While the selected areas are water scarce areas and the dependent people are mostly small and marginal farmers and landless labourers all user groups in a watershed have not been made part of the Watershed Association (WA) and shared the direct benefit flows. PIAs have adopted different implementation approach. However, none of them has tapped other sources of funding and integrated the same in the extended project works. The approaches of all PIAs have been to implement the plan/activities within the prescribed budget limit, with almost no planning for user groups. The WDT is not effective in the area of community organization. Since all the PIAs are local, so they prefer to undertake the programme in their own lands or in lands of own relatives or close associates. Sometimes they took bigger activities in their lands and supported those activities out of the watershed funds in the name watershed activities. However, they all have performed well in terms of level of achievements of physical (93.00 % and above in number and 83.00 % and above in coverage) and financial (98.00 % and above) which may be seen in table No. 3.14.

Table –3.13: Year-wise Formation of UGs and SHGs of the Selected Watersheds

	Formation of UG									Formation of SHG								
	No	General		SC		OBC		Total		No	General		SC		OBC		Total	
		Male	Female	Male	Female	Male	Female	Male	Female		Male	Female	Male	Female	Male	Female	Male	Female
I- Nawada																		
2002-03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2003-04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2004-05	5	4	-	6	-	-	-	10	-	-	-	-	-	-	-	-	-	-
2005-06	8	6	-	13	-	2	-	21	-	4	5	-	-	9	-	2	5	11
2006-07	9	9	2	12	-	7	-	28	2	2	3	-	-	12	3	4	6	16
Total	**22**	**19**	**2**	**31**	**-**	**9**	**-**	**59**	**2**	**6**	**8**	**-**	**-**	**21**	**3**	**6**	**11**	**27**
II- Kaimur																		
2002-03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2003-04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2004-05	4	9	-	6	-	-	-	10	-	-	-	-	-	-	-	-	-	-
2005-06	11	23	-	13	-	2	-	21	-	1	5	-	-	9	-	2	5	11
2006-07	12	14	-	9	-	7	-	28	2	2	3	-	-	12	3	4	6	16
Total	**27**	**46**	**-**	**28**	**-**	**9**	**-**	**59**	**2**	**3**	**8**	**-**	**-**	**21**	**3**	**6**	**11**	**27**
III- Aurangabad																		
2002-03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2003-04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2004-05	4	6	-	9	-	2	-	17	-	-	-	-	-	-	-	-	-	-
2005-06	9	18	-	12	-	5	-	35	-	1	-	-	-	3	-	1	-	4
2006-07	8	16	-	11	-	12	-	39	-	4	-	-	-	9	-	3	-	12
Total	**21**	**40**	**-**	**32**	**-**	**19**	**-**	**91**	**-**	**5**	**-**	**-**	**-**	**12**	**-**	**4**	**-**	**16**
IV- Rohtas																		
2002-03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2003-04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2004-05	7	12	-	-	-	9	-	21	-	-	-	-	-	-	-	-	-	-
2005-06	8	8	-	-	-	19	-	27	-	1	-	-	-	-	-	11	-	11
2006-07	5	8	-	-	-	8	-	16	-	3	-	-	-	25	-	4	-	29
Total	**20**	**28**	**-**	**-**	**-**	**36**	**-**	**64**	**-**	**4**	**-**	**-**	**-**	**25**	**-**	**15**	**-**	**40**

Source: Field Survey

Table No. 3.14: Details of Physical & Financial Targets and Achievements of the selected Watersheds During 2002-2007

Sl. No	Districts	Name of the Selected Watershed	Physical				Financial (In lakh Rs.)	
			Target		Achievement		Target	Achievement (In %)
			No.	Coverage	No. (%)	Coverage (%)		
I	Nawada	Nata Nala M/W-B	182	242	171(93.96)	217(89.67)	18.10	17.840 (98.56)
II	Kaimur	Khamkala M/W-K-5	132	253.5	190(143.94)	212.5(83.83)	18.00329	17.837 (99.08)
III	Aurangabad	Narkapi Machani M/W – K-8	161	237	159(98.76)	224(94.51)	18.00489	17.84746 (99.13)
IV	Rohtas	Jayantipur M/W Sone-2-I	198	136	192(96.97)	123(90.44)	18.10	17.96980 (99.28)

Source: Respective Watersheds

3.11 Overall Impact

In fact, there in no single indicator of successful watershed development, so the most feasible approach is to compare the performance of a variety of indicators, which also reflect the diversity of project objectives. These include, among other things cost of the project, creation of employment, additional area covered under cultivation and irrigation etc. Besides pre and post analysis of area, production and productivity, cropping intensity, income benefits, irrigation, recharging groundwater, area under green cover/biomass, etc. also reflect the performance. All the projects surveyed shared most of these objectives. The indicators vary in their level of rigor and reliability, which is inevitable given the lack of baseline or monitoring data in the selected villages. Table No. 3.15 presents an overview of performance indicators and table No. 3.16 show the percentage change in post project year over pre project year.

Developing non-arable lands also has direct benefits, particularly if it increases the long term availability of products such as fuel and fodder, historically supplied by these lands. Soil and water conservation trenches are dug to concentrate water and soil with trees and grasses planted in the trenches. In watershed area the villagers were also provided with fuel wood and fruit saplings, as part of the watershed development programme to meet their fuel and fodder requirement in near future. Fruit saplings have been given to farmers in all watersheds for plantations in their own farm. The survival rate of the saplings for fuel and fodder has been found ranging from 23.33 per cent to 36.76 per cent across the selected watersheds. Similarly in case of saplings for horticultural crops it is 32.14 per cent to 45.00 per cent across the selected watersheds. If these rates are maintained, visible impact may be seen in near future. But for the time being it will be early to conclude something specific.

Costs and Benefits

As such the project includes several activities other than soil and water conservation measures. If all the activities are considered for holistic development, the cost per hectare comes to Rs. 8213 in WS-I followed by Rs. 8144 in WS-II, Rs. 7103 in WS-IV

and Rs. 6561 in WS-III. The internal rate of return, calculated on the basis of the additional income over and above the pre-project income from agriculture, micro enterprises, wages, etc. within village, varies from 187.00 per cent to 202.00 per cent (average of 4th & 5th year) across the sample watersheds. The cost and benefit ratio also varies from 1:1.87 to 1:2.02 (table No. 3.15).

Creation of Employment

The watershed development programme has a significant positive impact on creation of employment opportunities for the villagers, both landless as well as landowners. The data presented in table No. 3.15 show that employment has been created during the four year operations to the extent of about 7142 mandays in WS-I to the highest of 8915 of mandays in WS-III. The average employment generation per hectare of watershed areas works out to 12.75 mandays in WS-I, 14.80 mandays in WS-IV, 16.31 mandays in WS-II and 17.58 mandays in WS-III.

Financial Assistance

Financial assistance @ Rs. 15,000/- to male SHG and @ Rs. 36,000/- to female SHG has been given across the watersheds. The amount was not given in cash rather distributed in kinds like; she-goats, machines (sewing, patta plate making, etc.) The assistance was given under livelihood support activities of the watershed programme. The information on additional area brought under cultivation as well as irrigation does not show much encouraging. It is due to the fact that the increase in area is less than 5.00 per cent of project area.

The quantitative impact on some important variables, as shown in table No. 3.16 indicates that except pulses (-2.55%) in WS-III, the productivity of major crops have noticed positive change but in case of cereals it is from (6.44 % to 2.87 %), pulses (-) 2.55% to 10.44%, oilseeds from 0.59% to 6.78% and vegetables and others from 0.19% to 2.40% across the watersheds. The cropped area increased up to 6.41 per cent in cases of cereals, (-) 8.93 per cent to 8.57 per cent in case of pulses, up to 16.67 per cent in case of vegetables and others and no change was found in oilseeds area across the watersheds. The cropping intensity has fallen by 4.72 per cent in WS-III whereas that of increased to 2.55 per cent in WS-II and 2.00 per cent in WS-I. No change has

been found in WS-IV. As regards the income benefit, it has increased from 8.22 per cent to 13.28 per cent per hectare per annum. Similarly, annual per hectare family income has also increased from 5.45 per cent to 10.49 per cent across the selected watersheds. However, its equity depends on the magnitude of the households of the area. Positive change has also been found in case of level of groundwater and coverage of green/biomass in the villages.

Basic Amenities

In order to have assessed the quality of life of the sample households, the stock of basic amenities available to them is important, which are shown in table No. 3.17. The data presented in table revealed that the households have the access of schooling facilities for their children up to the secondary level, medical facility, public distribution outlet, bank, police station, etc. locally. The number of public toilet is negligible, which indicate that public sanitation programme has not reached in the villages. Most of the households used to sell their produce mostly in the hands local traders or middlemen since there is no regulated market structures in the villages.

Table – 3.15: Performance Indicators of the Selected Watersheds

Sl.No.	Particulars	Selected Watershed			
		Watershed – I (Nawada)	Watershed – II (Kaimur)	Watershed – III (Aurangabad)	Watershed – IV (Rohtas)
1.	Project Cost (Rs. In lakh)	17.840	17.837	17.847	17.969
2.	Watershed Area taken up for Development (in ha.)	560	521	507	544
3.	Area developed (in ha.)	208	219	272	253
4.	Per Hectare Cost (In Rs.)	8213/ha	8144/ha	6561/ha	7102/ha
5.	Internal Rate of Return (In %)	187	192	189	202
6.	Cost Benefit Ratio	1:1.87	1:1.92	1:1.89	1:2.02
7.	Agro Forestry:				
	i) No. of seedlings planted	250	325	300	340
	ii) No. of seedlings survived	85	95	70	125
	iii) Survival percentage (%)	34.00	29.23	23.33	36.76
	iv) Area covered (in ha.)	4	7	6	5
8.	Horticulture:				
	i) No. of seedlings planted	800	750	700	700
	ii) No. of seedlings survived	360	300	225	250
	iii) Survival percentage (%)	45.00	40.00	32.14	35.71
	iv) Area covered (in ha.)	18	20	25	22
9.	Employment generated (man days)	7142(12.75/ha)	8500(16.31/ha)	8915 (17.58/ha)	8050 (14.80/ha)
10.	No. of training conducted	5	4	5	5
11.	No. of persons trained	93	70	65	75
12.	Fund given to per SHG	M=15000, F=36000	M=15000, F=36000	M=15000, F=36000	M=15000, F=36000
13.	Additional area brought under cultivation	2	8	5	6
14.	Additional area brought under supplemental irrigation	18	14	14	17

Source: Field Survey

Table – 3.16: Pre and Post Project Scenario of the Selected Watersheds

Sl. No.	Particulars	Watershed – I (Nawada)			Watershed – II (Kaimur)			Watershed – III (Aurangabad)			Watershed – IV (Rohtas)		
		Pre	Post	% Change	Pre	Post	% Change	Pre	Post	% Change	Pre	Post	% Change
1.	Productivity of major crops (kg/ha.):												
	a) Cereals	1961	2005	2.24	1593	1600	0.44	2110	2140	1.42	2090	2150	2.87
	b) Pulses	708	789	10.44	685	685	0.00	667	650	(-) 2.55	650	650	0.00
	c) Oilseeds	509	512	0.59	489	502	2.66	590	630	6.78	575	600	4.35
	d) Vegetables & Others	14.65	14.70	0.34	12318	12425	0.87	15550	15580	0.19	12500	12800	2.40
2.	Major cropped area (in ha.):												
	a) Cereals	156	166	6.41	132	135	2.27	217	217	0.00	190	190	0.00
	b) Pulses	35	38	8.57	56	51	(-) 8.93	42	42	0.00	27	25	(-) 7.41
	c) Oilseeds	5	5	0.00	8	8	0.00	13	13	0.00	10	10	0.00
	d) Vegetables & Others	28	30	7.14	40	40	0.00	42	48	14.29	30	35	16.67
3.	Cropping Intensity (%)	112	114	2	120.92	124	2.55	143.7	139	(-) 4.72	140.5	140	0.00
4.	Farm Income per ha. per year (in	16015	18142	13.28	20930	22718	8.54	22150	23970	8.22	24300	26500	9.05
5.	Family income per ha. per year (in	22165	23400	5.57	22917	25320	10.49	27500	29000	5.45	26500	28000	5.66
6.	Migration of rural labour	25	25	0	10	10	0.00	0.00	0.00	0.00	-	-	-
7.	Green cover/ biomas (%)	5	6	20.00	20	22	10.00	8	10	25.00	5	7	40.00
8.	Ground water level (metres)	20	16	20.00	23	25	8.70	19	18	(-) 5.26	16	15	(-) 6.25
9.	Animal breed improvement	No	No	No	No	No	No	No	No	No	No	No	No
10.	Fodder yield (kg/per ha.)	400	400	00.00	375	390	4.00	510	525	2.94	300	300	00.00
11.	Average milk yield (litres per day)	360	425	18.06	615	650	5.69	450	500	11.11	325	300	00.00
12.	Number of farmers adopted stall feeding	No	No	No	No	No	No	No	No	No	No	No	No
13.	Percentage run of from the	-	-	-	-	-	-	-	-	-	-	-	-

Source: Primary Data

Table – 3.17: Basic Amenities Available to the Sample Households under Selected Watersheds

Sl. No.	Particulars	Watershed – I (Nawada)		Watershed – II (Kaimur)		Watershed – III (Aurangabad)		Watershed – IV (Rohtas)	
		2001-02	2006-07	2001-02	2006-07	2001-02	2006-07	2001-02	2006-07
1.	School : a) Primary School	01	01	1	1	1	1	1	1
	b) Secondary School	01	01	1	1	1	1	1	1
	c) High School	-	-	-	-	-	-	-	-
2.	No. of Students : a) Boys	375	700	212	262	352	515	42	47
	b) Girls	125	350	148	152	107	200	38	43
3.	Nearest Medical Services (In kms.): a) Doctor	01	01	1	1	2	2	2	2
	b) Nurse	01	01	1	1	2	2	2	2
	c) Nearest Primary Health Centre	01	01	1	1	4	4	2	2
4.	Nearest Post Office (In kms.)	01	01	1	1	1	1	2	2
5.	Nearest Police Station (In kms.)	01	01	1	1	4	4	2	2
6.	Nearest Public Distribution System Outlet (Ration Shop) (In kms.)	01	01	1	1	1	1	1	1
7.	Nearest Bank (In kms.)	01	01	1	1	5	5	2	2
8.	Nearest Agriculture Produce Market (In kms.)	15	15	17	17	5	5	4	4
9.	Number of Public Toilets	-	-	-	-	5	7	-	-
10.	Number of Households with Latrine facilities	32	45	27	41	9	15	11	14

Source: Field Survey

CHAPTER – IV

SUMMARY & CONCLUSIONS

4.1 Background

The Green Revolution that transformed agriculture elsewhere in India had little impact on rainfed agriculture where agricultural productivity is low, natural resources are degraded, and the people are poor. It is one of the reasons of poverty. A vast majority of the rural poor depend on these degraded natural resources for their livelihood. These areas are characterized by a large human and cattle population, which are continuously putting heavy pressure on the already fragil natural resource base for food, fodder and fuel. A scientific natural resource management approach was needed to improve the vegetative cover and groundwater potential of these areas, while at the same time involving the rural poor in planning, implementing and managing the resource base. Accordingly, following the recommendation of the Hanumantha Rao Committee, at watershed approach, was adopted from 1995. The Ministry of Agriculture (MoA), Ministry of Rural Development (MoRD) and Ministry of Environment and Forest (MoEF) along with their respective departments in the state are the three main government ministries in charge of watershed development programmes in the country. Each programme focuses on different aspects and activities within the ministry's development criteria. The Ministry of Agriculture has worked in watershed development since 1960s. The largest project in terms of scope and extent is the National Watershed Development Project for Rainfed Areas (NWDPRA) being implemented by Ministry of Agriculture. The broad objectives of the NWDPRA are as follows:

1. *Conservation, development and sustainable management of natural resources including their use.*
2. *Enhancement of agricultural productivity and production in a sustainable manner.*
3. *Restoration of ecological balance in the degraded and fragile rainfed eco-systems by greening these areas through appropriate mix of trees, shrubs and grasses.*

4. *Reduction in regional disparity between irrigated and rainfed areas.*
5. *Creation of sustained employment opportunities for the rural community including the landless.*

In view of recommendations of the Hanumantha Rao Committee (1994), the Ministry of Agriculture revised its guidelines for NWDPRA as more participatory, sustainable and equitable. There has been a radical shift of top down approach to bottom up line management system in organizing the watershed areas. This bottom up approach with revised guidelines of NWDPRA i.e., WARSA JANSAHBHAGITA with full participation and consensus of the participants provides for decentralization of producers, flexibility in choice of technology and provision for active involvement of the watershed community in planning, execution and evaluation of the programme so that the programme becomes sustainable and growth oriented.

4.2 Review of Literature

The literature on watershed development is growing rapidly but most of it is confined to qualitative descriptions of success stories. The few quantitative studies available tend to be based on a small number of heavily supervised projects, with no information about long term effects. At the same time the vast majority of projects were never evaluated, and there were good reasons to suspect that most of them had little impact (Kern & Singh, 1992). Watershed projects have become wide spread in rainfed areas in recent years, with a current annual budget that exceeds US $ 500 million (Farrington, Turton & James, 1999). A study (Sastry et. al; 2002) in Kupan area of Chittor district of Andhra Pradesh revealed that many water harvesting structures such as check dam cascades, percolation tanks and farms/sunken ponds were constructed to augment water resources in addition to canopy development. Thus, groundwater recharge has increased tremendously. Non land based activities such were supported in watershed programme village with some support had a set back after withdrawal of watershed programme. However, there are some activities that have been continuing even today (Reddy et. al, 2002). Sastry et. al (2003) found that the sustainability of agriculture is possible by harvesting rainwater and

improving the groundwater. A study conducted by Policy and Development Initiatives (2001) indicated that the employment benefit is the most favourable impact of the watershed programme. Benefits accrued from the watershed development strengthened the livelihood of the village community. In addition to this, the watershed programme intervention created a spirit of collectivization of resources among the villagers (Mishra, 2007). A watershed changed whole eco-system and socio-economic scenario in a village of Hassan district of Karnataka (Kakade et. al, 2001). There is no separation of the terms watershed development and livelihood intervention because the watersheds as the bio-physical environment are the basis of livelihoods for all villagers (felix.gnetem@ideamail.ch) . A study in Kanpur Dehat district of Uttar Pradesh found that implementation of watershed development project has resulted in area expansion, increase in livestock population and improvement in crop productivity (Babu et. al; 2004). Ameja & Khara (2005) concluded that watershed development can be the most effective approach in not only mitigating the effects environmental crisis but also in increasing the employment opportunities.

But it is important to examine the weaknesses so that the programme achieves its objectives and the nation gets full value of time, money and priority (Seth, 2000). Development is understood in terms of how the whole village or area can best support itself with the resources it already has (ifpri.org, 2001). Mishra & Mishra (2009) found that watershed management suffers from major constraints like lack of funds, insufficient manpower, poor co-ordination, low mobility, etc. Mishra (2009) said that its inclusive development strategy has broadened the scope of the watershed development programme as an intervention to improve the living standard of the tribal households of Koraput district in Orissa. But Planning Commission's Working Group of Natural Resource Management (NRM) – 2007 noted that in spite of spending about US $ 4500 million for watershed development in the rainfed region, the results are invisible and treated areas have reverted to their original status, thus development processes require a through examination. Hence, a situation specific assessment needs to be done at the regular intervals. It may be

due to this fact RFS division of Ministry of Agriculture suggested the Directorate of Economics & Statistics, Ministry of Agriculture, Government of India and thus, the AER Division of the Ministry has assigned an impact evaluation study on **"Impact Evaluation of Revised National Watershed Development Projects for Rainfed Areas (NWDPRA) during 10th Plan in Bihar"** to Agro-Economic Research Centre for Bihar & Jharkhand, T M Bhagalpur University, Bhagalpur.

4.3 Objectives of the Study

The basic objectives of the present Mid-Term Evaluation are as follows:

1. *To assess the qualitative performance of the programme.*
2. *To cross-examine the information furnished by States on implementation of the programme.*
3. *To assess the impact of the programme.*
4. *To ensure implementation of the programme in accordance with the revised guidelines.*
5. *To have suitable policy implications, if need be.*

4.4 Methodology

The study is based on both secondary and primary data. As far as secondary data is concerned the study has used the data collected from the nodal department of the programme at the state level i.e., Directorate of Soil Conservation, Dept. of Agriculture, Government of Bihar and its district offices and other published and unpublished data of the government, 11th Plan document and various other sources. The primary data was collected from various units through canvassing structured schedules viz., village schedule and household's schedule. The village schedule was administered in micro watersheds village schedules' and the household schedule. The village schedule was administered in micro watersheds villages and the household schedule amongst the beneficiaries and non-beneficiaries of the programme. A sample of 320 village households was selected for the purpose of study. The sample was drawn on the basis of a multistage stratified sampling method. In the first stage four districts were selected on the basis of larger physical and financial achievements under the projects/schemes. These districts are

Nawada, Kaimur, Aurangabad and Rohtas. In the second stage one micro watershed from each of the selected districts was selected on the basis of the same criteria as adopted in case of selection of the districts. Thereafter lists of beneficiaries and non-beneficiaries from each of the selected watershed areas/villages were prepared and classified in 5 categories of households viz., landless, marginal (1ha), small (1-2 ha), medium (2-4 ha) and large (4 ha and above). A total of 40 households each from beneficiary and non-beneficiary groups in each selected watershed areas were randomly selected without replacement for in-depth enquiry. Thus, 80 households form the size of sample in each district, taking together into account 320 households form the size of the sample for the study.

4.5 Reference Period

In order to have a comparison in the changes of situational study variables, 'Before and After' approach of evaluation has been followed. For this purpose, information have been gathered/collected for two different time periods coinciding before and after the introduction of WARSA JAN SAHBHAGITA. Thus, there are two different reference periods viz., 2001-02 and 2006-07 respectively for the purpose of the study.

4.6 Profile of the Watershed Areas

The sample watershed districts lie in zone – III (B) i.e., western sub-zone of south-alluvial plane, which receives about 990-1240 mms. of average annual rainfall and has a variety of soils – sandy loam, clay loam, loam and clay. The total geographical area of the sample districts ranging from 2.55 per cent to 4.09 per cent of the state's total area (94163 Sq. kms). The population in the districts is 1.55 per cent to 2.95 per cent to the total population (2001) of the state (82.99 million). The percentage of scheduled castes population in the districts is around 30 to 37 per cent. The per capita gross district domestic product (GDDP) at 1999-2000 prices in 2004-05 are Rs. 4857 in Nawada (WS-I), Rs. 5788 in Kaimur (WS-II), Rs. 5463 in Aurangabad (WS-III) and Rs. 7056 in Rohtas (WS-IV). The net sown area in the districts are 44.98 per cent, 44.73 per cent, 60.30 per cent and 64.96 per cent respectively to the total geographical area of respective districts. The cropping intensities are 135.71 per cent, 120.92 per cent, 143.72 per cent and 140.55 per cent respectively. There are altogether 875

households constituting 61.37 per cent general caste, 21.83 per cent scheduled caste, 16.33 per cent other backward caste and 0.57 per cent scheduled tribes. The population figures indicate 5207 persons. Educational status indicates divergent trends across the sample watersheds while higher percentage of illiteracy was found in WS-III & IV (53.65 & 39.25%) respectively whereas that of lower in WS-I & II (17.00 & 16.73%) respectively. The land resources indicate that the total areas of watersheds are 533 ha at the overall level. Cultivable area is reported to 83.63 per cent of the total area. The land holding status indicates 63.66 per cent are marginal farmers, 25.03 per cent small farmers, 7.09 per cent medium farmers and 4.22 per cent big farmers. The percentage of irrigation to the total area is 57.80. There are 06 SHGs in WS-I, 03 in WS-II, 05 in WS-III and 04 in WS-IV. The numbers of UGs are 22 in WS-I, 27 in WS-II, 21 in WS-III and 20 in WS-IV.

The sample respondents are included beneficiaries and non-beneficiaries. Out of the 160 beneficiary respondents 52.50 per cent are belonged to general caste, 30.63 per cent other backward caste, 15.62 per cent scheduled caste and 1.25 per cent scheduled tribe. The total population is 1037 persons (6.48 persons/Hh). Similarly among non-beneficiary group 49.37 are belonged to general caste, 5.62 per cent other backward caste and 25.00 per cent scheduled caste. The total population is 1086 persons (6.79 persons/Hh).

4.7 Impact of the Programme

In Bihar, the work activities commenced in 2002-03 and completed in 2006-07. Land and water resource development activities constitute the primary areas of intervention. The expenditure on management constitutes about 18.38 per cent whereas 81.62 per cent incurred on development components, which includes resource management (51.64%), farm production system for land owning families (20.58%) and livelihood support system for landless families (9.10%). The impact of the project on various items may be briefly seen as below:

a. Land Use

In WS-I, the area under private wasteland decreased by 16.67 per cent indicating development of waste lands by way of plantation, etc. the benefits from which would also be available to the non-landholders. Similarly in WS-II, the area under govt. wasteland and private wasteland decreased by 15 .00 per cent and 22.00 per cent respectively, which reveals that community as well as private plantations have also been made in the area. In WS-III & IV, decrease in govt. and private waste land by 21.92 per cent and 21.43 per cent and 31.44 per cent respectively have been found, clearly indicating increase in community and private plantations.

b. Irrigation Development

The change in irrigational status of agricultural land in 2006-07 over 2001-02 of the watershed indicated marginal increase in irrigated area in all the selected watersheds and almost in all the crop seasons, which may be due to increase in number of water harvesting structures (tanks, check dams, ponds, etc.). The increase was mainly found on big farms, which showed that perceived benefits are concentrated on large farms. Of course it is not a new concern. In fact, it needs group owned water harvesting structures in real sense rather jointly owned by own relatives/neighbours or raiyets. The approach to sharing the benefits of water harvesting structure among the resource poor farmers is to develop well, which has been found important sources of irrigation.

c. Area and Production of the Crop

The land development and creation of new water harvesting structures in all the watershed areas have not much effectively brought some additional areas under the important crops both in kharif and rabi. The data indicate that there is increase in the area under paddy crops from 0.64 per cent to 4.37 per cent, maize 0.65 per cent to 3.37 per cent, pulses 0.99 per cent to 2.08 per cent and oilseeds up to 1.85 per cent. Of course, there is increase in area of important crops but it is not much appreciable. It is worth to mention here that almost similar increase has been indicated by the non-beneficiary respondents.

In regard to production, it increased from 1.11 per cent to 4.87 per cent in case of paddy, 1.25 per cent to 6.97 per cent in case of wheat, 2.28 per cent to 6.61 per cent in case of maize, 1.24 per cent to 3.97 per cent in case of pulses and oilseeds witnessed negative growth. The findings indicate that the production increase is higher in rabi season for wheat, pulses and oilseeds across all the watersheds and this indicates the overall effectiveness of the watershed activities. Similar change was also indicated in case of non-beneficiary respondents, which revealed that benefits were not centered on the beneficiaries rather shared with non-beneficiaries also.

d. Cost of Cultivation

It is generally presumed that if the facilities are extended to farmers, the cost of the production of the crops will come down provided the prices of the inputs are constant. But things are different. Neither the cost fallen nor is the prices of any inputs constant. Among the beneficiary farmers, it rose at the overall level to 8.16 per cent in WS-I, 5.54 per cent in WS-II, 4.38 per cent in WS-III and 13.08 per cent in WS-IV. Among the non-beneficiary farmers, it increased to 8.53 per cent in WS-I, 12.36 per cent in WS-II, 12.39 per cent in WS-III and 5.16 per cent in WS-IV. The reason for increase in cost of cultivation is mainly due to increase in prices of the inputs like fertilizer, irrigation, seeds, etc. The watershed development programme could not slash to the cost of production. The reason is obvious lesser the impact of the programme.

e. Disposal of Produce

The disposal for all the crops level in WS-I is lower among the beneficiary households. However it is a bit higher among the non-beneficiary households. The reason behind low disposal may be lower production. Among the beneficiary households, the percentage of disposal is comparatively higher across all the three watersheds viz., 34.47 per cent in WS-II, 18.82 per cent in WS-III and 19.86 per cent in WS-IV. It is by 0.39 per cent in WS-I, 6.46 per cent in WS-II, 17.15 in WS-III and 21.93 per cent in WS-IV among the non-beneficiary households. It revealed that the volume of disposal has increased, which may be due to distribution of benefits amongst the households or villagers.

f. Income

The total average income of beneficiary group has increased in all the sample watersheds but it recorded higher in WS-III 25.24 per cent followed by WS-II 19.22 per cent, WS-IV 11.30 per cent and WS-I 0.31 per cent. Almost similar is the case of non-beneficiary group. It increased by 23.18 per cent in WS-IV followed by 14.72 per cent in WS-I, 5.13 per cent in WS-II and 2.56 per cent in WS-III.

g. Livestock holdings

The data suggest in all watersheds milk and meat generating animals/birds are kept by a large number of families to supplement their food items and cash resources, while cows and buffaloes are kept for sourcing domestic milk consumption of children and of course for generating income. In all the selected watersheds the total number of livestock increased. It increased as much as 73.00 per cent in WS-I, 30.74 per cent in WS-IV, 21.32 per cent in WS-III and 10.78 per cent in WS-II. It reveals that the project has facilitated in keeping larger number of livestock. But in absence of clear and agreed livestock holding and grazing practices there can not be favourable long term impact on conservation of common land resources.

h. Quality of Life

The perceptions of beneficiary farmers indicate that positive changes have taken place in recharging of groundwater level and qualitative aspects of livelihoods by about 15.00 to 20.00 per cent across the watersheds. Irrigation, afforestation and availability of irrigation have changed positively to the tune of 17.50 per cent, absorption of women in various activities (7.50 to 15.00%), production (10.00 to 15.00%), cropping intensity (7.50 to 10.00%) etc. Non-beneficiary farmers also indicated positive change of the programme on improvement in groundwater conditions (7.50 to 15.00%), qualitative aspect of livelihood (5.00 to 12.50%), production (2.50 to 7.50), availability of irrigation (5.00 to 15.00%). The analysis reveals that there is a general improvement in quality of life but in overall sense, the impact of the programme in these watersheds has been somewhat lower.

i. Training and Formation of UGs & SHGs

In the initial years of the programme no UGs/SHGs could be formed in any of the sample districts, which may be due to delay in launching of the programme. These could be formed after 2003-04. SHGs formed by landless and women particularly of SCs received sewing machines, she-goats, leaf plate making machine, dhankutti machine, etc. for undertaking non-farm group activities. 3 to 4 training programmes relating to know-how of the programme and land management practices are organized across all the watersheds. But due to poor knowledge, skill and low level of maintenance of the assets substantial support to the livelihood has not been found.

j. Operational Effectiveness

The overall approaches of all the PIAs have been to implement the plan/activities within the prescribed budget limit with almost no planning for user groups. The WDT is not effective in the area of community organization. However, they all have performed well in terms of level of achievements of physical (93% and above in number and 83% and above in coverage) and financial (98% and above).

k. Overall Impact

In fact, there is no single indicator of successful watershed development, so the most feasible approach is to compare the performance of a variety of indicators, which also reflect the diversity of project objectives. It is noteworthy that the cost per hectare is helpful in assessing their cost effectiveness. It is calculated at Rs. 8213/ha in WS-I, Rs. 8144/ha in WS-II, Rs. 7103/ha in WS-IV and Rs. 6561/ha in WS-III. The programme has significant positive impact on creation of employment opportunities. It has been created about 7142 mandays in WS-I to the highest of 8915 of mandays in WS-III. The internal rate of return calculated on the basis of the additional income over and above the pre-project income from agriculture, micro-enterprises, wages etc. within the village, varies from 187.00 per cent to 202.00 per cent (average of 4th & 5th year) across the sample watersheds. The cost and benefit ratio also varies from 1:1.87 to 1:2.02. The average employment generation per hectare works out to 12.75 mandays in WS-I, 14.80 mandays in WS-IV, 16.31

mandays in WS-II and 17.58 mandays in WS-III. The quantitative impact on productivity of the crops indicates that except pulses (-2.55%) in WS-III, the productivity of major crops have noticed positive change but in case of cereals, pulses (-) 2.55% to 10.44%, oilseeds from 0.59% to 6.78% and vegetables and others from 0.19 % to 2.40 % across the watersheds. The cropping intensity has fallen by 4.72 per cent in WS-III whereas that of increased to 2.55 per cent in WS-II and 2.00 per cent in WS-I. No change has been found in WS-IV. As regards the income benefit it has increased from 8.22 per cent to 13.28 per cent per hectare per annum. Similarly annual per hectare family income has also increased from 5.45 per cent to 10.49 per cent across the sample watersheds. However, its equity depends on the magnitude of the households of the area. Positive change has also been found in case of level of groundwater and coverage of green/biomass in the villages.

4.8 Suggestions/Recommendations

Based on our findings from four sample watershed areas in Bihar, we have identified some issues that need attention of the policy makers as well as the project functionaries. The emerging issues and the recommendations are presented as below:

1. People's participation in watershed activities is poor except in case of wage earners/subsidy beneficiaries. Most of the farmers expressed that improved, certified and guaranteed seeds in addition to enlarging water potential and providing market would usher agriculture in rain fed agro-eco-regions. In fact, people's participation is expected only when provisions of direct benefits to the farmers are made. So watershed activities should be taken up in such a way (PRA and action research) that majority of villagers could be encouraged/incentivized to participate (*Attn: Ministry of Agriculture, Government of India and Directorate Soil Conservation, Dept. of Agriculture, Govt. of Bihar).*

2. We have found in our sample watersheds that although rain fed and water scarce areas have been chosen for the programme, the land areas developed

are essentially private croplands. The community land development activities do not get much attention. As the target of PIA is to develop a total area of 500 ha, with no minimum expenditure or area earmarked for community land. PIAs usually opt for the easier course of developing only the flatter terrain of cropland areas, where quick participation of land owning households is also possible. In such a situation land beneficiaries are deprived of any direct benefits. In order to avoid such problem and conflict between the beneficiaries and non-beneficiaries, development of community land resources and introduction of income generating activities for the landless and other weaker sections should be considered. *(Attn: Ministry of Agriculture, Government of India & Directorate of Soil Conservation, Department of Agriculture, Government. of Bihar).*

3. There should be a Detailed Project Report (DPR) of the selected micro watershed area in the initial year of project and get it known to all by displaying the list of activities to be undertaken during the project period. It should be prepared by a team of technical experts on the basis of felt needs of local people. *(Attn.: Ministry of Agriculture, Government of India & Directorate of Soil Conservation, Department. of Agriculture, Government of Bihar).*

4. The effectiveness of community organization and sustaining watershed activities largely depend on the training and awareness of the members of WA, WC & WDT. The roles and responsibilities of these groups are defined but not in practice, which need to be activated by regular reviewing and monitoring of the programme *(Attn.: Directorate of Soil Conservation, Department of Agriculture, Government of Bihar).*

5. There is need to diversify the role of WDT to get associated in the post-project area activities for a minimum of 3-4 years after the project is completed to help various user groups. It requires re-validation of WDT as a professional body to render its services in the area *(Attn.: Directorate of Soil Conservation, Department of Agriculture, Government of Bihar).*

6. Last but not the least, we have found that high breed she-goats are given to SHG members in our study area under livelihood support system to landless families, which could not survive after a month or so in local conditions, as reported. Hence, the husbandry ability of the beneficiary members as well as suitability of the area must be considered before extending the assistance under the programme *(Attn.: District Nodal Agency of the NWDPRA Programme).*

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ANNEXURE – I

COMMENTS ON DRAFT REPORT

1. Title of the Draft Study Report Examined: MID-TERM EVALUATIN OF REVISED NATIONAL WATERSHED DEVELOPMENT PROJECTS FOR RAINFED AREAS (NWDPRA) IN BIHAR.
2. Date of Receipt of the Draft Report: 05/09/2009
3. Date of Dispatch of Comments: 13/09/2009
4. Comments on the Objectives of the Study:
   Objectives number 1 & 2 have been studied according to study design but in case of No. 3, information relating to Natural Resource Management (NRM), Farm Production System (FPS) and Livelihood Support System (LSS) has barely mentioned. In case of impact analysis, more information regarding employment generation across size class and a comparative discussion between beneficiary and non-beneficiary farmers may enhance the quality of the study.
5. Comments on Methodology:
   The study has followed the prescribed format of the study design. In case of selecting sample farmers the method of with or without replacement in place of only stratified random sampling should be mentioned.
6. Comments on Presentation and get up etc.:
   i. The title of the study will be changed as IMPACT EVALUATION OF REVISED NATIONAL WATERSHED DEVELOPMENT PROJECTS FOR RAINFED AREAS (NWDPRA) DURING 10^{TH} PLAN instead of MID-TERM EVALUATION OF REVISED NATIONAL WATERSHED DEVELOPMENT PROJECTS FOR RAINFED AREAS (NWDPRA) DURING 10^{th} PLAN. Ministry instructed about the change well ahead of finalization of the study. Hence change the term on page 12 onwards.
   ii. Source of the table based on primary data (viz., table 2-3 onwards) should be clearly mentioned as Source: Field Survey, etc.
   iii. Little/more information regarding formation and activities of SHG's and UG's are needed.

iv. Information regarding educational and occupational status of the non-beneficiary farmers have been omitted.

v. In order to have qualitative aspects of the sample farmers, information regarding basic amenities available to the households are needed.

vi. In case of impact assessment benefit cost ratio and internal rate of return are to be assessed according to the revised guidelines of the Ministry of Agriculture.

vii. In case of policy prescription, Clause - 3 & 4 sound almost the same and hence advised to merge these two clauses into one recommendation.

7. Overall view on acceptability of Report:

The overall presentation of the draft study is satisfactory barring the above mentioned aberration. Before finalization, the above mentioned comments should be incorporated. Although, Ministry instructed to present the evaluating study into two volumes --- it is in this present situation is not feasible and may be accepted in one volume.

Sd/-

(Kazi M B Rahim)

Hon. Director

Agro-Economic Research Centre

Visva-Bharati

Shantiniketan – 731 235

(WB)

ANNEXURE – II

ACTION TAKEN REPORT

1. Title of the Study Report: **IMPACT EVALUATION OF REVISED NATIONAL WATERSHED DEVELOPMENT PROJECTS FOR RAINFED AREAS (NWDPRA) DURING 10TH PLAN IN BIHAR.**
2. Date of receipt of the comments : 17/09/2009
3. Date of dispatch of comments: 27/10/2009
4. Comments on Objectives:
   Incorporated a brief note on NRM, EPS & LSS. Discussed as per the given table plan.
5. Comments on Methodology: Clarified
6. Comments on Presentation and Get up:
   i. Revised
   ii. Incorporated
   iii. Incorporated under section 3.9
   iv. Incorporated data relating to occupational status of non-beneficiary in table No. 2.8 (a). As regards the educational status table No. 2.4 may be seen.
   v. Incorporated in the text and data in table No. 3.17.
   vi. Incorporated in the text and figures in table No. 3.15.
   vii. Action taken accordingly.
7. Overall view:
   Incorporated accordingly.

Ranjan Kumar Sinha
Project Leader