Research Reports Series - 107

Research Study on

Nutrition Security and Equity in its Access in Watershed Development Programmes

Dr. Ch. Radhika Rani
Dr. U. Hemantha Kumar

Centre for Agrarian Studies
National Institute of Rural Development & Panchayati Raj
(Ministry of Rural Development, Government of India)
Rajendranagar, Hyderabad -30
www.nird.org.in

VISION

- The vision of NIRD&PR is to focus on the policies and programmes that benefit the rural poor, strive to energise the democratic decentralisation processes, improve the operation and efficiency of rural development personnel, promote transfer of technology through its social laboratories, Technology Park and create environmental awareness.

- As a "think-tank" for the Ministry of Rural Development, NIRD&PR while acting as a repository of knowledge on rural development would assist the Ministry in policy formulation and choice of options in rural development to usher in the changes.

MISSION

- To examine and analyse the factors contributing to the improvement of economic and social well-being of people in rural areas on a sustainable basis with focus on the rural poor and the other disadvantaged groups through research, action research and consultancy efforts.

- To fcilitate the rural development efforts with particular emphasis and focus on the rural poor by improving the knowledge, skills and attitudes of rural development officials and non-officials through organising training, workshops and seminars.

Research Reports Series - 107

Research Study on

Nutrition Security and Equity in its Access in Watershed Development Programmes

Dr. Ch. Radhika Rani
Dr. U. Hemantha Kumar

National Institute of Rural Development & Panchayati Raj
Rajendranagar, Hyderabad - 500030
India

ISBN : 978-93-84503-81-9

July, 2017

Published by:
National Institute of Rural Development and Panchayati Raj
Ministry of Rural Development, Government of India
Rajendranagar, Hyderabad - 500 030, India
Telephone : 040 - 24008473
www.nird.org.in

Printed at **M/s Vaishnavi Laser Graphics**
Barkathpura, Hyderabad - 500 027. Tel : 040-2755 2178

Acknowledgements

Achieving nutrition security is a challenge that resonates world over, including India. It is an accepted fact that the mere self-sufficiency in foodgrain production cannot result in steep reduction in micronutrient deficiencies in the country because population needs adequate quantities of balanced diet to remain well-nourished and healthy. Since nutrition security and agriculture are recognised as mutually reinforcing states, there is heightened interest in addressing these problems jointly. An integrated approach to land management is therefore, necessary to address the links between land, water, crop and malnutrition. The study is an attempt to understand the nutrition security of the beneficiaries of the watershed programme, an important agriculture programme addressing the land management in the country.

At the outset, we express our sincere thanks and gratitude to the National Institute of Rural Development and Panchayati Raj (NIRD&PR) for sponsoring this study without which this report would not have materialised. We are grateful to the Director General of the organisation, Dr. W. R. Reddy, IAS, for his constant support in all the academic endeavours, including this study report. We thank our former DDG i/c Shri Rajeev Sadanandan, IAS, and all our colleagues who had given us valuable inputs that greatly improved the manuscript. The contribution of unknown referees is immense in shaping the manuscript to its present form.

Collection of data from sixteen watershed villages and eight non-watershed villages from four States with a total sample of 960 households was an enormous task and could not have been completed without the active support of many. We would like to place on record our sincere thanks to the SLNA, CEOs and other officials of watershed departments of the States of Telangana, Karnataka, Chhattisgarh and Jharkhand. Finally, we are thankful to all the members of the sample households who gave us their valuable time and added invaluably to our knowledge on agriculture and nutritional security linkages.

Ch. Radhika Rani
U. Hemantha Kumar

CONTENTS

List of Tables

Executive Summary

Despite strong economic growth in recent decades, India bears a high burden of child undernutrition, which is an important indicator of country's overall human capital development. Many reviews were there on impact of agricultural interventions on nutrition security. However, Watershed Development Programme (WDP) which is one of the important agricultural interventions was not covered in these reviews, so far. The study aims to understand to what extent the increase in Natural Resource Management and Production Systems, the main components of WDP are actually translating into positive nutritional outcomes.

The study covered sixteen completed watershed programmes in four States i.e, Telangana, Karnataka, Chhattisgarh and Jharkhand. For comparison, eight control villages were selected, two in each State. The total samples include640 Households (HH) in watershed villages and 320 HH in non-watershed villages. The number of Small and Marginal Farmers (SMF), Large and Medium Farmers (LMF) and Landless Households covered for the study were 480, 240 and 240 respectively. The period of data collection was during 2014 -15. While, the average arable land size of SMF was almost same in all the four States, the average arable land holding size of LMF was more in Chhattisgarh and Jharkhand compared to Telangana and Karnataka.The impact of WDP on reduction in cultivable waste land was more in Telangana and Karnataka compared to Chhattisgarh and Jharkhand. The reduction in cultivable waste lands and fallow lands while having a positive impact on arable lands, reduced the land availability for green fodder.The adequacy in availability of green fodder after the implementation of WDP, was reported by only 56 per cent of LMF and 34 per cent of SMF category. Improvement in drinking water for human beings and cattle is the major priority for implementation of any watershed programme. The groundwater table in the watershed villages was in the depth ranging from 150 ft to 240 ft compared to non-watershed villages, where it was available at a depth of 275 ft to 600 ft.

The Crop Diversification Index (CDI) of SMF was 0.57 compared to the CDI of LMF with 0.52 during Kharif. The same in non-watershed villages was 0.26 and 0.35 respectively for SMF and LMF due to less area under vegetable production in these villages compared to watershed villages. Within the watershed villages the crop diversification was more during Kharif than Rabi. Sixty per cent of LMF in Chhattisgarh, 45 per cent in Jharkhand and 50 per cent each in Telangana and Karnataka were maintaining more than two milch animals in watershed villages. Whereas, the SMF category of Telangana and Chhattisgarh were in a better position in terms of maintaining more than

two milch animals with 60.5 and 52.5 per cent respectively.The percentage of landless households in watershed villages maintaining one or two milch animals was highest in Jharkhand with 90 per cent and lowest in Telangana with 22.3 per cent. Compared to women in SMF category, the employment generated through agricultural activities for women in LMF was less in all the four States, more so in Telangana and Jharkhand with only 80 and 95 days respectively. Similarly the men in LMF category gained less number of days of employment with farming compared to men in SMF category, reason being the difference in cropping pattern taken up by these two categories. The income from agriculture in watershed villages was higher for LMF with 61.89 per cent followed by SMF with 58.67 per cent. The diversified cropping pattern taken by the SMF has not resulted much in increase in income due to less marketable surplus. However, the income gain in watershed villages for these households was through livelihood diversification with livestock occupying 26.78 per cent of their total income. Livestock has become a significant source of livelihood for landless households in watershed villages with 36.35 per cent of their total income.

The per capita availability of rice was much higher in watershed villages with 185 kgs/capita/annum compared to the per capita requirement of 137 kgs/capita/annum. However, it was lower in case of wheat with 0.40 Q/annum/capita for LMF and SMF, in these villages. The per capita availability of wheat was further lower for SMF in non-watershed villages with 0.25 Q/capita /annum. The per capita vegetable requirement as per ICMR norms were 10.8 Q /capita /annum. The per capita availability of vegetables for the LMF households in watershed villages was 15.4, 6.8, 4.56 and 4.24 Q/capita/annum in Chhattisgarh, Jharkhand, Telangana and Karnataka respectively. The same for SMF category households was 8, 4.2, 5.5 and 5.87 Q/capita/annum. These figures were much lower in non-watershed villages of all the four States. This shows that though there was an increase in vegetable production in watershed villages which has led to an increase in per capita availability, this was much lower compared to the average requirement per person.

In watershed villages, the per capita consumption of cereals of LMF, SMF and landless with 2.75, 2.59 and 2.63 kgs/week which was almost on par with requirement of 2.87 kgs/week. Whereas, the consumption of pulses with 13.14 gms/capita/day for LMF, SMFand landless households was much less than the requirement with 50 to 60 gms/day. The per capita vegetable consumption of LMF, SMF and landless households with 0.27, 0.29 and 0.19 kgs per capita per week. However, this was far less compared to the average requirement worked out per week, as per nutrition guidelines as 2.1 kgs/capita/week.The per capita consumption of milk in the watershed villages was 104.85, 47.14 and 27.42 gms/day which was less than the per capita requirement of milk as per ICMR norms i.e, 220 gms per day. Though there was an increase in the consumption of

quality foods in watershed villages compared to non-watershed villages, this was much lower compared to the per capita requirement. Intra-household consumption also varies with the women consuming less quality foods than men.

An increase in consumption of quality food items by the men and women in watershed villages seems to have translated into a normal BMI. However, the picture was alarming in case of children in SMF and landless category with a BMI of 18.3 and 16.1, respectively.The picture was much bleaker in non-watershed villages. Anthropometric measures also indicate high percentage of stunting, wasting and underweight of the boys in grade two and three respectively in watershed villages. Attention to nutritional outcomes is also important from child birth to the second birthday which is crucial for cognitive development. The per cent of boys and girls with stunting, wasting and underweight was higher in this age group, even in watershed villages. In the age group of five years (sixty months) the percentage of stunting in grade two and three was 44 in boys and 66.9 in girls in watershed villages. The same in non-watershed villages was much more with 50 and 78 per cent. The percentage of children with underweight in the age group of five years in watershed villages was 36 and 38.8 per cent respectively for boys and girls. The same in case of non-watershed villages was 45 and 47.4 per cent respectively. More alarming is the fact that the children who suffer from wasting face, a markedly increased risk of death and more than one third of the developing world's children who are wasted live in India. The wasting percentage of boys and girls in grade two and three in watershed villages was 37 per cent each. The same in non-watershed villages was 54.7 and 54.8 per cent respectively for boys and girls.

The priority for the implementation of any watershed programme is to improve the drinking water status, improving the land productivity and livelihoods of its stakeholders. There was an increase in groundwater status, availability of drinking water, net sown area and diversified cropping pattern in the watershed programmes analysed. An increase in the number of days of employment was observed because of increase in agriculture and livestock livelihoods which has led to an increase in consumption of quality food items such as eggs, milk and meat. Diversified cropping pattern with vegetables led to an increase in the consumption of vegetables. However, this was not adequately translated into healthy anthropometric indices especially for the children in the watershed villages. This shows that there is a long way to go for the watershed development programmes in improving the nutritional status of its stakeholders - a natural corollary of any natural resource management programme. Lastly, nutrition-specific interventions need to be mandatorily implemented in all agricultural interventions related with NRM and productivity enhancement.

Chapter I

INTRODUCTION

Achieving Nutritional Security is a challenge that resonates world over. Almost every country in the world experiences a level of malnutrition which poses serious threat to the economic resources in the form of public health expenditure. In 2011 undernutrition was estimated to be implicated in 45% of all deaths among children under five (some 3.1 million children worldwide Black et al, 2013). Virtually no country including India is free of malnutrition.

Despite strong economic growth in recent decades, India is home to some 217 million undernourished people, or a quarter of all undernourished people globally (FAO, 2013). India also bears a high burden of child undernutrition, which is an important indicator of a country's overall human capital development. According to the United Nations Children's Fund (UNICEF), nearly half of pre-school children in India are stunted and a similar number are underweight.

According to the World Health Organisation (WHO) in India, 56 per cent of adolescent girls and 85 per cent of pregnant women in poorer States are affected by a high prevalence of anemia. Extensive prevalence of deficiencies in essential micro-nutrients is therefore a challenge in the country. Micro-nutrient deficiencies have the potential to weaken the mental and physical development of children and adolescents and to reduce the productivity of adults due to illness and reduce work capacity .The loss in productivity as a result of micro-nutrient deficiency is estimated to cost India the equivalent of 2.95 per cent of GDP annually (Horton 1999, FAO, 2012). The nutrition indicators for assessment of food insecurity are low BMI among adults and under five underweight rates. The relationship between these indicators and food security is complex. Underweight rate in pre-school children is the most widely used nutrition indicator for assessment of food insecurity (Lisa and Haddad, 2015). Over 40 per cent of pre-school children in India are under weight. By this indicator India is rated very poor in terms of food security, close to Sub Saharan Africa. At 43%, the percentage of children underweight in India is twice the average prevailing in Sub- Saharan Africa (22 per cent) (HUNGaMa Survey, 2011). Therefore, addressing the issue of malnutrition has taken a greater momentum internationally as well as in India (Lancet, 2013,Gillespie et al, 2013). The inclusion of

'Food Security and Good Nutrition' as one of the twelve Development Goals proposed in the UN's High Level Panel on Development (2015) is an indicator of this.This reflects the insight that policies, programmes and processes to improve nutrition outcomes have a role to play in poverty reduction and global development.

Conceptual Framework of Food and Nutrition Security

Historically food security was the main focus of all developing nations in the context of adequate food supply to all. But with increased observation of inadequate food intake by certain sections of the community , the concept of food security has been changing, adding the dimensions of access (Sen,1981), vulnerability (Watts and Bohle 1993) and sustainability (Chambers 1989). Many studies were there with various dimensions and indicators of food security. But the most commonly accepted definition was that given by FAO 2000 that 'Food Security'is achieved when it is ensured that "all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life".The four categorical elements of food security i.e availability, access, utilisation, and stability are relevant at both individual i.e micro level and macro level.

With an increase in focus on the malnutrition aspects of the women and children in most of the developing countries, the concept of nutrition security in addition to food security was brought into focus from mid-1990.'Nutrition Security', was defined as adequate nutritional status in terms of protein, energy, vitamins, and minerals for all household members at all times (Quisumbing 1995).The nutritional status of an individual depends upon dietary intake and health status which are interdependent. The conceptual framework of food and nutritional security thus integrates food security and malnutrition framework. The immediate causes of nutritional status are further influenced by adequate household food security in the context of availability and access), adequate care for mother and children in the context of child nutrition, and health status. (Smith and Haddad 1999).

Poverty is one factor said to be effecting malnutrition. The effects of poverty on child malnutrition are pervasive. A person is considered to live in (absolute) poverty when he/she is unable to satisfy his or her basic needs – for example, food, health, water, shelter, primary education and community participation – adequately (Frankenberger 1996). The nutritional well-being of the poor is thus not merely an outcome of development,

but a pre-condition for it. The linkages between the two are both of a direct, short term nature, and of an indirect, long term one, whereby the latter also closely relates to population growth (Von Braun 1999, Leisinger 1999).Poor households and individuals are unable to achieve food security, have inadequate resources for care and are not able to utilise (or contribute to the creation of) resources for health ona sustainable basis.

Globally and nationally, there is a direct relationship between food availability, and affordable access to food. Assessment of food production and proportion of hungry population is relatively an easy measure and has been regularly reported by most countries; these reports are compiled by FAO and presented as hunger maps. India has been self-sufficient in food production since seventies and has built up adequate buffer stocks. The average annual growth rate of agriculture during the Eleventh Plan Period was about 3.6%. From the national foodgrain availability perspective, the approach to food security of its citizensis through public distribution system at subsidised cost. However, declining per capita availability of foodgrains is of major concern. If we take five-year averages for those years from 1992 to 2010,the figure declined every five years without exception from 474.9 grams of cereals and pulses for the years of 1992-96 to 440.4 grams for the period 2007-2010 (The Hindu, May 6, 2012). A good food security framework needs to focus not only on productivity but diversification as well.

The mere self-sufficiency in foodgrain production cannot result in steep reduction in under nutrition rates or micronutrient deficiencies in the country because population needs adequate quantities of balanced diet to remain well-nourished and healthy. For ensuring nutritional security, it is not only important to increase the per capita availability of foodgrains, but also ensure the right amount of food items in the food basket of the common man. World Food Summit in 1964 brought into focus the linkage between food, nutrition, potable water supply and sanitation which are critical for prevention of infections. An integrated approach to land management is therefore, necessary to address the links between land, water, and crop and malnutrition. The efforts of food-insecure households to acquire food may also have important implications for the environment and the use of natural resources. Malnourished people often live in ecologically vulnerable areas, and tend to use land-exploiting agricultural practices in their need for higher food production. This in turn undermines their livelihoods and those of future generations (WFS 1996).

Agriculture and Nutrition Security Linkages

Agriculture has great potential to impact the food security of poor, rural households.There have been renewed calls for greater integration of nutrition and agriculture policy (USAID 2010, IFPRI 2011) as agriculture is the primary sector of employment for the poor (Barrett 2010) and food expenditures occupy the largest budget share of the poor (Ahmed et al. 2007); Historically it was believed that household food security is a pre-condition to achieve nutrition security and this will be possible with an increase in food production through technology (Harris 1987). Achieving sufficient food supply at the macro level is one strategy to ensure household food security (Von Braun etal 1992). However, this is not necessarily the primary, as it is common to have 20-30 per cent of the population consuming less than 80 per cent of the calorific requirements when the nation's food availability was greater than 100 per cent (World Bank 1986). The three main pathways through which the agriculture influences the nutritional status of individuals are: i) Increased diversified production systems which improves the consumption pattern of individuals ii) Increased income which improves the sanitary and health status of the individuals iii) Effects on time allocation pattern of the women in fetching the drinking water or working in the field which influences their energy expenditure pattern.

Increased production and diversification of food need to be promoted in such a way as to offer particular benefit to the rural poor.In addition, it is also important to see the link between women and FNS as they play an important role as producers of food, as managers of natural resources, in income generation and as providers of care for their families. With limited access to land education, credit, information, technology and decision making bodies (Quisumbing 1995) women are often impaired in fulfilling their potential role as providers of food and nutrition security and inensuring care, health and hygiene for themselves and their families. This is aggravated by the fact that women themselves are often more vulnerable or more affected by hunger and malnutrition than men, especially by iron deficiency and undernourishment during pregnancy and lactation. The conditions of gender inequality where, women and girls are more poorly nourished throughout the life cycle, show higher rates of mortality, have less access to health care, and are subject to greater household food insecurity (UN SCN 2004, 15).Since nutrition security and agriculture are recognised as mutually reinforcing factors, there is heightened interest in addressing these problems jointly (von Braun et al 2010, Barrett 2010).

Similarly it is also important to assess to what extent the agricultural programmes are influencing the time allocation patterns of women at home, because with altered labour requirements the time allocated to nurturing behavior may also change (Juster and Stafford 1991). For this reason there needs to be a clear understanding of the linkage between household income generation and individual's malnutrition status. Lastly education of the mother plays an important effect on the increased household resources including food on the child's consumption and nutritional status. Studies (Tucker and Sanjur 1988) documented the maternal education effect on child nutrition for both formal and informal education status. However, this is not under the scope of the present study.

Food and nutrition security are interconnected as only a food based approach could help in overcoming malnutrition (Swaminathan, 2013). However, reviews (World Bank, 2007, Berti et al 2003) of agricultural interventions on nutritional impact revealed that agricultural interventions have not always been successful in improving nutrition outcomes. Masset et al (2011) in their meta-analysis study reviewed and synthesised the evidence of the effectiveness of potential win –win agricultural interventions that promote the adoption of new technology to improve income and the composition of the diet of the poor. However, this review excluded some agricultural interventions among which watershed development is one. As improvement in nutrition security of the stakeholders is an implicit goal of any watershed programme with an increase in income, crop diversification and change of diet, the study aims to understand this.

Watershed Programmes and Nutrition

In India watersheds have become the pivotal unit for natural resource management in rainfed areas. The core objective of this programme was to enhance rural food and nutritional security and income through improved natural resource management. Watershed programmes have been funded and implemented by the government from early 1970 onwards . Various watershed programmes like Drought Prone Area Programme (DPAP), Desert Development Programme (DDP), River Valley Project (RVP), National Watershed Development Project for Rainfed Areas (NWDPRA) and Integrated Wasteland Development Programme (IWDP) were launched subsequently in various parts of the country during different time periods. There has been a revision of guidelines in the programme with major revision during 1994 which emphasised collective action and community participation including participation of the primary stakeholders through CBOs, NGOs and PRIs. The watershed guidelines were again revised in 2001 (Hariyali Guidelines)

to further simplify and facilitate the involvement of PRIs more meaningfully in planning, implementation and evaluation and in the community empowerment. Subsequently Neeranchal Committee (2005) evaluated the entire government sponsored, NGO and donor implemented watershed development programmes in India and suggested a shift in focus away from a purely engineering and structural focus to a deeper concern with livelihood issues. This has led to the evolving of "Integrated Watershed Management Programme (IWMP)" with the common guidelines for all the watershed programmes that are being implemented across the country. The experiences and outcome of several watershed programmes such as Sujala, Indo-German and NABARD watershed programmes that were implemented through donor agencies like World Bank, GTZ, etc., were also translated into the IWMP where the focus was shifted from S&M works to enhance the productivity and income through livelihood activities.

In India the experiences of watershed development projects are varied with a plethora of literature on watershed development programmes covering wide range of issues. With increasing awareness about the problems related to environment, use of watershed technology is becoming popular in view of their potential for growth, improvement in income levels and augmenting the natural resource base of the disadvantaged regions of the country (NGH, 1991). Many studies (Turton et al,1998, Shah (2001), focused on the positive impact of watershed development on cropping, agricultural productivity, employment generation and increase in income amongst others. The Kothapally study by Wani et al (2001) shown significant impact of watershed development on crop production, increase in groundwater level, reduction in runoff water, increase in income, etc. The Impact study by NIRD&PR on watersheds brought out that the impact on production systems was 33.36 % at the national average. It is observed that the initiation of watershed development activities brought additional area under cultivation which resulted in crop diversification (Kumar and Sharma 2011). In addition, the improved productivity with the cost-efficient water harvesting structures, improved the livelihoods through crop intensification and diversification through high value crops (Wani et al 2008;Sreedevi and Wani 2009). However, to what extent the benefits of watershed programme have been concomitantly leading to improvement in livelihoods of marginalised sections within the watershed programme remains an issue. There are also concerns regarding the distribution of the benefits accrued through a watershed programme. For instance WSD envisages the construction of a wide range of physical assets principally for soil and water management but it is the better-off, being landholders, who generally benefit disproportionately who can invest on groundwater development. This is because

groundwater operates under the private property regime and the land owner has unlimited right over the water under his/her land and is free to decide how much to extract for what use and so on (Joy and Paranjape 2009).

For extending the benefits to landless, development of common property resources do play a role as they are the main sources of fodder for livestock of these people. The major dilemma faced while developing natural resources within a watershed emanates from inherent trade-off between regeneration of commons through soil and water conservation in the upper reaches and the resultant productivity enhancement in the lower reaches (Shah 2008). It is a fact that the poor depend more on commons than the rich (Jodha 1986) and measures have to be taken for generating livelihoods for those left out. WSD projects have invested considerable efforts in establishing the rules for access to such areas and in creating collaborative agreements for community management of CPRs. The key question is to what extent the poor or landless could be able to improve their livelihoods with an increase in productivity of CPRs. Studies revealed the fact that when degraded ecosystems have been revitalised, two of the three factors directly impacted by climate change, namely the ecosystems and water are addressed. It is further enhanced when biodiversity concerns are included. However, one cannot assume that water availability is automatically ensured for all the stakeholders equally. As the land productivity is concomitant with water availability, the issue of improvement of nutritional status of women and children particularly belonging to the landless category, as a result of implementation of watershed programme arises. In the light of above discussion the following research questions emerged.

Research Questions

1. Impact of watershed programme on
    a. The increase in productivity of natural resources i.e land and water.
    b. The change in cropping pattern,employment and income of the beneficiaries in a WDP.
    c. Change in consumption pattern of the beneficiaries.
    d. Change in nutritional status of the beneficiaries.

2. Impact of WDP on different stakeholders within a watershed village i.e, large, medium, small, marginal farmers and landless labourers.

3. Change in consumption pattern and nutritional status of the family members within a household i.e, men, women and children.

In view of the above research questions, the following objectives were framed.

Objectives

1. To examine the increase in productivity of natural resources i.e, land and water with the implementation of WDP.

2. To analyse the change in consumption pattern of the beneficiaries of a WDP.

3. To examine the change in nutritional status of the beneficiaries in watershed villages.

4. To analyse the extent of equity in consumption of nutritious food by the various stakeholders in a WDP.

Approach of the Study

Literature on Impact studies suggests the use of comparison of the 'project parameters'with the 'non - project control region' (Gomme 2002). This method automatically incorporates the correction for the impact of technology in the absence of the project. For the present study, with and without approach was used as there were no thorough benchmark information for the study watersheds, except some of the indicators like water levels in the borewells, area brought under cultivation. The study was conducted in four States namely, Telangana, Karnataka, Chhattisgarh and Jharkhand. In each State four watershed villages and two non-watershed villages were selected as control villages. To select the control village, we have enquired the condition of the watershed villages before the implementation of the watershed programme and probed whether the same condition prevails upon in any existing neighbouring villages and accordingly, two control villages were selected as non-watershed villages. The bio-physical and agro-climatic conditions of non-watershed villages were similar to that of watershed villages. The selection of watershed villages was based on purposive sampling method. For the selection of the watersheds, we enquired with NABARD and the Department of

Watershed programme in the respective States to obtain the information on watershed programmes where all the major interventions were taken up successfully and impacts could be visibly seen. The details regarding the selected watersheds is given in Chapter II. One pilot study was conducted in Kothapally watershed village in Telangana to test the schedules. While conducting the pilot study, it was observed that not many large farmers exist in the villages now a days because of sub division and mutation. Therefore, the farmers were selected in two groups i.e, large and medium (LMF) in one category and small and marginal (SMF) in another category.

In each watershed village 10 LMF, 20 SMF and 10 landless households were selected on the basis of proportionate random sampling. In case of non-watershed village it was 5, 10 and 5 respectively. Thus the total sample of watershed villages in each State consists of 160 out of which 40 LMF, 80 SMF and 40 landless households. The total sample of non-watershed villages in each State consists of 20 LMF, 40 SMF and 20 landless households respectively. For the four States combined, the total sample was 640 in watershed villages and 320 in non-watershed villages. Besides Focus Group Discussions (FGD's) secondaryInformation was collected from State Project Office, District Project Office, District Hand Book, Records of the Project Implementing Agency, etc. Broad themes for FGD were planning process of watershed, institutional involvement, awareness generated regarding equitable resource use pattern, benefit sharing mechanism, issues for sustainability and conflict resolution mechanism. The needed information from the two respondent groups was gathered personally administering the pretested interview schedule. The primary data was collected during 2014-15.

Analysis

Impact of the watershed programme on the beneficiaries was assessed through change in land use pattern, increase in the status of drinking water and irrigation water, crop diversification and change in income and employment status. Impact on nutritional security was assessed through weekly recall of household consumption in the manner similar to that of NFHS -3. Body Mass Index (BMI) a widely used measure of nutritional status was assessed to measure the nutritional status.Scales and measuring boards were used to measure women and men in the age group of 15 and 59 years, and children between the age group of 5 and 15 years. This index excludes women who were pregnant

at the time of survey and women who gave birth during the two months preceding the survey. A cut off point of 18.5 was used to define thinness or acute under nutrition and a BMI of 25 or above indicated overweight or obesity.

To assess the nutritional status of children, anthropometric measures were taken in which all children under five years of age were weighed and measured. The interviewing team in every study village has included the ANM worker of that village who conducted the anthropometric measures such as stunting, wasting and underweight. There is variation in height and weight of the sample children which approximates normal distribution. Use of standard reference population as a point of comparison facilitates the understanding of nutrition status of the children in sample villages .The use of reference population was based on the new international reference population released by WHO in April 2006 (WHO Multicentre Growth Reference Study Group, 2006) and accepted by the Government of India. The validity of these indices was determined by many factors, including the coverage of the children in the households and the accuracy of the anthropometric measures. Height and weight data of all the children of the sample households who are available at home was taken. However, the data of the children who were out of station during the period of survey was not taken by the team. In terms of percentage those children accounts to only 6 per cent. In addition, two of the three indices (i.e, weight- for- age and height - for - age) are sensitive to misreporting of children's ages. However, their age was cross validated with other members in the household. This is the limitation of this exercise. Each of the three nutritional status indicators is expressed in standard deviation units (Z Scores) from the median of the reference population.

Chapter II

DETAILS OF THE WATERSHED VILLAGES SELECTED IN EACH STATE

The watersheds which were completed and sustaining successfully during post watershed implementation were selected in all the four States. The Table below presents the names of the watershed villages and non-watershed villages selected in each State.

Table 2.1: Details of the Watershed and Non-watershed Villages

Telangana	Chhattisgarh	Karnataka	Jharkhand
Watershed Villages			
Gangapur (2004 –NABARD)	Basim (2002 - IWDP)	B.Mattakere (2008- NABARD)	Aurad (2002-NABARD)
Kishtapur (2004 – NABARD)	Uperwara (2002 –IWDP-III)	Basapura (2008- NABARD)	Bhubhui (2003- (DPAP
Kottapally (1999-DPAP)	Masania Kalan (2002 –IWDP-1)	Channappanapura 2004-05(IWDP 2)	Budha Kocha (2003-DPAP)
Antharam (2003-04- DPAP)	Aamgaon (2003-DPAP-8)	Kebbepura (2003-04 DPAP-Hariyali I)	Nichintpur (2002-IWDP-1)
Non-Watershed Villages			
Mailaram	Bhilai Dabri	Hunasanalu	Bero
Marpally	Nandil	Kengaki	Dokad

- Figures in parentheses indicate the project under which the watershed was funded and the date of initiation

In Chhattisgarh, the study was taken up in Raipur and Janjgir-Champa districts. In Raipur district, Basim and Uperwara watershed villages were selected. In Janjgir-Champa district Masania Kalan and Aamgaon watershed villages were selected. Except Aamgoan watershed which was implemented under DPAP scheme, the remaining three watersheds were implemented under IWDP scheme. The Aamgaon watershed programme was started during 2003-04 and completed by 2008-09. The remaining three watersheds implemented under IWDP started during 2002-03 and completed by 2007-08.All the major interventions were taken up successfully and impacts could be visibly seen in these four sample watershed villages which will be discussed in the next chapters.

In Jharkhand, the study was taken up in Ranchi and Saraikela Kharasawan districts. In Ranchi district, Aurad, BhudaKocha and Bhubhui watershed villages were selected. In Saraikela Kharasawan district Nichintpur watershed village was selected. The Aurad watershed was funded by NABARD and implemented by PRADHAN during 2002 to 2008. Whereas, Bhubhui watershed was started during 2003 under DPAP scheme implemented by PRADHAN. Budha Kocha watershed was started during 2003 under DPAP and implemented by Ramakrishna Mission. Nichintpur watershed programme started during 2002 under IWDP and implemented by KGVK.

In Telangana, the study was taken up in Medak and Ranga Reddy districts. In Medak District, the Gangapur and Kishtapur watershed villages were selected. In Ranga Reddy District Kottapally and Antharam watershed villages were selected. The Gangapur and Kishtapur watersheds were taken up by NABARD under the Indo-German watershed programme.Whereas, the Kottapally and Antharam watersheds were implemented by the watershed department of erstwhile government of Andhra Pradesh. Kothapally watershed was taken up in a consortium mode by ICRISAT, Central Research Institute for Dryland Agriculture (CRIDA), National Remote Sensing Agency (NRSA), and District Water Management Agency (DWMA), Andhra Pradesh during 1999- 2005. The selection of these watersheds was based on the reports given by NABARD and the Department of Watershed Agency, Telangana where all the major interventions were taken up successfully and impacts could be visibly seen.

In Karnataka,the study was taken up in Mysore and Chamrajnagar districts. In Mysore district, B.Matakere (Bhutanahalli Watershed Project) and Basapura (Mahakalamma watershed project) watershed villages were selected. In Chamrajnagar district Kebbepura (Malagamma watershed project) and Chennappanapura (Maragadakere sub watershed project) watershed villages were selected. Maragadakere Sub Watershed was IWDP – II watershed project initiated in the year 2004-05 and completed by 2012-13. The Kebbepura (Malagamma) sub watershed was a DPAP. Hariyali I watershed was initiated in the year 2003-04 and completed by 2007-08. Basapura (Mahakalamma) watershed project was a NABARD funded project under Indo-German Watershed Projects initiated during 2005-06 and completed by 2013-14. B.Mattakere (Bhuthanahalli) watershed project was a NABARD funded project under Indo-German Watershed Projects initiated during 2005-06 and completed by 2013-14.

Impact of Watershed Programme on the Villages as observed through FGD's

a. Change in the Status of Drinking Water and Area under Irrigation

The focus group discussions revealed that before the implementation of the programme the status of the groundwater was very poor in all the selected watershed villages. Many of the open wells were defunct.The availability of drinking water within the village was only for three to four months. Daily the women of the villages walk for about three to four km to fetch the water. The men used to go even farthest places by bicycle to fetch the drinking water. With the implementation of soil and moisture conservation works there was a positive change in the availability of groundwater (Annexure-I, Table I). In Kothapally watershed, out of 62 open wells only 10 to 12 were functional before the watershed programme. Whereas, all the defunct bore wells became functional after the implementation of WDP. The level of groundwater which used to be 400 - 500 ft depth on an average in all the study watershed villages has raised to 150 to 200 ft depth. The desilting work taken up in the tank of Kebbepura village in Karnataka improved the drinking water situation for livestock and rechargingof the surrounding bore wells. An increase in area under irrigation was reported by the villagers which was materialised mostly with digging of the bore wells in Chhattisgarh, Jharkhand and Karnataka and by the recharging of open wells in watershed villages of Kothapally and Gangapur in Telangana. The digging up of new bore wells was not happened in later case mainly because of social regulation imposed in these villages regarding the digging of new bore wells. Many of the bore wells in non-watershed villages were observed to be in dysfunctional state. For example in Kengaki village in Chamrajnagar district, there were 25 bore wells, out of which only four to five were functional during the time of study with a depth of 800-850 feet.

b. Change in Cropping Pattern

An increase in area under irrigation, has an impact on changing the cropping pattern. Change from mono cropping to multiple cropping reflects the reduction of risk in cultivation by the farmers. This could be seen in all the watershed villages where the farmers used to cultivate one or two crops annually, shifted to multi cropping. In the sample watershed villages of Chhattisgarh and Jharkhand, in addition to the area under the existing crops such as paddy the farmers were diversified their cultivation to vegetable crops. The yield rates were also increased remarkably in these villages (Annexure II Table 2). However, this shift in cropping pattern was occurred more with water intensive crops such as Banana, Turmeric, Sugarcane, Ginger replacing the traditional millets like Sorghum, Ragi and

Bajra. While most of the area in Kothapally watershed was under Cotton previously, it was replaced with Maize and Pigeon Pea intercrop after the implementation of WDP. In Basapura village (Mahakalamma watershed) the farmers started intercropping of Pigeon Pea with Cotton after the implementation of WDP. In B.Mattakeri village (Bhutanahalli watershed) the crops such as Tobacco, Sugarcane, Banana, Cotton, and Pumpkin were being taken up by the farmers. Department of Horticulture gave Coconut and Pepper saplings to the farmers in B.Mattakeri and Basapura villages after the implementation of WDP. Some of the farmers raised Sapota plantations which were given on lease to buyers from Mysore. In Chennappanapura village of Chamrajnagar district, the farmers have taken up the cultivation of Turmeric and Banana in around 50 and 45 acres, respectively. The area under Sugarcane which was around 45 to 50 acres previously increased to 65 to 75 acres in this village. The implementation of WDP in this village transpired to the implementation of some best practices such as installation of drip system in around 75 acres belonging to 40 farmers and installation of sprinkler system in 8 acres belonging to 5 farmers, under the subsidy from Horticulture Mission. The farmers in entire Gangapur watershed village in Medak district have taken up the cultivation of vegetables and particularly the Chilly crop. With an increase in area and production of Chilly in this village, a local market yard was established by the State. Traders from surrounding States procure Chilly from this village. The productivity of almost all the crops has increased in watershed villages when compared to the productivity of these crops before the implementation of the programme. For example in Karnataka, in Chennappanapura village the productivity of Ragi has increased from 2.5 to 3 Q/acre to 4 to 4.5 Q/acre. Similarly the productivity of Sorghum which was 4 to 5 Q/acre earlier, increased to 6.5 to 8 Q/acre. The productivity of Sugarcane increased from 30 to 35 Q/acre to 38 to 45 Q/acre. Similarly, in Kebbepura village, the Sunflower productivity has increased from 5-6 Q/acre to 10 Q/acre and in Basapura village the Cotton productivity has increased from 3 Q/acre to 7-8 Q/acre.

c. Change in Livelihoods

The major livelihood before the implementation of WDP was agriculture, livestock and migration. While the migration has come down after the implementation of WDP, the dependency on livestock has increased. There was an increase in number of livestock in all the watershed villages. The increase was more in case of dairy animals compared to small ruminants. The preference was more towards Buffaloes compared to Cows in these villages because of the milk yield and its fat content. An increase in the milk yield

was also observed in these watershed villages though modestly with an increase in area under fodder crops, on main land and on the farm bunds. The number of households depending on non-farm employment such as petty shops, trading, tailoring, etc., has also increased (Annexure I Table 3).

d. Change in Socio-economic and Nutritional Status

The wage rate for agriculture works has increased in all the watershed villages both for men and women. This was mostly due to the impact of MGNREGS. The increase in wage rate was observed in non-watershed villages also. The number of SHG groups has increased in all the watershed villages from an average of four to five to 30 to 33. The number of children going to anganwadi centres has increased with an increase in wage labour works to women under WDP and MGNREGS, as observed by the villagers in WDP villages. An increase in vegetable consumption was observed in all the watershed villages with an increase in vegetable cultivation. Not much change was observed in milk consumption of small, marginal farmers and landless except by the large and medium farmers. Positive change was observed in meat consumption mostly among landless followed by marginal and small farmers in the order. The access to health and education in these villages has not changed much except in case of Kothapally where the government school in this village has received many awards. The villagers, the SHG members, the watershed committee members were proud of the accolades they received in the implementation of WDP. This commitment was transpired to other development practitioners of the village including the high school teachers.

e. Downside Effects of the Watershed Programme

We could see from the discussion above that there was an increase in the number of borewells as well as groundwater level after the implementation of WDP in all the study villages. This strengthened the cropping system with paddy and vegetables in Chhattisgarh and Jharkhand watershed villages. However, the increase in area under water intensive crops such as Sugarcane, Ginger, Tobacco, and Banana in the watershed villages has led them back to, square one position. In the Kothapally village there was a ban on digging new bore wells for a long time, after the initiation of watershed project. This ban is being ignored in the last two years where the farmers were digging new bore wells with an increase in drought situations during Kharif. This resulted in plummeting ground water levels and the borewells which were functional previously have become defunct at the time of the study. This was also seen in Chennappanapura village of Chamrajnagar district.

Chapter III

IMPACT OF THE WATERSHED PROGRAMME

a. Socio-economic Status of the Households

The social status, primary occupation and educational status of the watershed and non-watershed village households is given in Table 3.1. OBCs and SCs constitute majority of the sample households in Chhattisgarh whereas STs constitute the majority in Jharkhand, in watershed villages. While, OBCs and SCs constitute majority of the sample households in Telangana, STs constitute the major group in Mysore district of Karnataka. While the primary occupation of the sample households was agriculture, wage employment was also a major source of occupation for the majority of households among the sample respondents. The literacy status of the head of the household was taken as a proxy to understand the awareness of development programmes and nutritional status of his family members. The number of respondents who have studied upto college level were more in Chhattisgarh followed by Telangana. Both the sample districts of Telangana were proximate to Hyderabad and therefore the access to education was positive. The number of illiterates were more in Karnataka particularly in Mysore district. The selected watershed villages in this district belongs to forest fringe villages and therefore the number of illiterates and STs were more in this State followed by Jharkhand.

Table 3.1: Socio-economic Status of the Sample HHs (No.)

States	Social Status					Primary Occupation				Educational Status			
	OC	OBC	SC	ST	Agri.	Agri. Labour	Artisan	Trader	Others	Primary	Secon-dary	College	Non-Literate
Chhattisgarh													
Watershed	10	130	20	-	124	36	-	-	-	90	40	30	-
Non-watershed	-	70	10	-	70	10	-	-	-	50	30	-	-
Jharkhand													
Watershed	-	31	-	129	86	38	-	1	35	113	4	0	43
Non-watershed	4	-	1	75	71	5	-	2	2	50	0	1	29
Telangana													
Watershed	23	101	35	1	118	38		3	1	56	26	29	49
Non-watershed	5	59	16	0	60	27		3	-	27	13	6	34
Karnataka													
Watershed	27	59	39	35	120	96	-	3	5	21	24	15	100
Non-watershed	-	49	9	22	45	35	-	1	-	14	11	11	44

i. Status of Landholding of the Sample Households

The land-holding status of Small and Marginal Farmers (SMF) as well as Large and Medium Farmers (LMF) is given in Table 3.2. The average landholding size of arable land in case of SMF was 0.93 ha and 0.76 ha in watershed villages of Chhattisgarh and Jharkhand respectively.Whereas, the average landholding size of the same of LMF was more with around 8.13 ha in watershed villages of these States.The average size of area under irrigation of LMF in both the Chhattisgarh and Jharkhand which was more when compared to SMF. The land use pattern presents an understanding on resilience capacity of natural resources base in the sample villages. The percentage of irrigated area out of net sown area among LMF was more in watershed villages of Telangana and Chhattisgarh with 93.8 and 93.7 per cent followed by Jharkhand and Karnataka with 72.3 and 65.26 per cent respectively.The same among non-watershed villages was more in Jharkhand with 71.45 per cent followed by Chhattisgarh and Karnataka with 59.5 per cent respectively. The percentage of irrigated area out of net sown area among SMF was more in watershed villages of Jharkhand and Karnataka with around 84 per cent followed by Telangana and Chhattisgarh with 83.76 and 78.2 per cent respectively. The same among SMF of non-watershed villages was more in Jharkhand followed by Karnataka, Chhattisgarh and Telangana with 62.89,51.72,49.5 and 46.76 per cent respectively.

Table 3.2: Landholding Status

States	Landholding (Average in acres) Convert to Ha									
	LMF					SMF				
	Arable Land	Non-arable Land	Irrigated Area	Net Sown Area	Gross Sown Area	Arable Land	Non-arable Land	Irrigated Area	Net Sown Area	Gross Sown Area
Chhattisgarh										
Watershed	25.6	3.5	24.0	25.6	51.2	2.3	0.75	1.80	2.3	4.6
Non-watershed	27.01	5.4	13.4	22.5	45.0	2.7	0.66	1.1	2.22	4.44
Jharkhand										
Watershed	22.8	2.56	16.5	22.8	45.6	1.87	0.33	1.57	1.87	3.74
Non-watershed	19.67	4.4	11.44	16.01	32.01	1.98	0.67	1.0	1.59	3.18

(Contd.....)

Table 3.2 ***(Contd...)***

Telangana (ha)										
Watershed	5.40	0	4.53	5.40	9.05	2.32	0.42	2.23	2.74	4.46
Non-watershed	4.95	2.02	3.89	6.97	8.02	1.89	1.23	1.23	2.63	4.46
Karnataka (ha)										
Watershed	4.78	2.88	3.72	5.70	8.93	1.67	0.3	1.96	2.34	3.94
Non-watershed	2.56	3.48	3.00	5.04	6.66	0.99	1.04	1.05	2.03	3.27

b. Bio-physical and Productivity Enhancement

Bio-physical or environmental impacts are critical for the economic impacts of watershed investments due to the organic linkages between natural resource base and the factors of production. This chapter focuses on the bio-physical factors that lead to the productivity enhancement of the watershed investments. Impact indicators are grouped under land development and changes in water bodies. Important indicators pertaining to these two groups include: wasteland treatment; common pool resource (CPR) development; land development for crops, fodder, and horticulture under land development and the indicators for changes in water bodies include : rain water harvesting, groundwater recharge; drinking and irrigation water potential. The analysis is carried out between the watershed and non-watershed villages and also between differentcategories of households.

i. Conversion of Non-arable into Arable Land

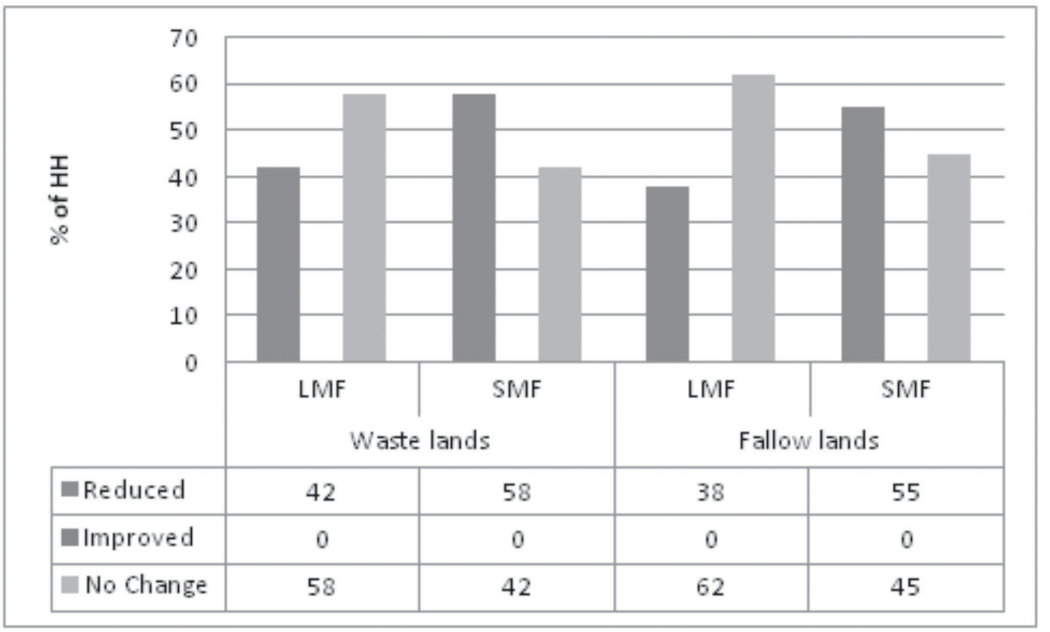
Land use pattern reflects the relative importance of economic activities pertaining to land. Conversion of non-arable lands to arable lands indicates not only the pressure on land but also the agricultural productivity and returns from agriculture. Area under cultivable waste also reflects the relative economics of farming while area under fallows indicates the annual rainfall fluctuations. Area under fallows goes up with the decline in annual rainfall. Given the potential of watershed technology in increasing land productivity it is expected that the share of arable lands would increase. Figures below indicate that the positive impact of WSD in terms of land use was more prominent in the case of small farmers. This points towards better benefit flows in favor of small farmers when compared to large farmers in terms of land use pattern.

ii. Wasteland Treatment

Treatment of waste or degraded lands, common pool resources (CPRs) and land developed for fodder indicate the extent of area covered under WSD that would provide

common and environmental benefits. Improved quality of these lands would enhance the availability of fodder and fuel wood. At the aggregate level, the reduction in cultivable waste lands and the fallow lands for Large and Medium Farmers (LMF) was 42 and 38 per cent and the same in case of SMF category was 58 and 55 per cent (Fig 1). Significant is the fact that, majority of them expressed 'no change' in cultivable waste land and fallow land because most of them particularly in Chhattisgarh and Jharkhand have expressed their dissatisfaction that the land to be brought into cultivation was still left over, even after the implementation of WDP.

Fig 1: Reduction in Wastelands and Fallow Lands



	Waste lands		Fallow lands	
	LMF	SMF	LMF	SMF
Reduced	42	58	38	55
Improved	0	0	0	0
No Change	58	42	62	45

On an average, the reduction in cultivable waste land was more among the LMF category of Chhattisgarh and Jharkhand with around 2.48 ha and 1.60 ha respectively (Table 3.3). Whereas, the reduction in cultivable waste land of LMF in Telangana and Karnataka was around 1.5 ha. However, if we take the average size of landholding of LMF of these two States which was much larger ranging between 9 to 10 ha, compared to Telangana and Karnataka with around 5 ha, the impact of WDP on reduction in waste lands and fallow lands in Telangana and Karnataka was much higher.

Table 3.3: Change in Land Use Pattern

States	Reduction in (ha)(Average)			
	LMF		SMF	
	Cultivable Wasteland	Fallow Lands	Cultivable Wasteland	Fallow Lands
Chhattisgarh				
Watershed	2.48	0.04	0.20	0.15
Non-watershed	-	-	-	-
Jharkhand				
Watershed	1.60	0.08	0.40	0.24
Non-watershed	-	-	-	-
Telangana				
Watershed	1.5	0.5	0.5	0.25
Non-watershed	-	-	-	-
Karnataka				
Watershed	1.5	0.45	0.5	0.17
Non-watershed	-	-	-	-

iii. Impact of WDP on Fodder Availability

The land area developed for green fodder and the adequacy in its availability as reported by LMF category at the aggregate level was 56 per cent. The same by SMF was 34 per cent. Surprisingly, some of the landless category in Telangana and Jharkhand States also indicate positive impact on the availability of green fodder, available on revenue wastelands and farm bunds. However, this was insignificant at the aggregate level. The reduction in cultivable wastelands and fallow lands while having a positive impact on arable lands, reduced the land availability for green fodder. Due to this, 28 per cent of LMF and 18 per cent of SMF reported less availability of green fodder, in the watershed villages. Only 45 per cent of the LMF of watershed villages in Karnataka reported adequacy in fodder availability. Whereas, around 70 per cent of LMF of the other three States reported availability of green fodder in adequate quantity. The Table below (Table 3.4) indicate that the time taken for fetching green fodder in watershed villages was less compared to non-watershed villages ranging between one to two hours for LMF category. Whereas, the same in non-watershed villages ranges between one to three hours in case of LMF category.

Fig 2: Impact of WDP on Fodder Availability

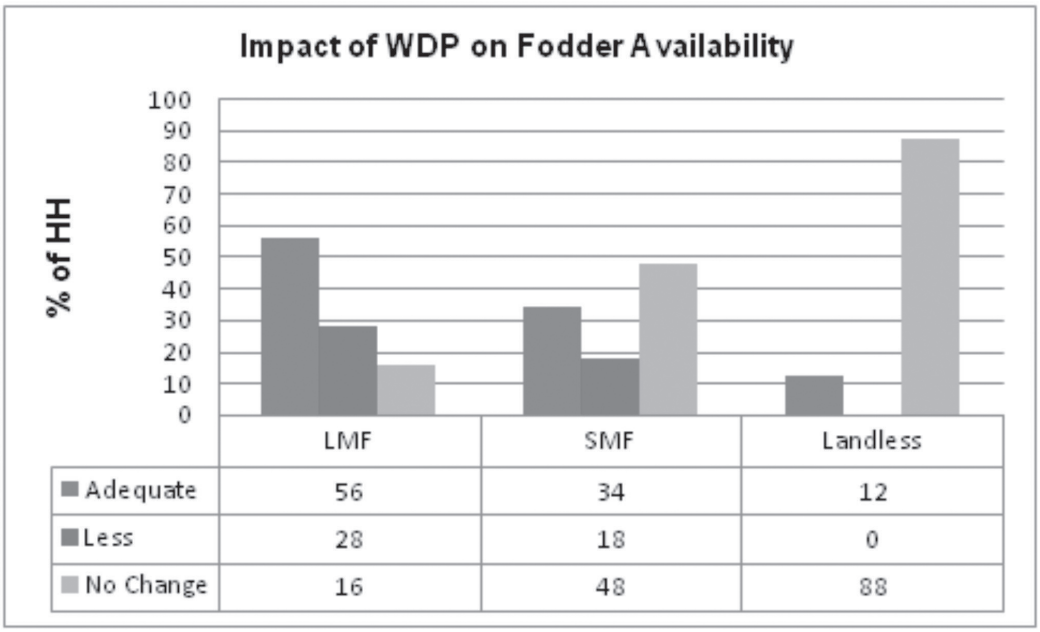


Table 3.4: Impact of Watershed on Natural Resource Management: Availability of Fodder

States	Availability of Fodder (Average %)							
	LMF				SMF			
	Adequate	Less	If less, scarcity in Months	Time taken for fetching (Hrs/Day)	Adequate	Less	If less, scarcity in Months	Time taken for fetching (Hrs/Day)
Chhattisgarh								
Watershed	74.0	26.0	2.0	1.5	66.0	34.0	3.0	2.5
Non-watershed	42.5	57.5	5.0	1.5	40.1	59.9	5.0	3.5
Jharkhand								
Watershed	69.6	30.4	3.0	2.0	72.7	27.3	3.0	2.0
Non-watershed	44.9	55.1	5 .0	3.10	49.0	51.0	3.0	3.0
Telangana								
Watershed	72.2	27.8	-	1.0	76.3	23.7	3.0	1.0
Non-watershed	100.0	-	6	1.0	100.0	-	-	1.0
Karnataka								
Watershed	45.0	55.0	4.2	1.3	38.8	61.2	7.2	1.6
Non-watershed	-	100.0	6.0	2.0	-	100.0	-	-

iv. Access to Drinking Water and Change in Irrigation Status

One of the priority for implementation of WDP in an area is improvement of drinking water for human beings and cattle. The impact of the rainwater harvesting structures is expected to improve the groundwater and surface water availability for drinking and irrigation purposes. Increase in groundwater recharge or potential is measured in terms of number of wells recharged and the depth of water table. The water harvesting structures play a key role by storing water and allow sufficient time for water to percolate deep into the soil. Land development activities such as contour bunding, land levelling and cultivation practices also contribute towards accumulation of groundwater. The type and number of water sources available on an average for each sample household in the sample villages is seen in Table 3.5. Dug wells and borewells were the major water sources in all the watershed villages. Ponds and nala /streams also contributed to some extent mainly in Chhattisgarh and Jharkhand.

Table 3.5: Sources of Irrigation and Accessibility

States	Sources of Irrigation and Status									
	LMF Dug-wells	SMF Bore-wells	Pond	Nala/ Stream (lifting)	Others	Dug-wells	Bore-wells	Pond	Nala/ Stream (lifting)	Others
Chhattisgarh										
Watershed	02	01	01	01	-	02	02	01	01	-
Non-watershed	02	01	-	-	-	01	01	-	-	-
Jharkhand										
Watershed	02	01	02	01	-	02	-	01	01	-
Non-watershed	01	01	-	-	-	01	01	-	-	-
Telangana										
Watershed	1	1	-	-	-	1	1	-	1	-
Non-watershed	1	1	-	-	-	1	1	-	1	-
Karnataka										
Watershed	2	1	-	-	-	1	1	-	1	-
Non-watershed	-	-	-	-	-	-	1	-	-	-

The Table below presents the sample households observations regarding the adequacy of drinking water availability, quality of the drinking water and reasons for the improvement in drinking water status. The groundwater table was observed in all the watershed villages in the range of 150 ft to 240 ft compared to non-watershed villages where it was available at a depth of 275 ft in Chhattisgarh or 600 ft in Karnataka (Table 3.7). This was reflected in the adequacy in availability of drinking water status as expressed by all the LMF and SMH households in the watershed villages. Majority of the households of watershed villages belonging to LMF category in all watershed villages factored out the improvement in the groundwater status as the main reason for improvement in the quality of drinking water. Whereas, 68.4 per cent of households in Chhattisgarh and 64.3 per cent in Jharkhand belonging to SMF category observed an increase in surface water storage through tanks and farm ponds.

The qualitative improvement in the availability of drinking water comes out clearly in terms of time spent in fetching water. With an increase in groundwater the functional bore-wells water availability has increased because of which the people have stopped fetching water from the village ponds which usually are away from the village. Another reason is the poor quality of water in these tanks /ponds due to contamination with chemical fertilisers and pesticides because of which the villagers were shifting to groundwater sources. While the time spent for drinking water in watershed villages for LMF ranges from 0.5 hr to 1.0 hr in Chhattisgarh and Jharkhand, the same in case of non-watershed villages ranges from 1.5 hr to 2.0 hrs. In Telangana irrespective of the WDP all the villagers were dependent on drinking water supply from the market. This is to evade the risk of poor quality of bore water they get in their villages.

Table 3.6 Drinking Water Availability

States	Availability of Drinking Water & Status													
	LMF							SMF						
	Quantity		Quality		Reason for Improvement (%)		Time taken for fetching (Hrs/day)	Quantity		Quality		Reason for Improvement (%)		Time taken for fetching (Hrs/day)
	Adequate	Less	No.	Better	Enhanced groundwater	Increase surface water storage		Adequate	Less	No.	Better	Enhanced groundwater	Increase surface water storage	
Watershed	79.0	21.0	11.5	88.5	89.5	66.8	0.5	88.5	11.5	9.9	90.1	91.1	68.4	0.5
Non-watershed	62.1	37.9	34.2	65.8	11.4	21.2	2.0	51.8	48.2	33.7	66.3	12.0	18.9	2.5

(Contd.....)

Table 3.6 *(Contd...)*

Jharkhand														
Watershed	84.5	15.5	13.4	86.6	84.8	55.6	1.0	90.1	9.9	12.2	87.8	85.6	64.3	1.0
Non-watershed	66.8	33.2	33.5	66.5	14.3	31.6	1.5	58.3	41.7	37.8	62.2	14.5	21.4	1.4
Telangana														
Watershed	82.9	17.1	8.8	91.2	70.0	30.0	0.5	73.4	26.6	13.0	87.0	65.0	35.0	0.5
Non-watershed	37.1	62.9	38.2	61.8	90.0	10.0	0.5	100.0	-	31.0	69.0	90.0	10.0	0.5
Karnataka														
Watershed	97.5	2.5	7.5	92.5	-	100.0	0.5	76.2	23.8	14.5	85.5	-	-	0.5
Non-watershed	25.0	75.0	25.0	75.0	-	-	1.0	18.5	81.5	24.1	75.9	-	-	1.5

Table 3.7: Potential of Water Availability

States	Increase in Groundwater Level (in fts.)													
	LMF							SMF						
	Wells (Nos. & Water level Ft.		Bore wells (Nos. & Water level Ft.)		Tanks (HHs) Command Area (ha.) (Nos. & Water level Ft.)		Water Retention Period (in Months)	Wells (Nos. & Water level Ft.		Bore wells (Nos. & Water level Ft.)		Tanks (HHs) Command Area (ha.) (No s. & Water level Ft.)		Water Retention Period (in Months)
	Increased	Status quo	Increased	Status quo	Increased	Status quo		Increased	Status quo	Increased	Status quo	Increased	Status quo	
Chhattisgarh														
Watershed	(04)	-	(04)	-	(02)	-	6	(03)	-	(03)	-	(02)	-	9
	(-15)		(-150)		(5)			(-20)		(-165)		(5)		
Non-watershed	(+30)	-	(+275)	-	1-2	-	2	-40	-	-200	-	2	-	3
Jharkhand														
Watershed	(02)	-	(02)	-	(01)	-	4	(02)	-	(03)	-	(01)	-	9
	(-20)		(-225)		(-4)			(-20)		(-190)		(-4)		
Non-watershed	(+35)	-	(+250)	-	1	-	1.5	-30	-	(+210)	-	1	-	3
Telangana														
Watershed	01	-	01	-	-	-	12	01	-	01	-	-	-	12
	(-40)		(-240)					(-40)		(-200)				
Non-watershed	(+250)	-		-	-	-	6		-	01 (+500)	-	-	-	6
Karnataka														
Watershed	01	-	02	-	-	-	9	-	-	01	-	-	-	9
	(-80)		(-200)							(-250)				
Non-watershed	-	-	(+800)	-	-	-	5	-	-	01 (+600)	-	-	-	5

(-) indicates positive impact (improvement in Groundwater Recharge)

v. Impact on Productivity Enhancement

Farm productivity is directly linked to the biophysical environment. The improvements in bio-physical indicators that have taken place due to WSD are expected to reflect in area and yield improvements. Bio-physical impacts also influence livestock productivity. In this section an attempt is made to assess the productivity impacts of agriculture and livestock sectors. In the case of agriculture change in area under crops, cropping intensity, crop diversity, yield improvements were assessed. In the case of livestock changes in livestock holdings, composition and milk yields were assessed.

Watershed interventions provide an opportunity for change in cropping pattern on one hand and strengthening the existing cropping systems on the other hand. They provide an opportunity to farmers to generate farm income within short period through crop intensification and diversification. Crop diversification is the technique of intensification of crop and maximum utilisation of specific land for using multiple crops in a short period. The main cereal crops during the kharif season were paddy (both in Chhattisgarh and Jharkhand) wheat (Chhattisgarh) and maize &pulses (Jharkhand) (Table3.9 a). The pulses taken up by the farmers during this season in the watershed villages were Moong, Urad (Black Gram) followed by Tur (Pigeon Pea), and Chana. Maize and pulses were also the main crops in these two States and Telangana. Majority of sample households of both SMF and LMF of Karnataka were reported Cotton crop in addition to these as a main crop. All these were grouped into commercial crops. The area under paddy has improved significantly in all the four States in case of LMF (Table 3.8). All the SMF in the watershed villages of all the four States were shifted to vegetable cultivation with an increase in irrigated area. Even the LMF category of all the watershed villages have allocated part of their land to vegetable cultivation with an increase in irrigated area. The change in the area of the major crops in both Rabi and Kharif season for both small and large farm category of farmers is given in Table 3.9. The information regarding the productivity of the crops and marketed surplus is provided in Annexure II (Tables 3.9 a, 3.9 b, c and d).

Table 3.8: Change in cropping pattern

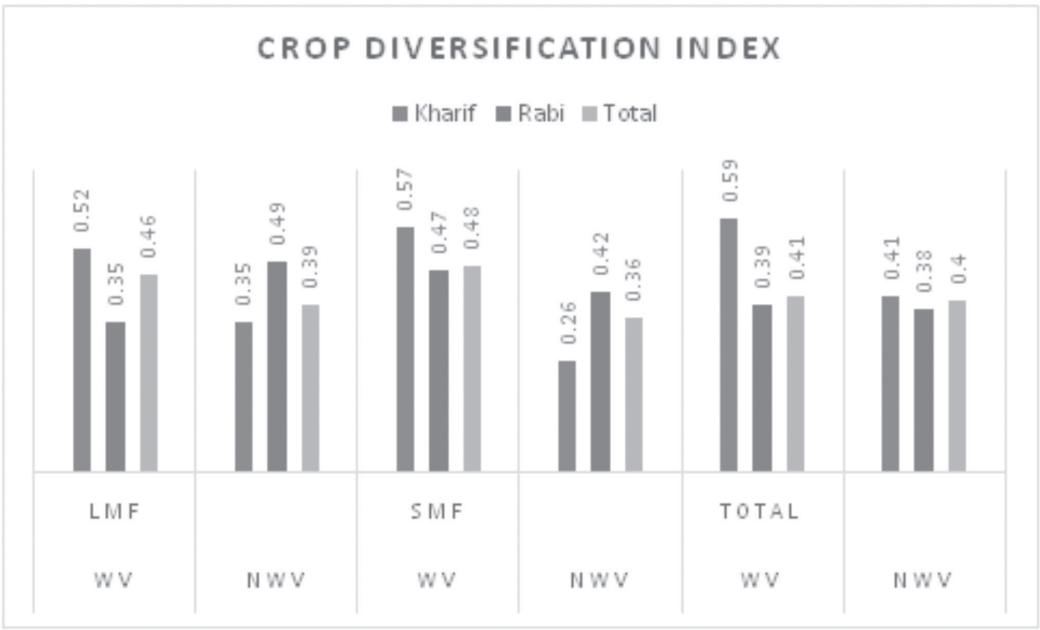
States	Change in Cropping Pattern (area in ha.) (Average per household)											
	LMF						SMF					
	Watershed			Non-watershed			Watershed			Non-watershed		
	Paddy	Commercial Crops	Vegetables / Other Crops	Paddy	Commercial Crops	Vegetables / Other Crops	Paddy	Commercial Crops	Vegetables / Other Crops	Paddy	Commercial Crops	Vegetables / Other Crops
Chhattisgarh (avg in ha)												
Kharif	4.9	0.12	3.64	3.25	1.01	1.38	1.62	0.05	0.40	0.81	0.32	0.60
Rabi	1.62	0.81	-	2.03	3.65	-	0.40	0.41	1.21	0.60	0.20	0.81
Jharkhand (avg in ha)												
Kharif	4.04	2.43	2.4	3.45	1.21	2.03	1.21	0.80	0.61	0.77	0.40	0.60
Rabi	1.62	0.10	1.42	0.60	0.40	1.01	0.32	0.81	-	0.32	0.20	0.20
Karnataka												
Kharif	2.0	3.6	2.0	1.0	2.3	1.0	0.5	1.0	0.84	1.0	1.34	-
Rabi	1.0	1.0	2.0	1.0	1.0	1.0		1.0	1.34	-	1.03	1.3
Telangana												
Kharif	2.2	2.8	1.3	3.6	2.3	-	1.3	1.5	0.8	2.1	1.8	-
Rabi	2.9	1.3	0.8	3.2	4.0	0.2	1.2	1.2	0.8	2.2	1.6	-

c. Crop Diversification and Intensity

The change in cropping pattern is also measured through Crop Diversification Index (CDI). Crop diversification takes place either through area augmentation or crop substitution. If carried out appropriately, it can be used a tool to augment farm income, generate employment, alleviate poverty and conserves soil and water resources.Crop Diversification provides a broader choice in the production of a variety of crops in a given area and also lessens the risk of crop failure. There were studies (Pingali and Rosegrant 1995) which support the positive impact of crop diversification. It can offer comparatively higher net returns from crops, higher net returns per unit of labour, optimisation of resource use, and higher land utilisation efficiency (Ashfaq et al. 2008). Crop diversification as a result of increase in soil fertility and water availability over a period of time is measured using Simpson Index. A higher diversity index indicate higher magnitude of diversification in production patterns suggesting ability to reduce risks

associated with failure of one crop due to variable rainfall and other biotic and abiotic factors. While, lesser indicates concentration of crops due to specialisation. The Crop Diversification Index was calculated for the two category farmers in the watershed and non-watershed villages for both Kharif and Rabi. The figure below indicates that CDI was more during Kharif than Rabi for both category of farmers in watershed villages. This is because of the shift in cropping pattern to vegetables in these villages during Kharif. Area under Paddy or Wheat was increased in the watershed villages with an increase in area under supplementary irrigation in both the casesof LMF and SMFduring Rabi. Therefore, the CDI of LMF and SMF of watershed villages during Rabi was less with 0.35 per cent and 0.47 per cent compared to non-watershed villages with 0.49 and 0.42 per cent respectively.

Figure 3: Crop Diversification Index



Cropping Intensity

Cropping intensity is determined mainly by the availability of irrigation and also the duration of crop varieties. Irrigated plots were used for double cropping or sown more than once in a year. Where ever WSD has improved irrigation or soil moisture, cropping intensity has enhanced. As observed in Table 3.10, the cropping intensity of both the category households in watershed villages was more than non-watershed villages.

Table 3.9: Cropping Intensity

States	Cropping Intensity (%)	
	LMF	SMF
Chhattisgarh		
Watershed	137.8	140.5
Non-Watershed	121	107
Jharkhand		
Watershed	124	124
Non-Watershed	98.6	79.5
Telangana		
Watershed	128	128
Non-Watershed	101	109.5
Karnataka		
Watershed	142.4	177.5
Non-Watershed	117.9	89.5

d. Livelihood Diversification

Dependency on Livestock is seen as one of the important risk bearing factor in rainfed areas. Livestock economy is highly dependent on the bio-physical or natural resource base of the region. The decline of draft animals is significant in all categories both in watershed and non-watershed villages which could be due to the tractorisation and diseconomies of keeping the bullocks in the light of fodder and water scarcity. These factors have been identified for the decline in draft power in many regions (Reddy, 2010). For all land based agricultural operations the farmers in both watershed and non-watershed villages were depending on hired high cost machinery and tractors. Among the milch animals, cross breed cows and desi buffaloes were common. Buffaloes are usually hardy animals compared to cows and can thrive well. Therefore, mostly desi buffaloes are being maintained by the landless and marginal farmers who doesn't have the land for growing fodder. Whereas, cross breed cows were found mostly with LMF category. Small ruminants were being grown by shepherd community. Among the small ruminants sheep were being preferred than the goat. This is mostly because of the climatic conditions. The coarse wool of sheep helps them to thrive well during coarse conditions.

The owners of the milch animals preferred to raise more than one animal on an average for the continuous supply of milk and to avoid the dry periods of milch animals. The table below indicates 60 per cent of LMF in Chhattisgarh, 45 per cent in Jharkhand and 50 per cent each in Telangana and Karnataka were maintaining more than two milch

animals in watershed villages. Whereas, the SMF category of Telangana and Chhattisgarh were in a better position in terms of maintaining more than two milch animals with 60.5 and 52.5 per cent respectively. The per cent of landless households in watershed villages maintaining one or two milch animals was 55, 90 and 57.5 in Chhattisgarh, Jharkhand and Karnataka respectively. The maintenance of milch animalsby landless households of watershed villages in Telangana was less with 22.3 per cent compared to the other three States. The maintenance of small ruminants was more by these households in watershed villages of Telangana with majority (70 per cent) of them maintaining 20 small ruminants on an average. Surprisingly, LMF category of Chhattisgarh and Jharkhand were also depending on small ruminants in watershed villages with 80 and 70 per cent respectively.

Table 3.10 : Percentage of Households with Milch Animals (No.)

	LMF		SMF		Landless	
	WV	NWV	WV	NWV	NWV	WV
Chattisgarh						
Nil	3(7.5)	4(20)	16(20)	5(12.5)	18(45)	3(15)
One Animal	13(32.5)	12(60)	22(27.5)	9(22.5)	13(32.5)	11(55)
Two Animals	20(50)	4(20)	38(47.5)	14(35)	9(22.5)	4(20)
More than two Animals	4(10)	-	4(5)	12(30)	-	2(10)
Jharkhand						
Nil	8(20)	5(25)	9(11.25)	2(5)	6(15)	2(10)
One Animal	14(35)	11(55)	42(52.5)	11(27.5)	18(45)	8(40)
Two Animals	10(25)	2(10)	22(27.5)	22(55)	16(40)	9(45)
More than two Animals	8(20)	2(10)	7(8.75)	5(12.5)	-	1(5)
Karnataka						
Nil	11(27.5)	9(45)	26(32.5)	21(52.5)	12(30)	11(55)
One Animal	9(22.5)	5(25)	20(25)	9(22.5)	14(35)	4(20)
Two Animals	12(30)	4(20)	24(30)	6(15)	9(22.5)	5(25)
More than two Animals	8(20)	2(10)	10(12.5)	4(10)	5(12.5)	
Telangana						
Nil	12(30)	14)(70)	24(30)	23(57.8)	25(62.6)	420)
One Animal	8(20)	2(10)	8(10)	2(5.0)	4(9.5)	2(11.0)
Two Animals	8(20)	4(20)	16(20)	7(17.5)	5(12.8)	8(39.4)
More than two Animals	12(30)	-	32(40)	8(19.7)	10(25.1)	6(29.6)

· Figures in Parenthesis indicate Percentage to Total Number of Animals

Table 3.11 : Percentage of Households with Small Ruminants (No.)

	LMF		SMF		Landless	
	WV	NWV	WV	NWV	NWV	WV
Chhattisgarh						
Nil	8(20)	8(40)	17(21.25)	9(22.50	4(10)	2(10)
20 Animals /HH	32(80)	8(40)	50(62.5)	21(52.5)	29(72.5)	18(90)
More than 20 Animals /HH	-	4((20)	13(16.25)	10(25.0)	7(17.5)	-
Jharkhand						
Nil	11(27.5)	4(20)	46(57.5)	11(27.5)	11(27.5)	5(25)
20 Animals /HH	28(70)	16(80)	34(42.5)	29(72.5)	29(72.5)	15(75)
More than 20 Animals /HH	1(2.5)	-	-	-	-	-
Karnataka						
Nil	32(80)	1260)	36(45)	21(52.5)	9(22.5)	12(60)
20 Animals /HH	8(20)	8(40)	24(30)	9(22.5)	1127.5)	8(40)
More than 20 Animals /HH	-	-	20(25)	10(25)	20(50)	-
Telangana						
Nil	40(100)	18 (90.1)	52(65.1)	19(48.5)	-	22 (55)
20 Animals /HH	-	2(9.9)	8(10.0)	13(32.9)	2870)	13(32.5)
More than 20 Animals /HH	-	-	20(24.9)	8(18.6)	12(30)	5(12.5)

* Figures in Parentheses indicate Percentage to Total Number of Animals

e. Employment and Income

At the aggregate level impact of WSD on employment was significantly more among the small farmers in the case of male and female labour. Impact on non-farm employment was akin to that of farm employment, though the impact was more widespread, as about half of the households have reported increase in non-farm employment. With a change in cropping pattern towards the cultivation of vegetable crops which are labor intensive, an increase in employment days in the watershed villages compared to non-watershed villages was reported. The increase was more for the SMF category compared to LMF category for both men and women in watershed villages. In the watershed villages the number of

employment days generated per person in agricultural activities for SMF was more for women in the range of 160 days in Telangana to 185 days in Karnataka (Table 3.14). The same for men was in the range of 145 in Telangana to 160 each in Jharkhand and Karnataka. Compared to women in SMF category, the employment generated through agricultural activities for women in LMF was less in all the four States, more so in Telangana and Jharkhand with only 80 and 95 days respectively. Similarly the men in LMF category gained less number of days of employment through farming compared to men in SMF category, reason being the differencein cropping pattern taken up by these two categories. Vegetables being a labour intensive crop taken up mostly in the lands of SMF category resulted in the reporting of more number of days of employment by both men and women under agriculture. The employment days reported under non agriculture activity by the farming and landless households includes work under livestock and MGNREGS activities. The number of days of employment reported for the women of SMF category under non agriculture category was less in watershed villages with10 and 42 days compared to the women in non-watershed villages with 22 and 54 days in Chhattisgarh and Jharkhand. Similar was the case of women of LMF category with 15 and 24 days in watershed villages and 25 and 36 days in non-watershed villages in Chhattisgarh and Jharkhand respectively. The increase in number of days of employment in agriculture could be a reason for this.

Table 3.12: Availability of Labour Days for Farming Community

States	Availability of Labour Days (Average per HH)							
	LMF				SMF			
	Agriculture		Non-Agriculture		Agriculture		Non-Agriculture	
	M	W	M	W	M	W	M	W
Chhattisgarh								
Watershed	140	160	25	15	155	180	32	10
Non-watershed	110	125	40	25	115	135	50	22
Jharkhand								
Watershed	144	155	45	24	160	166	55	42
Non-watershed	125	130	60	36	140	145	60	54
Telangana								
Watershed	110	80	30	45	145	160	60	85
Non-watershed	80	60	45	30	95	90	75	80
Karnataka								
Watershed	125	95	65	42	160	185	70	85
Non-watershed	95	105	50	65	85	90	90	75

In case of landless households, clearly the number of days of employment was more in watershed villages of all the States compared to non-watershed villages (Table 3.15). The number of days of employment registered under the women was more for both agriculture and non-agriculture operations in all the States. The substantial positive impact of employment could not be entirely due to WSD, as part of the increase in employment may be due to other interventions viz., MGNREGS.This could be in the form of construction activities in the private and public sector and infrastructure development in the public sector. Even the employment generated through MGNREGS falls under non-agriculture if the works pertain to construction of roads, etc. Except in watershed villages of Telangana, the number of days of employment registered under non agriculture activities was more than the agriculture activities, in the watershed villages of the other three States for landless households. It was 50 per cent each in agriculture and non-agriculture activities for landless households of watershed villages in Telangana.

Table 3.13: Changes in Employment Status- Landless

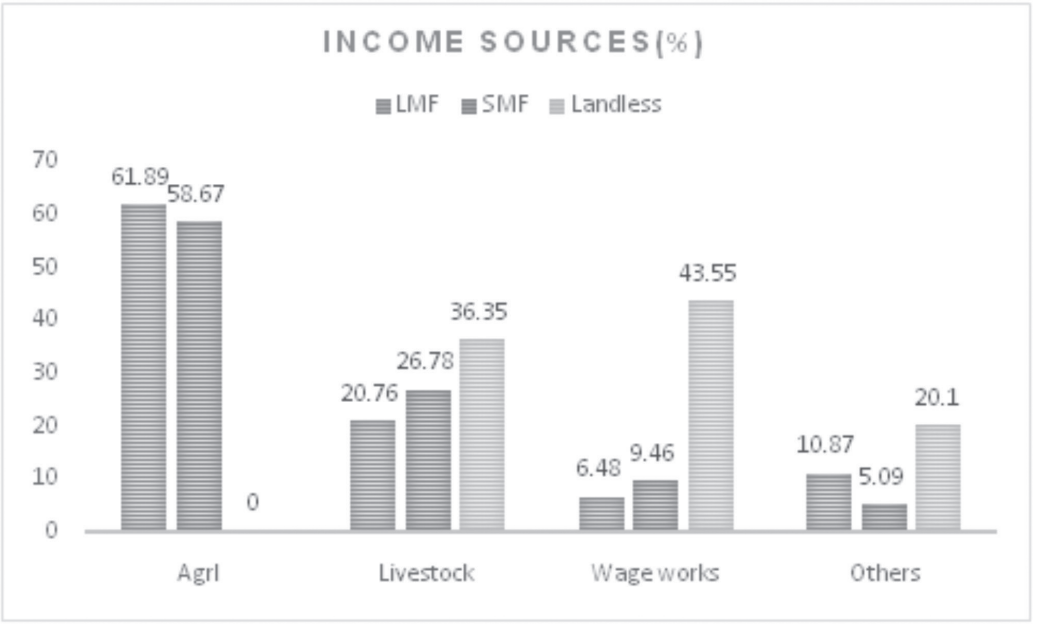
States	Availability of Labour Days for Landless							
	Agriculture (No. of days)		Non-Agriculture* (No. of days)		Wage Rate (₹)			
					Agriculture		Non-Agriculture*	
	M	W	M	W	M	W	M	W
			Chhattisgarh					
Watershed	40	60	150	100	150	120	150	150
Non-watershed	25	30	120	120	100	80	100	100
			Jharkhand					
Watershed	50	60	200	120	120	100	150	150
Non-watershed	30	50	100	100	80	60	100	100
			Telangana					
Watershed	85	103	90.0	70.0	245	140	120	100
Non-watershed	25	40	80	90	280	160	100	100
			Karnataka					
Watershed	90	110	185	165	180	135	115	100
Non-watershed	25	40	140	135	192	100	120	90

*Including MGNREGS @ ₹ 157/- (Chhattisgarh) & @ ₹153/- (Jharkhand)

Changes in Income

Major sources of income in the sample villages were agriculture, livestock and labour. Though there could be other sources, their share was marginal and we do not have the detailed source wise income data. Income from these three major sources was included to arrive at the aggregate income at the household level. It is not uncommon that the share of income from agriculture was maximum for all the three category farmers. However we could see from the figure below that the income from agriculture in watershed villages was more for LMF with 61.89 per cent followed by SMF with 58.67 per cent despite their crop diversification. However, the income gain in watershed villages for these households was through livelihood diversification with livestock occupying 26.78 per cent of their total income. Livestock has become a significant source of livelihood for landless households in watershed villages with 36.35 per cent of their total income. Income from livestock was mostly through the sale of milk and the sale of sheep and goat.

Figure 4 : Share of Different Sources of Income in Watershed Villages (%)



To sum up, water harvesting structures play a crucial role in generating impacts in watershed villages. The impact was visible in increase of groundwater sources, water retention period, and rise of water table and strengthening of drinking water status in the

watershed villages. Change in cropping pattern was observed with more crop diversification during Kharif and increase in staple food crops like Paddy and Wheat during Rabi. Impact was also visible in terms of increase in employment days generated for both men and women in agriculture and livestock in watershed villages.

Chapter IV

IMPACT OF WDP ON NUTRITIONAL STATUS

Nutritional Security: Access

So far we have discussed about the impact of watershed programme on change in land use pattern, access to drinking water, increase in irrigated area, cropping area, yields and income. With the increase in foodgrain production in the country and with an access to subsidised foodgrains through ration shops, the food security of the people has increased. However, to what extent the food security has translated into nutrition security is still a matter of concern. Nutrition security emerged with the recognition of the necessity to include nutritional aspects into food security. Nutrition aspects will be included not only with disposable income in hand but also with secure access to an appropriately nutritious diet coupled with a sanitary environment, adequate health services and care to ensure a healthy and active life for all household members.

The factors which influence the nutritional status at the level of individual human being are dietary intake and health status. The dietary intake should meet a certain threshold in terms of quantity and quality whereas, nutrient intake should be balanced in terms of carbohydrates, protein and fat (macro nutrients) and vitamins and minerals (micro nutrients) and appropriately absorbed in the human body. At the household level, the dietary intake of specific individuals depends on two major issues: what type of food is being served on the table (Access to nutritious food) and who is to eat it (Intra household equity) (Weingartner 2010). The factors that should be considered as potential cause of nutrition security might not be possible to capture within a single layer of factors, but cut across many causal layers, among which the watershed programme which is meant for improving the lives of the people, is the major one.

FAO defined nutrition security as a condition when all people at all times consume food of sufficient quantity and quality in terms of variety, diversity, nutrient content and safety to meet their dietary needs and food preferences for an active and healthy life, coupled with a sanitary environment adequate health and care (CFS 2012). The definition refers to two points i.e access and utilisation components. Utilisation, in the context of nutrition security refers to individuals biological capacity to make use of food for a productive life. Consensus on the measurement of the utilisation component has centered on various measures of nutritional status i.e anthropometric measures. The indicator that

can measure the access component is improved household diverse food consumption. The household dietary diversity i.e the number of different food groups consumed over a given reference period is an attractive proxy indicator for the following reasons.

- A more diversified diet is an important outcome in and of itself.
- A more diversified diet is associated with a number of improved outcomes in areas such as birth weight, child anthropometric status and improved haemoglobin concentrations.
- A more diversified diet is highly correlated with such factors as caloric and protein adequacy, percentage of protein from animal sources (high quality protein) and household income. Even in very poor households, increased food expenditure resulting from additional income is associated with increased quantity and quality of the diet.

The consumption of a variety of nutritious food is important for women's and men's health. Adequate amounts of protein, fat, carbohydrates vitamins and minerals are required for a well-balanced diet. Meat, fish, eggs and milk as well as pulses and nuts are rich in protein. Dark green, leafy vegetables are a rich source of iron, folic acid vitamin C, carotene, riboflavin and calcium. Weekly recall of household consumption was taken in the manner similar to that of NFHS -3 and asked men and women in a household how often they consume various types of foods (daily, once or twice in a week, occasionally or never). The schedules were prepared accordingly, to find out the per week household consumption of certain food items like cereals, pulses, vegetables, eggs, meat and milk. Among the cereals the staple food of the households in the four study States includes Rice, Wheat and Maize. Ragi was the staple millet crop in Karnataka. Similarly the major pulse that was consumed by all households was Red Gram. Therefore, Public Distribution System through ration shops forms a major source of cereal based calorie consumption for the households of SMF and landless. The LMF households though were observed to have possessed the BPL cards, they purchase the items such as Sugar or Gram which were being supplied at the rate of 1 kg per household in PDS shops.

Physical Availabilityof Major Foods per Household

Availability refers to the physical availability of food stocks in desired quantities. Using foodgrains as a proxy for food (in a context where foodgrains account for a large

share of food intake), availability of foodgrain is given by domestic production of feed, seed and wastage plus net imports plus draw-down of stocks at the macro level. Whereas, household level of availability of foodgrains depends on production and marketed surplus. The per capita availability of Rice and Wheat in the country was 84.8 kg/annum/capita or 0.848 Q/annum/capita during 2013-14. Similarly, for wheat it was 66.9/kg/annum/capita 0r 0.669 Q/annum/capita. The per capita requirement of cereals was 383 gms/capita/annum or 137 kgs/capita/annum. Compared to these figures, the per capita availability of Rice was much higher in watershed villages with 185 kgs/capita/annum. However, it was lower in watershed villages in case of wheat with 0.40 Q/annum/capita for LMF and SMF. The per capita availability of wheatwas further lower for SMF in non-watershed villages with 0.25 Q/capita /annum. The per capita vegetable requirement as per ICMR norms in the country were 108 kgs/capita /annum 0r 10.8Q/capita /annum. The per capita availability of vegetables for the LMF households in watershed villages was 15.4, 6.8,4.56 and 4.24 Q/annum in Chhattisgarh, Jharkhand, Telangana and Karnataka respectively. The same for SMF category households was 8, 4.2, 5.5 and 5.87 Q/annum in these States. These figures were much lower in non-watershed villages with LMF of 3 and SMF of 1.6 Q/annum in Chhattisgarh, 3 and 1.4 Q/annum in Jharkhand, 0.9 and 2.91 Q/annum in Telangana and 2.91 and 1.17 Q/annum in Karnataka respectively. This shows that though there was an increase in vegetable production in watershed villages which has led to an increase in per capita availability, this was much lower compared to the average requirement per person, except in Chhattisgarh.

Table 4.1: Physical Availability per HH

Crops	LMF				SMF			
	Total Production	(Quintal) Quantity Retained by HH own Consumption (Quintal)	Quantity Marketed (Quintal)	Per Capita Availability (per annum- Quintal/ Kgs)	Total production (Quintal)	Quantity Retained by HH own Consumption (Quintal)	Quantity Marketed (Quintal)	Per Capita Availability (per annum- Quintal/ Kgs)
Chhattisgarh								
Watershed								
Paddy	180	15	165	3	60	10	50	2
Vegetables	1252	32.5	1175	6.5	340	40	300	8
Wheat	10	2	8	0.40	10	2	8	0.40
Non-watershed								
Paddy	120	5	115	1	42	7	35	1.4

(Contd.....)

Table 4.1 ***(Contd...)***

Vegetables	690	15	675	3	88	8	80	1.6
Wheat	7	2	5	0.40	5.25	1.25	4	0.25
Jharkhand								
Watershed								
Paddy	160	9	151	1.8	52	10	42	2
Vegetables	884	34	850	6.8	369	21	348	4.2
Maize	16	1	15	0.20	4	0	4	-
Pulses	4	1	3	0.20	2	0.5	1.5	0.10
Non-watershed								
Paddy	96	6	90	1.2	36	7	29	1.4
Vegetables	315	15	300	3	92	7	85	1.4
Telangana								
Watershed								
Paddy	349.31	3	346.31	0.75	126.19	25.04	101.15	6.26
Vegetables	93.27	22.8	70.47	4.56	108.38	27.5	80.88	5.5
Maize	90.52	-	90.52	-	140.22	-	140.22	-
Pulses	31.48	1	30.48	0.25	-	-	-	-
Non-watershed								
Paddy	303.56	22.05	281.51	5.51	112.42	25	87.42	6.25
Vegetables	10.33	4.5	5.83	0.9	-	-	-	-
Maize	88.2	-	88.2	-	66.91	-	66.91	-
Pulses	19.68	0.68	19.00	0.17	-	-	-	-
Karnataka								
Watershed								
Maize	65.19	0.74	64.45	0.18	24.16	-	24.16	-
Cotton	23.61	-	23.61	-	14.76	-	14.76	-
Vegetables	246	21.2	224.8	4.24	145.26	29.35	135.26	5.87
Non-watershed								
Maize	14.76	1.76	14.76	0.44	18.15	-	18.15	-
Cotton	19.68	-	19.68	-	9.84	-	9.84	-
Paddy	-	-	-	-	38.37	20	18.37	5
Vegetables	56.58	14.58	42	2.91	32.67	5.89	26.78	1.17

Consumption Pattern of the Households in the Watershed Villages - Inter Household Equity

Inter household equity was assessed by comparing the consumption of different food items by the watershed and non-watershed households.In general, there was an increase in the consumption of all items by all the households of the watershed households. However, compared to the cereals the consumption of quality food items such as vegetables, eggs, milk and meat. etc., has increased more among the small and marginal households of watershed villages compared to non-watershed villages. Among the different food items, the increase in consumption of meat was 30 per cent more by the landless

households in watershed villages over the non-watershed villages (Table 4.3). The increase in consumption of vegetables was more with 4.30 kgs per week among the SMF in watershed villages over the non-watershed villages. Whereas, the consumption of milk was more by LMF of watershed villages with 1.63 lts/week compared to non-watershed villages.

The inter household equity in terms of consumption was also assessed between different households within the watershed villages. It could be seen from the table below (Table 4.2) that as you move down the ladder from large and medium farmers to the landless households there is a shift in the consumption pattern in the watershed villages. The average consumption of cereals by LMF, SMF and landless households was 13.77,12.99 and 13.15 kgs /week (Table 4.2). Per capita consumption was worked out to be 2.75, 2.59 and 2.63 kgs/week. Whereas, the average requirement of cereals was 137.88 kgs/capita/annum or 2.87 kgs/week (NCAER,2014).The per capita net pulse availability has declined from around 60 grams per day in the 1950s to 40 grams in the 1980s and further to around 35 grams per day in 2000s at the national level.However combined with imports resulted in a marginal increase in pulse consumption estimated at around 50 grams per day in 2012-13 which was almost equal to the recommended daily requirement of pulses at 50 to 60 grams per day at the macro level. The major pulse taken up by the farmers in the watershed villages was gram either solely or as an intercrop. The consumption of pulses was 1.13,0.86 and 0.46 kgs/capita/week or 32.28, 24.57 and 13.14 gms/capita/day for LMF, SMF and landless households. The national nutrition guidelines recommends average daily consumption of 300 g /capita/day (Sachdeva, 2013) for vegetables. This comes to around 2.1 kgs/capita/week. A perceptible increase in vegetable consumption was observed in watershed villages with an increase in area under vegetables. The per capita vegetable consumption of LMF, SMF and landless households was 0.27, 0.29 and 0.19 kgs per capita per week. However, this was far less compared to the average requirement recommended.

There was increase in consumption of milk in watershed villages by 1.63,0.35 and 0.33 lts/week over non watershed villages (Table 4.3). However this increase was not satisfactory as we could observe from the Table 4.2 that the per capita consumption of milk in the watershed villages was 104.85,47.14 and 27.42 gms/day which was very less than the per capita requirement of milk as per ICMR norms i.e, 220 gms per day.

Table 4.2: Household Consumption per Week in Watershed Villages

Category	Cereals (kgs)	Pulses (kgs)	Vegetables (kgs)	Eggs (No.)	Meat (kgs)	Milk (lts)
LMF	13.77	1.13	9.70	10.50	1.37	3.67
SMF	12.99	0.86	10.22	14.25	1.65	1.65
Landless	13.15	0.46	6.75	12.50	2.50	0.96

Table 4.3: Increase in Consumption in Watershed Villages over Non-watershed Villages

Category	Cereals (kgs)	Pulses (kgs)	Vegetables (kgs)	Eggs (No.)	Meat (kgs)	Milk (lts)
LMF	-0.4	0.11	2.08	2.75	0.50	1.63
SMF	-0.13	0.07	3.50	7.5	0.80	0.35
Landless	0.96	0.35	4.30	4.32	0.75	0.33

To sum up, an increase in the consumption of pulses, vegetables, milk, eggs and meat was observed among the households in watershed villages. Inter-household consumption pattern revealed that consumption of cereals, pulses and milk increased more among the LMF households compared to the other category. Consumption of vegetables and eggs increased more by the SMF category and the consumption of meat increased more by landless category. However, except cereals the consumption of pulses, vegetables and milk was very less compared the requirement per capita per day.

Intra-household Equity

So far we have observed the inter-household consumption of food items in watershed and non-watershed villages. This section compares the consumption pattern of women and men within the households in watershed villages by assessing the frequency of consumption of foods. A mixed response was observed between the genders of different households.

Tables 4.4 A to C indicate the following observations.

- Though there was an increase in consumption of milk among the LMF the daily consumption of milk was more among the men compared to the women. Similar was the case of consumption of other items except eggs. Compared to men, the percentage of women who reported daily consumption of eggs was more with 17.2 per cent. The women in these households reported replacing the less consumption of meat and milk with that of eggs.

- Among the SMF category though the percentage of women consuming milk daily was more than men , it is quite alarming to observe that good number of women (16.7 per cent) have never taken the milk so far. However, it is heartening to observe that with an increase in the area under pulses the per cent of women who consume pulses daily and twice or thrice in a week was more than men. Similar was the case of consumption of leafy vegetables. Whereas, the percentage of men consuming the quality foods such eggs, fish and meat was more compared to the women.

- The frequency of consumption of foods of landless households was almost the same as that of SMFhouseholds. The frequency of consumption of meat was more in these households.However the frequency of consumption of all the items by the women in these households was less compared to the men except the pulses and leafy vegetables.

Table 4.4 a. Watershed Villages

Frequency of Consumption of Foods: 1. Large and Medium Farmers						
Type of Food	Total Number	Daily (Once/ Twice/ Thrice)	No. of Times in week (No.)	One in a Week	Occa-ssionally	Never
Men						
Milk or Curd	33	78.8%	15.2%	6.1%	-	-
Pulses or Beans	26	19.2%	69.2%	11.5%	-	-
Leafy Vegetables	40	16.0%	68.0%	16.0%	-	-
Fruits	30	10.0%	33.3%	20.0%	33.3%	3.3%
Eggs	29	13.8%	65.5%	17.2%	3.4%	-
Fish	19	-	-	10.5%	84.2%	5.3%
Chicken or Meat	36	25.8%	-	32.3%	38.7%	3.2%
Women						
Milk or Curd	28	75.0%	17.9%	7.1%	-	-
Pulses or Beans	23	13.0%	73.9%	13.0%	-	-
Leafy Vegetables	19	5.3%	84.2%	10.5%	-	-
Fruits	28	10.7%	32.1%	21.4%	32.1%	3.6%
Eggs	29	17.2%	58.6%	24.1%	-	-
Fish	21	4.8%	-	19.0%	71.4%	4.8%
Chicken or Meat	31	19.4%	-	33.3%	44.4%	2.8%

Table 4.4 b : Frequency of Consumption of Foods : 2. Small and Marginal Farmers

Type of Food	Total Number	Daily (Once/ Twice/ Thrice)	No. of Times in week (No.)	One in a Week	Occa-ssionally	Never
Men (Age Group of 15 or above)						
Milk or Curd	31	61.3%	19.4%	6.5%	12.9%	-
Pulses or Beans	29	-	25.0%	50.0%	25.0%	-
Leafy Vegetables	27	-	33.3%	33.3%	-	33.3%
Fruits	30	10.0%	33.3%	3.3%	53.3%	-
Eggs	28	28.6%	39.3%	14.3%	14.3%	3.6%
Fish	21	4.8%	-	19.0%	71.4%	4.8%
Chicken or Meat	27	50.0%	-	-	50.0%	
Women (Age Group 15 or above)						
Milk or Curd	27	66.7%	16.7%	-	-	16.7%
Pulses or Beans	26	6.9%	75.9%	6.9%	6.9%	3.4%
Leafy Vegetables	24	11.1%	66.7%	11.1%	3.7%	7.4%
Fruits	23		40.0%	20.0%	40.0%	-
Eggs	30	20.0%	40.0%	20.0%	20.0%	-
Fish	18	-	33.3%	33.3%	-	33.3%
Chicken or Meat	22	37.0%	-	11.1%	48.1%	3.7%

Table 4.4 c : Frequency of Consumption of Foods : Landless

Type of Food	Total Number	Daily (Once/ Twice/ Thrice)	No. of Times in week (No.)	One in a Week	Occa-ssionally	Never
Men (Age Group of 15 or above)						
Milk or Curd	24	62.5%	20.8%	8.3%	8.3%	-
Pulses or Beans	33	15.2%	63.6%	15.2%	6.1%	-
Leafy Vegetables	24	29.2%	58.3%	12.5%	-	-
Fruits	31	16.1%	12.9%	38.7%	29.0%	3.2%
Eggs	28	35.7%	17.9%	42.9%		3.6%
Fish	15	6.7%	-	6.7%	66.7%	20.0%
Chicken or Meat	29	7.1%	46.4%	42.9%	3.6%	-
Women (Age Group 15 or above)						
Milk or Curd	23	52.2%	30.4%	8.7%	8.7%	-
Pulses or Beans	30	16.7%	66.7%	13.3%	3.3%	-
Leafy Vegetables	23	34.8%	52.2%	13.0%	-	-
Fruits	28	14.3%	10.7%	50.0%	25.0%	-
Eggs	27	29.6%	22.2%	48.1%	-	-
Fish	18	5.6%	-	11.1%	72.2%	11.1%
Chicken or Meat	28	6.9%	44.8%	44.8%	3.4%	-

Nutritional Status of the Households

A widely used measure of nutritional status is a combination of weight and height measurement known as Body Mass Index (BMI). Though it is not a perfect measure because it only depends on height and weight and does not take into consideration different levels of adiposity based on age and physical activity levels, it is a commonly used instrument to correlate the risk of health problems with the weights of an individual (Bailey and Ferro-Luxxi, 1996, Shetty P,). Low body weight associated with low intake, is an indication that people are not reaching their growth potential and hence is essentially a sign of continued hunger and nutritional distress. The BMI is defined as weight in kilograms divided by height in meters squared (kg/m2). Scales and measuring boards were used to measure women and men in the age group of 15 and 59 years and children between the age group of 5 and 15 years. This index excludes women who were pregnant at the time of survey and women who gave birth during the two months preceding the survey. A cut off point of 18.5 is used to define thinness or acute under nutrition and a BMI of 25 or above indicated overweight or obesity.

The Table 4.5 shows the proportion of women and men falling into high risk categories of the Body Mass Index, according to the background characteristics. The mean BMI of women in SMF category in the age group of age 15-59 in watershed villages was 22.2 whereas the same for non-watershed villages was18.6. Also notable is the point that the BMI of women in the age group 15 to 59 was more for SMF followed by LMF and landless with 21.9 and 21.8 respectively in watershed villages. An increase in consumption of quality food items by the women in watershed villages seems to have sufficiently translated into a healthy BMI. Chronic energy deficiency is usually indicated by a BMI of less than 18.5. This was seen in all the categories of children between the age group of 5 to 15 years in non-watershed villages. Even the children of small marginal and landless category in watershed villages also have low BMI.

Table 4.5: Average Body Mass Index of the Households

Gender	LMF		SMF		Landless	
	WV	NWV	WV	NWV	WV	NWV
Men (15 &59)	22.5	21.2	21.9	20.4	21.1	19.3
Women (15 &59)	21.9	20.5	22.2	18.6	21.8	18.0
Children (5 – 15 Years)	19.3	16.9	18.3	13.0	16.1	12.5

Nutritional Status of Children

Children and women are more vulnerable to malnutrition because of low dietary intake, infectious diseases, lack of appropriate care and inequitable distribution of food within the household. To assess the nutritional status of children, anthropometric measures are included in which all children under five years of age were weighed and measured. The interviewing team in every study village has included the ANM worker of that village who conducted the anthropometric measures. The team carried along with them the scale and measuring board. Younger children of less than twelve months old were measured lying down on the board and older children were measured while standing.

There is variation in height and weight of the sample children and this variation approximates normal distribution. Use of standard reference population as a point of comparison facilitates the understanding of nutrition status of the children in sample villages. The use of reference population is based on the empirical finding that well-nourished children in all population groups for which the data exists follow similar growth patterns before puberty. The tables below show estimates based on a new international reference population released by WHO in April 2006 (WHO Multicenter Growth Reference Study Group, 2006) and accepted by the Government of India. The new standard is based on children around the world (Brazil, Ghana, India, Norway, Oman, and the United States) who are raised in healthy environments, whose mothers do not smoke, and who are fed with recommended feeding practices (exclusive breast feeding for the first six months and appropriate complementary feeding from 6 to 23 months). The WHO growth standards identifies breastfed child as the normative model for growth and development standards, depicts normal early childhood growth under optimal environmental conditions and can be used to assess children regardless of ethnicity, socioeconomic status and type of feeding.

The three standard indices of physical growth that describes the nutritional status of children are presented below:

- Height – for – age (Stunting)
- Weight – for – height (Wasting)
- Weight – for – age (Uunderweight)

The validity of these indices is determined by many factors, including the coverage of the children in the households and the accuracy of the anthropometric measures. Height and weight data of all the children of the sample households who are available at home

was taken. However, the data of the children who were out of station during the period of survey was not taken by the team. In terms of percentage those children accounts to only 6 per cent. In addition, two of the three indices (weight- for- age and height - for - age) are sensitive to misreporting of children's ages. However, their age was cross validated with other members in the household. These two are the limitations of this exercise.

Each of the three nutritional status indicators is expressed in standard deviation units (Z Scores) from the median of the reference population. Each index provides different information about growth and body composition, which is used to assess nutritional status.The details are provided in Box below.

The height-for-age index is an indicator of linear growth retardation and cumulative growth deficits. Children whose height-for-age Z Score is below minus two standard deviations (-2 SD) from the median of the reference population are considered short for their age (stunted) and are chronically malnourished. Children below minus three standard deviations (-3 SD) from the median of the reference population are considered to be severely stunted. Stunting reflects failure to receive adequate nutrition over a long period of time and is also affected by recurrent and chronic illness. Height for age therefore represents the long term effects of malnutrition in a population and does not vary according to recent dietary intake.

The Weight – for- age index measures body mass in relation to body length and describes current nutritional status. Children whose Z score is below minus two standard deviations (-2 SD) from the median of the reference population are considered thin (wasted) for their height and are acutely malnourished. Wasting represents the failure to receive adequate nutrition in the period immediately preceding the survey and may be the result of inadequate food intake or recent episode of illness causing loss of weight and the onset of malnutrition. Children whose weight-for- height is below minus three standard deviations (-3SD) from the median of the reference population are considered to be severely wasted.

Weight-for-age is a composite index of height-for-age and weight-for-height. It takes into account both acute and chronic malnutrition. Children whose weight –for-age is below minus two standard deviations from the median of the reference population are classified as underweight. Children whose weight –for-age is below minus three standard deviations (-3 SD) from the median of the reference population are considered to be severely underweight.

Source: NFHS -3

Table 4.6 A : Percentage of Children classified as Malnourished according to three Anthropometric Indices of Nutritional Status - Watershed Villages

Age in Months	Height for Age (%)-Boys			Height for Age (%)-Girls			Weight for Height %- Boys			Weight for Height %- Girls			Weight for Age % - Boys			Weight for Age % - Girls		
	-3 SD	-2 SD	SDO	-3 SD	-2 SD	SDO	-3 SD	-2 SD	SDO	-3 SD	-2 SD	SDO	-3 SD	-2 SD	SDO	-3 SD	-2 SD	SDO
12	14.6	11.4	6.1	8.1	37.9	9.9	11.1	29.1	31.1	10.1	31.2	30.1	10.1	27.1	32.5	11.7	22.1	41.1
24	13.5	21.9	7.9	11.9	31.5	9.7	14.9	25.9	29.2	14.6	31.6	32.2	11.1	26.2	28.2	10.5	21.6	38.6
36	14.2	22.4	7.2	14.9	43.8	7.4	14.3	29.2	31.6	13.4	28.5	28.1	10.2	24.1	37.8	11.1	22.2	40.2
48	17.9	23.9	7.6	19.1	38.9	8.8	12.9	26.1	31.6	14.1	22.5	27.1	12.2	23.1	36.9	14.2	26.6	42.6
60	20.4	23.6	8.9	25.1	41.3	11.6	10.9	24.9	38.9	15.1	21.2	36.5	13.2	21.1	40.4	12.1	26.1	43.8

Table 4.6 B : Percentage of Children classified as Malnourished according to three Anthropometric Indices of Nutritional Status - Non Watershed Villages

Age in Months	Height for Age (%)- Boys			Height for Age (%)- Girls			Weight for Height %- Boys			Weight for Height %- Girls			Weight for Age % - Boys			Weight for Age % - Girls		
	-3 SD	-2 SD	SDO	-3 SD	-2 SD	SDO	-3 SD	-2 SD	SDO	-3 SD	-2 SD	SDO	-3 SD	-2 SD	SDO	-3 SD	-2 SD	SDO
12	21.4	23.4	4.4	24.1	39.1	8.1	19.9	29.2	24.5	18.3	41.6	23.9	14.5	31.1	27.7	13.9	24.5	32.7
24	33.1	25.2	5.1	27.7	38.2	8.4	19.6	31.6	22.8	18.8	42.2	30.2	14.8	32.5	28.8	14.1	25.7	29.8
36	33.4	27.2	5.7	28.5	45.1	8.1	19.1	33.9	25.5	16.7	43.6	27.7	14.9	33.8	33.5	14.4	27.4	36.9
48	26.1	29.1	5.9	31.1	48.1	7.9	21.2	34.2	19.9	17.9	45.1	26.4	16.5	34.1	30.4	14.9	30.1	37.2
60	27.1	21.1	4.1	38.5	41.1	6.9	23.1	32.6	24.5	20.4	31.8	31.5	15.3	31.7	39.4	15.1	33.1	33.0

The Table 4.6 shows the percentage of children classified as undernourished by selected demographic characteristics in different age groups below five years. Attention to nutritional outcomes is also important from child birth to till it reaches the second birthday which is crucial for cognitive development. The percent of boys and girls with stunting, wasting and underweight was higher in this age group, even in watershed villages. Undernutrition in children under Age 2 diminishes the ability of children to learn and earn throughout their lives. Nutritional deprivation leaves children tired and weak, and lowers their IQs, so they perform poorly in school. As adults they are less productive and earn less than their healthy peers (UNICEF, 2009). The cycle of undernutrition and poverty thereby repeats itself, generation after generation. Lack of attention to child and maternal nutrition today will result in considerably higher costs tomorrow. In the age group of five years (sixty months) the percentage of stunting in grade two and three was 44 in boys and 66.9 in girls in watershed villages. The same in non-watershed villages was much more with 50 and 78 per cent. The per cent of children with underweight in the age group of five years in watershed villages was 36 and 38.8 per cent respectively for boys and girls.The same in case of non-watershed villages was 45 and 47.4 per cent respectively. More alarming is the fact that the children who suffer from wasting face a markedly increased risk of death and more than one third of the developing world's children who are wasted live in India. The wasting percentage of boys and girls in grade two and three in watershed villages was 37 per cent each. The same in non-watershed villages was 54.7 and 54.8 per cent respectively for boys and girls.

SUMMARY AND CONCLUSIONS

Despite strong economic growth in recent decades, India bears a high burden of child-undernutrition, which is an important indicator of a country's overall human capital development.Therefore, the momentum to address the issue of malnutrition in the country and internationally has never been higher. The inclusion of 'Food Security and Good Nutrition' as one of the twelve Development Goals proposed in the UN's High Level Panel on Development after 2015 is an indicator of this.

Achieving nutritional security is the end result of any natural resource based programme. Watershed development is the major programme being implemented in the country for managing/husbanding natural resources in a sustainable manner.Many studies revealed the positive impact of water harvesting structures on land productivity and improved cropping practices. The study aimed to understand the impact of the watershed programmes on improving the nutritional status of the households in the watershed villages.

The focus group discussions revealed that with the implementation of soil and moisture conservation works, the level of groundwater which used to be 400 - 500 ft depth on an average in all the study watershed villages has raised to 150 to 200 ft depth.An increase in area under irrigation, has an impact on changing the cropping pattern from mono cropping to multi cropping. However, this shift in cropping pattern was more towards water intensive crops such as Banana, Turmeric, Sugarcane, Ginger replacing the traditional millets like Sorghum, Ragi and Bajra.

The average arable landholding size of LMF was more in Chhattisgrah and Jharkhand compared to Telangana and Karnataka.Whereas, the average arable land size of SMF was almost same in all the four States. The reduction in cultivable wasteland and fallow land of SMF category was to the extent of 58 and 55 per cent while, the same for LMF was 42 and 38 per cent respectively. More impact was seen in Telangana and Karnataka compared to Chhattisgarh and Jharkhand on reduction in wasteland. The adequacy in availability of green fodder after the implementation of WDP, was reported by only 56 per cent of LMF and 34 per cent of SMF category as the reduction in cultivable waste-lands and fallow lands while having a positive impact on arable lands, reduced the land availability for green fodder. Improvement in drinking water for human beings and cattle is the major priority for implementation of any watershed programme. The groundwater

table in the watershed villages was in the range of 150 ft to 240 ft compared to non-watershed villages, where it was available at a depth of 275 ft to 600 ft.

Small and Marginal farmers diversified their crops more with an increase in irrigation facility in watershed villages. Their CDI was 0.57 compared to the CDI of LMF with 0.52 during Kharif. The same in non-watershed villages was 0.26 and 0.35 respectively for SMF and LMF. Within the watershed villages, the crop diversification was more during Kharif than Rrabi. The area under Paddy or Wheat was increased in the watershed villages with an increase in area under supplementary irrigation for both LMF and SMF during Rabi. Therefore, the CDI of LMF and SMF of watershed villages during Rabi was less with 0.35 per cent and 0.47 per cent compared to non-watershed villages with 0.49 and 0.42 per cent respectively.

With an increase in availability of green fodder, 60 per cent of LMF in Chhattisgarh, 45 per cent in Jharkhand and 50 per cent each in Telangana and Karnataka were maintaining more than two milch animals in watershed villages. Whereas, the SMF category of Telangana and Chhattisgarh were in a better position in terms of maintaining more than two milch animals with 60.5 and 52.5 per cent respectively. The percentage of landless households in watershed villages maintaining one or two milch animals was 55, 90 and 57.5 in Chhattisgarh, Jharkhand and Karnataka respectively. The maintenance of milch animals by landless households of watershed villages in Telangana was less with 22.3 per cent compared to the other three States.The maintenance of small ruminants was more by these households in watershed villages of Telangana with majority (70 per cent) of them maintaining 20 small ruminants on an average.Surprisingly, LMF category of Chhattisgarh and Jharkhand were also depending on small ruminants in watershed villages with 80 and 70 per cent respectively.

The employment generated through agricultural activities for women of SMF category in watershed villages was 45, 21, 50 and 95 days in Chhattisgarh, Jharkhand, Telangana and Karnataka respectively. The same for women of LMF category was 35, 25 and 20 days in watershed villages of Chhattisgarh, Karnataka and Jharkhand. The employment gained was negative in case of LMF women in Karnataka. The income from agriculture in watershed villages was more for LMF with 61.89 per cent followed by SMF with 58.67 per cent despite their crop diversification. However, the income gain in watershed villages for these households was through livelihood diversification

through livestock occupying 26.78 per cent of their total income. Livestock has become a significant source of livelihood for landless households in watershed villages with 36.35 per cent of their total income.

The per capita requirement of cereals was 383 gms/capita/annum or 137 kgs/capita/annum. Compared to these figures, the per capita availability of rice was much higher in watershed villages with 185 kgs/capita/annum.However, it was lower in watershed villages in case of Wheat with 0.40 Q/annum/capita for LMF and SMF. The per capita availability of wheat was further lower for SMF in non watershed villages with 0.25 Q/capita / annum. The per capita vegetable requirement as per ICMR norms in the country were 108 kgs/capita /annum 0r 10.8Q/capita /annum. The per capita availability of vegetables for the LMF households in watershed villages was 15.4, 6.8,4.56 and 4.24 Q/annum in Chhattisgarh, Jharkhand, Telangana and Karnataka respectively. The same for SMF category households was 8, 4.2 ,5.5 and 5.87 Q/annum. These figures were much lower in non watershed villages with LMF of 3 and SMF of 1.6 Q/annum in Chhattisgarh, 3 and 1.4 Q/annum in Jharkhand, 0.9 and 2.91 Q/annum in Telangana and 2.91 and 1.17 Q/annum in Karnataka respectively. This shows that though there was an increase in vegetable production in watershed villages which has led to an increase in per capita availability, this was much lower compared to the average requirement per person.

The per capita consumption of cereals of LMF, SMF and landless was 2.75, 2.59 and 2.63 kgs/week while, the average requirement of cereals was 2.87 kgs/week. The recommended daily requirement of pulses at 50 to 60 grams per day. Whereas, the consumption of pulses /was 13.14 gms/capita/day for LMF, SMF and landless households. A perceptible increase in vegetable consumption was observed in watershed villages with an increase in area under vegetables. The per capita vegetable consumption of LMF, SMF and landless households was 0.27, 0.29 and 0.19 kgs per capita per week. However, this was far less compared to the average requirement worked out per week, as per nutrition guidelines as 2.1 kgs/capita/week.The per capita consumption of milk in the watershed villages was 104.85, 47.14 and 27.42 gms/day which was very less than the per capita requirement of milk as per ICMR norms is 220 gms per day. The frequency of consumption of quality food items of women was much less compared to men within a household in watershed villages.

An increase in consumption of quality food items by the men and women in watershed villages seems to have translated into a normal BMI. However, the picture was alarming

in case of children with less BMI in watershed villages in SMF and landless category with 18.3 and 16.1. The picture was much bleaker in non-watershed villages. Anthropometric measures also indicate high percentage of stunting, wasting and underweight of the boys in grade two and three respectively in watershed villages.

Conclusions

The priority for the implementation of any watershed programme is to improve the drinking water status, improving the land productivity and livelihoods of its stakeholders. There was an increase in groundwater status, availability of drinking water, net sown area and diversified cropping pattern in the watershed programmes analysed. An increase in the number of days of employment was observed because of increase in agriculture and livestock livelihoods which has led to an increase in consumption of quality food items such as eggs, milk and meat. Diversified cropping pattern with vegetables led to an increase in the consumption of vegetables. However, this was not adequately translated into healthy anthropometric indices especially for the children in the watershed villages. This shows that there is a long way to go for the watershed development programmes in improving the nutritional status of its stakeholders - a natural corollary of any natural resource management programme. However, nutrition specific interventions need to be mandatorily implemented in all agricultural interventions with related to NRM and productivity enhancement.

REFERENCES

1. Ashfaq M, S. Hassan, Z. M. Naseer, A. Baig and J. Asma (2008), "Factors Affecting Farm Diversification In Rice – Wheat", Pakistan Journal of Agricultural Sciences 45 (3): 45 - 47
2. Bandepudi Ramkumar, Bekele Shiferaw, Wani S P, Nageswara Rao GD and Sreedevi TK (2007), "Socio-economic Profiles Production and Resource Use Patterns in selected Semi-Arid Indian Watershed Villages", Global theme on Agro Ecosystems: No. 34
3. Black RE, C G Victora, S P Walker, Z A Bhutta, P. Christian and M de Onis (2013), "Maternal and Child Under-nutrition and Overweight in Low Income and Middle Income Countries", The Lancet (2013)
4. Chorley RJ (1969), "The Drainage Basin as the Fundamental Geomorphic Unit - Water, Earth and Man (Ed)", R. J. Chorley, London : Methuen ,1969,77-99
5. CFS (2012), "Coming to Terms with Food and Nutrition Security, Available at http://www.fao.org/docrep/meeting/026/MD776E.pdf (Accessed July, 2014)
6. FAO (2012), "The State of Food Insecurity in the World 2012": (ed) Economic Growth is Necessary but not Sufficient to Accelerate Reduction of Hunger and Malnutrition, FAO, Rome
7. FAO (2013), "The State of Food Insecurity in the World: The Multiple Dimensions of Food Security", Rome: Food and Agriculture Organisation
8. Fan S, Hazell P and Throat, S. K (2000), "Impact of Public Expenditure on Poverty in Rural India": Economic and Political Weekly, XXXV, No. 40
9. Gillespie, S, Harris J and Kadiyala S (2012), "The Agriculture - Nutrition Disconnect in India. What Do We Know?" IFPRI Discussion Paper 01187, Washington DC: International Food Policy Research Institute
10. Hakan Tongul and Matt Hobson (2013), "Scaling-up an Integrated Watershed Management Approach through Social Protection Programmes in Ethiopia: The MERET and PSNP Schemes', New Dialogue: Putting People at the Heart of Global Development: Case Studies
11. Horton S (1999), "Opportunities for Investments in Nutrition in Low-income Asia", Asian Development Review 17.1 – 2: 246 – 73

12. HUNGaMa Survey (2011) http://www.cse.iitb.ac.in (Accessed August, 2014)

13. Hanumantha Rao Ch (2000), "Watershed Development in India: Recent Experience and Emerging Issues", Economic and Political Weekly, 35 (45): 3943-3947

14. IIPS (2007), "National Family Health Surveys 2005 – 2006", Mumbai: International Institute for Population Sciences

15. Joe Gomme (2002), "Water Aid Impact Assessment Guidelines" www.wateraid.org

16. Joy, K J, Parnjpe, Suhas, Shah, Amita, Badigar, Shrinivas and Lele, Sharachchandra (2005), "Scaling-up of Watershed Development Projects in India: Learning from the First Generation Projects", Fourth IWMI-Tata Annual Partners Meet, International Water Management Institute, Anand, India. pp.133-134

17. Joshi P K, Tewari L, Jha, A K and Shiyani R L (2000), "Meta Analysis to assess Impact of Watershed. Proceedings Workshop on Institutions for Greater Impact of Technologies", National Centre for Agriculture Economics and Policy Research (ICAR), New Delhi, India

18. Joshi P K, Pangare V, Shiferaw B, Wani S P, Bouma J and Scott C A (2004), "Socio-economic and Policy Research on Watershed Management in India: Synthesis of Past Experiences and Needs for Future Research." Global Theme on Agro-ecosystem, Report No. 7, International Crops Research Institute for Semi-Arid Tropics, Patancheru, India.

19. Kerr J, Pangare, G and Pangare V L (2002), "Watershed Development Projects in India: An Evaluation", International Food Policy Research Institute, Research Report - 127, Washington DC. Retrieved from: http://www.ifpri.org/sites/default/files/pubs/pubs/abstract/127/rr127.pdf on January 10, 2013

20. Lalita Joshi and Marcella D'Souza (2013), "Food and Nutrition Security", Watershed Organisation Trust, Food and Nutrition Security Pp-28

21. Lancet (2013), "Maternal and Child Nutrition", Executive Summary of Lancet Maternal and Child Nutrition Series, www.lancet.com (Accessed during August 2014)

22. Lisa S Smith and Lawrence Haddad (2015), "Reducing Child under Nutrition: Past Drivers and Priorities for the Post MDG Era", World Development Vol 68 pp: 180-204

23. More, Rosemary J (1969), "The Basin Hydrological Cycle", p 67-76, In: R J Chorley (ed.), Water

24. NCAER (2014), "An Analysis of Changing Food Consumption Pattern in India A Research Paper Prepared under the Project Agricultural Outlook and Situation Analysis Reports"

25. Palanisami K, D Suresh Kumar and B Chandrasekaran (2002), "Watershed Development: Concept and Issues," "Watershed Management: Issues and Policies for the 21st Century" (ed.)

26. Pingali P L and M W Rosegrant (1995), "Agricultural Commercialisation and Diversification: Processes and Policies", Food Policy 20 (3), 171-85

27. Reddy V R, M G Galab, S Soussan and Baganski, O S (2004), "Participatory Watershed Development in India: Can it Sustain Rural Livelihoods?", Development and Change, 15 (2), 297-326

28. Rosegrant M (2002), "Policies and Institutions for Sustainable Water Resource Management: A Research agenda", Challenge Programme on Water and Food, Background Paper 5. International Water Management Institute (IWMI Colombo Sri Lanka pp35)

29. Sachdeva S, Sachdev T R, Sachdeva R (2013), "Increasing Fruit and Vegetable Consumption: Challenges and Opportunities", Indian J Community Med; 38:192-7

30. Shah, Amita (2001), "Who Benefits from Participatory Watershed Development? Lessons from Gujarat, India", Sustainable Agriculture and Rural Livelihoods Programme Gatekeeper Series No. 97. London: International Institute for Economic Development

31. Sreedevi T K, S P Wani, R Sudi, M S Patel, T Jayesh, S N Singh and Tushar Shah (2006), "On-site and Off-site Impact of Watershed Development: A Case Study of Rajasamadhiyala, Gujarat, India", Global Theme on Agro-Ecosystems, Report No. 20. Patancheru, 502 324, India: International Crops Research Institute for the Semi-Arid Tropics, 48 pp

32. Stephen R Daniels, Philip R Khoury, John A Morrison (1997), "The Utility of Body Mass Index as a Measure of Body Fatness in Children and Adolescents: Differences by Race and Gender, Paediatrics, Volume 99, Issue 6

33. Swaminathan M S & Bhavani R K (2013): Food Production & Availability - Essential Prerequisites for Sustainable Food Security, Indian J Med Res 138, September 2013, pp 383-391

34. Turton C, Coulter J, Shah A, and Farrington J (1998), "Participatory Watershed Development in India: Impact of the New Guidelines", New Delhi: DFID and MoRAE

35. United Nations Children's Fund (UNICEF) (2009): Tracking Progress on Child and Maternal Nutrition: A Survival and Development Priority

36. Ved R and Menon P (2012), "Analysing Inter-Sectoral Convergence to Improve Child Under- nutrition in India", IFPRI Discussion Paper 01208, Washington D C: International Food Policy Research Institute

37. Wani S P, T K Sreedevi, T S V Reddy, B Venkateswarlu and Prasad C S (2008), "Community Watersheds for Improved Livelihoods through Consortium Approach in Drought-prone Rain-fed Areas", Journal of Hydrological Research and Development 23:55-77

38. Weingartner L (2010), "The Concept of Food and Nutrition Security", in K Klennert (ed.), Achieving Food and Nutrition Security: Actions to Meet the Global Challenge - A Training Course Reader (3rd Edition), Inwent, Bonn, Ack

ANNEXURE - I

Table 1: Change in the Status of Drinking Water and Area under Irrigation

a. Chhattisgarh								
Name of the State/District/ WSD/Indicators	Chhattisgarh							
	Raipur				Janjgir&Champa			
	Basim		Uperwara		Masania Kalan		Aamgaon	
	Before	After	Before	After	Before	After	Before	After
Depth of Groundwater (ft.) Tube WellWell	300 30-40	190 15	320 25	210-250 20	150 100	90 40	250-	100-120
Area under Irrigation (ha.)	21	148	201	446	50	107	902	1392
Drinking Water Facility (availability in months)	6	9	8	12	8	10	8	12
Jharkhand	Ranchi						Saraikhela-kharasawan	
	Aurad		Bhubhui		BudhaKocha		Nichintpur	
	Before	Before	Before	Before	Before	Before	Before	Before
Depth of Groundwater (ft.) Tube WellWell	24070	17535-40	22565	19040	25045	21025	22140	19030
Area under Irrigation (ha.)	37	125	44	122	45	98	111	132
Drinking Water Facility (availability in months)	6 Before	10 After	8 Before	12 After	9 Before	12 After	9 Before	12 After

b. Telangana								
Name of the State/District/ WSD/Indicators	Telangana							
	Medak				Ranga Reddy			
	Gangapur		Kishtapur		Kottapally		Antharam	
	Before	After	Before	After	Before	After	Before	After
Depth of Ground-water (mts.) Tube Well Open wells	1	4	400	220	200-300 (ft) 10-12	40-120 62	600	250

(Contd.....)

Table 1 ***(Contd...)***

Number of Groundwater Structures rejuvenated			-	12				
Drinking water (availability in months)	3-4	12	3-4	12	3-4	12	3-4	12
Area under Irrigation (ha.)	36	212	113	316	—	200	312	516
a. Karnataka								
Name of the State/District/ WSD/Indicators	Karnataka							
	Mysore				Chamarajanagara			
	B.Mattakere		Basapura		Channappanapura		Kebbepura	
	Before	After	Before	After	Before	After	Before	After
Depth of Groundwater (ft.) Tube Well Well	160	40-50	420 120	220 50	95-105 (Mts.)	85-90 (Mts.)	180-200	600-800
Number of Groundwater Structures rejuvenated	-	30	24	50	18	34	25-30	150-200
Drinking water (availability in months)					9	11	6	12
Area under Irrigation (ha.)	83	142			750	1100	50	200

Table 2.: Changes in Area sown & Cropping Pattern (ha.)

Chhattisgarh

Name of the State/District/ WSD/Indicators	Chhattisgarh							
	Raipur				Janjgir & Champa			
	Basim		Uperwara		Masania Kalan		Aamgaon	
	Before	After	Before	After	Before	After	Before	After
Gross Sown Area (Ha.)	280	390	311	510	197.15	280	415	522
Net Sown Area (Ha.)	250	284	245	422	146.14	146.14	298	385

Table 2 ***(Contd...)***

Name of Crop Grown	Paddy	Paddy, Vegetables	Paddy Vegetables	Paddy Vegetable Wheat	Paddy	Paddy Vegetables Wheat	Paddy	Paddy Vegetables
Number of crops in a year	01	03	02	03	01	03	01	02
Yield of the crops (Qts.) (per acres)								
Paddy	12	15	11	15	9	12	4-5	12-15
Vegetables	2	5-7	2 to 5	10 to 25	-	15	3	10-12
Wheat	-	-	-	5-7	-	5	-	-

Jharkhand

Name of the State/District/ WSD/ Indicators	Jharkhand							
	Ranchi				Ranchi			
	Auradi		Auradi		Auradi		Auradi	
	Before	Before	Before	Before	Before	Before	Before	Before
Gross Sown Area (ha.)	211	298	244	345	198	242	214	265
Net Sown Area (ha.)	188	224	194	233	176	190	184	222
Name of Crop Grown	Paddy Maize Pulses	Paddy, Maize Pulses Vegetables	Paddy Pulses Maize	Paddy Pulses Maize Vegetable	Paddy Maize	Paddy Maize Pulses Vegetables	Paddy Maize	Paddy Maize Pulses Vegetables
Number of crops in a year	01	02	02	02	01	02	01	02
Yield of the crops (Qts.) (per acres)								
Paddy	5-7	12-15	4	12	5	12-14	5	10
Maize	1.5	3-4	1	3	1	3	1.5	3
Pulses	0.5	1.5-2	0.5	1	0.5	2	-	1.5
Vegetables	1-2	5	2	7	1.5	8		8

(Contd.....)

Table 2 ***(Contd...)***

Telangana

Name of the State/ District/WSD/ Indicators	Telangana							
	Medak				Ranga Reddy			
	Gangapur		Kishtapur		Kottapally		Antharam	
	Before	After	Before	After	Before	After	Before	After
Gross Sown Area (Ha.)	439	611	256	544	68	396		
Net Sown Area (Ha.)	226	441	186	272	43	200	216	654
Name of Crop Grown	Paddy. Cotton, Maize	Paddy, Maize, Vegeta-bles Chillies	Paddy. Cotton, Maize	Paddy, Maize, Vegetables, Chillies	Native sorghum, Cotton, Maize	Hybrid Maize, Pigeon Pea, Vegeta bles Flori-culture, Bt. Cotton	Cotton Maize Korra Jowar Gram	Cotton Jowar (hybrid) Vegeta bles Flori Redgram Bengal Gram Maize
Number of crops in a year	3	5	3	5	3	9	7	7
Yield of the crops (Qts.)Hybrid Maize,								
Pigeon Pea,					8-10	35-10	4-5	6-7
Vegetables,					-	4-5	5-6	15-20
Floriculture,							-	-
Bt. Cotton								
Paddy,	18-20	30-35	18-20	30-35	6-7	10-12	-	-
Maize,	8-10	12-15	8-10	12-25	-	-	-	-
Vegetables,								
Chilly	-	10-12	-	10-12	-	-	12-14	20-25

Karnataka								
Name of the State/ District/WSD/ Indicators	Karnataka							
	Mysore				Chamarajanagara			
	B.Mattakere		Basapura		Channappanapura		Kebbepura	
	Before	After	Before	After	Before	After	Before	After
Net Sown Area (ha)	154	256			2490	2460	325	406
Gross Sown Area (ha.)	215	496			-		326	508

(Contd.....)

Table 2 ***(Contd...)***

Name of Crop Grown	Ragi, Cotton	Sugar, Banana Ginger Tomato Vegeta-bles			Ragi, sorghum, horese-gram, cow pea, napier, bajra, sama, sugar-cane, redgram	Maize, Ragi, Mango, Cocunut, Banana, Sugar-cane, Redgram, Sorghum, Turmeric	Ground-nut, Sugar-cane, Ragi, Jowar, Sun-flower	Turme-ric, Banana, Papaya, Sun-flower, Maize
Number of crops in a year	2	5			8	10	6	7-8
Yield of the crops (Qts.)								
Ragi	8	10-12			2.5-3	4-4.5	6	7
Maize,								
Mango,							6	7
Coconut								
Sugarcane (Tons)							7-8	13-15
Redgram, Sorghum								
Turmeric								
Papaya,					30-35	38-45		
Sunflower,	-	2.5						
Groundnut					1.5-2	2-2.5		
					4-5	6.5-8		
Banana								
Cotton							14	20-25
Wheat								
Paddy							5-6	10
Tobacco								
Sea sum							-	20
Horse gram								
Lablab							10	5-6
Vegetables								
Pepper	3	7.5					10	5-6
Sapota								
								12

Table 3 : Changes in Livestock based livelihood Patterns

Chhattisgarh								
Name of the State/ District/WSD/ Indicators	Chhattisgarh							
	Raipur				Janjgir&Champa			
	Basim		Uperwara		Masania Kalan		Aamgaon	
	Before	After	Before	After	Before	After	Before	After
Number of Milk Animals in the village	08	21	1200	2500	-	128	15	100
Yield of the milk animals (Lts.) (Average)	0.5	4	1.5	4.5	-	2	0.5	2
Types of the livelihoods	Agri-culture & Cons-truction	Agri-culture	Agri culture, Flori-culture	Agri-culture, Flori-culture Fishery	Agri culture	Agri-culture	Agri-culture	Agri-culture Vege-tables
Status of Migration	Partial	No	nil	nil	-	-	-	-

Jharkhand

Name of the State/ District/WSD/ Indicators	Jharkhand							
	Ranchi				Ranchi			
	Auradi		Auradi		Auradi		Auradi	
	Before	Before	Before	Before	Before	Before	Before	Before
Number of Milk Animals in the village	6	14	10	18	6	14	5	11
Yield of the milk animals (Lts.) (Average)	0.5	2	0.5	2.5	0.5	2	0.5	2
Types of the livelihoods	Agri-culture & Other Labour work	Agri-culture	Agri-culture, labour (nearby city)	Agri-culture,	Agri-culture	Agri-culture	Agri-culture	Agri culture Vege-tables
Status of Migration	Moderate	Partial	Partial	Partial	-	-	-	-

(Contd.....)

Table 3 ***(Contd...)***

Telangana Name of the State/ District/WSD/ Indicators	Telangana							
	Medak				Ranga Reddy			
	Gangapur		Kishtapur		Kottapally		Antharam	
	Before	After	Before	After	Before	After	Before	After
Number of Milk Animals in the village Cows Buffalo Small Ruminants	30-40	415	50-60	380-400	100-120	500-600	30 35 250	40 20 484
Yield of the milk animals(Lts.) (Average)	2-3	8-10	3-4	8-10	2	10	2-2.5	6
Types of the livelihoods	Agri-culture, Livestock, Migration	Agri-culture, Horti-culture, Livestock	Agri-culture, Livestock, Migration	Agri-culture, Horti-culture, Livestock	Agri-culture, Livestock Migration	Agri-culture, Livestock, Non-farm	Agri-culture Livestock	Agri-culture Livestock
Status of Migration (HH)	54	0	80-100	0	300	-	80-85	30

Karnataka								
Name of the State/ District/WSD/ Indicators	Karnataka							
	Mysore				Chamarajanagara			
	B.Mattakere		Basapura		Channappanapura		Kebbepura	
	Before	After	Before	After	Before	After	Before	After
Number of Milk Animals in the village Cows Buffalo Small Ruminants	951 224 331	2450 345 1394	57 56 1457	67 82 1358	85-90	135-140	50	150
Yield of the milk animals (Lts.) (Average)	3	5					1	3
Types of the livelihoods	Agri culture, Livestock Labour	Agri culture, Livestock	Agri culture, Livestock Migration		Agri culture,	Agri culture,	Agri culture, Sheep Rearing, Business	Agri culture, Sheep Rearing, Business
Status of Migration (HH)	240	60			400-450	92-100	60-65	20-25

Table 4 : Change in Nutritional and Socio-economic Status

Name of the State/ District/WSD/ Indicators	Chhattisgarh							
	Raipur				Janjgir&Champa			
	Basim		Uperwara		Masania Kalan		Aamgaon	
	Before	After	Before	After	Before	After	Before	After
Main Staple food for Consumption	Paddy	Paddy	Rice	Rice Wheat	Rice	Rice Wheat	Rice	Rice Wheat
Consumption of Vegetables and fruits (%)	Partial (60%)	Regular (85%)	40	90	30	78	25	68
Wage rate in the village (₹)	40-50	-60-80 (Agri-culture) -157 (MGNR-EGS) -150 (others)	- Agri-culture 40 Female 60 Male	Agri-culture 100-150/- 157- MGNR-EGS	100/- (M) 60 (F)	150 (M) 120(F) 157/- (MGNR-EGS)	100/-(M) 60 (F)	150 (M) 120(F) 157/- (MGNR-EGS
Number of SHGs	01	04	03	12	-	05	-	06
Nature of Functioning of Ration Shops	good	good	01	01	-	01	-	01
Number of BPL Cardholders	191	184	700	420	701	517	72	52
Nature of functioning of Anganwadis	good	good	01	01	-	02	01	02
Number of Children attending	14	25	10	28	-	29	34	129
Anganwadis Sources of Health Services	PHC	PHC	PHC	PHC + Sub-Health Centre	PHC	PHC+ SHC	PHC	SHC
Where the Children go for Education	Primary School, Angan-wadi	Primary School, Angan-wadi	Primary	Primary, Middle Middle Secon-dary	Primary	Primary, Secon-dary Higher Secon-dary	Primary	Primary
Drinking Water Facility (availability in months)	6	9	8	12	8	10	8	12

(Contd.....)

Table 4 ***(Contd...)***

Jharkhand								
Name of the State/ District/WSD/ Indicators	Jharkhand							
	Ranchi				Ranchi			
	Auradi		Auradi		Auradi		Auradi	
	Before	Before	Before	Before	Before	Before	Before	Before
Main Staple food for Consumption	Paddy	Paddy	Rice	Rice	Rice	Rice	Rice	Rice
Consumption of Vegetables and fruits (%)	50	65	30	85	40	82	40	75
Wage rate in the village (₹)	50-60/-	100-120 (Agri-culture)-153 (MGNR-EGS) -150 (others)	- (Agri-culture 60 Female 80 Male	Agri culture 100-150/- 153-MGNR-EGS	80/-(M) 60 (F)	120(M) 100(F) 153/- (MGNR-EGS)	80/- (M) 60 (F)	120 (M) 80(F) 153/- (MGNR-EGS
Number of SHGs	-	20	-	6	-	08	-	04
Nature of Functioning of Ration Shops	good	good	01	01	-	01	-	01
Number of BPL Cardholders	155	139	166	142	188	176	112	108
Nature of functioning of Anganwadis	Partial function-ing	good	-	01	-	01	-	01
Number of Children attending Anganwadis	12	24	9	21	-	23	-	19
Sources of Health Services	PHC	PHC	PHC	PHC	PHC	PHC	PHC	PHC
Where the Children go for Education	Primary School, Angan-wadi	Primary School, Angan-wadi	Primary	Primary	Primary	Primary	Primary	Primary
Drinking Water Facility(availability in months)	6	10	8	12	9	12	9	12

(Contd.....)

Table 4 ***(Contd...)***

Telangana								
Name of the State/ District/WSD/ Indicators	Telangana							
	Medak				Ranga Reddy			
	Gangapur		Kishtapur		Kottapally		Antharam	
	Before	After	Before	After	Before	After	Before	After
Main Staple food for Consumption	Rice	Rice, Vegetables	Rice	Rice, Vegetables	Millets, Rice	Millets, Rice, Vege-tables, Meat	Millets Rice	Rice Vege-tables
Consumption of Vegetables and fruits (%)								
Wage rate in the village (₹)							-	100
Number of SHGs	6	36	6	28	2	42	12	30-33
Nature of Functioning of Ration Shops	01	01	01	01	01	01	01	01
Number of BPL Cardholders					-	500	-	400
Number of functioning of Anganwadis	02	02	02	02	02	02	02	02
Number of Children attending Anganwadis	15	20-30	10-15	25-30	15	25		20
Sources of Health Services	PHC	PHC	PHC	PHC	-	SHC		PHC
Where the Children go for Education	Primary Secon-dary	Primary Secon-dary	Primary	Primary Secon-dary	Primary	Primary, Secon-dary	Primary	Primary
Drinking Water Facility (Availability)	3-4	12			2-3	12	3	9

(Contd.....)

Table 4 ***(Contd...)***

Karnataka								
Name of the State/ District/WSD/ Indicators	Karnataka							
	Mysore				Chamarajanagara			
	B.Mattakere		Basapura		Channappanapura		Kebbepura	
	Before	After	Before	After	Before	After	Before	After
Main Staple food \for Consumption	Ragi Rice	Rice Ragi Vege-tables			Ragi, Rice	Rice	Jowar, Ragi	Rice, Ragi & Vege-tables
Consumption of Vegetables and fruits (%)								
Wage rate in the village (₹)	M-140 F-100	M-220 F-150	160	240	50-M 25-F	200-M 100-M	M-50 F-20-30	M-200-250F-100-130
Number of SHGs	20	63	18	63	16	36	-	15
Nature of Functioning of Ration Shops	Yes	Yes	01	01	Good	Good	Yes	Yes
Number of BPL Cardholders	280	230	354	328			300	225
Number of functioning of Anganwadis	02	02	01	01	02	03	1	2
Number of Children attending Anganwadis							19	65
Sources of Health Services		PHC	PHC	PHC			PHC	PHC
Where the Children go for Education			Primary	Primary	Primary	Primary Secon-dary	Primary	Primary Secon-dary
Drinking Water Facility(Availability	6	12	6	12	9	11	8	12

ANNEXURE - II

Table 3.9 a: Crop Production & Yield: SMF — Chhattisgarh & Jharkhand

Crop	Area (in ha.)	Production per ha. (Quintal)	Price per Quintal	Cost per ha.	Total production (Quintal)	Quantity Marketed (Quintal)	Total cost (₹)	Gross Income (₹)	Net Income (₹)
Chhattisgarh									
Watershed									
Kharif									
Paddy	1.62	37.0	1300	24,600	60	50	40,000	65,000	15,000
Vegetables	0.40	100	-	15,000	100	80	15,000	50,000	35,000
Rabi									
Vegetables	1.21	32.4	-	44,460	240	220	54,000	1,44,000	90,000
Wheat	0.81	10	1200	6175	10	8	6175	9,600	3,425
Non-Watershed									
Kharif									
Paddy	1.42	29.64	1300	24,700	42	35	35,000	45,500	10,500
Vegetables	0.40	88	-	14,500	88	80	14,500	38,000	23,500
Rabi									
Wheat	0.61	5.25	1200	2,500	5.25	4.0	2,500	4,800	2,300
Jharkhand									
Watershed									
Kharif									
Paddy	1.21	29.64	1200	20,995	36	30	25,500	36,000	10,500
Vegetables	0.61	105	-	20,700	105	98	20,700	48,000	27,300
Maize	0.40	4	800	2500	4	4	2500	3200	700
Pulses	0.40	2	2100	1400	2	1.5	1400	3150	1750
Rabi									
Paddy	0.81	16	1300	10,000	16	12	10,000	15,600	5,600
Vegetables	1.21	217.36	-	20,995	264	250	25,500	1,32,000	1,06,500
Non-Watershed									
Kharif									
Paddy	1.21	24.7	1300	16,055	30	24	19,500	32,200	11,700
Vegetables	0.40	92	-	10,500	92	85	10,500	42,000	31,500
Rabi									
Paddy	0.61	6	1300	5,700	6	5	5,700	6,500	800

Table 3.9 b: Crop Production & Yield: LMF-Chhattisgarh & Jharkhand

Crop	Area (inha.)	Production perha. (Quintal)	Price per Quintal	Cost perha.	Total production (Quintal)	Quantity Marketed (Quintal)	Total cost (₹)	Gross Income (₹)	Net Income (₹)
Chhattisgarh									
Watershed									
Kharif									
Paddy	4.9	37.05	1300	24,700	180	165	1,20,000	2,14,500	94,500
Vegetables	3.64	247	-	37,050	900	850	1,35,000	4,25,000	2,65,000
Rabi									
Vegetables	1.62	217.36	-	37,050	352	325	60,000	1,65,000	1,05,000
Wheat	0.81	10	1200	5,000	10	8	5,000	9,600	4,600
Non-Watershed									
Kharif									
Paddy	3.2	37.05	1300	24,700	120	115	80,000	1,49,500	69,500
Vegetables	3.0	227.24	-	38,285	690	675	1,16,250	3,40,000	2,23,750
Rabi									
Wheat	0.81	7	1200	5000	7	5	5000	6000	1000
Jharkhand									
Watershed									
Kharif									
Paddy	4.04	29.64	1300	24,700	120	115	1,00,000	1,49,500	49,500
Vegetables	2.4	237.12	-	37,050	576	550	90,000	3,25,000	2,35,000
Maize	1.62	9.88	800	6,175	16	15	10,000	12,000	2,000
Pulses	0.81	4	2100	2800	4	3	2,800	6,300	3,500
Rabi									
Paddy	1.62	24.7	1300	12,350	40	36	20,000	46,800	26,800
Vegetables	1.42	217.36	-	20,995	308	300	29,750	1,48,000	1,18,250
Non-Watershed									
Kharif									
Paddy	3.2	24.7	1300	17,290	80	75	56,000	97,500	41,500
Vegetables	1.42	222.3	-	37,050	315	300	52,500	3,00,000	2,47,500
Rabi									
Paddy	0.81	168	1300	8,000	16	15	8,000	10,400	2,400

Table 3.9c: Crop Production & Yield: SMF — Karnataka & Telangana

Crop	Area (inha.)	Production perha. (Quintal)	Price per Quintal	Cost perha.	Total production (Quintal)	Quantity Marketed (Quintal)	Total cost (₹)	Gross Income (₹)	Net Income (₹)
Telangana									
Watershed									
Kharif									
Paddy	1.3	51.66	1213	30282	67.15	42.15	39366.6	62663.58	32381.58
Vegetables	0.8	38	1641	38000	74.78	73.78	30400	121072	9672
Commercial									
Crops (Maize)	1.5	36.9	1134	6587	55.35	55.35	9880.5	62766.9	52886.4
Rabi									
Paddy	1.2	49.2	1183	34594	59.04	59	41512	69844	28332
Vegetables	0.8	42	1433						
Commercial									
Crops (Maize)	1.2	24.6	2200	31369	29.52	29.52	37642	64944	27302
Non-Watershed									
Kharif									
Paddy	1.8	32.39	1332	33920.94	58.30	33.30	61057.69	44355.6	-16702.09
Maize	1.6	29.52	1241	8715	47.23	47.23	13944	58612.43	44668
Rabi									
Paddy	1.1	49.2	1327	31416.66	54.12	54.12	34558.32	71817.24	37258.92
Maize	0.8	24.6	1200	10000	19.68	19.68	8000	23616	15616
Karnataka									
Watershed									
Kharif									
Maize	0.5	14.76	1565	4017	7.38	7.38	2008.5	11549.7	9541.2
Cotton	0.5	9.84	4195	19921.8	4.92	4.92	9960.9	20639.4	10678.5
Vegetables	0.84	172.93	1784	26343	145.26	135.26	22128.12	241303.8	219175.68
Rabi									
Maize	1.0	16.78	1861	5221	12843.66	16.78	5221	31227.58	26006.58
Vegetables	1.34	118.91	2041	21667	159.33	150.33	29033.78	306823.53	277789.75
Non-Watershed									
Kharif									
Maize	0.34	7.38	1513	4486	18.15	18.15	1525.24	27460.95	25935.71
Cotton	1.0	9.84	3533	6947	9.84	9.84	6947	34764.72	27817.72
Rabi									
Paddy	1.3	21.52	1480	25574.16	38.37	18.37	33246.40	27187.6	-6058.8
Vegetables	0.64	64.91	2182	35416	41.54	40.54	22666.24	88458.28	65792.04

Table 3.9 d: Crop Production & Yield: LMF- Karnataka & Telangana

Crop	Area (inha.)	Production perha. (Quintal)	Price per Quintal	Cost perha.	Total production (Quintal)	Quantity Marketed (Quintal)	Total cost (₹)	Gross Income (₹)	Net Income (₹)
Telangana									
Watershed									
Kharif									
Paddy	2.2	61.5	1287	33210	135.3	110.3	13062	141956.1	68894.1
Vegetables	1.3	44.4	1750	56000	57.72	56.72	72800	99260	26460
Maize	1.8	36.9	1150	13928.02	66.42	66.42	25071.33	76383	51311.67
Pulses	1.0	19.68	2548	8039	19.68	18.68	8039.28	47596.64	39557.36
Rabi									
Paddy	2.9	59.04	1349	45177.9	171.21	171.21	131015.91	230970.88	99954.47
Vegetables	0.8	44.44	1782	55020.36	35.55	35.00	44016.28	62370	13353.72
Maize	0.7	34.44	1680	25382	24.10	24.10	17767.4	40488	22720.6
Pulses	0.6	19.68	3162	12880.56	11.80	11.80	7728.33	37311.6	29583.27
Non-Watershed									
Kharif									
Paddy	3.6	46.74	1236	37546.98	168.26	166.26	135169.12	205497.36	70328.24
Maize	2.3	29.52	1653	12946.98	67.89	67.89	29778.05	112222.17	82444
Rabi									
Paddy	3.2	56.58	1475	43106.58	181.05	180.05	137941.05	265573.75	127632.7
Vegetables	0.2	51.66	1761	54120	10.33	10.00	10824	17610	6786
Maize	1.0	20.91	1835	21242	20.91	20.91	21242	38369.85	17127.85
Pulses	1.0	19.68	4125	15625.92	19.68	19.00	15625.92	78375	62749.08
Karnataka									
Watershed									
Kharif									
Maize	2.0	23.37	1891	18450	46.74	46.00	36900	86986	50086
Cotton	1.6	14.76	4850	48860.52	23.61	23.61	78176.83	114508.5	36331.67
Vegetables	2.0	46.74	2263	49726.44	93.48	93.00	99452.88	210459	111006.12
Rabi									
Maize	1.0	18.45	1745	19342.98	18.45	18.45	19342.98	32195.25	12852.27
Vegetables	2.0	76.26	1965	55017.9	152.52	150.00	110035.8	294750	184714.2
Non-Watershed									
Kharif									
Maize	1.0	14.76	1750	15559.5	14.76	14.76	15559.5	25830	10270.5
Cotton	2.3	19.68	3950	30408.06	19.68	19.68	69938.53	77736	7797.5
Vegetables	1.0	56.58	1695	52238	56.58	56.58	52238	95903.1	43665.1
Rabi									
Paddy	1.0	46.74	1535	45177.9	46.74	46	45177.90	70610	25433

ANNEXURE - III

Table 4.2a: State wise details on Sources of Food Access (per HH)

Item	LMF Total HH Consump-tion (per Week/ (Kgs)	Available from Own Source (Kgs)	Purchase through Market (Kgs)	PDS (per Monthly/ Kgs)	SMF Total HH Consump-tion (per Week/ (Kgs)	Available from Own Source (Kgs)	Purchase through Market (Kgs)	PDS (per Monthly/ Kgs)
Chhattisgarh								
Watershed								
Rice	20	20	-	-	15	15	-	35
Dal	1	1	-	-	0.75	-	-	2
Sugar	1	-	1	-	1	-	-	1
Oils	1	-	1	-	0.50		0.50	-
Vegetables	9.7	10	-	-	12	8-12		-
Eggs (Nos./Rs.)	12	-	12/50/-	-	16	-	12/50/-	-
Meat	1	-	1	-	1	-	1	-
Milk (lts.)	5	2	3	-	2	-	1	-
Non-watershed								
Rice	20	20	-	-	15	15	-	35
Dal	0.50	0.50	-	-	1	0.50	-	2
Sugar	1		0.50	-	0.50	-	0.50	1
Oils	0.50		0.50	-	0.50	-	0.50	-
Vegetables	8	8-10	-	-	8	8-10		-
Eggs (Nos.	06	-	06/25/-	-	06	-	06/25/-	-
Meat	1	-		-	1	-	1	-
Milk	3	-	3	-	2	-	2	-
Jharkhand								
Watershed								
Rice	15	15	-	-	15	15	-	35
Dal	1.25	1.25	-	-	1	1	-	1
Sugar	1	-	1	-	1	-	1	1
Oils	1	-	1	-	0.50	-	0.50	-
Vegetables	15	15	-	-	12	12	-	-
Eggs (Nos./Rs.)	15	-	15	-	15	-	12	-
Meat	1.5	-	1.5	-	2	-	1	-
Milk	4	2	2	-	4	1	3	-
Non-watershed								
Rice	15	15	-	-	15	15		35
Dal	1	1	-	-	0.25	0.25		1
Sugar	1	-	1	-	0.50	-	0.50	1
Oils	0.50	-	0.50	-	0.50	-	0.50	-
Vegetables	10	10	-	-	8	8		-
Eggs (Nos.	10	-	10	-	8	-	8	-
Meat	0.50	-	0.50	-	0.50	-	0.50	-
Milk	4	1	3	-	2	-	2	-

Table 4.2b: Sources of Food Access (per HH)

Item	LMF Total HH Consump-tion (per Week/ (Kgs)	Available from Own Source (Kgs)	Purchase through Market (Kgs)	PDS (per Monthly/ Kgs)	SMF Total HH Consump-tion (per Week/ (Kgs)	Available from Own Source (Kgs)	Purchase through Market (Kgs)	PDS (per Monthly/ Kgs)
Andhra Pradesh								
Watershed								
Rice	11.8	9.8	13.4	16.2	12.1	10.5	12.0	17.0
Dal	1.0	1.3	1.0	1.0	0.9	1.0	0.8	0.7
Sugar	1.2		1.3	0.8	1.1		1.0	0.6
Oils	1.2		1.2	1.0	1.2		1.1	0.9
Vegetables	5.7	3.0	5.7		10.2	3.3	5.4	
Eggs (No.)	9		10		16	4	8	
Meat	2		2		2.5		1	
Milk (lts.)	5	5	5		4	6	3	
Non-watershed								
Rice	10.8	21.0	6.9	13.3	12.6		11.7	17.6
Dal	1.1	1.5	1.2		0.8	0.6	1.2	0.5
Sugar	1.2		14.2		1.1		4.0	0.7
Oils	1.3		1.3		1.0		1.0	1.0
Vegetables	4.1		3.9		4.2		4.3	
Eggs (Nos.)	9		9		7		8	
Meat	1		1		1		1	
Milk	5	7	4		4	6	4	
Karnataka								
Watershed								
Rice	8.3		8.9	22.0	9.5	12.0	11.9	21.7
Dal	1.3	3.0	2.5	1.0	1.7	3.0	2.6	1.0
Sugar	1.3		2.3	0.9	1.7		2.4	0.9
Oils	1.2		2.7		1.6		2.6	
Vegetables	3.4		9.6		6.7	2.0	4.9	
Eggs (Nos./Rs.)	6	10	15		10	14	10	
Meat	1.0	1.0	2.6		1.1		1.4	
Milk	3.7	4.5	8.7		4.6	6.2	7.6	
Non-watershed								
Rice	10.9		11.1	20.2	9.9		8.4	18.8
Dal	1.5		3.2		1.4		2.2	
Sugar	1.0		1.8	0.8	5.0		16.4	0.5
Oils	1.3		2.5		1.4		2.2	
Vegetables	2.4		5.2		2.4		3.8	
Eggs (Nos./Rs.)	5		12	4	8	12	10	4
Meat	0.9		0.9	4.0	0.9		1.3	3.5
Milk	5.3	13.5	11.2		4.1	6.2	5.5	

RESEARCH REPORTS SERIES

I. Role of PRIs in Management of Rural Health Care and Family Welfare Services: An Exploratory Study

2. The State-Sponsored Innovative Rural Development Programmes - The VDB of Nagaland

3. Management of Public Distribution in Two States - Gujarat and Karnataka

4. Viability of Service Area Approach to Small Farmers

5. Social Security to the Poor : Efficacy of PDS and WEPs in Karnataka

6. Participatory Planning : A Study of the Planning Process in Kerala

7. Micro Credit for Micro Enterprises

8. Planning for Kohir Mandal

9. Demography of Crimes in Rural Areas : Causes and Remedies

10. Impact Assessment of Wage Employment (JRY and EAS) Programmes in Selected Areas of Uttar Pradesh

11. Working of Tribal Panchayats in Bilaspur District, Madhya Pradesh

12. Functional and Financial Devolution on Panchayats (A Study in Daman & Diu and Dadra & Nagar Haveli)

13. People's Perception of Panchayati Raj in Kerala

14. Nyaya Panchayats in India : A Study

15. Emerging Leadership among SCs/STs under New Panchayati Raj Act in Karnataka

16. The Role of Panchayati Raj in Natural Resource Management: A Study of Two Village Panchayats in Tamil Nadu

17. Community Polytechnics and Rural Development

18. Role of Melas in Marketing of Rural Industries Products

19. Impact of Committee System in Promoting Devolution of Panchayats : A Study in West Bengal

20. Planning for Sustainable Rural Environment through Watersheds and Water Harvesting Structures : A Process Study

21. Impact Assessment of Wage Employment (JRY & EAS) Programmes in Selected Areas of Bihar

22. Decentralisation of Power in Schedule V Areas : Interface Between Panchayati Raj Institutions and Line Departments

23. Participatory Micro Level Planning : A Study of the 11th Janmabhoomi Programme of Andhra Pradesh

24. Management of Panchayati Raj Finances in Andhra Pradesh : A Study in Medak District
25. A Study on Wage Employment Programme in Kurnool (Andhra Pradesh) and Surat (Gujarat) Districts
26. Self-employment Projects-Group Approaches
27. Management of Public Distribution System in Two States (Kerala and Orissa)
28. Capacity Building of SHGs to take up Micro-Enterprises under SGSY : A Quick Study in Jalna District, Maharashtra
29. Rural Infrastructure and Welfare of the Poor
30. Organisational and Institutional Arrangements across the Watershed Programmes: A Study of Kerala Model
31. Rural Road Links : A Study of Sagar District in Madhya Pradesh
32. Micro Credit Interventions in Promoting Micro Enterprises
33. Impact of Integrated Wasteland Development Programme (Phase-II) (IIWDP) : A Study in Uttar Pradesh
34. Entrepreneurship Development among Rural Women
35. Employment. Earnings and Environment among Diamond Cutting Workers in Gujarat
36. Direct Funding to Watershed Community : Process and Impact
37. Employment and Levels of Living Among Cane and Bamboo Artisans in Tripura
38. Strategies for Marketing of Rural Industries Products
39. Activities for Women under Cluster Approach and their Capacity-Building under SGSY - A Study in Five States
40. Management of Rural Development Programmes with Special Reference to JGSY: A Study
41. Changing Pattern of District Administration with Particular Reference to the Role of the Collector in Panchayati Raj
42. Panchayati Raj Finances in Maharashtra : A Quick Study
43. InstitutionaI and Infrastructural Impediments in Rural Industrialisation in Dindigul District, Tamil Nadu
44. Gram Sabha : A Study in Two States
45. Social Mobilisation for Elimination of Child Labour : A Study of MVF
46. Participatory Management of Land Resources with Special Reference to JFM : Impact on Andhra Pradesh

47. Functioning; Performance and Leakage in Public Distribution System : A Study in Three States
48. Impact Assessment of JRY and EAS Programmes in Tripura
49. A Case Study of Savings and Investments of Rural Households in Sagar District of Madhya Pradesh
50. Emerging Leadership in the Tribal Area
51. Partnership in Community-initiated Forest Management System : Conflicts and Prospects
52. Training Towards Capability-Building among Various ClienteIe Groups In Watershed
53. Muga/Eri Silk Production and Constraints : A Process Study in Assam and Mizoram
54. Community Interventions in Traditional Rain Water Harvesting-Drinking Water
55. Capacity Building of Community-Based Organisations : A Study
56. Empowerment of Weaker Sections - The Barefoot College, SWRC, Tilonia
57. Positive and Inhibiting Factors in Cluster Approaches and Group Functioning of Micro Enterprises under SGSY
58. Post-Literacy and Continuing Education : A Study in Yamunanagar District of Haryana
59. Infrastructure for Rural Poor
60. Functioning of PDS in North-Eastern States
61. Assessment of Targeted PDS in Rural India
62. Rural Road Connectivity : A Process Study of PMGSY
63. Marketing Channels for Select Products of SGSY
64. Farmers' Suicides in Andhra Pradesh and Karnataka
65. Working of Women's Thrift Cooperatives under MACS Act in A.P. - A Study
66. Decentralised Planning and Management of Primary Health Care Services under Panchayati Raj Institutions
67. Implementation of SGRY in Chhattisgarh
68. Quick Study on Performance of SHGs and DWCRA Implemented by Government and Non-Government Organisations
69. Poverty, Gender and Reproductive Choice - An Analysis of Linkages
70. Empowerment of Women in PRIs : A Study in Six Select States
71. Flood Disaster Management: A Study

72. Risk, Vulnerability and Coping Mechanisms in Rainfed Agriculture : A Study in Three States

73. Gramsat: Utility and Effectiveness

74. Micro-Level Experiments in Food Security - A Study across States

75. Community Based Resource Management - A Study of Forest Panchayats of Uttaranchal

76. Agrarian Relations and Rural Poverty in Post-Reforms Period : A Study of Bihar and Orissa

77. Implementation of IAY : Issues and Achievements : A Nation-wide Study

78. Interventions of Livelihood Options for HIV and AIDS Affected People in the Rural Areas

79. Effectiveness of Watershed Development on Environment Conservation : A Case Study in Jharkhand and Madhya Pradesh

80. Gender and MGNREGS

81. Stakeholders' Participation and Equity Aspects of Watershed Development: A Study in Andhra Pradesh and Rajasthan

82. Stress Audit : For Rural Development Institutions At District and Block Level

83. Marketing Strategies for Traditional Fishery Products

84. Approaches to Forest Management : A Comparative Study of JFM and Self - Initiated Forest Management

85. Crisis in Handloom Industry: A Study in Andhra Pradesh and Tamil Nadu

86. Competency Mapping : For Rural Development Officials

87. Status of Land Allotted to Poor under Land Distribution Programmes - An Evaluation in Selected States

88. Behavioural Competencies Requirement for MGNREGS Administation

89. Pro-Poor Strategy for Micro-Credit Delivery System

90. Comparative Study of Institutional Arrangements and Farming Systems : Viable Options for Small and Marginal Farmers

91. A Study on Marketing Infrastructure for Fruits and Vegetables in India

92. Impact of Antyodaya Anna Yojana (AAY) on the Food Security of the Poorest of the Poor in Rural Areas

93. Impact of Federations in Economic Improvement of SHG Members : A Study Across Two States of India

94. Inclusion Of Persons With Disabilities Under MGNREGS : A Study Across Three States

95. Role of Exclusive Credit Linkage Programme for Occupational Dynamics Among Fisherwomen – A Study in Andhra Pradesh & Tamil Nadu States

96. Land and Water Use Practices for Sustainable Smallholders' Livelihoods : A Study in Four States

97. e-Connectivity of Panchayats

98. Factors Facilitating Participation of Women in Mahatma Gandhi NREGS

99. Empowerment of Landless: An Analysis of Land Distribution and Land Purchase Programmes of Andhra Pradesh

100. Factors Affecting Participation of Tribals in MGNREGS: A Comparative Study

101. Watershed and its Impact on Poverty Alleviation and Sustainable Livelihoods: A Comparative Study in Six States

102. Study of Marketing of SGSY Products in Pune District of Maharashtra: Case of Public Private Partnership

103. Traditional Irrigation System in Bihar

104. Effectiveness of Watershed Management : A Study of Some Successful Watershed Projects in Five States

105. Role of Technology in Entrepreneurship Development and Emerging Gender Relations in Poor Women

106. Agrarian Distress, Coping Mechanisms and Ramifications of Debt Waiver Scheme (A Study in Telangana State)

CURRENT NIRD&PR PUBLICATIONS

S.No.	TITLE	Price ₹
1.	Action Research-Enhancing SHG Movement Livelihood Promotion in Anantapur District, Andhra Pradesh (Discounted Price) by Gyanmudra & Team	830-00
2.	Agrarian Crisis in India – The Way out (Discounted Price) - K. Suman Chandra, V. Suresh Babu, P.K. Nath - 2013	1,295-00
3.	Blending the Traditional with the Modern… (Discounted Price)	450-00
	a) Cost effective rural housing technologies (paperback)	500-00
	b) Cost effective rural housing technologies (bound)	
4.	Course Modules for Entrepreneurship Development Training Programmes – RSETI Directory 2011 (Discounted Price)	200-00
5.	Democratisation of Water B K Thapliyal, SSP Sharma, P. ShivRam, U. Hemanth Kumar	1,650.00
6.	Devolution of Functions and Finances on Panchayats in Andhra Pradesh by K. Sivasubrahmanyam	430-00
7.	Devolution of Functions and Finances on Panchayats in Orissa by A. C. Jena	250-00
8.	Directory of Rural Technology	
	a) PART - I (Discounted Price)	200-00
	b) PART – II	550-00
	c) PART – III	540-00
	d) PART – IV (Discounted Price)	230-00
	Edited by Mathew C. Kunnumkal and Bharat R Sant	
9.	Disaster Management – Orissa Cyclones, Floods and Tidal Waves Disaster (2001) by R.C. Choudhury & K. Prasad Rao, et. al.	490-00
10.	Emerging Institutions for Decentralised Rural Development Edited by S.P.Jain	
	Volume – I (2001)	575-00
	Volume – II (2001)	575-00
11.	Gender Issues in Education Edited by Arvind Yadappanavar & Gyanmudra	210.00
12.	Guaranteed Employment for the Rural Poor	
	a) Volume – I	340-00
	b) Volume - II	220-00
13.	Impact of SGSY & IAY Programmes on Minorities 2011	475-00
14.	India Panchayati Raj Report (2001)	
	a) Volume - I	450-00
	b) Volume - II Edited by R.C.Choudhury and S.P.Jain	450-00
15.	India Rural Development Report – 1999	500-00
16.	India Rural Development Report – 2005 (Discounted Price)	1000-00
17.	Indigenous and Traditional Knowledge for Promotion of Sustainable Agriculture V. Suresh Babu, K. Suman Chandra and S.M. Iliyas (August 2013)	850 - 00
18.	Issues Related to Planning Sustainable Livelihood Settlement for HIV/AIDS Affected People in Rural Areas S K Bhanj and R. Chinnadurai	350-00
19.	Research Methods for Rural Development Professionals (Discounted Price) by Gyanmudra	500-00
20.	Right to Education - Challenges and Strategies (Discounted Price) by M. Sarumathy and Gyanmudra	420-00
21.	Rural Development Statistics – 2009 - 2010	785-00
22.	Rural Development Statistics – 2011-12	350-00
23.	Rural Development Statistics – 2012-13	470-00
24.	Rural Development Statistics – 2013-14	490-00
25.	Social Audit : A Peoples Manual (2007) (Discounted Price)	100-00
26.	The New Rural Paradigm: Policies and Governance (Discounted Price) by Gyanmudra and M. Sarumathy	450-00
27.	Rural Development Statistics- 2015-16	750-00

Note : 20% discount to all individuals, organisations and participants of training programmes ; 50% discount to the Institutional Members of NIRD&PR)

For Orders Contact :

Centre for Development Documentation and Communication (CDC)

National Institute of Rural Development and Panchayati Raj

Rajendranagar, Hyderabad - 500 030. India.

Tel & Fax : 24008473 Grams : Gravik; E-mail : cdc.nird@gov.in Website : http://www.nird.org.in

About NIRD&PR

National Institute of Rural Development and Panchayati Raj continuously strives to serve the nation through training, research, action research and consultancy activities for development of the rural poor and enhance their quality of life. It aims to:

(i) organise training programmes, conferences, seminars and workshops for senior level development managers, elected representatives, bankers, NGOs and other stakeholders.

(ii) undertake, aid, promote and coordinate research.

(iii) study functioning of the Panchayati Raj Institutions and rural development programmes across the States.

(iv) analyse and propose solutions to problems in planning and implementation of the programmes for rural development; and

(v) develop content and disseminate information through periodicals, reports, e-modules and other publications.

Considering the challenges faced by the Government in the development of a large section of rural poor across the country through its various policies and programmes, NIRD&PR as apex training Institute in the field of rural development has to cater to the training and capacity development needs of a large clientele. To achieve these objectives, a nation-wide network of training infrastructure has to play its rightful role. The clientele include a large number of elected PRI representatives at different levels, rural development functionaries, NGOs, Bankers and other stakeholders. Capacity building of rural development personnel and elected representatives is an intrinsic part of the entire rural development process. It helps to improve their managerial skills while keeping them abreast with the latest changes in strategies, government policies and programmes to augment their knowledge and working efficiency resulting in strengthening of the delivery mechanism for the benefit of all the stakeholders. The challenge is huge and NIRD&PR has been able to play its role in the country's rural development initiatives by facilitating qualitative changes in programmes implementation through a process of training, research, action research, consultancy, information dissemination and information building on a continual basis. This has enabled the Institute to emerge as the National Apex Institute for capacity development in the area of rural development.

In its continuous effort to develop managerial skills of functionaries in rural development process, the Institute started one-year fully residential Post Graduate Diploma in Rural Development Management (PGDRDM) and two one-year PG Diploma programmes in Distance Mode namely, Sustainable Rural Development (PGD-SRD) and Tribal Development Management (PGD-TDM).

For further details write to :

Director General

National Institute of Rural Development and Panchayati Raj

Rajendranagar, Hyderabad - 500 030, India

Telefax : 040-24008473, E-mail : cdc.nird@gov.in

Website : http://www.nird.org.in