An Impact Assessment of Integrated Watershed Management Programme on rural economy of Nagaland

Thesis

submitted to

NAGALAND UNIVERSITY

in partial fulfillment of requirements for the Degree

of

Doctor of Philosophy

in

Agricultural Economics

By

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2018

DECLARATION

I, **S.Kanitoli chishi** , hereby declare that the subject matter of this thesis is the record of work done by me, that the contents of this thesis did not form the basis of the award of any previous degree to me or to the best of my knowledge to anybody else, and that the thesis had not been submitted by me for any research degree in any other university/institute.

This is being submitted to Nagaland University for the degree of Doctor of Philosophy in **Agricultural Economics.**

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CERTIFICATE – I

This is to certify that the thesis entitled "**An Impact Assessment of Integrated Watershed Management Programme on rural economy of Nagaland"** submitted to Nagaland University in partial fulfillment of the requirements for the award of degree of Doctor of Philosophy (Agriculture) in **Agricultural economics** is the record of research work carried out by **Ms. S.Kanitoli chishi** Registration No. 552/2014 under my personal supervision and guidance.

The result of the investigation reported in the thesis has not been submitted for any other degree or diploma. The assistance of all kinds received by the student has been duly acknowledged.

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CERTIFICATE – II

VIVA VOCE ON THESIS OF DOCTOR OF PHILOSOPHY IN Agricultural Economics

This is to certify that the thesis entitled "**An Impact Assessment of Integrated Watershed Management Programme on rural economy of Nagaland"** submitted by **S.Kanitoli Chishi Admission No. 130/12 Registration No.552/2014** to the NAGALAND UNIVERSITY in partial fulfillment of the requirements for the award of degree of Doctor of Philosophy in Agricultural Economics has been examined by the Advisory Board and External examiner on …….....

The performance of the student has been found **Satisfactory/Unsatisfactory.**

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Abstract

The present study was selected to discuss the programme implemented under Integrated Watershed Development Programmes in Nagaland was to access the Impact of watershed on the level of economics for the beneficiaries and non-beneficiaries to access the income and employment for that purpose two districts from the Nagaland state viz; Dimapur and Zunheboto were selected by purposely sampling technique covered under watershed in the zone. Two blocks from each district were randomly selected. Thus finally 8 numbers of watersheds were selected. In the second stage of sampling was selected randomly from identified watershed areas. The net returns of the beneficiaries were found higher than the non-beneficiaries. The overall net returns of the beneficiaries are Rs 18, 31,370 as compared to Rs 11, 56,914 of the non-beneficiaries. Large farmers were found to have highest percent increase in net return over small, semi-medium and medium farmers. It is found that the marginal

propensity to consume is highest for the large farmers have least MPC of 0.05. The overall average size of land holding of beneficiary is 21.75 ha as compared to non-beneficiary which has 21.16 ha. The average labours employed by the beneficiary are 44 as compared to 27 labours of non-beneficiary. It is found that large farmers have large size of land holding and employs more number of labours. It was found that there is an increase in the income of for both beneficiary and non-beneficiary but comparatively beneficiary has more increased income. The medium farmers have higher increased income of 541 rupees as compared to large farmers with 493 rupees, semi-medium with 440 rupees and small with 280 rupees respectively. On an average 483 man days were created before IWMP and it increased to 507 man days after implementation of IWMP. There was a high increase of man days in horticulture enterprise from 125 to 135 man days with an increase of 10 days. Large farmers are found generate more employment by the crop activities than other farm groups but the percent change in employment is more in small farmers, main constraints in the implementation of Integrated watershed management Programme is the infra-structural problem of lack of machines and equipment, lack of awareness about finance facilities. If there are proper Information centre set

up at the block level than there will timely dissemination of the information to the farmers. Easy availability of market and knowledge on post harvest management will help boost the economy of the rural areas in Nagaland.

Key words: IWDP, impact, assessment, economics, beneficiaries, non-beneficiaries.

Chapter - I

Introduction

Water is life. It originates in water if at all it ends, it will end with water. The role of water is felt everywhere, its scarcity causes drought, famines, its' excess causes flood and deluge. Water scarcity in some parts and flood elsewhere it is normal. Satisfying human needs for food, water and economic opportunity while simultaneously maintaining the viability of water dependent ecosystem shall be the major challenge of the century. Water is possibly our most precious natural resource. The abundance and quality of water drives all human system and those of most other organisms (Bhalla and Hazell, 2003).

In Nagaland the Department of Land resource Development created by the Government of Nagaland in the year 1993-04 for implementation of integrated watershed Management Programme. The department implements the centrally sponsored schemes by the Ministry of Rural Development, DoLR, which is leaded by the Minister and the secretary in-charge of the department in the Government level. At the state level it is headed by the Director, Land resources, under which multidisciplinary team of technical

officers in the directorate set up plans and policies and also supervise the implementation of the watershed programme. At the district level it is headed by the District Project officer and assisted by the assistant project officers, assistant inspectors and watershed development team members.

A total of 42 projects have been endorsed by the Government of India covering 694 villages across 11 districts of the state covering a total watershed area of 3,76,806.50 Ha. Watershed programmes in the state is also implemented by other departments such as department of Agriculture and soil and water conservation department.

The present study on Impact of IWMP on rural economy of Nagaland will help understand how the programme has a significant impact on the livelihood of the beneficiaries over non-beneficiaries. This type of studies will help the policy makers, department of land resource to understand the positive impact and also the loopholes so that the programme will have a greater impact on the rural economy. The present study was carried with the following objective:

1. To examine the socio-economic status of the sample farmers,

2. To study the different activities implemented in the Integrated Watershed Management Programme,

3. To study the economic status of different activities of Integrated Watershed Management Programme,

4. To assess the impact of Integrated Watershed Management Programme on income and employment, and

5. To study the constraints faced by the sample farmers in the implementation of Integrated Watershed Management Programme.

Chapter - II

Review of Literatures

Comprehensive review of the past studies is an essential component of any research endeavours, which helps to decide appropriate technical procedure and provides supports in interpretation of research findings. Commensurate with proposed objective, some relevant studies have been briefly reviewed under:

2.1. Impact of IWMP on socio-economic status of farmers:

Reddy and Kumari (1986) observed the significant difference in the levels of knowledge of improved cultivars of rainfed groundnut in case of trained and untrained farmers.

Singh and Comer (1988) studied the main steps in developing a successful and effective training. The knowledge score of participants and non-participating farmers about the modern methods of cultivation of wheat and paddy were compared by using ‘t’ statistics and it was found that the participants farmers had significantly higher knowledge than the non-participant farmers ($t=12.8$, $p>0.05$). It was further found that the adoption index of non-participant farmers was only 25.66 percent showing substantial difference between participant and non-participant farmers with regard to their level of adoption of improved agricultural practices.

Chauhan *et. al*. (1990) reported the significant knowledge was gained by the programme trainees in the field of improved practices of conservation and preservation of resources, variety, bio-fertilizer, chemical

fertilizer, plant protection, tree species, and conservation of water through agronomical and mechanical, besides details of watershed.

Malik (1990) studied the principles and procedure involved in designing successful farmer's training programme. The guideline related to: seeing farmers as adults who have a prosperity to change slowly and hold beliefs which are hard if not possible to alter; the effectiveness of extension teaching being reliant on the voluntary participation of the audience; farmers having confidence in their extension officers, and it not being possible to help farmers unless they actually want to help themselves.

Field/ (1994) studied the social discount rate (SDR), a key element in public project net present value calculations, is intended to represent society's preference for current over future consumption.

Wabhitkar *et. al.* (1998) conducted a study to determine the relationship between the level of adoption of high yielding varieties and various socio-economic, psychological and communication characteristics and concluded that education, land holding, annual income, socio-economic status, economic motivation, risk preference, management orientation, cosmopolitan attitude, contact with extension agencies and mass media exposure were found to be significantly related to adoption.

Gomez-Limon and Berbel (2000) study the estimated the economic, social and environmental implications of pricing irrigation water in Spain using goal programming.

Geda *et. al.* (2001) reported that the poverty status was strongly associated with the level of education, household size and engagement in agricultural activities.

Rajuladevi (2001) concluded that the female-headed household were most adversely affected poverty group in the studied villages irrespective of caste.

Sivanarayana *et. al.* (2002) studied the gaps between the planning and actual implementation, the knowledge and adoption of learned technology and the strengths and weaknesses in the planning and implementation of training efforts.

Govindadass (2003) observed that the level of adoption of training technology in rice cultivation with an increase in the educational level of the small and marginal farmers. The educated farmers made perceptible improvement in productivity worth allocative skills acquired through education.

Goswami *et. al.* (2005) studied that the annual income, irrigated cropped area, material possession, social participation, mass media exposure and extension contact were positively correlated with the adoption of scientific farm innovation.

Orei *et. al.* (2005) studied the effectiveness of an agricultural training programme on the multiplication of healthy planting materials. They also conducted in-service training for colleagues and farmers, which

had multiplying effect on the multiplication of clean and healthy planting materials.

Siag *et. al*. (2005) observed that in order to bridge up the gap between technology developed and technology transferred, there is need to strengthen the extension network besides putting emphasis on specific local recommendations.

Biswar (2009) observed a large number of human resources in the country should be used efficiently and gainfully through proper education, training and motivation.

Chinchmalapure *et. al.* (2009) studied that the training effectiveness index sums to be high in case of the IPm training programme because of the efficient conduct of the training programmes in terms of trainees participation as well as the courage of need-based subject matters, as compared to the training on organic farming.

Choudhary (2010) observed that majority of the beneficiaries belonged to middle and young age groups.

Kulshrestha *et al*. (2010) opined that majority of the watershed beneficiaries belonged to middle age group.

Kumar and Pepat (2010) concluded that the socio-economic and psychological characteristics, viz. education, caste, farm size, social participation, extension participation, market orientation, economic motivation and perception had positive and significant associations with farmers knowledge.

Mishra (2012) found that higher percentage (47.62 per cent) of the beneficiaries belonged to middle age group and also the majority (55.24 per cent) of the beneficiaries were having education from primary to high school, respectively.

Mishra *et al.* (2014) reported that the watershed development program respondent in both district were similar in the opinion that increasing occupational competency.

Yadav (2016) observed that maximum number of beneficiaries belonged to middle age (35 to 50 years) group and also the maximum number of beneficiaries were primary passed.

Pannu *et al,* (2017) found that socio psychological had scored (70.16 mps) and technical constraints (64.33 mps) were the most important constraints which hinder the adoption of indigenous water harvesting practices.

2.2. The Economics of Integrated Watershed Management Programme (IWMP):

Agarwal and Kumawat (1974) studied on potential of increasing farm income through credit and stated that introduction of technology without comparable credit facilities cannot be expected to have any significant impact on farm income. So, efforts should be made to extend credit facilities along with other input facilities.

Ferguson and Maurice (1974) observed that the watershed management planning deals with decisions about the allocations of scarce resources among competing production possibilities with the optimal allocation of scarce resources among competing needs - is the purpose of economics.

Sagof (1988) reported that it is true despite criticisms that CBA is flawed as a form of policy analysis because it fails to differentiate between moral and economic values.

Tietenberg (1988) claimed that CBA has promised more than it has delivered as a policy decision tool etc;

Sharma (1993) reported that beneficiaries (having annual income of Rs 50,000/- in rural area and urban areas (having annual income of Rs 75,000/-) of co-operative dairy farmers were economically benefitted as compared to non-beneficiaries, respectively.

Field (1994) reported the CBA is the principal analytical framework used to evaluate public expenditure decisions.

Braden and Vanlerland (1999) reported the methods for applying economic principles to sustainable water management.

Mc-Donald and Johns (1999) reported the social benefit-cost accounting, applying the method to a watershed in Bogota, Columbia.

Ninan and Lakshmikanthamma (2001) studied the social cost-benefit analysis of a watershed development project in India, with reference to NPV, BCR and IRR.

Jollifffe (2002) conducted a study on the maximum, minimum and average level of household schooling to test whether education effects the production of household income through a weak-link, allocative of worker effect and suggested that allocative is the largest effect for total income.

Steiguer and Mau-Crimmins (2002) reported that the cost-benefit ratio has changed the scenario over last 25 years a variety of benefit for market led benefit gain by the respondents in the study areas.

Kumar and Kaptan (2004) reported that the number of middle and higher income families (having annual income of Rs 70,000) in rural (21.7 million) and urban areas (24.2 million) is nearly the same.

Choudhary (2010) reported that higher percentage of beneficiaries (39.17 per cent) had higher economic motivation.

Sharma *et al*. (2015) found that out of total 149 respondent 30 (20.13 per cent) did not have any enhancement of top opportunity but 26 (17.45 per cent) did avail more than 50.00 per cent & less than 25.00 per cent of employment opportunity and 45 (30.20 per cent) had less than 50.00 per cent employment opportunity.

2.3. Impact of Integrated Watershed Management Programme (IWMP) on income and employment:

Hirevenkanagoudar *et. al.* (1984) compared the knowledge score of participants and non-participating farmers about the modern methods of cultivation of wheat and paddy were compared by using 't' statistics and it was found that the participant farmers had significantly higher knowledge than the non-participant farmers ($t= 12.8$, $p>0.05$). It was further found that the adoption index of non-participant was only 25.66 percent showing substantial difference between participant and non-participant farmers with regard to their level of adoption of improved agricultural practices.

Lakshmi *et. al.* (1988) opined that 70 per cent of IRDP benefiaries' recorded additional income ranging from Rs. 5530 per annum in case of bullock carts to Rs. 3436 per annum in respect of dairy units. The study reported that among beneficiaries, 18.6 per cent appeared to have gone above the poverty line.

Sharma (1993) carried out a research work in Agra district to compare income and employment of the member and non-member farms. Study revealed that overall income and employment both for the small and marginal member farms were enhanced by 25.00 per cent and 18.00 per cent in compare to the non-member farms, respectively.

Devi (1994) studied the IRDP potentiality in Kerala state and found that majority of beneficiaries (76.66 per cent) experienced an increase in the income by 10.15 per cent, while 28.33 percent beneficiaries had increased their income by 50 to 100 per cent.

Paul (1994) studied the Hill Cattle Development Programmed in humid temperate zone of Himachal Pradesh and revealed that the project appraisal yielded a Pay Back Period of Eleven years and Internal rate of Return of 40.6 per cent. The net present worth was found positive and benefit cost ratio was greater than unity at different discount rates. The result reflected favourable on the economic worthiness of the programme.

Singh (1994) studied the ICDP, Meerut and reported its payback period, as ten years on its investment and NPV were positive. The benefit-cost Ratio's, were greater than unity at different discount rates and the Internal Rate of Return was 34.5 per cent. All these investment criteria reflected favourable on the economic worthiness of this project.

DeVuyst and Ipe (1999) studied the use of incentives to encourage farmers to adopt best management practices.

Ahmed and Philip (2000) studied the effectiveness of training programmes where about 50.00 per cent of the trainees gained a medium level of knowledge and acquired a medium skill level in all the training programmes. Overall 35.00 per cent of trainees had a medium level of symbolic adoption.

Cacho (2001) studied a formal economic analysis on the role of agro-forestry at the level of a watershed. The potential costs of incentives, land degradation and forest externalities were estimated.

Ipe *et al.* (2001) have also investigated the use of incentives to encourage farmers to adopt best management practices.

Jolliffe (2002) conducted a study on the maximum, minimum and average level of household schooling to test whether education effects the production of household income through a weak-link, allocative of worker effect and suggested that allocative is the largest effect for total income.

Loehle *et al,* (2002) opined the increased pressure upon private concerns to broaden the scope of their planning to include non-commodity resources.

Rahim (2003) reported that the educated farmers quoted extension as their reliable source of information, while uneducated farmers seek information from other sources such as fellow farmers, friends and relatives.

Ramakrishnan *et. al.* (2003) studied that the training received had positively and significantly contributed to most of the variations in the knowledge gain of the trainees.

Kumar and Kaptan (2004) opined India is now seeing at dramatic shift towards prosperity in rural households. The lowest income class (Rs 25,000 and below) is estimated to swank from more than 60.00 per cent in 1994-95 to 50.00 per cent in 2006-2007.

Rudra and Mukhopadhyay (2005) opined that technology domination resulting from poor awareness of the farmers lead to poor technology adoption.

Reddy and Reddy (2006) studied on the impact of the training programmes conducted to farmers in the command area of the Srisailam

Right Branch canal (SRBC) and found that there is a substantial increase in knowledge of farmers on improved production practices as a result of the training programme conducted.

Borde and Rajput (2010) observed that majority of trainees in all the six national training courses were found in medium level of per unit in gained knowledge. Mean difference between pre and past knowledge score ranges from 4.14 to 5.91 and was found significant,

Kulshrestha *et. al.* (2010) concluded that majority of the watershed beneficiaries belonged to low annual income group.

Singh and Prakash (2010) reported that the share of the poorest 69 per cent of the households in Khamenlok watershed before the project was 56 per cent of the total income, which increased to about 62 per cent after the project. On the other hand, the share of the upper 5 per cent in the total income was 18 percent before the project, which decreased to about 14 per cent after the project. This increase in the share of the poorest group and decline in the share of the richest group after the project indicated an improvement in the farm income distribution after the project.

Mehmet and Sermin, (2011) opined that Integrated Water Management (IWM) is becoming increasing important in such a country, where the economy depends predominately on agriculture, as IWM is one of the major component to develop the forestry, agriculture, soil and water ecology, water use and other sciences to provide the guidelines for the choosing appropriate IWM alternatives of social and economic aspects is an essential part of evaluating the effects of IWM schemes.

Raju *et al.* (2012) reported that the respondents (78 per cent) of watershed villages had their annual income between Rs 0.51 to Rs 1.50 lakh, where as it was 54 per cent of respondents in non-watershed villages which have income level between Rs 0.51 to Rs 1.54 lakh, respectively.

Yadav (2012) opined that the higher percentage of watershed beneficiaries had medium level of economic motivation.

Mishra *et al.* (2014) reported that higher percentage of beneficiaries (32.38) were busy not only in cultivation, but they were earning through labour work and other business.

Gupta *et al.* (2018) opined that 48.75 per cent of beneficiary respondents had high employment generation.

2.4. Different activities implemented in the Integrated Watershed Management Programme (IWMP):

Kelman (1981) opined that certain policy decision may be correct even though the costs outweigh the benefits.

Patel (1983) observed that the role of active interaction between the suppliers of technology, the users of technology and the facilitators of technology were essential if new technology had to be successfully implemented. This required strengthening of input supply mechanism, training of farmers in the optimum use of the inputs and continuous extension services with feedback information.

Singh and Sharma (1987) conducted a study on seasonal variations in employment in different farming system on small farms in mid western region of Uttar Pradesh. They concluded that comparatively there was more employment under crop farming system than crops + goat farming or crop + dairy + goat farming under optimum system. There was full employment in both farming systems where goat farming was involved, while in crop farming system there could not be full employment even under optimum farming system.

Anantharaman and Ramanathan (1990) opined that majority of the trainees had expresses of new skills on various items and considerably sharpened the skills already known.

Turner *et al.* (1994) observed that the use of non-comparable measuring units does not avoid a value judgment, it merely postpones.

Boardman *el al.* (1996) observed the increasingly rely upon existing studies as sources for borrowing benefit values.

Dahiya *et. al.* (1997) conducted a study on training rural women on grain storage and found that combination of media with lecture was helpful in retaining and sustaining attention, interest and knowledge and also helped to clarify the message. The estimation impact assessment index was 48.81.

Nagabhushanam (1998) conducted a study to examine the impact of training on the knowledge and skill levels in paddy cultivation of farm women and concluded that characteristics involving social participation,

employment, land holding, division-making and innovativeness were found to have a significant relationship with the skill; level acquired.

Prabhukumar and Veerabhadraiah (1998) conducted a study on behavioural changes among farmers before and after the training programmes and observed a significant change in the management attitudes and knowledge after the training.

Barathan (2001) reported that the reduction in poverty means increase in his scope of employment, when the level of poverty of the state falls one would expect the employment opportunities in the state to increase.

Winters *et. al.* (2002) studied that the value of property (asset) position of the household has a significant effect on household participation in income generating activities.

Ajay (2005) studied the impact of training on the adoption of improved practices among the cassava farmers and found that the majority of the farmers (55 percent) belong to the medium adoption category. There was also a significant difference in the level of adoption between the trained group and untrained group.

Muhammad *et. al.* (2005) conducted a study on the impact of the training of rice production technology and found that the rice growers who adopts the latest plant protection measures and follow other recommended practices gets much higher yield per hectare than those who do not adopt the latest rice production technologies.

Kiran and Shenoy (2010) reported that the farmers with high extension participation, high risk orientation and high scientific orientation who had undergone more number of trainings were more inclined to take up innovative measures for agricultural production.

Meena and Sharma (2012) reported that constraints related to organization of various group at watershed level was assigned the highest 45 mean score (2.71) and ranked first, the second, third, fourth and fifth ranks were accorded to the category of constraints soil & water conservation (2.69) crop production (2.20) agro forestry and dry land horticulture (2.15) & house hold production system (1.92) and the last rank was assigned to live stock management constraints (1.86), respectively.

Raju *et al.* (2017) reported that the mean size of land holding between watershed and non-watershed villages, is statistically not significant at 0.05 level of significance, with mean score of 3.9 ha and 3.2 ha in watershed and non-watershed villages respectively.

2.5. Constraints faced by the farmers in IWMP covered areas:

Guruswami (1976) conducted a study on utilization of farm finance advanced by a nationalized bank and identified that about 18.68 per cent of the respondents diverted the loans because of non-availability of finance for consumption purposes, diversion of this sort negatively influenced the repaying capacity of the burrowers since the use to which the money was

put were not in the nature of improving the economic status of the intended beneficiary.

Sinha and Prasad (1980) studied in the Muzzafarpur district of Bihar and found that only 9.86 per cent of the borrowers had made full repayment, 44.33 per cent were irregular in repayment and 32.56 per cent had not paid any instalment, while 13.25 per cent had taken loan under food for work programme, where no repayment was needed. Repayment habit of the loaners, were found to be fairly poor.

Bank of Baroda (1981) studied on over-dues in case of agricultural loan and reported that the reasons for poor recovery were backwardness of borrowers, lack of continuous flow of income, poor quality of animals, death of animals due to improper health care and low milk yield.

Pandey (1984) revealed that the small and medium farmers accumulated more debts than their normal repaying capacity. They concluded that causes of poor recovery being political interference, prevelance of wilful default, excess debt burden, issue loans, mis-utilization of loans, over estimation of repaying capacity generated from proposed investment etc.

Suryanarayana and Chiranjeevulu (1985) found that repayment performance of farmers was positively related to productive utilization of credit, the numbers of defaulters were less. The total share of institutional credit on the total credit goes highest to small then followed by medium and large.

Gupta *et. al.* (1986) studied that large farmers repaid maximum amount of loan (48.88 per cent), followed by medium and small farmers in Hoshangabad ditrict of Madhya Pradesh. The overdue were highest in case of medium farmers, followed by small and large farmers.

Desai and Reddy (1989) identified the major operational constrains at field level for the successful employment of training. It was concluded that the understanding and the development of the means of overcoming the constraints were essential.

Uddin (1989) opined that the rural areas have multiple problems-problems of low income, saving, production, education, over population etc. Therefore, these areas are marked with static and dynamic backwardness.

Vasanthakumar and Singh (1991) reported that credit was found to be a crucial element in transfer of technology to small farmers, illiteracy, low social participation and low contact with extension agency were associated with moderate credit gap.

Khan (1998) reported that the shortage of extension staff and poor extension services were major constraint on the agricultural productivity and fast diffusion of diffusion of new agricultural technologies in the tribal areas.

Sharma and Reddy (2000) conducted a survey and found that the training programmes implemented among sheep farmers improved the

farmer's knowledge on sheep rearing and its socio-economic status and personal psychological characteristics of sheep farmers.

Ali *et. al.* (2002) observed that the lack of marketing , transport, storage facilities, insufficiency of capital and information system is not strong enough to meet the need of bridging poor and illiterate farmers with the latest technical know-how.

Sundaranbel *et. al.* (2004) identified that the benefits and constraints in attending the various training programmes by women farmers and revealed that the major constraints in attending the various training were villager's criticism, wage loss, high technicalities in teaching, conduction of training programmes outside the village for long duration, and coincidence with farm operations.

Tamban *et. al.* (2005) studied the different interface programmes in the coconut sector in Kerala, India and observed that interface transfer that is based on the concept of research-extension-farmer interface.

Choudhary (2010) opined that the major constraint perceived by the beneficiaries were such as lack of irrigation facility, untimely availability watershed based production technology, higher cost of input like seed production technology, higher cost of input like seed, fertilizers, pesticides, lack of finance facility and uncertainty about the availability of irrigation water.

Daipuria *et. al.* (2010) reported that lack of education, lack of knowledge of improved technology, lack of knowledge in right time,

agriculture literature contained with difficult words, lack of interaction with extension officers, lack of training, demonstration, lack of irrigation, demonization of extension workers, lack of co-operation in extension wok and lack of fertilizer and manure availability in right time were the constraints in adoption of improved cotton production technology.

Kadlag and Atkare (2010) observed that in agriculture sector, credit programme for the resource development is carried out and technology transfer to the tribal farmer is done through the agricultural programme so as to increase the productivity of the traditional crops grown by the farmers. To reach at the grass root level the representatives from the community were selected for efficient dissemination of technology.

Pannu *et. al.* (2014) reported that socio-economic, psychological and technical constraints were the most important constraints for the adoption of water-shed management.

Chapter – III

RESEARCH METHODOLOGY

The present study is related to IWMP scheme, which is working as per the guideline of Central government with the help of Ministry of Agriculture, Government of India.

Local of the study:

Since the intensive IWMP started in 2008-09, so it is worth, while to study its impact. Since the data of the initial period cannot be compared with the data of recent years. It is more scientific and practical to compare the economy of the beneficiaries and non-beneficiaries covered in the area of IWMP schemes.

Selection of districts: The IWMP was launched in 2008-09 in all 11 district viz: Dimapur, Kohima, Kiphire, Longleng, Mokokchung, Mon, Phek, Peren, Tuensang, Wokha and Zunheboto of Nagaland, out of these districts two districts

namely, Zunheboto and Dimapur districts of Nagaland selected because of the fact that it is expected to provide all the relevant information and hence can conveniently be obtained for conducting this study. Keeping all the above facts, both districts of Nagaland are therefore purposively selected to conduct this study.

(a). Zunheboto district: Zunheboto is one of the under developed district of Nagaland having a total geographical area of 1,36,455 ha. In this district all 4 types of agroclimatic viz hot per humid, hot moist sub-humid, warm humid and warm per humid conditions are present.

(b). Dimapur district: Dimapur district is situated in the South-Eastern part of Nagaland, bounded by Kohima districts inthe North, Assam state in the South and Peren district in the West, Earlier a part of Kohima district, it was made a separate district on December 21, 1999. It is inhabited by the mixed type of populations. It is a basically plain area district rich in

agricultural and horticultural production base area and surrounded by important river Dhansiri. Dimapur is most development district of the State.

Selection of Blocks: Two blocks from each district were selected randomly for the IWMP programme.

Selection of Villages: Altogether eight villages were selected randomly from each district with four villages from each block from the list of villages was obtained from the office of SDO (Civil) Rural Development (RD) Block headquarter and other related offices.

Selection of Farmers: After selection of the villages, list of beneficiaries and non-beneficiaries of IWMP was prepared from each of the selected village. In order to have representative sample from each village a sample of 20 households in which 10 household from beneficiaries and 10 household from non-beneficiaries was drawn following the simple random sampling

method. This resulted in selection of 160 respondents from 8 villages in which 80 are beneficiaries of IWMP scheme and 80 are non-beneficiaries of IWMP scheme.

Data collection:

Primary and secondary sources viz, office of the Project Director, IWMP Zunheboto and Dimapur various published materials from the Directorate of land resource and Agriculture, Government of Nagaland, etc. In order to identify the constraints in implementing the IWMP programme discussion with IWMP functionaries at district level /block level etc. was of the districts and state which will enlighten the socio-economic and infrastructural scenario of the area under study. The primary data was collected through tested and structured schedules were questionnaires especially designed for this study.

Analytical techniques and tools:

1. Change in net income:

Income generated through crop and livestock enterprises were worked out by economics activities incurred on the farm by getting the total income gain by adding in off farm activities, the changes in gross and net returns as a result of IWDP assistance was estimated as follows:

Net return = Gross return - Total Expenditure

2. Change in Employment level:

To estimate the changes in the status of employment of family members was calculated involve in all the activities. The total employment level was worked out by adding the employment hours on crop activities, livestock activities and off farm activities.

3. Change in consumption expenditure:

The changes in the consumption by the beneficiaries were measured by calculating marginal propensity to consume (MPC).

MPC = ΔC / ΔY = Changes in consumption / Changes in income

Whereas: MPC = Marginal propensity to consume,

C = Expenditure on consumption items,

Y = Income of the family.

Period: *The primary data will be collected during 2012-14 for the Study purpose*

CHAPTER - IV

RESULT AND DISCUSSIONS

The data collected for the study from the sample farmers of the Integrated Watershed Management Programme (IWMP) were analyzed with reference to the aforementioned objectives and the result are presented and discussed in this chapter. For better understanding of the various facts of the subject as mentioned under:

4.1. Socio economic aspects of the selected respondents.

4.2. Different activities implemented in integrated watershed management programme (IWMP).

4.3. Economic status of different activities of Integrated Watershed Management Programme (IWMP).

4.4. Impact of IWMP on income and employment of the sample farmers.

4.5. Constraints faced by the sample farmers in the implementation of Integrated Watershed Management Programme (IWMP).

Sl. No.	A). AGE	Beneficiaries		Non-beneficiaries		Total	
		Freq.	Per cent	Freq.	Per cent	Freq.	Per cent
1.	Young (up to 35 years)	6	7.50	8	10.00	14	8.75
2.	Middle (36-50 years)	31	38.75	43	53.75	74	46.25
3.	Old (51 & above)	43	53.75	29	36.25	72	45.00
Total		80	100.00	80	100.00	160	100.00
	B). SEX						
1.	Female	9	11.25	8	10.00	17	10.63
2.	Male	71	88.75	72	90.00	143	89.37
Total		80	100.00	80	100.00	160	100.00
	C) FAMILY SIZE						
1.	Less than 6	31	38.75	39	48.75	70	43.75
2.	6-8	42	52.50	33	41.25	75	46.87
3.	9 & above	7	8.75	8	10.00	15	9.38
Total		80	100.00	80	100.00	160	100.00
	D) EDUCATIONAL QUALIFICATION						
1.	Illiterate	10	12.50	12	15.00	22	13.75
2.	Primary school	26	32.50	28	35.00	54	33.75

3.	High school	24	30.00	24	30.00	48	30.00
4.	Graduate & above	20	25.00	16	20.00	36	22.50
Total		80	100.00	80	100.00	160	100.00

4.1. Socio- economic aspects of the selected respondents:

4.1.1. For the present study the respondent's demography was selected for age, sex, educational qualification and family size.

Table 4.1 shows the classification of respondents according to age, sex, educational qualification and family size. In respect of age categorization of the respondents, a nominal level of measurements was adopted to classify the respondents. A person in the age group 15 to 35 years as young or youth group, 36 to 50 age group as middle and 51 and above as old age group. So as per these guidelines, the age categorization of the sample respondents was done. The active age group was found to be the middle age group. For the beneficiaries, 53.75 per cent of the respondents belong to old age group (51 years and above), followed by 38.75 per cent

belong to middle age group (36 to 50 years) and only 7.50 per cent belong to young age group (up to 35 years). While for the non-beneficiaries 46.25 per cent of the respondents belong to middle age group (36 to 50 years), followed by 45.00 per cent respondents belong old age group (51 years and above) and only 8.75 per cent of the respondents belong to young age group (up to 35 years).

As per the table, we observed that 89.37 per cent of the respondent belongs to the male category and the remaining 10.63 per cent of the respondent belongs to the female category. 46.87 per cent of the respondent had family size of 6 to 8, followed by 43.75 percent having family size of less than 6 and only 9.38 per cent of the respondent had family size 9 and above.

The educational qualification of the respondents can be viewed from table 4.1. The table shows very low illiteracy rate of only 13.75 per cent and high literacy rate of 86.25 per cent. Out of 86.25 per cent literacy rate, 33.75 per cent of the respondent studied up to primary level, 30.00 percent studied up to higher secondary / High school level and the remaining 22.50 per cent had studied up to graduate and above. Comparatively non-beneficiaries had more illiterate respondent (15.00 per cent) against 12.50

per cent of the beneficiaries. It indicates that the educational level of the beneficiaries household have been inspired due to the implementation of IWMP.

Table 4.1. Respondents demography based on age, sex, family size and educational Qualification:

4.1.2. Classification of the respondent based on occupation and land holding:

Table 4.2 represents classification based on occupation and land holding of the respondent. 50.00 per cent of the beneficiaries are engaged primarily in agriculture, 25.00 per cent are engaged in service sector, 16.00 per cent are engaged in business and only 5.00 per cent are engaged in other sector. While for the non-beneficiaries 45.00 per cent are engaged in service sector, followed by 40.00 per cent in agriculture, only 3.75 per cent are engaged in business sector and 11.25 per cent are engaged in other sector. The secondary occupation of the respondent are mostly engaged in

business sector with 54.38 per cent, followed by 23.75 per cent in

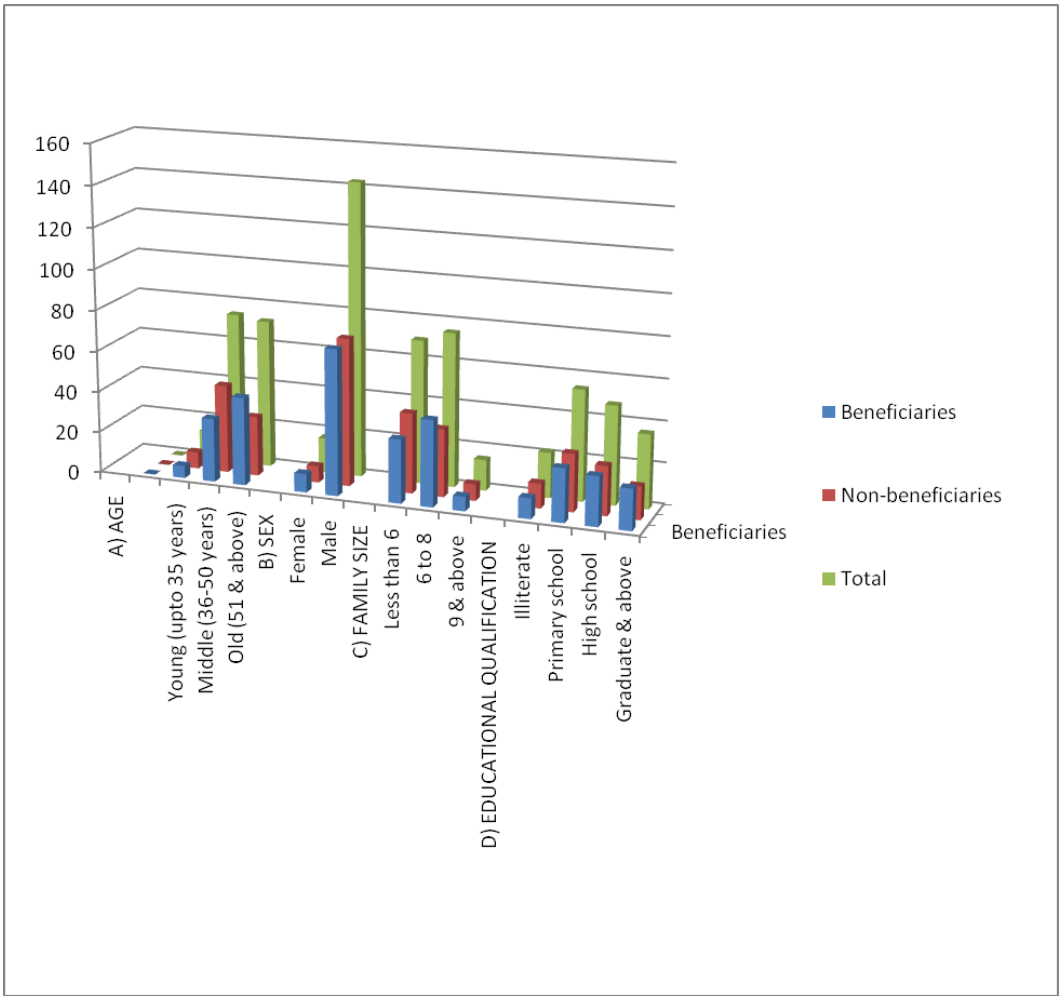

Figure 4.1 Respondents demography based on age, sex, family size and educational Qualification.

business sector with 54.38 per cent, followed by 23.75 per cent in agriculture, 11.25 per cent in business and only 10.62 per cent in other sectors, respectively.

In case of land holding, 39.37 per cent of the respondent belongs to medium group farmers, 30.63 per cent belongs to large farm groups, 24.37 per cent belongs to semi-medium group and only 5.63 per cent belongs to small farm group. Comparatively the beneficiaries are mostly in the medium farm groups (41.25 per cent) against 39.37 per cent of the non-beneficiaries, respectively.

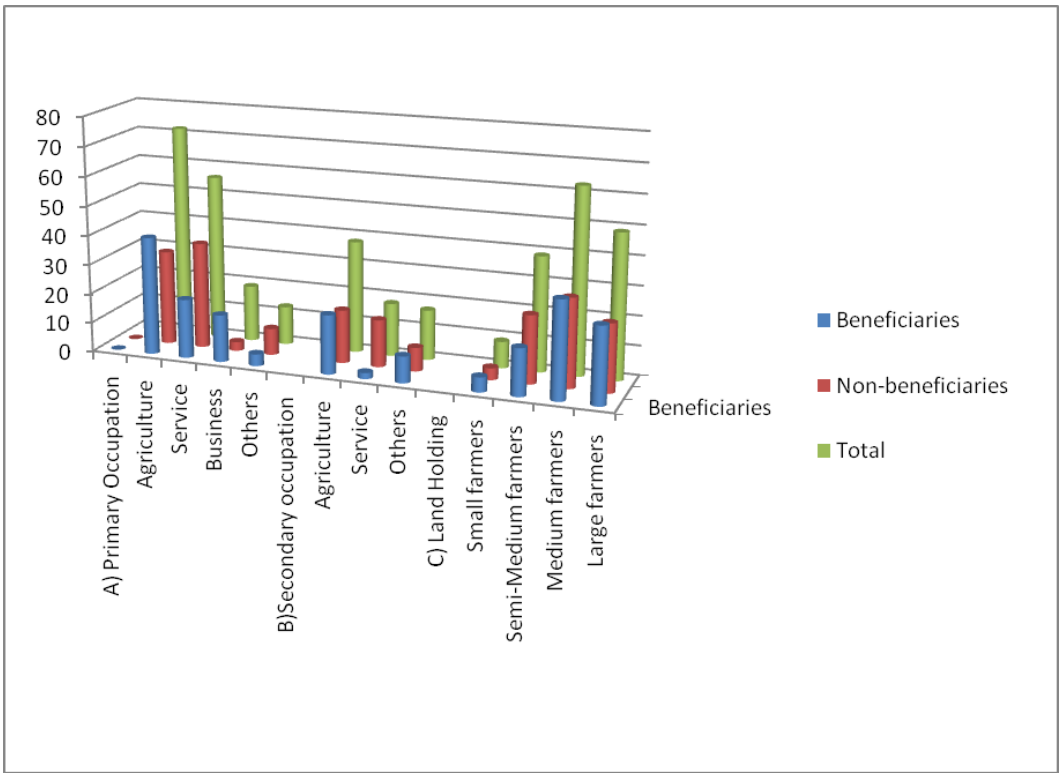

Figure 4.2 Respondent demography according to occupation and land holding

Table 4.2. Respondent demography according to occupation and land holding

SL. NO.	A) Primary Occupation	Beneficiaries		Non-beneficiaries		Total	
		Freq.	Per cent	Freq.	Per cent	Freq.	Per cent
1	Agriculture	40	50	32	40	72	45
2	Service	20	25	36	45	56	35
3	Business	16	20	3	3.75	19	11.87
4	Others	4	5	9	11.25	13	8.13
Total		80	100	80	100	160	100
	B)Secondary occupation						
1	Agriculture	20	25	18	22.5	38	23.75
2	Service	2	2.5	16	20	18	11.25
4	Others	9	11.25	8	10	17	10.62
Total		80	100	80	100	160	100
	C) Land Holding						

1	Small farmers	5	6.25	4	5	9	5.63
2	Semi-Medium farmers	16	20	23	28.75	39	24.37
3	Medium farmers	33	41.25	30	37.5	63	39.37
4	Large farmers	26	32.5	23	28.75	49	30.63
Total		80	100	80	100	160	100

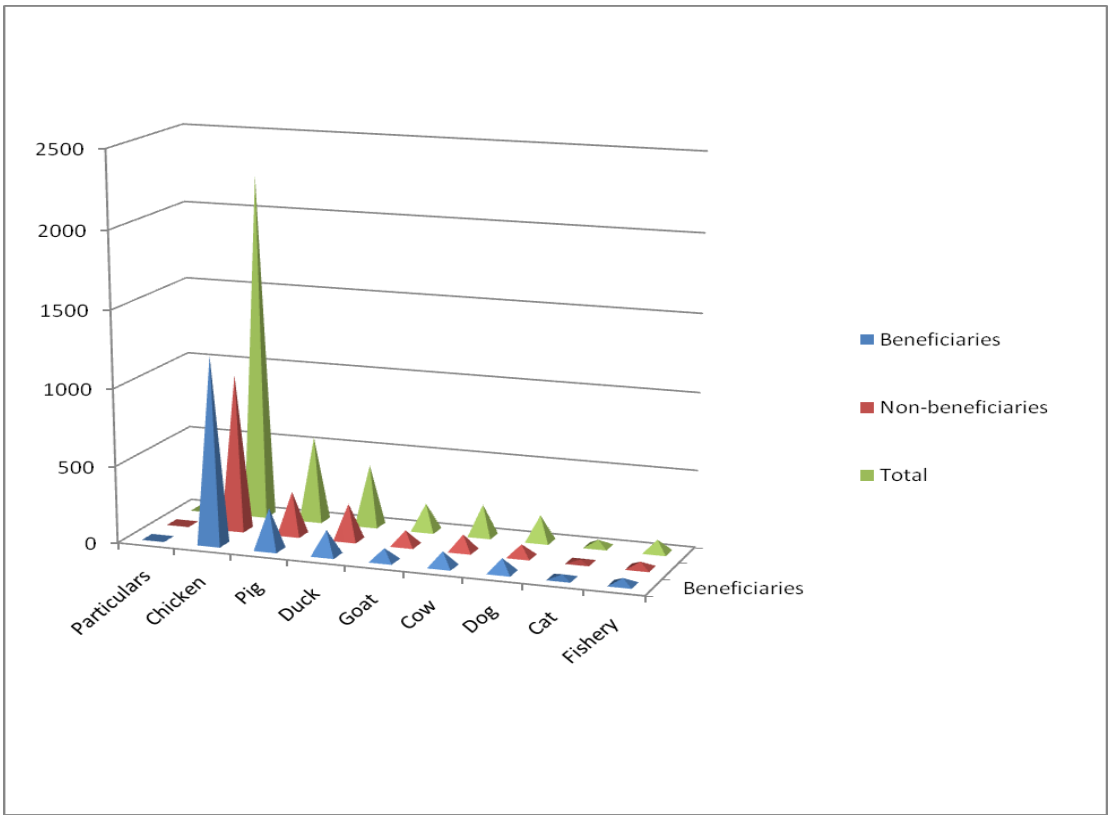

Figure 4.3. Livestock pattern of the sample farmers

Table 4.3. Livestock pattern of the sample farmers

SL. NO.	Particulars	Beneficiaries		Non-beneficiaries		Total	
		Numbers	**Percent**	**Numbers**	**Percent**	**Numbers**	**Percent**
1	Chicken	1215	**65.22**	1013	57.26	2228	61.34
2	Pig	268	**14.39**	280	15.83	548	15.09
3	Duck	162	**8.69**	235	13.28	397	10.93
4	Goat	80	**4.29**	96	5.43	176	4.85
5	Cow	98	**5.26**	105	5.94	203	5.59
8	Fishery	40	**2.15**	40	2.26	80	2.20
Total		1863	100	1769	100	3632	100

4.2. Different activities implemented in Integrated Watershed Management Programme (IWMP)

4.2.1 Different Entry point activity carried out under IWMP in Nagaland.

Table 4.4. shows the different entry point activity carried out under IWMP in Nagaland. From the table we can see that constructions of water tank / pond / reservoir has been carried in most of the village with a total of 393 villages, followed by construction of marketing shed in 115 villages, construction of toilet in 75 villages, construction of footstep and waiting shed in 66 villages, construction community hall/repair or renovation of community hall carried out in 56 villages, construction of community kitchen/ guest house/building/post harvest storage unit carried out in 32 villages, distribution of plastic chairs in 27 villages, construction of ring well carried out in 19 villages, construction of rostrum and approach road /repairing of road are carried out in 18 villages, fencing of project site has been carried out in 16 villages, construction of retaining wall carried out in 11 villages, pipeline for water reservoir is carried out in 10 villages, construction of culvert in 8 villages, sugarcane crushing machine set up in 7 villages, drainage and renovation of school has been carried in 6 villages, generator and rice mill has been set up in 4 villages, construction of community fishery pond, connection of street light / solar light, purchasing of syntex / water barrels, furniture / utensils has been carried out 3 villages, setting up of Bamboo charcoal making hearth, check dam, hand pump, agar

distillation unit has been carried out in only 1 village each. Miscellaneous work like construction of granary, village gate, basketball court, soil metalling etc; has been carried out in 17 villages.

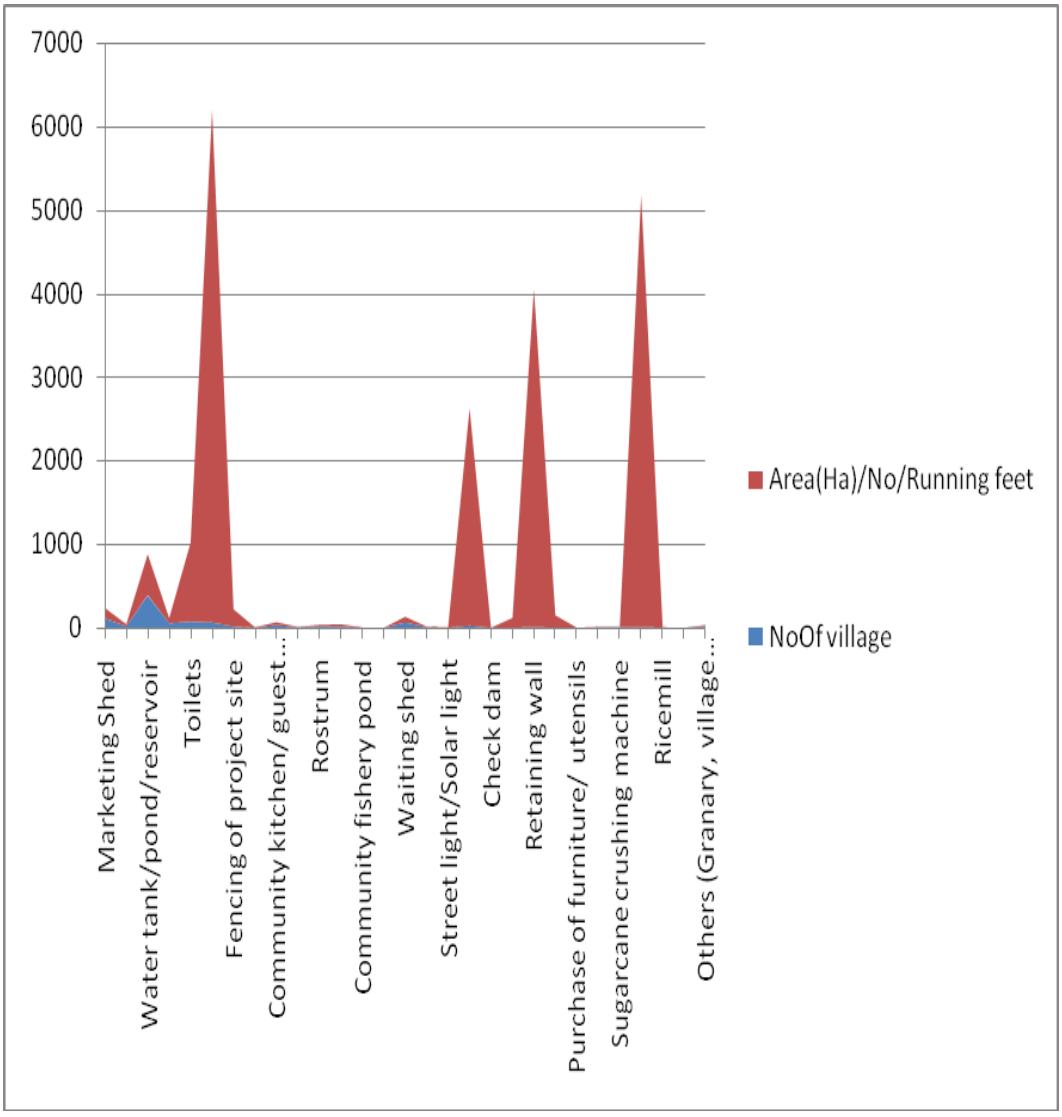

Figure 4.4. Different Entry point activity carried out under IWMP in Nagaland

Table 4.4. Different Entry point activity carried out under IWMP in Nagaland

Sl.No	Name of the works	No. Of village	Area(Ha)/No/Running feet
1	Marketing Shed	115	125 Nos.
2	Ring-well	19	25 Nos.
3	Water tank / pond / reservoir	393	488 Nos.
4	Community hall/repair or renovation of community hall	56	61 Nos.
5	Toilets	75	946 Nos.
6	Footstep	66	6121 feet
7	Fencing of project site	16	206 rolls
8	Generator	4	4 Nos.
9	Community kitchen / guest house/building/post harvest storage unit	32	36 Nos.
10	Renovation of school building	6	6 Nos.
11	Rostrum	18	18 Nos.

12	Approach road / repairing of road	18	25.78 Km
13	Community fishery pond	3	3 Nos.
14	Bamboo charcoal making hearth	1	1 Nos.
15	Waiting shed	66	67 Nos.
16	Culvert	8	8 Nos.
17	Street light / Solar light	3	3 Nos.
18	Plastic chair	27	2597 Nos.
19	Check dam	1	1
20	Syntex / water barrels	3	116 Nos.
21	Retaining wall	11	4039 feet
22	Hand pump	1	150 feet
23	Purchase of furniture / utensils	3	
24	Drainage	6	6 Nos.
25	Sugarcane crushing machine	7	7 Nos.
26	Pipeline for water reservoir	10	5160 metres
27	Rice-mill	4	4 Nos.
28	Agar distillation unit	1	1 Nos.
29	Others (Granary, village gate, Basketball court, soil	17	17 Nos.

	metailing etc;)		
Overall		990	

(Source: Department of Land resource, Nagaland)

4.2.2. Different activities implemented under IWMP for the beneficiary

According to Table 4.5 we can see that the most common activity implemented by IWMP is distribution of saplings followed by funding of SHG, trainings, animal husbandry, demonstration, agri-based activity, and exposure trips.

Table 4.5. Different activities implemented under IWMP for the beneficiary:

Sl. No.	Activity Implemented	Numbers	Per cent
1.	Trainings	56	16.62
2.	Exposure trips	25	7.42
3.	Demonstration and Exhibition	38	11.28
4.	Distribution of saplings	78	23.15
5.	Agri-based activity	26	7.72

6.	Animal husbandry	40	11.86
7.	Funding of SHG	62	18.39
8.	Others	12	3.56
Overall		337	100

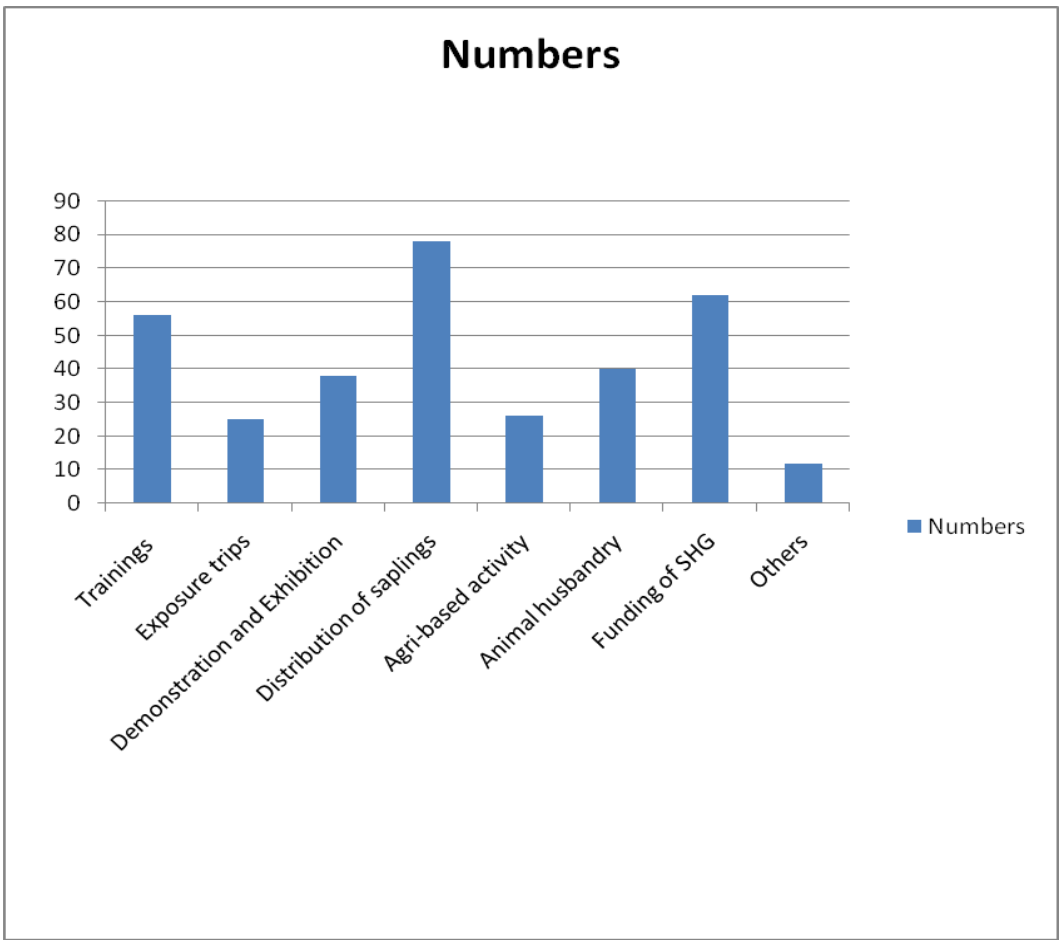

Figure 4.5. Different activities implemented under IWMP for the beneficiary

4.3. Economic status of different activities of Integrated Watershed Management Programme (IWMP):

4.3.1 Comparison of the Annual gross return generated, expenditure incurred and resultant net return collected to non-beneficiary and beneficiary farmers from crops (ha / year).

Table 4.6 presents the Annual gross return generated, expenditure incurred and resultant net return accrued to non-beneficiary and beneficiary farmers from crops (ha / year). From the table we can see that the net returns of the beneficiaries are higher than the non-beneficiaries. The overall net returns of the beneficiaries are Rs 18, 31,370.00/- as compared to Rs 11, 56,914.00/- of the non-beneficiaries. Similar findings were cited by Devi (1994) and Yadav (2012) also found in his studies that watershed beneficiaries have medium level of economic motivation.

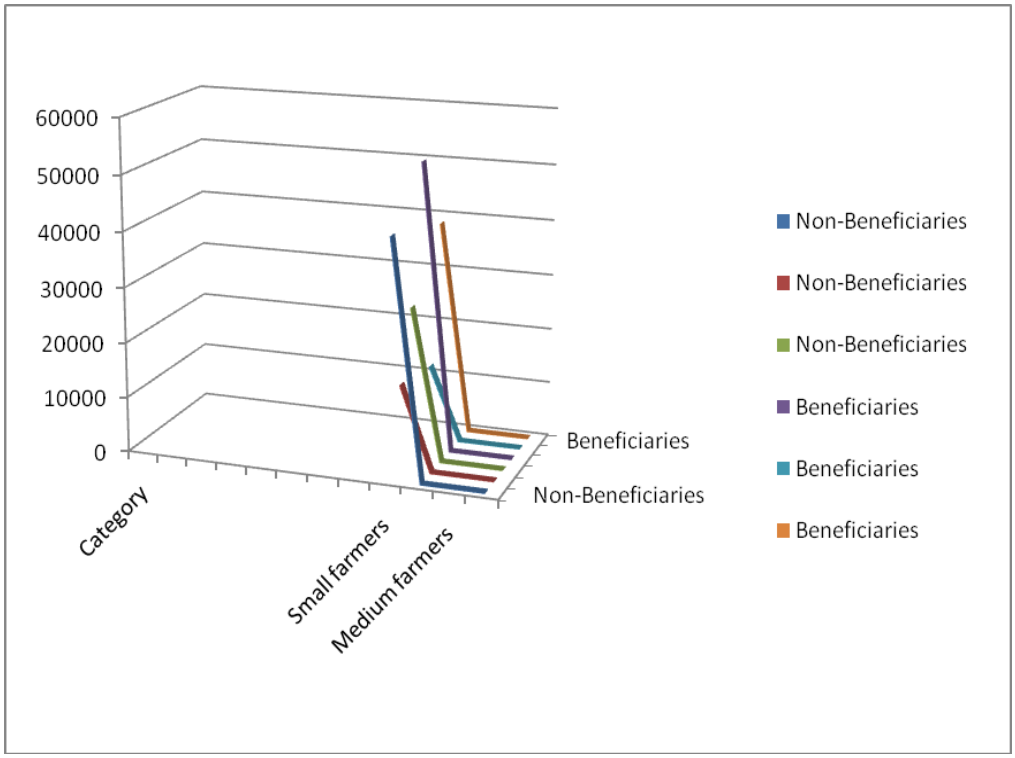

Figure 4.6 Annual gross return generated, expenditure incurred and resultant net return accrued to non-beneficiary and beneficiary farmers from crops (ha / year)

Table 4.6 Return generated of non-beneficiary and beneficiary farmers from crops (ha / year)

Sl. No	Category	Non-Beneficiaries			Beneficiaries		
		Gross income	Expenditure	Net returns	Gross Income	Expenditure	Net returns
1	Small farmers	42,800	15,300	27,500	52,000	13,500	38,500
2	Semi-medium farmers	4,52,580	2,30,080	2,22,500	2,97,680	1,27,380	1,70,300
3	Medium farmers	5,85,110	1,65,010	4,20,100	7,65,040	2,57,000	5,08,040
4	Large farmers	6,29,114	2,25,100	4,04,014	14,54,080	3,14,000	11,40,080

0verall	17,09,604	5,52,690	11,56,914	25,62,800	7,31,430	18,31,370

4.4.2. Evaluation of change in annual net return (ha / Annum):

Table 4.7 reveals the change in annual net return of beneficiary farmers over non-beneficiary farmers from crops on diverse size group of farms (ha / Annum**).** It is found that large farmers have highest percent increase in net return over small, semi-medium and medium farmers. Similar finding were also reported by Sharma (1993) in his research in comparison of income and employment of the members and non-farm members in agra district where it was found that both small and marginal members farm were enhanced by 25.00 percent and 18.00 percent in compare to the non-member farms respectively.

Table 4.7. Change in annual net return (ha / Annum)

Sl. No.	Category	Average net return of beneficiary	Average net return of non-beneficiary	Absolute increase in net return of beneficiary over non-beneficiary	Per cent increase in net return
1	Small farmers	7,700	6,875	825	**2.80**
2	Semi-Medium farmers	10,643.75	9,673.91	969.84	**3.29**
3	Medium farmers	15,395.15	14,003.26	1,391.89	**4.72**
4	Large farmers	43,849.23	17,565.83	26,283.4	**89.19**
Overall		**77,588.13**	**48,118**	**29,470.13**	**100**

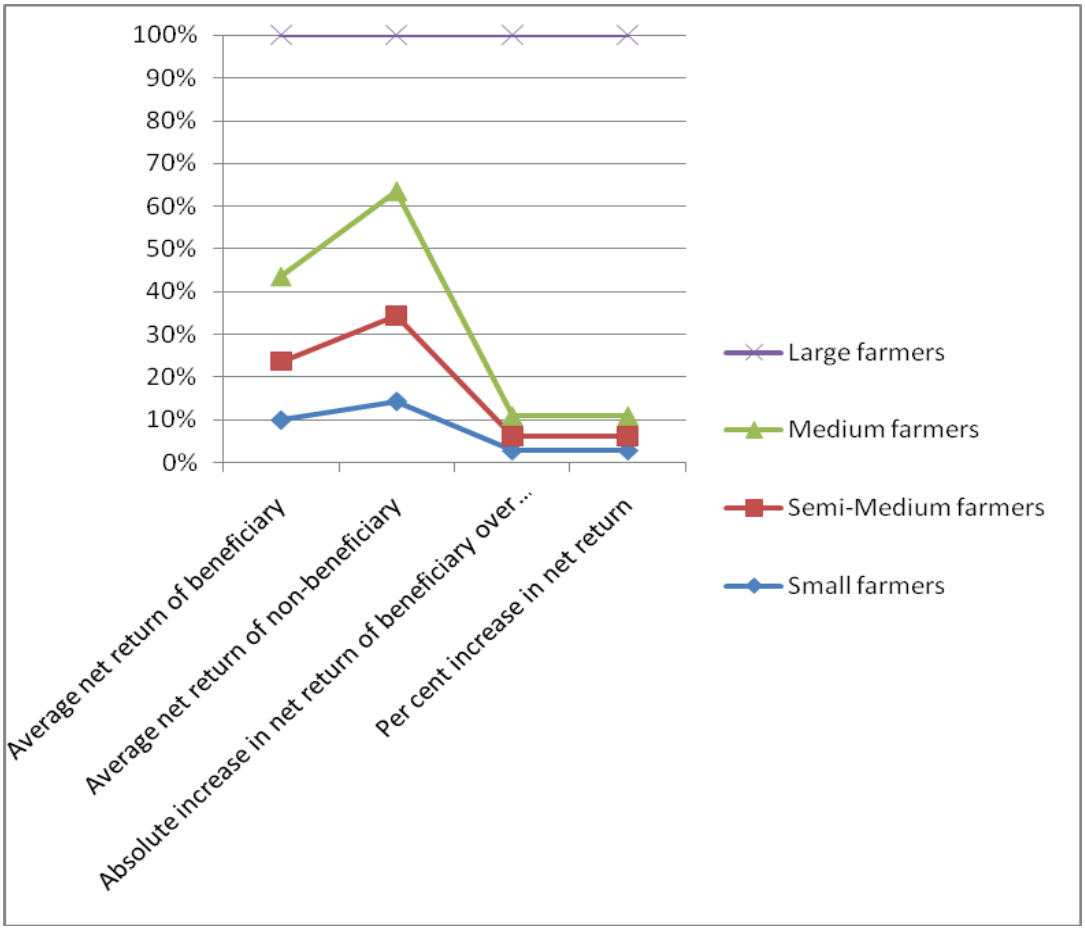

Figure 4.7. Change in annual net return of beneficiary farmers over non-beneficiary farmers from crops on different size group of farms (ha / Annum)

Cobb-Douglas Production Functions have been used in the present study for the assessment of the resource use efficiency of different enterprises viz; crop production, livestock and plantation crops on different farm size groups in the selected area. The production function of different enterprises were fitted as regressing gross return (y), x_1, x_2, x_3, x_4, x_5, x_6, x_7

and x_8 in terms of rupees as independent variables on marginal, small and medium farm size groups as well as overall farm size group.

Table 1 reveals the ordinary least square (OLS) estimates of parameters of Cobb-Douglas type of production with respect to different farm size groups. The regression co-efficient of input a was found to be positive with significant at 1 per cent level, which indicate that model is good fit, while the negative values has no role or very little role towards the gross return, besides the contribution of the constant is having the importance if all the selected inputs variables were kept as constant. Similar studies were carried out by Sharma *et al.* (2007); Sharma (2013).

Table 1. Elasticity Co-efficient of different enterprises on beneficiaries farm size groups

SN	No's of Obs.	Variables	Reg. Co-effi.	t-Statistics	R^2
(i).	**Marginal farm size group**				

1.	10	a	-16384^{NS} (5.09E+10)	-3.2E-07^{NS}	0.995627**
2.		x_1	0.025571^{NS} (0.038727)	0.660283^{NS}	
3.		x_2	33.91158* (24.25238)	1.398279*	
4.		x_3	-15.3005^{NS} (8.979653)	-1.70391^{NS}	
5.		x_4	3.17E+16^{NS} (2.96E+16)	1.072674^{NS}	
6.		x_5	-42.0953^{NS} (27.14217)	-1.55092^{NS}	

7.		x_6	44.36427^{***} (30.91366)	1.435103^{***}	(312.048)
8.		x_7	244.4481^{***} (131.2289)	1.862762^{***}	
9.		x_8	$-5E+15^{NS}$ (4.62E+15)	-1.07267^{NS}	
(ii).	**Small farm size group**				
1.		a	2723.806^{***} (3.912539)	1.886113^{***}	0.870789^{***} (1527.016)
2.		x_1	0.19939^{*} (0.088797)	2.245466^{*}	
3.		x_2	4.847295^{*}	1.238913^{*}	

			(3.912539)		
4.		x_3	-4.87357^{NS} (4.984829)	-0.97768^{NS}	
5.	40	x_4	53.15255* (259.3595)	0.204938*	
6.		x_5	-11.1585^{NS} (67.17767)	-0.1661^{NS}	
7.		x_6	-1.0825^{NS} (1.791139)	-0.60436^{NS}	
8.		x_7	6.654108* (17.58313)	0.378437*	
9.		x_8	-0.20627^{NS}	-0.0841^{NS}	

			(2.452675)		
(iii)	**Medium farm size group**				
1.	10	a	-5750.69^{NS} (5319.275)	-1.0811^{NS}	0.99505*** 849.6419)
2.		x_1	0.095459^{NS} (0.204114)	0.467673^{NS}	
3.		x_2	7.061947* (6.164715)	1.145543*	
4.		x_3	25.75573*** (15.20491)	1.693909***	
5.		x_4	-103.514^{NS} (92.39518)	-1.12034^{NS}	

6.		x_5	-10.6342^{NS} (7.810345)	-1.36155^{NS}	
7.		x_6	16.18642*** (2.428331)	6.665657***	
8.		x_7	45.66887*** (37.39815)	1.221153***	
9.		x_8	4.768853* (3.139343)	1.519061*	
(iv)	**Overall farm size group**				
1.		a	716.0078*** (947.6455)	3.246245***	0.947637***
2.		x_1	0.245545*	0.755565*	(1787.897)

			(0.07564)	
3.		x_2	1.398507^{*} (1.995703)	0.700759^{*}
4.		x_3	-1.89379^{NS} (4.724446)	-0.40085^{NS}
5.	60	x_4	-29.5739^{NS} (39.16007)	-0.75521^{NS}
6.		x_5	9.466241^{***} (4.491117)	2.10777^{***}
7.		x_6	2.708045^{*} (1.695795)	1.596917^{*}
8.		x_7	10.34837^{**}	0.685819^{**}

			(15.08908)		
9.		x_8	-0.38046^{NS} (1.41825)	-0.26826^{NS}	

In case of x_2 it was found to be positive in overall (4826.14) with maximum return and medium (406.68) with minimum return, as both the variables were found to be statistically significant at 1 per cent level, which indicates a good fit with more potential in compare to other inputs toward the gross returns. While in small and large farm size groups it was found to be statistically non-significant, which revealed that inputs having less contribution towards the gross return.

The regression co-efficient of x_3 was found to be (209.85) with statistically significant at 10 per cent level in medium farm size group, which shows that in compare to the other farm size groups it could be better utilized on the farm, because of having positive role for gaining the more net return. While on other farms its contribution is less or may be utilized or used in excess, which ultimate provides the negative response towards

the gross return. So it may be concluded that the investment on the medium farm size group may have further more potential after the investment or by shifting the other inputs for getting better return.

The value of x_4 ranges from 487.02 to 427.19 in medium and large size farm group, as both were found to be statistically significant at 10 per cent and 1 per cent level, respectively, which shows the positive significant contribution of the inputs to the gross return. So it will be better to shift the other inputs as an investment to these inputs for getting better prospects as well as benefiting the farmers, which indicates that in the coming days it is better to shift the inputs to the potential areas to get maximum profit after reshuffling them, in compare to other inputs, it has little contribution towards the gross return.

The value of x_5 (971.75) in small size farm group was found to be statistically significant at 1 per cent level, which shows the positive significant contribution of the inputs to the gross return. So it will be better to continue the investment on the input for getting better prospect as well as benefiting the farmers too which indicates that in the coming days it is better to shift the inputs to the potential area to get maximum profit in

compare to other inputs, wherever having more potentiality towards the gross return.

The value of x_6 (127.113) in small size farm group was found to be statistically significant at 10 per cent level, which shows the positive significant contribution of the input to the gross returns. So it will be better to continue the investment on the input for getting better prospect, which indicates that in the coming days it is better to shift the inputs to the potential area to get maximum profit in compare to other inputs, however getting positive response and having more potentiality towards the gross return.

The value of x_7 ranging from (13761.26) as maximum value to (6167.91) as minimum value in medium to large size farm groups, respectively were found to be statistically significant at 1 per cent level, which shows the positive significant contribution of the inputs to the gross return. So it will be better to continue the investment on these inputs for getting better prospects as well as benefiting the farmers after reshuffling the input cost, which indicates that in the coming days it is better to invest more to these inputs due to the potentiality variables and to get maximum profit in compare to other inputs.

The value of x_8 ranging from (13761.26) as maximum value to (6167.91) as minimum value in medium to large size farm groups, respectively were found to be statistically significant at 1 per cent level, which shows the positive significant contribution of the inputs to the gross return. So it will be better to continue the investment on these inputs for getting better prospects as well as benefiting the farmers after reshuffling the input cost, which indicates that in the coming days it is better to invest more to these inputs due to the potentiality variables and to get maximum profit in compare to other inputs.

By aggregating the cross-sectional data of all the farms in various farm size groups, production has been estimated for all the selected sample farms. The ordinary least square (OLS) estimates of parameters have been showed in table 5.22. The value of R^2 in all farm samples were found to be 0.76, which shows that 76 per cent of the variation of dependent variable explained by the independent variation chosen in the equation.

Even the positive with significant regression coefficient of a (constant) in overall and non-beneficiaries farm size groups, shows that their contribution have positive role towards the gross return.

Table 2 reveals that the evaluate how efficiently the farmers of the study area have been utilizing their resources, the marginal value product (MVP) of an input was compared with its respective factor cost. An optimal use of that factor was indicated as the ratio approach unity. The value of ratio greater than unity meant that returns could be increased by using more of that resource and for value of ratio will be less than unity indicates improper use of the resources. The marginal value products of a particular resource indicate the expected addition of that resource to the gross return caused by an addition of one unit of that resource, while other inputs are held constant. The marginal value products of these factors were computed by multiplying the regression coefficient of that resource with the geometric mean of gross return to the geometric mean of each resource. Similar studies were carried out by the Sharma (2002); Sharma (2006); Sharma *et al.* **(**2008).

The value of MVP for x_1 was having less contribution, which indicate that addition of one unit of this input would be adding Rs. 1926.51 towards the gross return, so it may be continue in future. The value of MVP for x_2 was found to be positive in large farm size group, which indicate that addition of one unit of x_2 would increase the gross return by Rs. 24.53, so it

may be continue in the coming days. The MVP of x_3 was found to be positive in small, medium,

Table 2. Result of Marginal Value Product analysis of beneficiaries farm size groups

SN	Variables	Geometric Mean	MVP	MFC	Efficiency
(i).	**Marginal farm**				
1.	x_1	7712.69	4.21915	98	0.04305
2.	x_2	239.363	932.569	23	40.5465
3.	x_3	49.4956	-420.76	22	-19.126
4.	x_4	118.756	7E+17	17	4.1E+16
5.	x_5	406.416	-11576	200	-57.881
6.	x_6	260.841	244.003	4	61.0008
7.	x_7	282.096	49745.2	175	284.258
8.	x_8	760.037	-7E+15	1	-7E+15
9.	y	6635.75	-450560	24	-18773
(ii).	**Small farm**				

1.	x_1	10404.1	44.8628	98	0.45778
2.	x_2	1146.43	181.774	23	7.9032
3.	x_3	48.933	-182.76	22	-8.3072
4.	x_4	305.331	1594.58	17	93.7986
5.	x_5	1188.44	-4184.5	200	-20.922
6.	x_6	929.477	-8.1187	4	-2.0297
7.	x_7	725.483	1846.51	175	10.5515
8.	x_8	795.914	-0.3868	1	-0.3868
9.	y	16865.6	102143	24	4255.95
(iii) .	**Medium farm**				

1.	x_1	14158.1	16.1802	98	0.1651
2.	x_2	1956.09	199.5	23	8.67391
3.	x_3	57.1146	727.599	22	33.0727
4.	x_4	516.804	-2339.4	17	-137.61
5.	x_5	1953.82	-3004.2	200	-15.021
6.	x_6	1713.19	91.4533	4	22.8633
7.	x_7	1248.93	9547.08	175	54.5547
8.	x_8	1289	6.736	1	6.736
9.	y	28374.6	-162457	24	-6769
(iv) .	**Overall farm**				

1.	x_1	10419.3	45.7941	98	0.46729
2.	x_2	965.251	43.4703	10	4.34703
3.	x_3	50.306	-58.865	22	-2.6757
4.	x_4	284.781	-735.4	17	-43.259
5.	x_5	1079.68	2942.42	200	14.7121
6.	x_6	832.766	16.835	4	4.20875
7.	x_7	678.538	2380.3	175	13.6017
8.	x_8	855.905	-0.5913	1	-0.5913
9.	y	15744.8	22255.9	24	927.33

(Figures in parenthesis indicates the Standard Error of regression Co-efficient)

*(*** Significant at 1 per cent, ** significant at 5 per cent and * significant at 10 per cent level)*

overall and non-beneficiaries farm size group, which indicates that addition of one unit of these inputs, would contribute Rs. 94.34, Rs. 309.61, Rs. 61.16 and Rs. 2952.46 on different farm size group, respectively towards the gross income, due to the better prospects by the input for gaining profit after shifting the input variables.

The MVP of x_4 in small, medium, large and overall farm size groups were found to be positive values, indicating that addition of one unit of these inputs will increase gross return by Rs. 40.57, Rs. 194.64, Rs. 128.25 and Rs. 643.54, clearly shows that farmers may continue to invest more on these inputs for getting better prospects in the future for more gross income

on their farms, whereas additional investment of one unit to these inputs would be increasing the gross returns and further contributing their share towards the gross return.

The MVP of x_5 in medium, large and overall farm size groups were found to be positive values, indicating that addition of one unit of these inputs will increase gross return by Rs. 441.51, Rs. 416.47 and Rs. 295.00, which will help the farmers to continue the investment on these inputs for getting more gross income on their farms, whereas additional investment of one unit to these inputs would be decreasing the gross returns and further non-contributing their share to the gross return on a farm.

The MVP of x_6 in small farm size group was found to be positive response, indicating that addition of one unit of this input will increase gross return by Rs. 1061.58, which is clear that farmers may continue to invest more on this very input for getting better prospects in the future towards the gross income, which alarm to stop the investment otherwise it may lead to the farmers towards more loss, whereas additional investment of one unit to this input would be increasing the gross returns and further contributing their share towards the gross return too. The MVP of x_7 in small and overall farm size groups were found to be positive values,

indicating that addition of one unit of these inputs will increase gross return by Rs. 129.34 and Rs. 6.78, clearly shows that farmers may continue to invest more on these inputs for getting better prospects in the future for more gross income, whereas additional investment of one unit to these inputs would be increasing the gross returns and further contributing their share towards the gross return.

The MVP of x_8 in small and overall farm size groups were found to be positive values, indicating that addition of one unit of these inputs will increase gross return by Rs. 129.34 and Rs. 6.78, clearly shows that farmers may continue to invest more on these inputs for getting better prospects in the future for more gross income, whereas additional investment of one unit to these inputs would be increasing the gross returns and further contributing their share towards the gross return.

The gross sectional data of overall farm size have been aggregated and the ratio of MVP to its factor cost was computed. It was observed that ratio of x_1 to x_8 were found to be positive and negative both values. Positive indicates the greater than unity and indicates that the farmers can incurred more investment on those inputs for getting better returns, while the negative values indicating either excess use of inputs and adverse response

towards the gross return, which needs to be curtailed immediately and further investment of such inputs must be shifted towards the higher results inputs which will provide the positive contribution to the gross return. The above result showed that none of the resources were used with optimum efficiency since MVP to factor cost ratio were not equal to unity. It further need shift of input variables for getting better prospects from the same investment of inputs, respectively. Similar studies were carried out by Sharma and Sharma (2018) Tangjang and Sharma (2018).

4.4.3 Marginal propensity to consume of household:

Table 4.8 shows the marginal propensity to consume of the respondent among the different group of land holders. It is found that the marginal propensity to consume is highest for semi-medium farmers (0.91) as compared to medium (0.46), and small farmers (0.44). The large farmers have least MPC of 0.05 which indicates that large farmer have capacity to save more with the increase in their income than small and medium farmers

Table 4.8. Marginal propensity to consume

Sl. No.	**Category**	**Total incremental consumption expenditure (Rs.) (ΔC)**	**Total incremental income (Rs.) (ΔY)**	**MPC = ΔC/ΔY**
1	Small farmers	**28,800**	**66,000**	**0.44**
2	Semi-medium farmers	**3,57,460**	**3,92,800**	**0.91**
3	Medium farmers	**4,22,010**	**9,28,140**	**0.46**
4	Large farmers	**5,39,100**	**11,544,094**	**0.05**
Overall		**13,47,370**	**12,931,034**	**0.10**

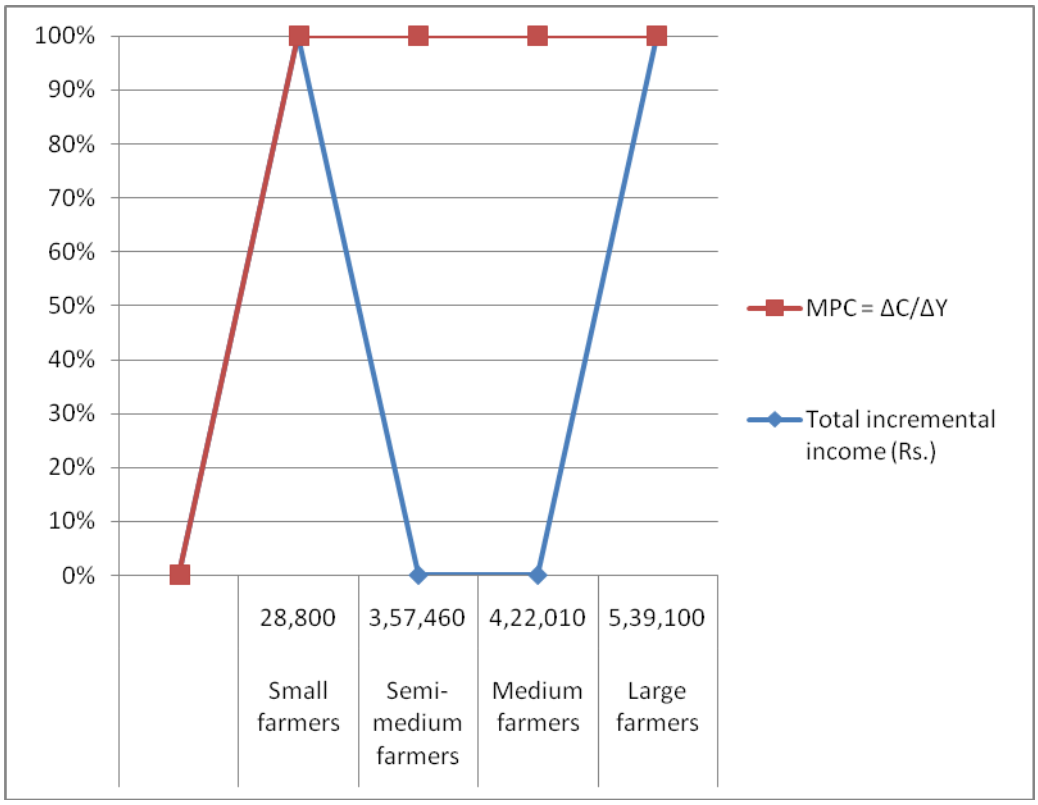

Figure 4.8. Marginal propensity to consume

4.4.4. Labour employment generated by crop activities for non-beneficiary and beneficiary families (Man days / family / ha):

Table 4.9 shows the labour employment generated by crop activities for non-beneficiary and beneficiary families (man days / family / ha). It is found that large farmers have large size of land holding and employs more number of labours as compared to small, semi-medium and medium farmers. The overall average size of land holding of beneficiary is 21.75 ha

as compared to non-beneficiary which has 21.16 ha. The average labors employed by the beneficiary are 44 as compared to 27 labours of non-beneficiary. Similar findings were also cited by Gupta et al (2018) that beneficiary respondent has high employment generation.

Table 4.9. Labour employment generated by crop activities for non-beneficiary and beneficiary families (Man days / family / ha)

Sl. No.	**Category**	**Non-beneficiary families**		**Beneficiary families**	
		Average size of land holding (Ha.)	**Average labor employed**	**Average size of land holding (Ha.)**	**Average labor employed**
1.	Small farmers	1.65	5	1.9	**7**
2.	Semi-medium farmers	3.36	6	3.15	**8**
3.	Medium	5.09	7	5.43	**10**

	farmers				
4.	Large farmers	11.06	9	11.27	**19**
Overall		**21.16**	**27**	**21.75**	**44**

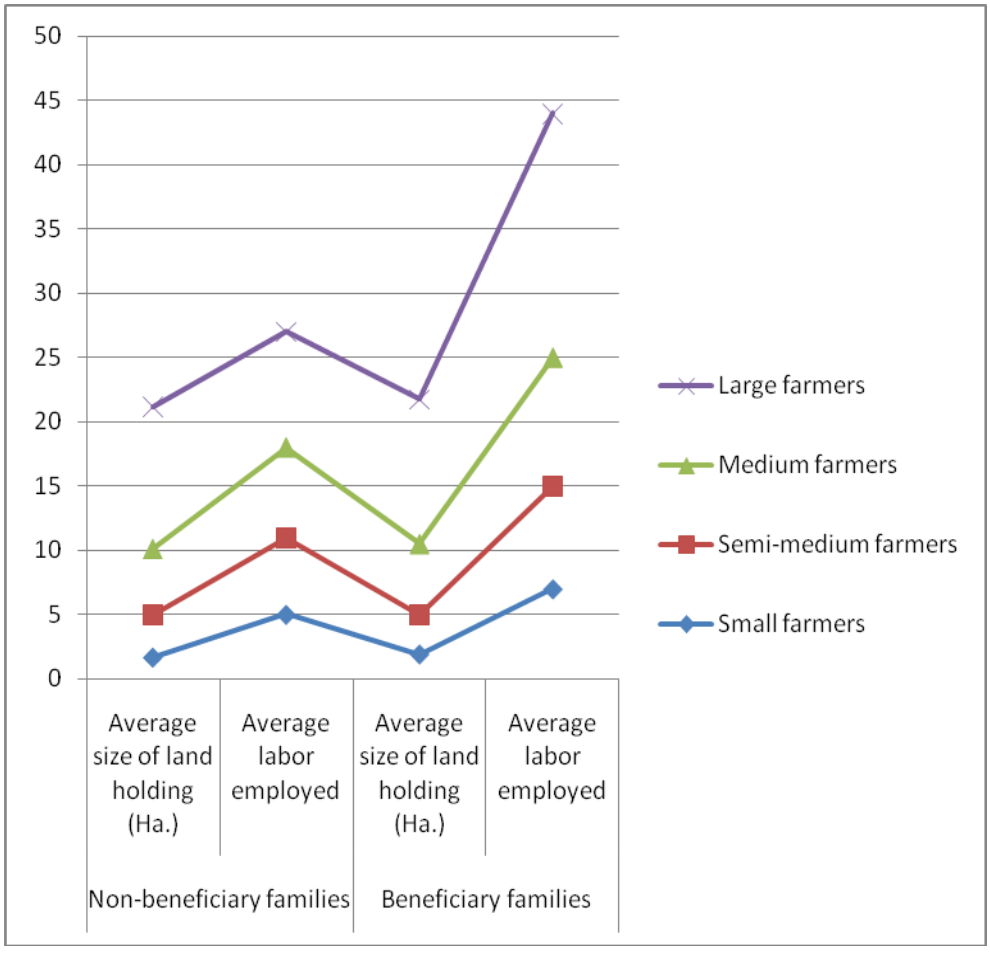

Figure 4.9. Labour employment generated by crop activities for non-beneficiary and beneficiary families (Man days / family / ha)

4.4. Impact of IWMP on income and employment of the sample farmers:

4.4.1. Average monthly income of the beneficiary and non-beneficiary.

Table 4.10. reveals the average monthly income of the beneficiary and non-beneficiary. It was found that there is an increase in the income of for both beneficiary and non-beneficiary but comparatively beneficiary has more increased income. The medium farmers have higher increased income of Rs 541.00/- as compared to large farmers with Rs 493.00/-, semi-medium with Rs 440.00/- and small with Rs 280.00/-, respectively. Similar findings was given by Singh and Prakash (2010) in their research on the share of the poorest household in Khamelok watershed before the project, it was found that the income increased from 56.00 percent to 62.00 percent after the project. Similar findings was also given by Raju et al (2012) where it was found that 78.00 percent of watershed villages had their annual income between Rs 0.51 lakh and 1.50 lakh whereas only 54 percent of the respondent in non-watershed villages have income between Rs 0.51 to 1.54 lakh respectively.

Table 4.10. Average monthly income of the beneficiary and non-beneficiary

Sl.No	Category of respondent	Category of respondent according to land holding	No. of respondent	Average monthly income(Rs)		Increase in income (Rs)
				Before IWMP	After IWMP	
1	Beneficiary	Small	5	1000	1280	280
		Semi-medium	16	4100	4540	440
		Medium	33	4246	4787	541
		Large	26	3589	4082	493
Total			80	12,935	14,689	1,754
2	Non-beneficiary	Small	4	1250	1400	150
		Semi-medium	23	2958	3393	435
		Medium	30	3433	3620	187
		Large	23	4861	5222	361
Total			80	12,502	13,635	1,133

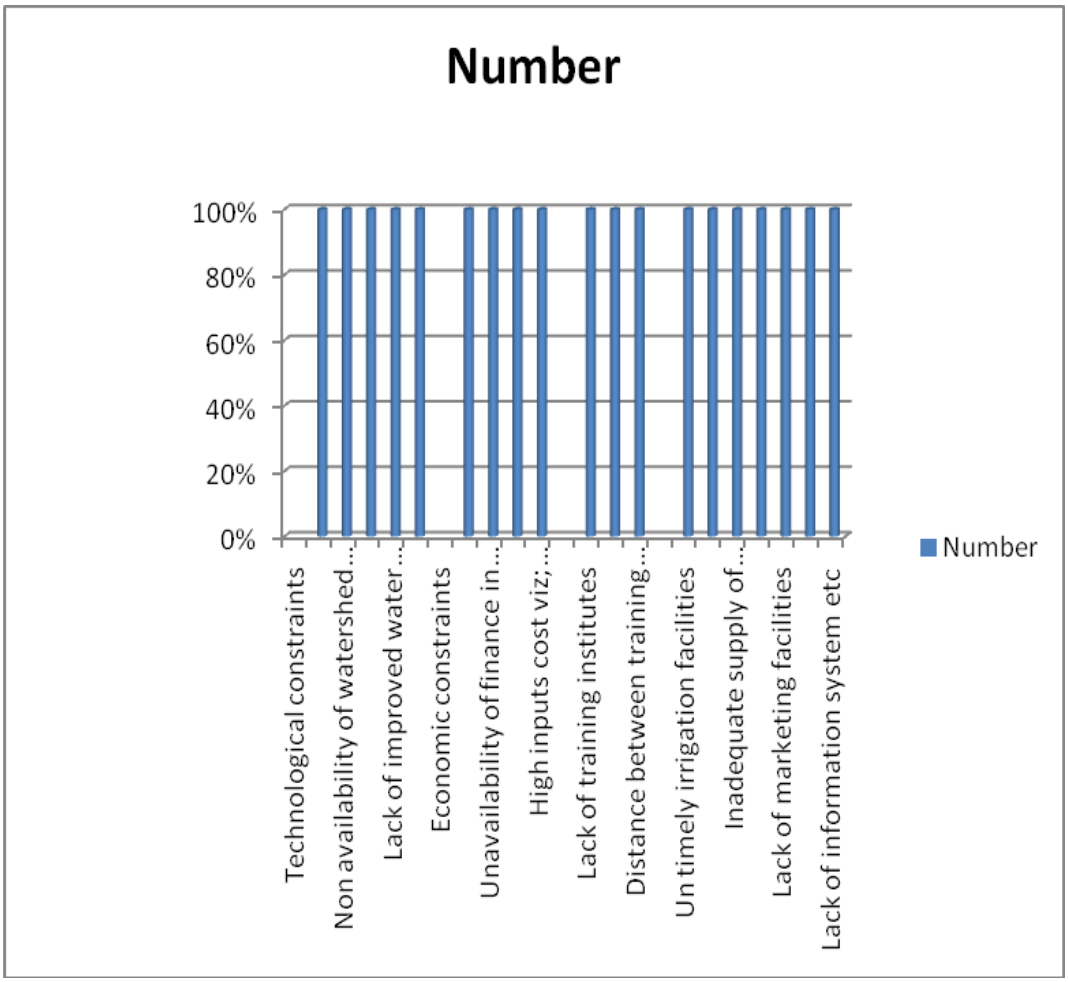

Figure 4.10 Constraint faced by beneficiaries in adoption of watershed management Practices in the study area.

4.4.2. Impact of IWMP on employment of the beneficiary:

Table 4.11. indicates the change in employment level (in mandays) of the beneficiary after the implementation of IWMP in various activities. On an average 483 man days were created before IWMP and it increased to

507 man days after implementation of IWMP. There was a high increase of man days in horticulture enterprise from 125 to 135 man days with an increase of 10 days, followed by fishery with increase in 8 days and the least increase in man days was of agriculture with only 1 man days.

Table 4.11. impact of IWMP on employment (in man days)

Sl.No	Enterprise	Before IWMP		After IWMP		Increase/ decrease in employment
		Employment	%	Employment	%	Employment
1	Agriculture	133.5	27.64	134.5	26.53	1
2	Horticulture	125	25.88	135	26.63	10
3	Livestock	78.5	16.25	80.5	15.88	2
4	Fishery	60.5	12.53	68.5	13.51	8
5	others	85.5	17.70	88.5	17.45	3
Total		483	100	507	100	24

4.4.3. Additional employment generated by the crop activities on beneficiary and Non-beneficiary farms (Man days / year / family):

Table 4.12. reveals the additional employment generated by the crop activities on beneficiary and non-beneficiary farms. From the table we can see that large farmers has generated more employment by the crop activities than other farm groups but the percent change in employment is more in small farmers, followed by semi-medium, medium and large farmers.

Table 4.12. Additional employment generated by the crop activities on beneficiary and Non-beneficiary farms (Man days / year / family)

Sl. No.	Category	Beneficiary farms	Non-beneficiary farms	Absolute change	Per cent change
1	Small	**44.1**	**38.2**	**5.9**	**31.05**
2	Semi-medium	**65.40**	**60**	**5.4**	**28.42**
3	Medium	**78**	**73**	**5**	**26.32**
4	Large	**82**	**79.3**	**2.7**	**14.21**

Overall	**269.5**	**250.5**	**19**	**100**

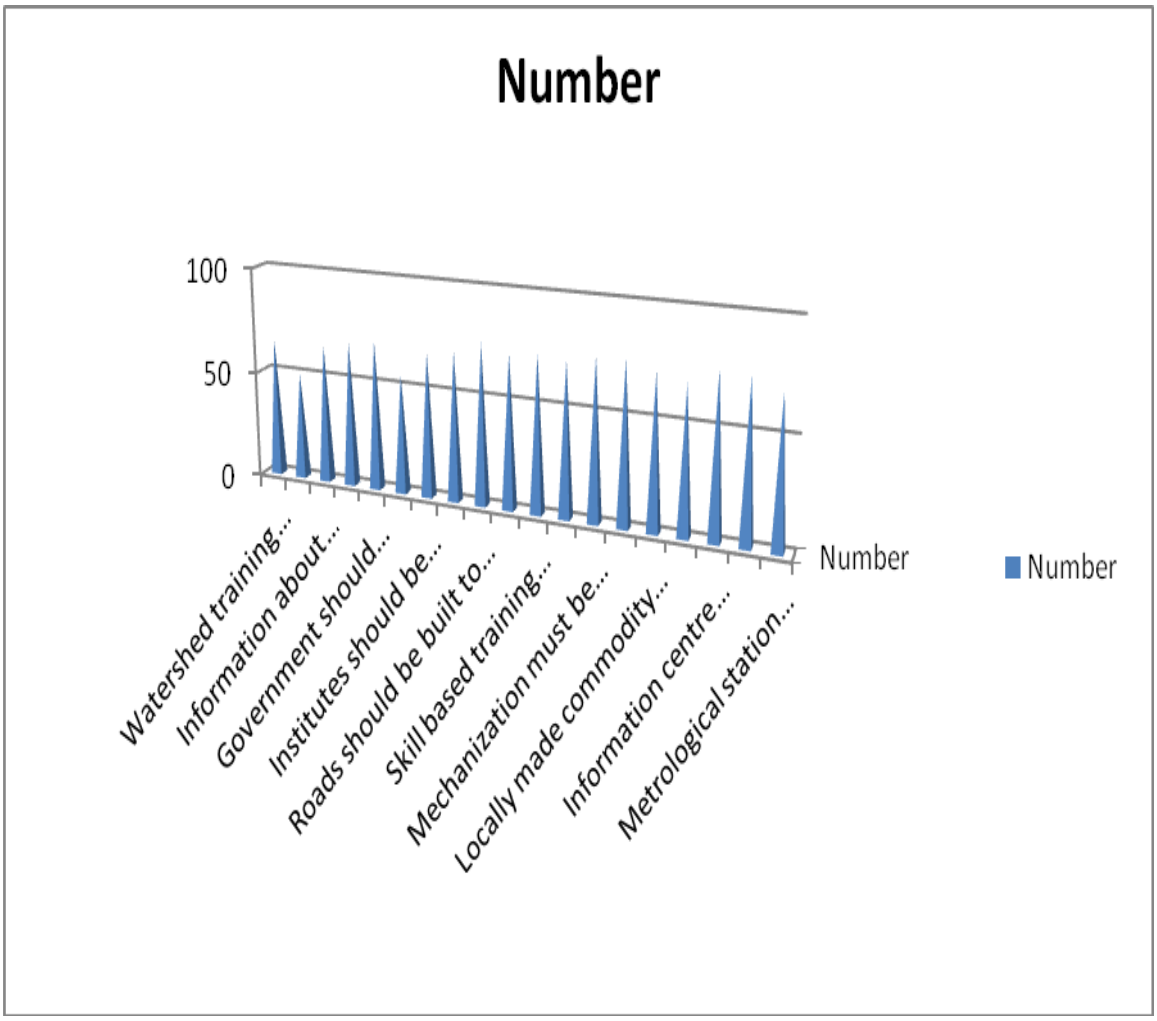

Figure 4.11 Suggestion given by beneficiaries in adoption of the watershed management Practices in the study area

4.4.4. Change in cropping pattern of respondent of the dimapur and zunheboto district ion respect to different crops.

Table 4.13 indicates the change in cropping pattern of the respondent of the dimapur and zunheboto district in respect to different crops. It is

Table 4.13. Change in cropping pattern

Sl. no	Farm size group	No. of respondent		Crops	Change in cropping pattern (ha)				Total change (Ha)		%	
					Before IWMP		After IWMP					
		Dim	Zbto		Dim	Zbto	Dim	Zbto	Dim	Zbto	Dim	Zbto
1	Small	9	0	Rice	4.5	0	4.95	0	0.45	0	0.72	0
				Maize	1.4	0	1.65	0	0.25	0		0
				Vegetables	0	0	0	0	0	0	0	0
				Oilseeds	0	0	0	0	0	0	0	0
				Plantation crops	3.4	0	5.65	0	2.25	0	3.59	0
				Total	9.3	0	12.25	0	2.95	0	4.71	0
2	Semi-medium	28	11	Rice	30.76	6.15	38.52	7	7.76	0.85	12.38	1.15
				Maize	7.38	3.75	8.15	3.75	0.77	0	1.23	0
				Vegetables	4.03	4	4.72	5.25	0.69	1.25	1.10	1.70
				Oilseeds	1.85	3.9	2.1	3.9	0.25	0	0.40	0
				Plantation	14.63	6.5	18.6	7.65	4.0	1.15	6.46	1.56

				crops			8		5				
				Total	58.65	24.3	72.17	27.55	13.52	3.25	21.58	4.42
3	Medium	24	42	Rice	37.71	42.1	47.87	50.54	10.16	8.44	16.12	11.47
				Maize	3.3	13.36	5.1	15.52	1.8	2.16	2.87	2.93
				Vegetables	2.2	13.06	4.33	15.86	2.13	2.8	3.40	3.80
				Oilseeds	0.5	7.63	0.75	9.49	0.25	1.86	0.40	2.53
				Plantation crops	24.45	39.75	33.7	55.68	9.25	15.93	14.76	21.64
				Total	68.16	115.9	91.75	147.09	23.59	32	37.65	43.47
4	Large	19	27	Rice	50.65	20.95	60.66	32.11	10.01	11.16	15.98	15.16
				Maize	5.03	11.18	8.5	13.93	3.47	2.75	5.54	3.73
				Vegetables	3.15	9.25	5.75	11.3	2.6	2.03	4.15	2.76
				Oilseeds	2.5	1.75	3.75	2.5	1.25	0.75	1.99	1.02
				Plantation crops	53.69	45.85	58.96	67.5	5.27	21.65	8.41	29.41
				Total	115.02	88.98	137.62	127.34	22.6	38.36	36.06	52.11
Total									62.66	73.61	100.00	100.00

found that in dimapur district small farmers have increased their cropping area from 9.3 ha to 12.25 ha. The semi-medium farmers in dimapur have increased their cropping area from 58.65 ha to 72.17 and 24.3 ha to 27.55 for zunheboto district. The medium farmers for dimapur district have increased their cropping area from 68.16 ha to 91.75 ha and for zunheboto district the respondent have increased cropping area from 115.9 ha to 147.09 ha. The large farmer in dimapur district have increased their cropping area from 115.02 ha to 127.34 and in case of zunheboto district they have increased from 88.98 ha to 127.34 ha. It is found that zunheboto district have high change in cropping pattern in respect to rice, maize, vegetables, oilseeds and plantation crop against dimapur district.

4.5. Constraints faced by the sample farmers in the implementation of Integrated Watershed Management Programme (IWMP):

Table 4.14 reveals the constraints faced by the beneficiaries in the implementation of Integrated Watershed Management Programme (IWMP). 95.00 per cent of the respondent faced the infra-structural problem of lack of machines and equipment, 93.75% respondent felt that there is lack of awareness about finance facilities, lack of transportation facilities and lack of information system. 90.00 per cent faced the technological problem of lack of knowledge about bunds and also unavailability of marketing facilities. 87.5 percent of the respondent faced the constraint of unavailability of finance on time and distance of training institution and 85 percent of the respondent

faced constraint due to lack of training institute. 82.5 percent respondent have constraint because of the lack of improved technology on water harvesting. 76.25 faced constraint due to untimely irrigation facilities and 72.5 percent respondent due to uncertainty about availability of irrigation water. 68 percent of the respondent faced problem due to lack of knowledge about improved variety. 62.5 percent of the have constraint due to fragmentation of land holding and inadequate supply of fertilizers and seed. 57.5 percent of the respondent faced problem due to non-availability of watershed based production technology and 56.25 percent of the respondent have constraints due to lack of training facilities. Only 37.50 per cent faced the problem of inactive extension workers or services, it implies that there are active workers who are easily accessible, respectively.

Table 4.14. Constraint faced by beneficiaries in adoption of watershed management Practices in the study area:

Sl. No.	**Constraints**	**Number**	**Percentage**	**Rank**
	Technological constraints			
1.	Lack of knowledge about improved varieties	**52**	**65**	**XI**
2.	Non availability of watershed based production technology	**46**	**57.5**	**XII**
3.	Lack of training facilities	**45**	**56.25**	**XIII**
4.	Lack of improved water harvesting technologies	**66**	**82.5**	**VI**

5.	Technical knowledge about the bund	**72**	**90**	**III**
B.	**Economic constraints**			
1.	Lack of awareness about finance facilities	**75**	**93.75**	**II**
2.	Unavailability of finance in time	**70**	**87.5**	**IV**
3.	Fragmentation of land holding	**50**	**62.5**	**X**
4.	High inputs cost viz; seeds, fertilizers etc	**48**	**60**	**XI**
C.	**Institutional constraints**			
1.	Lack of training institutes	**68**	**85**	**V**
2.	Lack of extension services / active workers	**30**	**37.5**	**XIV**
3.	Distance between training institution and village	**70**	**87.5**	**IV**
D.	**Infra-structural constraints**			
1.	Un timely irrigation facilities	**61**	**76.25**	**VII**
2.	Uncertainty about the availability of irrigation water	**58**	**72.5**	**VIII**
3.	Inadequate supply of fertilizers, seeds etc.	**50**	**62.5**	**X**
4.	Lack of transportation facilities	**75**	**93.75**	**II**
5.	Lack of marketing facilities	**72**	**90**	**III**
6.	Lack of machinery / equipments used etc;	**76**	**95**	**I**
7.	Lack of information system etc	**75**	**93.75**	**II**

4.6.Suggestions given by beneficiaries in adoption of the watershed management Practices in the study area:

Table 4.15 reveals the suggestion provided by the beneficiaries in adoption of the watershed management practice. Out of 80 respondent 95 percent of the respondent suggested that information centre should be established to disseminate the information on time and strong documentation of the work, 93.75 of the respondent felt the need of saving in the bank, mechanization and proper maintenance of road for transportation. 91.25 percent of the respondent suggested that skill based training programme should be encouraged, and 90 percent of the respondent suggested that the government subsidy for livelihood activity be increased, local product be registered under GIS and to encouraged people to come up with success stories. 87.5 percent of the respondent felt the need of the government assistance in time, need of area specific watershed activities training and metrological station to be established at block level. 85 percent of the respondent suggested that financial facilities to be given in time for adoption of watershed practices, training institute established at block level and also training on value addition/post harvest management. 81.25 percent of the respondent suggested that watershed training programme should be conducted at district/state level and information about watershed production technology should be given in time. Only 70 percent of the respondent suggested that farmers should maintain their land holding jointly for the development of watershed programme.

Chapter - V

Conclusion

The following conclusion emerged from the present study:

1. The beneficiaries mostly belong to the old age group i. e; 50 years and above as compared to non-beneficiaries that have mostly middle age group of 46.20 per cent, respectively.

2. The family size of the study is found to be 6 to 8 with a high literacy rate of 86.25 per cent. Primary level of education is found to be most prevalent (33.75 per cent), respectively.

3. Agriculture was found to be primary occupation for the beneficiary with 50.00 per cent of them engaged in it while service was the primary occupation for non-beneficiary group with 45.00 per cent, respectively.

4. The average size of land holding for beneficiary are 1.9, 3.15, 5.43 and 11.27 ha for small, semi-medium, medium and large farmers, respectively, while the average size of land holding for non-beneficiary are 1.65 ha, 3.36 ha, 5.09 ha and 11.06 ha for small, semi-medium, medium and large farmers, respectively. So, the land holding is found to increase with the increase in farm size.

5. Livestock rearing has economic importance for both the beneficiary and non-beneficiary group with rearing of poultry (2228 in number) occupy the most important enterprise for both the group of respondent, respectively.

6. The most common entry point activity carried out by IWMP in Nagaland is construction of water tank / pond or reservoir (393 village) followed by construction of marketing shed in 115 villages, respectively.

7. The most common activity implemented by IWMP is distribution of saplings followed by funding of SHG, trainings, animal husbandry, demonstration, agri-based activity and exposure trips, respectively.

8. The net returns of the beneficiaries were found to be higher than the non-beneficiaries. The overall net returns of the beneficiaries is Rs 18,31,370.00/- as compared to Rs 11,56,914.00/- of the non-beneficiaries, respectively.

9. Large farmers have highest percent increase in net return over small, semi-medium and medium farmers, respectively.

10. The marginal propensity to consume was found highest for semi-medium farmers 0.91 as compared to medium (0.46), small farmers (0.44) and large farmers (0.05), respectively.

11. Large farmers have large size of land holding and employ more number of labours as compared to small, semi-medium and medium farmers. The overall average size of land holding of beneficiary is 21.75 ha as compared to non-beneficiary which has

21.16 ha. The average labours employed by the beneficiary are 44 as compared to 27 labours of non-beneficiary, respectively.

12. It was found that there is an increase in the income of for both beneficiary and non-beneficiary but comparatively beneficiary has more increased income. The medium farmers have higher increased income of Rs 541.00/-, respectively.

13. On an average 483 man days were created before IWMP and it increased to 507 man days after implementation of IWMP. There was a high increase of man days in horticulture enterprise from 125 to 135 man days with an increase of 10 days, followed by fishery with increase in 8 days and the least increase in man days was of agriculture with only 1 man days, respectively.

14. It was found that 95.00 per cent of the respondent faced the infra-structural problem of lack of machinery and equipment, 93.75.00 per cent respondent felt that there is lack of lack of awareness about finance facilities, lack of transportation facilities and lack of information system. Only 37.50 per cent faced the problem of inactive extension workers or services, it implies that there are active workers who are easily accessible, respectively.

15. Large farmers has generated more employment by the crop activities than other farm groups but the percent change in employment is more in small farmers, followed by semi-medium, medium and large farmers, respectively.

16. It was found that 95.00 per cent of the respondent faced the infra-structural problem of lack of machines and equipment, 93.75 per cent respondent felt that there is lack of lack of awareness about finance facilities, lack of transportation facilities and lack of information system. 90.00 per cent faced the technological problem of lack of knowledge about bunds and also unavailability of marketing facilities. Only 37.50 per cent faced the problem of inactive extension workers or services, it implies that there are active workers who are easily accessible, respectively.

Suggestions

1. Information centre should be established at a block level in order to disseminate the information in time.

2. There should be proper roads to improve transport facilities.

3. Saving habit should be encouraged by establishing the new bank branches

4. Mechanization must be encouraged.

5. Skill based training programme should be encouraged.

6. Amount of rupees given by government for livelihood activity must be increased.

7. Success story / case study must be encouraged.

8. Locally made commodity should be registered under GIS.

9. Government should provide all kinds of assistance to be utilized within time frame.

10. Need based / area specific watershed activities training may be given.

11. Financial facilities given in time for the adoption of watershed practices.

12. Value added / post harvest management should be encouraged.

13. Watershed training programme should be conducted at district / state level.

14. Information about watershed production technology should be given in time.

15. Farmers should maintain their land holding jointly for the development of watershed programme.

16. State Government office should release suitable improved variety to the area.

17. Institutes should be made at district / block level for imparting trainings.

18. Financial facilities given in time for the adoption of watershed practices.

19. Metrological station should be established at block level.

Policy Implications

1. Information centre should be set up at the block level so that there is timely dissemination of the information to the beneficiary.

2. More focused should be on skilled based training.

3. The financial assistance provided by the government for livelihood activity should be enhanced and should be given at the appropriate time.

4. Training institute should be set up at the block and district level also.

5. Value added / post harvest management should be encouraged.

6. Metrological station should be established at block level.

7. Watershed training programme should be conducted at district / state level.

8. Financial facilities should be given in time for the adoption of watershed practices.

9. Need based / area specific watershed activities training should be given.

10. Adequate measures should be taken to set up market.

Photo gallery

Footstep constructed at Sastami village

Ginger plantation at Kitami village

Orange plantation at kitami village

Coffee Nursery at Lazami Village

Water reservoir tank at phishumi village

Zero energy cold storage at Philimi village

Bibliography

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