International Journal of Ecology and Environmental Sciences
www.ecologyjournal.in
Online ISSN: 2664-7133; Print ISSN: 2664-7125
Received: 09-08-2019; Accepted: 13-09-2019; Published: 20-09-2019
Volume 1; Issue 4; 2019; Page No. 40-45

Socio-economic impact of watershed management in balakot district Mansehra, Pakistan

Kiramat Shah[1], Waqar Ahmed[2*]
[1] Divisional Forest Officer, Khyber Pukhtunkhwa Wildlife, Pakistan
[2] Department of Forestry and Range Management, PMAS arid Agriculture University, Rawalpindi, Pakistan

Abstract
Watershed management plays an important role in supplying water; especially in arid areas. It has the potential to increase agriculture production, reduce soil erosion and siltation in dams and improve livelihood. The current study investigated socio-economic impact of watershed management in five selected villages of tehsil Balakot, District Mansehra, Pakistan. A sample size of 107 respondents was randomly selected in the study area and questionnaires were used to explore the best suitable techniques from past watershed management activities, and its effect on the rural community on soil and water. Results showed that high proportion of 41% respondent were illiterate, 68.2% were farmer by profession, 71.9% were poor with below average monthly income. Moreover 56% of respondents were depending on government forests for their timber need. Regarding watershed management activities had been done by the Forest Department, 85% respondents reported that the effect of watershed management activities on soil and water were positive and income of 89% respondents has been increased these activities. Most of the people were engaged in agriculture fields and feeding their livestock which they sell into the market and get a very low income. They also depend on forests for feeding their livestock and fuel wood, by which they degrade forest land as well. Most of the people of the study area gave a positive response to the Government and Non-Governmental organization projects and they also participated in these projects as well. The study suggests that preparation of future integrated watershed management plan should include strong socio-economic inputs regarding community education, awareness, of employment opportunities and basic necessities.

Keywords: watershed, respondents, forest department, scientific management plan

Introduction

Water being a major natural flow is an indispensable part of life. (France, 2006) [4] stated that water is a resource that will cause trouble if used unsustainably without conservation, underestimating its value. Further, (Akhtar, Ahmad & Booij, 2008) [1] stated that water issues in Pakistan are crucial challenges for the policymakers and managers of water resources in the country. (Kelso & Martin, 1973) [6] stated that water has basic role in socio-economic development as it is used for domestic purpose, for drinking, personal hygiene and other domestic purposes constitutes a primary component of economic and social welfare for developing world. Watershed management plays an important role in supplying water; especially in arid areas. It has the potential to increase agriculture production, reduce soil erosion and siltation in dams and improve livelihood. (Prabhakar, Latha & Rao, 2010) [9] stated that a successful watershed programme can develop skills of people and also influence economy in terms of increase in incomes and as well as on household expenditures. (Efati, 2000) [2] using questionnaires method stated that watershed management projects have influence on economic situation of village residents. Degradation of watershed areas decrease land productivity and increases social problems (Sertse, 2007) [11]. (Stokes, Mickovski & Thomas, 2004) [13] stated that eco-engineering is a long-term, ecological and economic strategy in managing sites vulnerable to natural and man-made hazards. Pakistan is dependent upon the upland watersheds, which provide at least 90% of the country's water for hydropower, irrigation, domestic water supplies, ground water recharge, consisted farming and naturally vegetative growth. (FAO, 2004) reported that about 30 to 60 percent of the freshwater flowing downstream in humid regions is provided by mountain watersheds while in semi-arid and arid areas they provide 70 to 95 percent. Akhtar *et al.*, (2008) stated that Pakistan is dependent on agriculture for its economic development, and agriculture system mainly depends upon Indus River Irrigation System, highlighting the importance of uplands watersheds. Pakistan can be divided into six watershed regions grouped to the north and west around the vast alluvial plains of Indus which act as a core of the country namely; (1) the Northern mountain region, (2) the uplands of Northern Punjab, (3) the western Mountain region, (4) the south western Baluchistan plateau, (5) the coastal zone and (6) the Indus plain, mentioned by Quraishi, (2015). The present research was conducted in Balakot region of district Mansehra, Pakistan. Various soil conservation techniques were used in order to rehabilitate the degraded lands of Balakot watershed area. This study was specifically conducted to know the extent of socio economic impact through watershed management activities and to suggest further improvement in household economy of the inhabitants. The main objectives were (1) to explore the best suitable techniques from past watershed management activities, (2) to study the effect of watershed management activities on the rural community and (3) to find out the effect of watershed management activities on soil and water.

Materials and Methods

Study area

The study area is Balakot village. Balakot (town) is located at 34° 33¹ N 37° 21¹ E coordinates 34°33¹ N 73°21¹ E about thirty eight kilometers north east of the city of Manshera in Khyber Pakhtunkhwa. It is a historical town a famous tourist destination of the region and the gateway to Kaghan valley, Khyber Pakhtunkhwa, Pakistan. The river Kunhar originating from Lulusar Lake runs through the city and merges with Jhelum River just outside Muzaffarabad in Azad Kasmir. Balakot has a humid subtropical climate with hot summer and cool winter. Rainfall in Balakot is much higher than in most other parts of Pakistan. The heaviest rainfall occurs either in late winter (February-March) associated with frontal systems or in the monsoon season (June-August), however all month sees significant rain fall on average. The town was destroyed during the 2005 earthquake and was later rebuilt with the assistance of the Government of Pakistan and other donors. The study area is very much prone to the natural hazards. Natural hazards can be defined as those hazards that threaten society, damage environmental processes and effect natural phenomenon occurring in that area. These hazards include earthquakes, drought, land sliding and flood, etc. A land slide is a geological phenomenon in Balakot which include a wide range of ground movement such as rock falls, deep failure of slopes and shallow debris flows. Tree species are well represented by the deciduous and evergreen types. The commonest broad leaved trees are walnut, ailanthus, traikun, eucalyptus, acacia, chestnut, birth-cherry, yew, barmi, peshor, wild olive, ash, elm, mulberry and many species of willow and poplar. Birch and occasionally juniper are found in the higher parts. Among the conifers, there are pine, deodar, blue pine, spruce and silver fir. The best known forests of pine in Balakot are the forest of Batrasi, Jaba, Dadar and Paraziarat. Deodar and blue pine grows in stony slopes like fir and spruce.

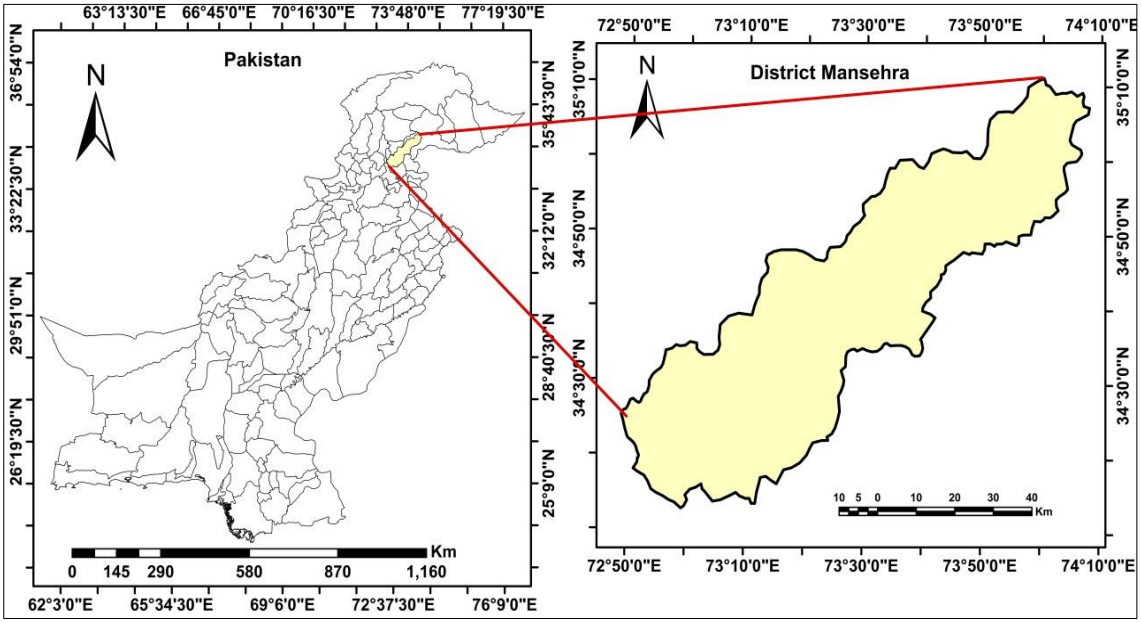

Fig 1

Data collection (field visit)

Secondary data was collected from different reports prepared by various experts in soil and water conservation. Questionnaire was developed for finding the socio-economic impact of watershed management in Balakot, District Mansehra. The study area is included in Kunhar watershed, about 37 Km from Mansehra. The data was collected using simple random sampling method, examining the economic, social and cultural impacts and 107 numbers of households were selected randomly (Mirjalili, 2012). The first stage of sampling comprises to select three union councils out of twelve (12) union councils of Balakot Tehsil. The total population of three union councils i.e Balakot, Satbanni and Shohal is about 48481 which comprise 22.58% of the total population of Balakot Tehsil. The three union councils consist of 38 villages, out of which 5 selected in which all the 31 sites were visited. The simple random sampling method was adopted. After ward 21 households were selected from each selected villages through simple random sampling that would result into 107 sample respondents representing the total population of tehsil Balakot.

Interviewing the respondents

The respondents were interviewed personally at their homes. The interview schedule was structured in English but the questions were asked in local language for the convenience to obtain required information. During interview every effort was made to remain informal and friendly with the respondents. The researcher faced some problems while interviewing farmers. Data collection was rather difficult in case where the farmers were illiterate. Some farmer remained untrusted and kept on questioning the nature of study. Quite a few were hesitant about showing their income during interview. Under such circumstances some indirect question were put to reach the correct answer. Though many difficulties were faced during this survey, the interview schedule was still good method to get authentic information. During the interview, there always existed

a social barrier between the interviewer and the respondent. It was noted that if they contributed, the respondent will disclose the facts otherwise not.

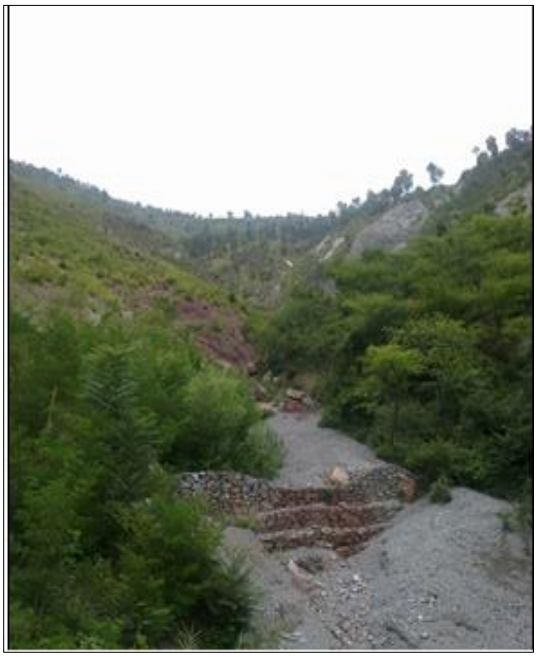

Fig 2: check dams

Fig 3: brush layering

Fig 3: Loose stones with live hadges

Fig 4: Loose boulder wall

Results

Level of education, profession and income

The adoption rate of modern technologies by the educated farmers could be higher than the traditional ones. The table 1 shows that 41.12% of the sample population was illiterate, while the percentage of literate respondent to primary, middle, matric, intermediate and above are 21.49, 14%, 13.11% and 10.28% respectively. Analysis (as shown in Table 1) describes that Majority of the household earned their livelihood from farming (68.224%), serving in NGO's (12.15%) and Government (19.619 %). It shows that the area is rural and they depend on natural resource of the area. The Table 1 also shows that about 71.962% of the sample population earns less than 10000, monthly income. 15.88% respondent earns 10000-15000 while 12.149% earn more

than 15000 monthly. It means that income level of the people is low. They use different available sources to earn their livelihood.

Table 1: Respondents' education, profession and monthly income.

S. No	Socio-economic variable	Frequency	Percentage
Education			
1	Illiterate	44	41.12
	Primary	23	21.49
	Middle	15	14
	Matric	14	13.11
	Intermediate and above	11	10.28
Profession			
2	Farming	73	68.224
	NGO's	13	12.15
	Government Service	21	19.619
Monthly income			
3	Less than 10000	77	71.962
	10000-15000	17	15.88
	More than 15000	13	12.149
	Total	107	100

Conversion of land into planted area

From the analysis of data it is clear that about 69.16% of the respondent were in favor of the conversion of land into planted area, while the remaining 30.84% did not agree (Table 2). This shows that there is danger of erosion in the area. So, contour ploughing, terracing must be encouraged to check the soil erosion in the study area.

Table 2: Conversion of land into planted area.

S. No	Response	Frequency	Percentage
1	Yes	74	69.16
2	No	33	30.84
	Total	107	100

Source of fuel wood and timber requirement

The respondents were asked about their sources of fuel wood. Majority (71.02%) of people were using fuel wood from Govt. forest, about 11.21% from communal forest and the remaining 17.77% from farm land (Table 3). This shows that the reserved forests are under severe threats. If agro-forestry techniques are adopted then the pressure on reserved forest can be lessened and the vegetation cover can be improved and soil losses could be checked. Mostly, the timber requirement is fulfilled from protected forest (56.07%), from guzara forest (28.63%) and from communal land (15.88%). It shows that there is illegal cutting of trees from protected forest in the vicinity of the village and government forests are under severe threats. If agro forestry is not started then pressure can be realized on state forest.

Table 3: Source of fuel wood and timber.

S. No	Dependency on forests	Frequency	Percentage
Source of Fuelwood			
1	From GovernmentForest	76	71.02
	From Communal Forest	12	11.21
	From FarmLand	19	17.77
Timber requirements			
2	Protected Forest	60	56.07
	Guzara Forest	30	28.63
	Communal forest	17	15.88
	Total	107	100

Source of fodder for cattle

Household gets fodder for cattle from different sources i.e about 24.30% from agriculture land, 30.84% by purchasing from other villagers and 44.86% fodder from other grazing land. The Table 4 is showing that there is shortage of fodder. So the shortage can be fulfilled by planting fodder trees like Ailanthus, Rubenia etc

Table 4: Source of fodder

S. No	Source of fodder	Frequency	%age
1	Agricultural land	26	24.30
2	By Purchasing	33	30.84
3.	Others grazing land	48	44.86
	Total	107	100

Watershed management activities and its impacts on soil and water conservation

The data analysis described that about 80.37% activities were done by forest department while 19.63% work done by soil conservation department (Table 5). The activities made both by forest department and soil conservation department are very much successful and people are fully adopting soil and water conservation measures. People were asked about the effect of watershed management activities on soil and water conservation. 85.05% of the respondents answer was positive and about 14.95% respondents answer was negative. This clarified that local people were in favor of watershed management activities and have welcomed the project in the area. The project is very much successful and is being implemented for the last 40 years.

Table 5: Watershed management activities

S. No	Management activities	Frequency	Percentage
Watershed management activities done by any department			
1	Forest department	86	80.37
	Soil conservation Dept.	21	19.63
Effect of watershed management activities on soil and water conservation			
2	Positive	91	85.05
	Negative	16	14.95
	Total	107	100

Increase income after watershed management activities

The respondents were asked about their opinion concerned with the increase in income after watershed management activities. Majorities (89.71%) of the respondents were of the opinion that the income of the people has increased and 10.29% response was negative (Table 6). This shows that education, health, business in that area have been improved because of the watershed management project activities, and people are involved in different watershed management practices in the study area.

Table 6: Increase income after watershed management activities.

S.no	Response	Frequency	Percentage
1	Yes	96	89.71
2	No	11	10.29
	Total	107	100

Erosion control through watershed management activities

As given in Table 7, about 85.98% of the respondents were of the view that there is remarkable erosion before watershed management activities while the remaining (14.02%) gave answer negatively. This shows that due to watershed management activities land degradation process has been checked to greater extent and the fertility of the land has been improved. The specific activities in field were brush wattle construction, check dams (Figure 1), brush layering (Figure 2), brush hedge layering, hedge layering, dead brushwood fences with live hedges, Loose stones with live hedges (Figure 3), sodding, plantation, retaining walls, and Loose Boulder Wall (Figure 4).

Table 7: Respondents' perception about erosion control.

S.no	Response	Frequency	Percentage
1	Yes	92	85.98
2	No	15	14.02
	Total	107	100

Choice of species for soil and water conservation purpose

The table 8 shows that the most preferred species for soil and water conservation are Rubinia (28.03%), Ailanthus (23.36%), Chir pine (23.36%), Eucalyptus (10.28%) and other species (14.35%). It means that broad leaves are preferred for quick response for soil stabilization while conifers are used for long term soil conservation practices.

Table 8: Choice of species for soil and water conservation purpose.

S.no	Species	Frequency	Percentage
1	Robinia	30	28.03
2	Ailanthus	25	23.36
3	Chir pine	25	23.36
4	Eucalyptus	11	10.28
5	Other specie	16	14.95
	Total	107	100

Discussion

The study in Balakot, District Mansehra, KPK Pakistan is carried out through questionnaire and using simple random sampling method, a similar method carried out by Jamali & Raessi, (2015) studying socio-economic aspects of some watershed management projects in Mateh-Sang watershed, Iran. The study recognized that there is a potential linkage between impacts of watershed management and socio-economic development that is in resemblance with the results concluded by (Mansouryan & Golrang, 2006) which aimed at the assessment of the socio-economic impacts of the projects in the watershed of the Shahid Yaqoobi Dam. Before the implementation of the watershed management project the rate of soil erosion was high causing floods, but after the implementation 85.98% people revealed that erosion problem has been lowered as mentioned in table 7, decreasing the occurrence of floods in the area. This result was same as obtained by (Mansouryan & Golrang, 2007) [7] in the assessment of the socio-economic impacts of the projects in the Kameh watershed, Khorasan. (Sharma, Samra, Scott, & Wani, 2005) [12] Stated that due to watershed degradation in many developing countries, livelihoods of millions of people have been threatened that constrained agricultural production. Increased populations of people and livestock, particularly in the steep, mountainous watersheds of Nepal and the Himalaya region rapidly depleted the existing natural resource base because the soil and vegetation systems cannot support present levels of use. The results of the economic evaluation of the watershed management projects represented the increase in income as 89.71% respondents gave positive response. Further, improvement in education, business and health was observed. The plus point of this project was that the people were in favor of the project and revealed (85.05%) that watershed management resulted in soil and water conservation of the area.

Conclusion

The study was conducted for the socio-economic impact of watershed management at Balakot, District Mansehra. Forest department and other non-governmental organizations helped them by introducing various projects in the study area to stabilize their lands. After an earthquake the soil become lose and need to be stabilized. In watershed management project, Khyber Pakhtunkhwa Forest Department planted number of trees of various species in the study area, and soil stabilization project by the UN helped people to stabilize the land. Fast growing species were planted on the lands because of rapid approach towards the soil stabilization after a massive earthquake. People of the study area also welcomed them and participated in those activities because they know that they work for them in order to save their property. Various soil stabilization models were also established near road side that stabilize the soil as well as increase the scenic beauty of the study area. Watershed management activities have greatly affected the condition of soil and water. The watershed management activities increased the income of the local community and also improved the health of the people and livestock. They also got a social interaction between the people of the various communities and also sold their products to the people outside the areas.The study also suggested some recommendation for further improvement of watershed conservation. Integrated watershed management plan be prepared for improvement of watershed areas of Balakot involving the local people. Technical assistance should be provided to the local communities by project staff in the conservation of check dam, terracing and providing fast growing soil binder species to check erosion. Awareness may be raised amongst the local communities about the benefits of planting broad leaved and coniferous trees, ecotourism and range improvement techniques. The participation of local communities may be ensured in the watershed

management practices by involving them in planning, implementations and monitoring action. Community plantation, nurseries, reseeding of local grasses, may be established in the study area so that soil erosion and water loss could be minimized. Free distribution of forest and fruity plants among the local communities may be ensured for increasing the forest cover of the study area and for the socio-economic conditions of the people. Private nursery grown must be encouraged so that the need of the local people of trees may fulfill. Local market may be created for promotion of non-timber forest products and for local handycraft.

References

1. Akhtar M, Ahmad N, Booij MJ. The impact of climate change on the water resources of Hindukush–Karakorum–Himalaya region under different glacier coverage scenarios. Journal of hydrology. 2008; 355(1-4):148-163.
2. Efati M. Watershed projects on improving the socioeconomic impacts of the project watershed village residents Proceedings of Jihad in agriculture and rural development-Tehran. Research Center of Ministry of Agriculture and Rural, 2000, (178).
3. FAO. Twenty-seventh FAO Regional Conference for the Near East: Forest and Tree Contribution to Environment, Water and Food Security. Doha, Qatar, 2004.
4. France RL. Introduction of watershed development: understanding and managing the impacts of sprawl. Rawman and Littlefield Publishers Group, Inc. Maryland USA, 2006.
5. Jamali AA, Raeesi N. Socio-Economic Aspects of Some Watershed Management Projects in Mateh-Sang Watershed, IRAN, 2006.
6. Kelso MM, Martin WE, Mack LE. Water supplies and economic growth in an arid environment, 1973.
7. Mansouryan J, Golrang B. Economic survey - social watershed projects in Iran (case study Khorasan Razavi Kama watershed). Sixth Conference of Iranian Agricultural Economics, 2007.
8. Mirjalili M. Economic, social and cultural effects of watershed management and flood basins. Proceedings of the Eighth National Conference on Science and Watershed Engineering, Lorestan University, 2012.
9. Prabhakar K, Latha KL, Rao AP. Watershed Programme: Impact on Socio-agricultural and Socio-economic Spheres of the Farmers. Journal of Agricultural Sciences. 2010; 1(1), 31-37.
10. Quraishi MA. Basics of forestry and allied science: concepts and theory (5th edition). A-One publishers, 2015.
11. Sertse S. Study and design guidelines on watershed management with reference to forestry. Unpublished. Bureau of Agriculture and Rural Development (BoARD), Mekelle, Tigray, 2007.
12. Sharma BR, Samra JS, Scott CA, Wani SP. *Watershed management challenges improving productivity, resources and livelihoods*. International Water Management Institute, 2005.
13. Stokes A, Mickovski SB, Thomas BR. Eco-engineering for the long-term protection of unstable slopes in Europe: developing management strategies for use in legislation. *Landslides: Evaluation & Stabilization*. 2004; *2*:1685-1690.