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Impact of joint forest management on the insect population and socio-economics of local communities of village miandam district swat, Pakistan

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Abstract
This research study was carried out to assess and analyze the socio-economic impacts of Joint Forest Management at Miandam, district Swat between October 2015 to April 2016 using structured Questionnaire and participatory approach. The main objectives of the present study was to assess the Socio-economic impacts of Joint Forest Management on the local communities in the study area, to compare Joint Forest Management with the traditional system of forest management on the local communities and to find out gaps between JFMC and Forest department. The results revealed that the socio-economic condition of local communities has been improved, they were highly dependent upon the forest resources and benefited from direct and indirect factors. Majority of local population prefers JFM over traditional forest management. It was observed that after JFM the status of forest and wildlife damages was decreased and positive improvement in management was observed. Most of Plants of the study area often give potential pollinators which characterize a chief asset of energy. It was observed that due to Joint Forest Management has increased the population of beneficial insects which has an important role in pollination and natural product development including honey, silk and lac products. However some of the respondents were against of JFM due to ignorance and favoritism of JFMCs. Lack of interest was reported by some of the staff due to problems like lack of incentives, delay in community decisions, conflicts on forest resources and ban on permits. Future prospects of JFM was explained and suggestions for full participation, involvement of other related agencies, democratic way of JFMCs formation and linkage with various running projects were identified for best results in the future.

Keywords: Joint Forest Management, Socio-economic impacts

1. Introduction
Large number of the population depends on forest resources therefore the livelihood options are being diversified, to make it sustainable. Social, physical and financial capitals of local communities will be improved under the existing approaches, through effective forest policy, as the social magnitude of the forests were explored in the last fifty years. After 1970s, the environment and ecological values of forests were also included in forest policies of the developed countries. Pakistan in the last eighties (1980s) prepared National Conservation Strategy (NCS), which gave these dimensions, but still the community and ecological interest may go side by side both interests which further complicate the forest management; however the interest of the immediate beneficiaries of forest should remain subservient to the public interest [1].

The local peoples cannot be excluded from the use of natural resources because they meet their needs for livelihood. JFM is a forest people friendly based approach under which the local communities and forest department may come into an agreement to mutually manage and protect the forest land adjacent villages and to share benefits and responsibilities. For the purpose of forest protection and management the forest department formed a committee as representation of the village community. The committee is famous by different names in different states, but more commonly known to Joint Forest management committee (JFMC) or forest protection committee (FPC).

The concept of Joint Forest Management (JFM) is foundation defined roles and responsibilities and mutual trust of both the parties, due to their joint efforts of the forest resources can be equally shared [2]. Under JFM, the local communities get a greater right to use a number of non-timber forest produces (NTFPs) such as seeds, herbs, spices, grasses, resin, gums, mushrooms, fuel wood and medicinal plants from the forest and share in income from timber in return for increased responsibilities for its defense from forest fire, uncontrolled grazing, harvesting and illegal cutting. Local communities are entitled to exercise their rights and receive their share as prescribed in the agreement b/w the forest department and local community and market the non-wood forest produce (NWFPs) from the forest. The royalty share in the entire forest of the Swat Forest Division is 60:40 i.e. 60% amount goes to the owners/stakeholder whereas the remaining 40% go to the forest department as service charge [3]. Insects play an important role in the ecosystem and performs multiple functions such as seed dispersal, nutrient cycling, pollination, bioturbation (mixing of soil sediments/particles), feeding on microorganism or parasites and can also help in enhancing plant growth. Many insect pests causing greater losses to Medicinal plants. Also, beneficial insects such as pollinators, visitors, parasitoids and predators could play an important role in improving the production of these medicinal plants. Many investigations have carried out that insect inhabiting various medicinal plant species [4]. So, it means that all the insects are not harmful, some of them are beneficial too and contribute in maintaining the natural balance of the ecosystem. The specific objectives of the study were;

a) To study the impacts of Joint Forest Management on socio-economic conditions of local communities in the study area.
b) To study the impact of joint forest management on the insect population in the study area.

2. Materials and methods

2.1 Study Area

Miandam village is located within latitude 35° 03' 12" North and longitude 72° 33' 39" East, about 57 km away from Saidu Sharif, District Swat Khyber Pakhtunkhwa, at an elevation of 6500 feet approximately, above sea level. Total population of the Village Miandam is 5078 comprising of 1676 households and total area is 10648 acres in which almost 75.31% area is covered by Forest. The study area falls under moist temperate forest, thus receiving summer monsoon and winter snow fall. Because of its cool climate and green hillsides, the area is frequented by tourists [3].

2.2 Socio economics stake holders

In village council Miandam, there are two sub-villages namely Gujaro village and Swato village. In Gujaro village there are four tribes, major tribe of the village is Gujars, comprising about 76% of the total population, while others are Mian tribe 14%, Mulyan (Mughal) 7% and Dawood Khail comprising about 7% of the total population and they are partially depended upon the forest resources. The total population of the Gujaro village is 2260 inhabiting 740 households while of Swato village total population is 2818 inhabiting 936 households, there are seven tribes in Swato village, major tribe of the village is Gadnr Khail comprising of almost 41% of the total population, while others are Khado Khail 20%, Swati Tribe (native) 18%, Khattak tribe 8%, Lajbori Tribe 6%, Dalazak tribe 4% and Mulyan (Mughal) comprising of only 3% of the total population. Total populated area is only 293 acres in which 283 acres include houses, hospital, Bazar, graveyard, road and pathways etc, while 10 acres area is covered by scattered trees in the populated area. These sections/Khels exists in the village having various professions and source of income. A major source of income of all Sections is agriculture as majority of peoples having their own agricultural lands. Secondly majority of peoples moved to abroad and also other parts of the country. Many of them depend on forest sources, such as the sale of fire wood, medicinal plants, Government servants and local trade. All people have more or less having the same social status [3].

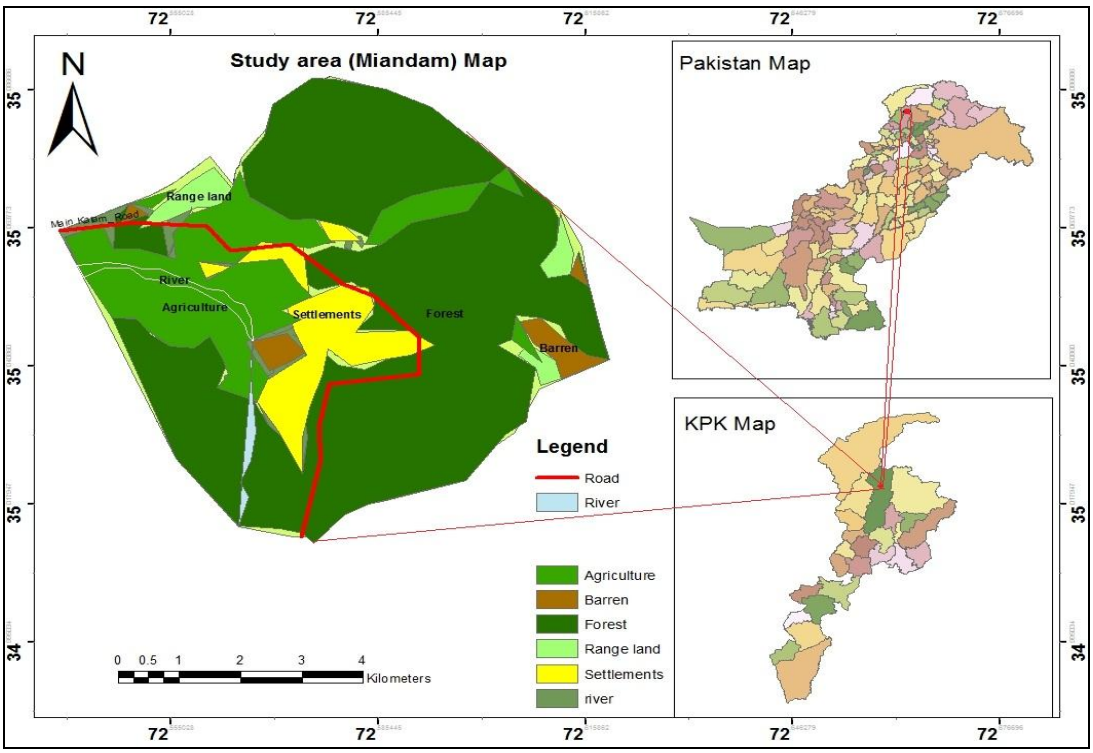

Fig 1: Map of the study area Miandam, District Swat

2.3 Forest
The total forest area of Village is 8018 acres that are protected forest, the management of which is carried out by the Forest department and local community (JFM). Forest department made a committee known as Joint Forest Management Committee (JFMC), which is working for the protection, control of illegal cutting, grazing and forest related activities and operations which are managed by JFMC and Forest Department mutually. Major flora of the area comprised of *Abies Pindrow* (Fir), *Pinus Wallichiana* (Kail) and *Picea smithiana* (Spruce) among the conifers while in broad-leaved are *Aesculus indica* (Jazz), *Olea ferruginea* (Zaitoon), *Quercus dilatata* (Bunj), *Juglans regia* (Walnut), *Robinia pseudocacia* (Kikar), *Taxus baccata* (Bermi), *Ailanthus altissima* (Bikyana), *Ficus palmate* (Inzar), *Populus nigra* (Popular) [3].

2.4 Wildlife Species
Major mammals and birds assessed by Wildlife Department of Swat in Miandam plaining unit, Mammals are, Common leopard *(Panthera pardus)*, Rhesus Monkey *(Macaca mulatta)*, Grey Goral *(Naemorhedus goral)*, Black Bear *(Selenarctos thibetanus)*, Jackal *(Canis aureus)* and birds are Monal Pheasant (*Lophophorus impejanus)*, Porcupine (*Erethizon dorsatum)*, Pigeon (*Columba livia*), See-see partridge *(Ammoperdix griseogularis)*, Chukar partridge *(Alectoris chukar)*, Grey partridge *(Francolinus pondicerianus)*, Koklass pheasant *(Pucrasia macrolopha)* and Kalij pheasant *(Lophura leucomelana)*.

2.5 Data Collection and Sampling
2.5.1 Primary Data Collection and Field Survey
Prior to field work the available information was collected on forest area, ecology of the area and social status was collected from local organization, local peoples and reports of local and international NGOs i.e. (WWF) etc. Participatory studies were carried out for familiar sharing with local communities on Joint forest management. Extensive field survey was carried out for Forest Resource mapping, categorization of households for socio-economic conditions, participatory study scheduling and recorded information review.

2.5.2 Questionnaire Survey
All the relevant information about the forest management was carried out through the designated questionnaire schedule. Questionnaire data were collected from both JFM partners i.e. Forest Department and Local communities. The questionnaire was composed of two parts i.e. part-1 for departmental personnel's (forest department Range staff) and part-2 or community peoples. The community questionnaire was further composed of general and JFM based questions. Questionnaire survey with sample intensity of 25% was carried out in the population of a local community of the study area, 419 questionnaires was interviewed from the local community while 20 questionnaires was filled from forest staff. The study was conducted through random sampling of the community. Questionnaire survey with sample intensity of 25% was carried out in the population of a local community of the study area. Total population of the village Miandam is 5078 inhabiting 1676 households.

2.5.3 Secondary Data Collection
Secondary data was collected from Forest department, JFMCs Village council/Union Council office, Agriculture office, and other attached District level concern offices.

2.6 Statistical Analysis
Both of quantitative and qualitative methods of social research were used in this study. Key informants as well as focus group interviews were included to obtain qualitative data. The questionnaire was collected, tabulated and cross tables of various variables were developed and analyzed under the domain descriptive statistics, in which frequencies, table, histograms, bar charts, line chart and Pie charts was used due to results was summarized. The quantitative data was statistically tested and analyzed by using T-test, Chi-Square test and Correlation was applied by computer software Statistical Package for Social Scientists (SPSS) [5].

3. Results and Discussions
3.1 Impact of JFM on Insect Population
It was observed during field visits that after the introduction of Joint Forest Management there is increased insect population in the local area. Several insect species (harmful/beneficial) found in the study area have been identified which were increased due to the Joint Forest Management. Some of them are listed in Table 1.

Table 1: List of Insects found in the study area

Common Name	Scientific Name	Status
Ambrosia Beetle	*Platypus quercivorus*	Harmful
Asian Pine Caterpillar	*Dendrolimus punctatus*	Harmful
Bag Worm	*Thyridopteryx ephemeraeformis*	Harmful
Brown lacewings	*Micromus tasmaniae*	Beneficial
Budworm	*Choristoneura fumiferana*	Harmful
Cone Beetle	*Conopthorus radiatae*	Harmful
Douglas Fir Beetle	*Dendroctonus pseudotsugae*	Harmful
Douglas Fir Tussock Moth	*Orgyia pseudotsugata*	Harmful
Dry Twig And Cone Beetle	*Ernobius punctulatus*	Harmful
Fir Budworm	*Choristoneura murinana*	Harmful
Forest Tent Caterpillar	*Malacosoma disstria*	Harmful
Honey Bee	*Apis mellifera*	Beneficial
Hoverflies	*Melangyna viridiceps*	Beneficial
Lacewings	Micromus tasmaniae	Beneficial
Lady Bird	*Coccinellidae*	Beneficial
Long Horn Beetle	*Anoplophora glabripennis*	Harmful
Mountain Pine Beetle	*Dendroconus ponderosae*	Harmful
Pine Processionary Caterpillar	*Thaumetopoea pityocampa*	Harmful
Pine wood nematode	*Bursaphelenchus xylophilus*	Harmful
Silkworm	*Bombyx mori*	Beneficial
Southern Pine Beetle	*Dendroctonus frontalis*	Harmful
Spruce Beetle	*Dendroctonus rufipennis*	Harmful
Spruce Budworm	*Choristoneura fumiferana*	Harmful
Walnut Twig Beetle	*Pityophthorus juglandis*	Harmful
Wood Wasp	*Sirex noctilio*	Harmful

3.2 Benefits of Community due to JFM
The present study revealed that the respondents mentioned two types of benefits i.e. direct and indirect benefits from JFM in the study area.

3.2.1 Direct Benefits
It has been observed that the local population was highly dependent on the forest products via fuel, timber and fodder. After JFM introduction majority of the population were getting these benefits more as compared to before the implementation of JFM. Majority of the sample population i.e. 80.4% were of the view that after introduction of JFM the local communities were given rights and concessions, While 19.6% of the sample population reported no change and was not satisfied.

Table 2: Direct Benefits/ Rights

Rights/Concessions	Increased	No Change	Total
Fuel wood, Fodder (Grass cutting), Timber	80.4%	19.6%	100%

Before the introduction of JFM, the communities were fulfilling their needs for fuel wood, fodder and timber without adopting any legal course [6]. The results indicate that after the introduction of JFM system the local community satisfied from the rights and concessions of JFM, however part of respondents were not satisfied. It is noted that dependency on forest wood and fodder remains the highest, indicating the availability of wood and grasses in forest and perhaps also lack of alternatives, in Miandam valley, fuelwood collection is mainly a women's job [3].

3.2.2 Indirect Benefits Due to JFM

The indirect benefits of the local community of the study area have been expressed as follows.

1. Employment

The present study revealed that about 11.20% of the sample population was directly benefited from JFM system. Peoples are also engaged in various activities like making of forest tress, cuttings and development like road construction, Marking, plantation, Seed dispersal, watering for newly planted plants, water channel construction and terracing etc.

2. Additional Income

it was observed that 49.90% sampled population were of the view that JFM provided an opportunity for additional income to the local population. Additional income had occurred to them like, Agriculture department with coordination of JFMCs also doing such activities like training to farmers on advance research varieties, distribution of free seeds to farmers and horticulture plant [6]. The major interest of the community is in NTFPs in JFM managed areas where for revenue and meeting subsistence needs generated from timber in the future holds little meaning or value in the beginning Women and children are mainly involved in collection of mushrooms and medicinal plants collected from Miandam forests [3].

3. Trainings and Skill Improvement:

In case of indirect benefits of trainings about 36% of the sample population are benefited. While 32.2% are benefited from skill improvement. Training and skill was received mainly in the field of,

1. Marking
2. Tree cutting
3. Pruning & loping
4. Nursery raising
5. Tree planting
6. Kitchen gardening horticulture
7. Advance agriculture cropping
8. Agro forestry plantation
9. Scientific collection & extraction of medicinal plants
10. Mushrooms collection
11. Bee keeping
12. Sericulture

4. Tourism

The study revealed that about 72.8% of the sample population were of the view that Tourism was increased, the reasons for this increased are (1) the better position of forests that are protected due to JFM system (2) Peace (3) easily accessible as compared to other forest areas (4) Government interest in forest protection as compared to previous governments (5) JFMCs awareness and facilitation campaigns. Tourism has positive impacts over local community i.e., trade improvement, transport improvement, social interaction, education, income generation to the hotel and houses on rent etc.

5. External Investment

It was observed that about 22.2% of the sample population was of the view that JFM is instrumental in attracting external investment by Government, NGOs, Agencies, Firms and other individuals. Many NGOs are actively participating with JFMCs, like SRSP, AWAAZ, LASONA, CDLD, CBI, UNDP etc.

6. Medicinal plants

It was noted that about 30.3% of the respondents were directly benefited from sale of medicinal plants. They collect and extract medicinal plants from forest area and earn their livelihood. During discussion with local community it was found that JFMCs created awareness about the importance and market rates of these medicinal plants, many of them are *Trillium govani* (Mathar jaray), *Paeonia emodi* (Mamakh), *Artemisia spp* (Tarkha), *Berberis lyceum* (Kuray), Spin Gulay, Mushroom (Gujay), Karkora, *Valeriana wallichii* (Musk bala), *Voila serpens* (Banafsha), Babona, Sparkai and Nazar Panra etc., are valuable in market. The peoples are aware and trained about the collection of medicinal plants.

7. Developmental Works

It was noted during the study that about 30.3% of the respondents were of the view that due to JFMC many developmental works are carried out for local community like roads construction, pathways construction, Hydro-electrical generator etc., with the help of various developmental projects.

8. Reduction in Encroachment

It was noted that about 53.9% of the respondents were of the view that Joint Forest Management has assisted to decrease area under illegal encroachments in many places of the study area. Some of the JFMCs members are keen observer of such problems and they are directly in coordination with Forest Officials. JFM plays an important role in re-establishment of usual relations and livelihood rights of local communities over forests. Hence, this policy re-introduced the concept of community based joint forest management institution [7].

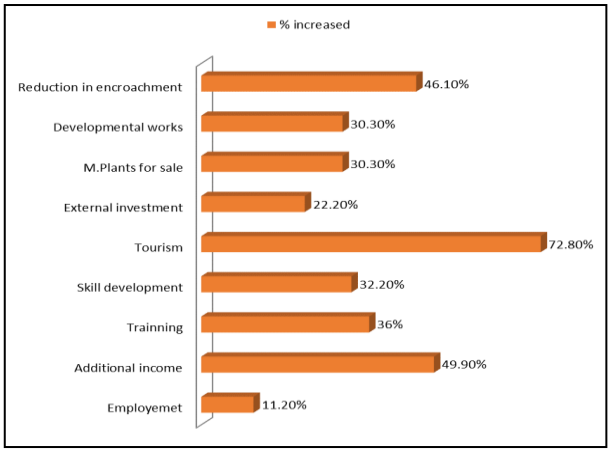

Fig 2: Indirect benefits due to JFM

- **Statistical application of Chi-Square test**

Statistical application of Chi-Square test was applied, Overall Chi-Square value is 366.25 in which P-Value <0.05, seeing as the P-value is less than 0.05 it is declared that the JFM has a strong association with the improvement of management.

3.3 Effect of JFM on forest resource

The survey revealed that 83.1% of the sample populations were of the view that damage to forest decreased after the introduction of JFM. The respondent's view of the decrease in forest damage was also verified from secondary data collected from the office of the Divisional forest officer, Swat Forest division, Swat as shown in Table No 5.

Table 3: Forest damage before and after JFM

Year	Damage before JFM (m3)	Year	Damage after JFM (m3)
2003-04	1008.6	2009-10	215.4
2004-05	226.6	2010-11	125.1
2005-06	225.9	2011-12	125.4
2006-07	962.8	2013-14	107.4
Total	2423.9	total	573.3
Average/year	605.9	Average/year	143.3

Source: Forest damage record (Miandam Planning Unit) at DFO office, SWAT

According to official data, the damage to forest by illegal timber cutting and smuggling decrease from 605.9 m3/year (before JFM) to 143.3 m3/year after introduction of JFM. In other words, the annual damage to forest had been decreased by 323% after JFM. The operations of the forest management activities consist of protecting the forest from over-exploitation, pruning, thinning and plantation, promoting the forest condition by weeding and singling, and harvesting the forest products [8].

7.4 Status of forest and wildlife Damages After JFM

It was noted that 89.3% of the sample population was of the view that damages to forest and wildlife decrease after JFM.

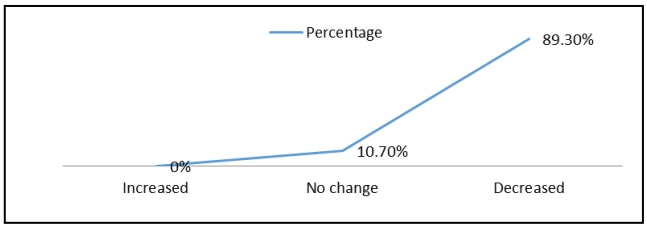

Fig 3: Status of Forest & Wildlife Damages (JFM)

The data analysis determined that there is decrease of forest and wild life damages after the introduction of JFM. During a field visit it was observed that JFMC control illegal grazing, illicit cutting, hunting and over utilization of forest resources NTFPs, due to which forest resources damages was decreased.

- **Statistical application of Chi-Square test**

Statistically it was tested and Chi-Square test had applied which give results Overall Chi-Square 516.66 and P-Value is <0.05. This shows that the Reduction in Forest & wildlife damages has a strong relationship with Joint Forest Management.

4. Conclusion

In the present research work, it is noted that after the introduction of JFM the status of forest damages has been reduced and insect population increased to a great extent. The community was benefited through timber, fuel wood, employment, training and skill improvement. It is also concluded that the local peoples were like JFM and cooperate with JFMCs while hunting and shooting of wild animals had banned after JFM system. It is also noted that the income status of the people has been increased due to direct and indirect benefits of JFM and there were positive socio-economic impacts of JFM on the local community observed by the respondents.

5. Recommendations

Based on the results of the present study the following suggestion must be done in order to conserve the natural resources.

1. Trust and confidence of the concerned rural peoples must be gained by the field functionaries.
2. Local staff should not be posted in JFM areas as they are unable to take action against defaulters.
3. The marking if forest trees to be felled/ removed should be done in the presence of JFMCs members in order to avoid any misconception.
4. There should be no favoritism by JFMC, in the permit allowing people to fulfill their needs.
5. Political interference/involvement should be discouraged.
6. It is recommended that Forest Department should take measures to involve local communities in decision-making as well as in the implementation process of joint related system that will be helpful for future forestry projects.
7. The Forest Department should develop a consensus amongst all involved stakeholders, and there should be uniformity in the perception of beneficiaries regarding a particular forest issue or project.
8. JFMCs should work with the local communities to accelerate the forest management activities instead of waiting some undetected help. On the other hand, forest department needs to win local communities' trust, and it will be solved by the strategy in which both partners should be benefited jointly.
9. The forest department should resolve the conflicts with communities and make sure about that traditional agreements will abide, the conflicts shall be resolved by the wish of all local concerns.
10. The Government especially the forest department must create perceptive understanding about the effects of Joint Forest management on rural life and their socio-economics. Lack of awareness about the impacts of JFM

on local communities was noted.

11. The forest department with the help of donor agencies and NGO's should ensure forest management education, training and capacity building of stakeholders, augment research and its validation and to develop an extension and technical cooperation programs for the validated research results.

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