ECONOMIC IMPORTANCE AND IMPACTS OF INDUS DELTA MANGROVE FORESTS ON LOCAL COMMUNITIES

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ABSTRACT

The study was carried out in Indus Delta Mangrove Forests of Pakistan to assess the economic importance of mangrove forests, impact on local communities and identify the factors responsible for degradation of mangrove forests. Among the eight villages in the total of two sub-divisions, fifty households were selected randomly; 6 – 7 from each village. The results indicated that average household size was seven persons per household having 68% of them one earning member and 70% were directly employed in fishery sector. 80% respondents had their own livestock and agriculture land. *Avuaennia marina* is mostly fed to the animals as lopped from vicinity forests. Water shortage, erosion and salinity were main problems faced by the agriculturists.

The study revealed that only 8% of the respondents were utilizing mangrove vegetation as a whole for fuel purpose. Responses about priority of importance of mangroves showed that shelter and progress of fish was at first priority then shelter and progress of wild birds, shelter and progress of vertebrates, fuel wood, protection barriers for villages, control on tides and erosion of coastal banks, environment apiculture and eco-tourism respectively.

100% of the respondents were in favor of social forestry schemes in the area and 92% of them were willing to plant coconut or date palm at their village, otak or house. Only 4% of the respondents reported that mangrove deterioration is severe due to livestock pressure and decreased fresh water flow downstream in Indus Delta; which resulted in high salinity and stunted growth of mangrove trees and animal life. The measures suggested by respondents included; increased fresh water down stream and control on camels, rotational grazing for livestock, control on cutting for fire purpose and construction of huts for effective regeneration and development of mangrove vegetation.

INTRODUCTION

Pakistan has a long coastline of 1046 km length extended from Jiwani near the Iranian border in the West to Sir Creek Indus Delta in the East adjacent to Indian border. It is perhaps the most intensively studied of all of the Indus ecosystems, being one of the largest areas of arid climate mangroves in the world. It is the fifth largest delta supplied by the eighth largest drainage basin in the world. (Wells and Coleman 1984).

Mangroves, the unique forest type cover an area of about 283000 hectare being 281000 hectares in Sindh and 2000 hectare in Baluchistan (Amjad and Khan, 1983). According to Mirza *et al.* (1983) the mangroves area is estimated to be about 260,000 hectares, being 44% of the total tidal range area of Indus delta. The satellite imagery indicated that about 160,000 ha of the delta are covered with mangroves (Farah and Meynell, 1992).

The mangroves management in Pakistan is under the control of different organizations, the area under the Sindh Forest and Port Qasim Authority are declared as

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"Protected Forests" whereas the area under the control of Sindh Board of Revenue is classified as Government Wasteland and not covered by Forest Act 1927. Sindh has half the coast line length (330 km) of that Balochistan (645 km), but it has a great wealth of mangroves (158,500 ha), about 22 times larger than that of Balochistan (7,340 ha).

Mangroves, the ecological treasures of Sindh, are facing a steady decline due to government negligence, and apathy of the local people. There are many factors responsible for this degradation. Ahmed, (1983) mentioned that grazing, browsing, lopping for fodder, insects, erosion by tidal action and illicit felling are the major causes of degradation of the mangrove forests of Sindh. In addition to these gradual rise in sea level, reduced load of silt and nutrients, industrial and municipal waste, oil discharge, mismanagement and control of some mangroves by other agencies like Revenue Department and Bin Qasim Port Authority also impart in the degradation of these forests.

The main diagnosed problem based on past studies in the existing mangrove ecosystem is a degeneration of the mangrove vegetation and habitat. Based on satellite images, mangroves coverage decreased from about 263,000 ha in 1977 and 160,000 ha in 1991, to about 130,000 ha in 1995. The loss has mainly occurred in the Keti Bundar and Shah Bundar area. While a loss in coverage has taken place, the extent may have been less, because of the incorrect interpretation of the mangrove in 1977 (Farah and Meynell, 1992). Originally eight species of mangrove had been recorded from the Indus Delta, but now only four of them can be found. (Qureshi, 1999).

If the threats to the forests are not checked, huge economic losses could result. Keeping in view the importance of mangrove forests, their deteriorating conditions, their economic importance and impact on local communities, this research was conducted with the objectives to identify factors responsible for degradation of mangrove forests, and to assess the economic importance and impact of Indus Delta mangroves on local communities.

MATERIALS AND METHODS

Location

The coastline zone of Sindh is 330 km long consisting of Indus Delta, which is 200 km long and 50 km wide and extends over an area of some 600,000 hectares, having 17 creeks and extensive mud flats. It is situated between 23° – 50' and 24° – 50' North latitude and 67° – 50' and 68° – 15' East longitude. The Indus Delta is unique amongst the large world deltas. It experiences the highest wave energy of any river in the world, receiving more wave energy in a single day during the monsoon season that the Mississippi Delta in a year (Haq, B. 1999 quoting Wells and Coleman, 1984). The area is not uniform in terms of silvicultural characteristics, and stakeholders. Problems and potentials based on browsing, availability of sweet drinking water, and potential threat to the mangrove vegetation Indus Delta is subdivided into six sub systems including Port Qasim, East Karachi, Keti Bundar, West Shah Bundar/Kharochan, Central Shah Bundar, and East Shah Bundar. The study area for this research (Fig.1) was Indus Delta sub-division Port Qasim (Between Waddi Khuddi and Korangi Creek) and East Karachi (Between Dabbo Creek and Waddi Khuddi Creek).
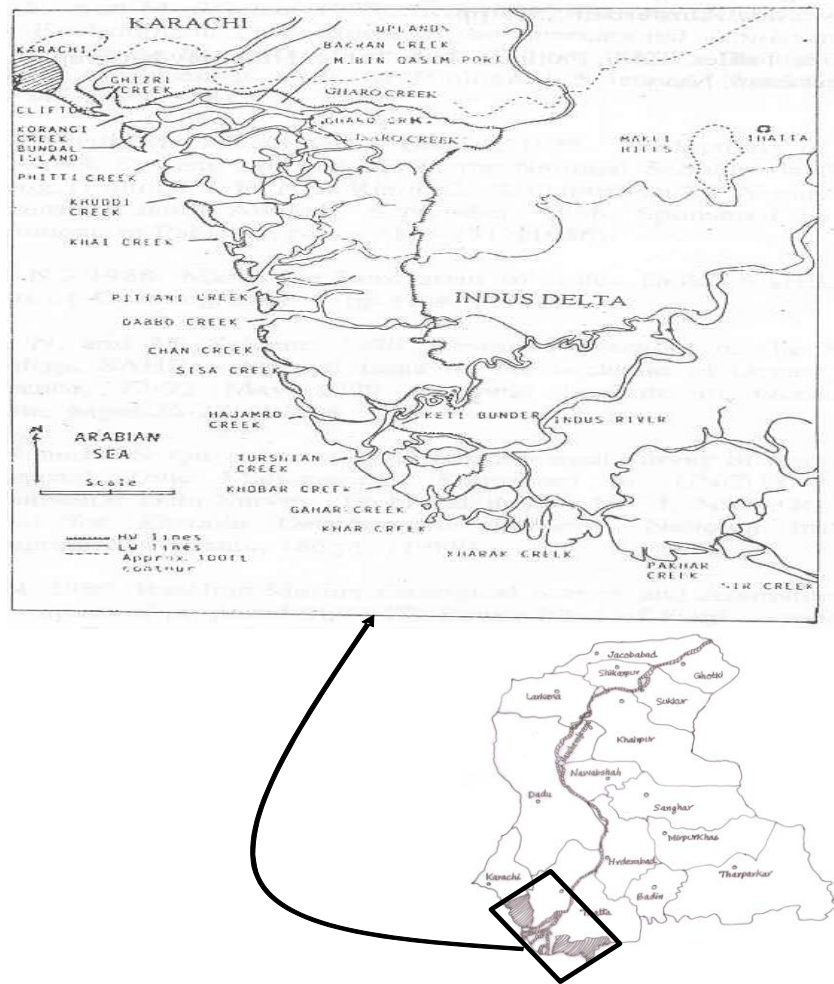
Fig.1. Indus Delta Map Showing Study Site

Instrument

A questionnaire was designed, keeping in view the need and objectives of the study to collect primary data. The questionnaire was pre-tested in Rehri village of the study area. On the basis of the experience gained and difficulties faced in pre-testing phase, the questionnaire was modified accordingly. The questionnaire contained questions about village population housing status, the available facilities in the village, socio-economic information about the household e.g. education level, profession, occupation system and details of household such as number of earning members, occupation of household, income level, expenditure, and information regarding mangrove regenerations and development having questions about use of wood for fire purpose, importance of mangroves, level of deterioration and suggestions for effective regeneration and development. The last part dealt with the social forestry, such as

usefulness of social forestry schemes in the area and willingness of the respondent in planting the trees.

Methodology

Indus delta mangrove forests consist of six sub-divisions and two sub-division i.e. East Karachi and Port Qasim were randomly selected for research purpose. These two sub divisions consist of two dehs and are comprised of eight villages, which make use of sub systems. It was decided to survey all the eight villages. Selection of household was carried out by adopting a two stage random sampling procedure so 6-7 households per village were randomly selected amongst these villages from the list of houses prepared. A total of fifty persons were interrogated belonging to different ages, sexes, professions and educational levels using pre-tested questionnaire. It was fully tried to ensure to have the most representative sample and personal bias avoided. Data gathered through questionnaires were classified, tabulated and were analyzed using statistics techniques.

RESULTS AND DISCUSSION

The results are based on the information obtained from the local people, about the Indus Delta Mangrove Forests, their economic importance and its impact on living standard of the dependent communities. The forest resources recognized in this research are vegetation, forest land, soil, water and fauna. In recent decades with the gradual expansion of agriculture sector and increase in population, the consumption of available water and forest resources also significantly increased resulting in gradual decline in the natural resources. To determine the effects, this research was carried out and the results are discussed below:

Socio-demographic Characteristics of the Respondents

The data showed that Ibrahim Haideri had highest population, number of houses, Pakka rooms, Katcha rooms and huts, where as Haji Khan Goath in Rehri deh had lowest population, number of houses, Pakka rooms, Katcha rooms and huts. It is also visible from the (Table 1) that a maximum number of people were enjoying Pakka rooms.

It was found that 41.33% of the respondents had family size ranging from 5 – 8 members (having 50% male, 46% female and 28% children composition) and 37.33% respondents had the family size between 1 – 4 (having the composition 38% male, 40% female and 34 % children). Even 21.33% respondents had the family size greater than 9 persons (having 12% male, 14% female, and 38% children in the family). It   was   found that people had large families as the average family size in the area was 7 members.

Education facilities were found low in the deltaic region. Education level has been classified into five groups i.e. Primary, Middle, Secondary, Higher Secondary and Religious institutions. All the villages had religious institutions for both male and female, 50% had middle schools for male and female, 37.5% had primary schools for both gender and 37.5% villages had secondary schools for male and 25.0% for female. None of the village in the study area had higher secondary education institute.

Table 1: Survey Village Profile

S. No.	Village Name	Population	Total # of Houses	Pakka rooms	Katcha rooms	Huts
1.	Haji Amir Paro (Rehri Deh)	15000	2000	1500	1000	500
2.	Chasma Goath (Rehri Deh)	9000	1800	2000	1000	500
3.	Haji Khan goath (Rehri Deh)	5000	800	900	400	200
4.	Ibrahim Haideri (Ibrahim Haideri Deh)	26000	3700	6000	2000	1000
5.	Lat Basti Goath (Ibrahim Haideri Deh)	12000	2400	3000	1000	500
6.	Ali Akbar Shah (Ibrahim Haideri Deh)	9000	1500	1600	800	300
7.	Irkan abad (Ibrahim Haideri Deh)	7000	1000	1500	1000	500
8.	Itehad Colony (Ibrahim Haideri Deh)	6000	800	1200	500	100
	Lowest	5000	800	900	400	200
Range	Highest	26000	3700	600	200	1000

As for the literacy status of respondents is concerned it was found that 30 % of the respondents were primary, 22% were secondary, 18% were illiterate, 12% were graduate, 10% were religiously educated and 8% were having higher secondary education. Even not a single respondent or any other family member was reported as post graduate in the surveyed area. The reasons for these low education facilities are the low priority and negligence by the government machinery. The reason for the low education level might be the schools & colleges are far away from the community centers. Gender wise distribution of education level of the family members showed that 62.66% male and 92.10% female were having primary qualification. 9.33% male and 5.26% female had middle qualification. Whereas 18.66 male and 2.63% female had secondary qualification. Only 5.33% and 4.00% male had higher secondary and graduate level qualification respectively. None of the male were post graduate and no female had higher secondary education or above. The reason behind the low education level of female was culturally restricted setting in the villages.

The data showed that 68% of respondents were the only earning source for the family. 22% of the respondents were having one relative other than them as earning source. Only 10% respondents had two relatives along with them to earn bread for the family. Relative may be brother or son working as a hand with the respondent. Most of the families were living in joint family system.

Professions of people of the area are given in Fig.2. 50% respondents were wholly engaged in fishing, while 12% and 8% were engaged in fishing + livestock and fishing + Livestock + agriculture respectively. 6% of the respondents were landlord and 24% were engaged in labour activities. As a whole 70% of the respondents were directly employed in fishing as a profession. This clearly indicates that there is considerable dependence on the local natural resources to survive.
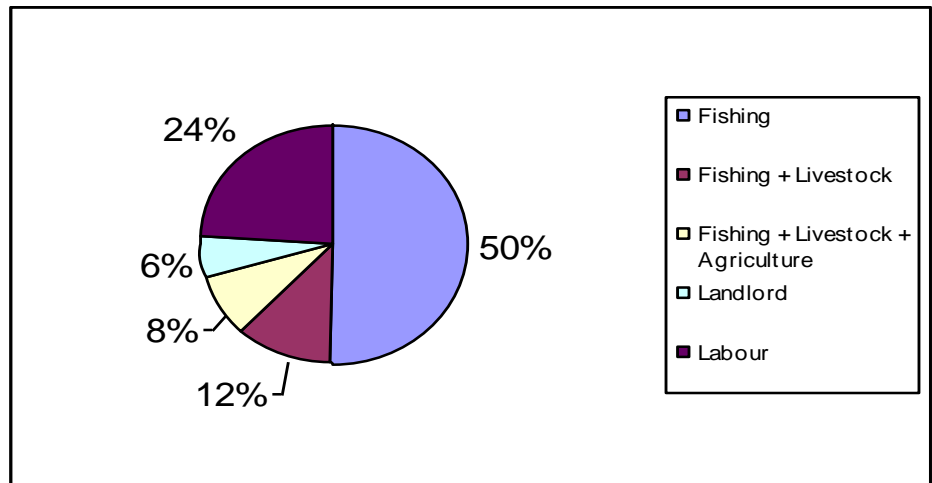
Fig. 2. Distribution of the Sample Population by Profession

Data indicated that low priority have been given to developmental works in the study area as 62.5% of the villages had no water supply and sanitation facility. Moreover revealed the communication was not a very serious problem in the area and access was easy to far flung areas due to road facility 100% of the villages had private transport and public call office facilities, where as 75%, 62.5%, 62.5% and 37.5% of the villages had post office, road, own transport, and public transport facilities respectively. The unavailability of market facility gives way to the monopoly of contractors. Small fishermen are directly affected as 37.5% of the villages had no market facility.

Presence of NGO/CBO

The data revealed that over 66% of the survey area NGO's/CBO's are working where as 34% of it had no external organization working there, which lead to low priority to development works. Membership of the respondents in village organization was found as low as 20%. The cause of low membership in the NGOs/CBOs is probably due to the reason that these communities are not mobilized.

Village organizations are right hand to the government machinery. 74% of the respondents interviewed were in favor of NGOs/CBOs, whereas 26% of them were in not in favor of NGOs/CBOs. The higher favor percentage reflected that local communities although not fully mobilized but understands the importance of community based organizations or NGOs.

Livestock and Vegetation

Livestock is one of the most important factor which determines the condition of forest resources in an area. The data showed that 80% of the livestock herders had their own, while 20% were having partners share too. Regarding type of livestock owned, 50% own buffaloes, 30% of the respondents have camel or buffalo + camel, where as 20% were having buffaloes and cows only. This livestock mostly depends for green fodder on mangrove vegetation. Grazing pressure is increasing day by day as the

demand for milk and meet has increased due to up growing population. The data indicated that 40% of the respondents kept livestock for getting income from sale. It included the sale of extra animal or for culling purpose. Other 40% sold the milk as well. 10% respondents were utilizing livestock for loading and riding purpose each. It is evident from the data results that main purpose for keeping livestock is income generation by their sale or by selling milk.

Moreover, 40% of the respondent grazed their livestock on *Avicennia marina*, *Porterasia coarctat* and *Tamarix dioca.* 20% on *Aleropus insignis* and *Suaeda fruiticosa* to their animals, whereas remaining respondents feed their livestock any of the available such as *Avicennia marina*, *Porterasia coarctat*, *Aegicerus corniculatum, Suaeda fruiticosa*, *Cerlops tagal* and *Tamarix dioca*.

The research results revealed that *Avicennia marina* which is 90% of the mangrove vegetation in the Indus Delta region is constantly under degeneration due to its more palatability to buffaloes, camels, cows, sheep and goats as well as easy access. Grasses, *Porterasia coaretat* and *Aleropus insignis*, and Shrub *Sueda fruiticosa* were also being grazed. For successful plantation non palatable species such as *Rhizophora mucronata* should be planted in gaps to protect it from grazing and to regenerate the denuded areas.

Fishermen Collecting Fuel Wood

Agriculture

One fourth of the persons were growing Wheat + Banana, Rice + other or Rice + Banana each. Other, 25% of the respondents were growing other crops including Barley and Maize for fodder purpose or vegetable crop for their own use.

Yearly Income Level

Fishing

The data on opinion of the respondents about earning from fishing revealed that 42.85% of the respondents were of view of having medium profit, 28.60% were of opinion the loss/survival and 17.14% were of opinion having low profit from this occupation. However 11.42% were having high profit from this profession. The results indicated that the communities engaged in the profession of fishing are better off. The reason behind the loss/survival expressed by the respondents were, dearness, unavailability of market facility and the wearing and tearing of the boats

Livestock Herders

Yearly income level of the sample population has been classified as up to Rs. 100000, 100001 – 200000, 200001 – 300000, 300001 – 400000 and above 400000. Out of ten respondents employed in this occupation, 40% had yearly income ranging between Rs. 200001 – 400000 and 30% of the respondents had Rs. 300001 – 400000. 20% of the respondents had yearly income between Rs. 100000 – 200000 and only 10% of the respondent had above Rs. 400000. No one had yearly income below Rs. 100000. Most of the respondents were engaged in livestock had good earning from this occupation.

Agriculturists

The yearly income of respondents employed in agriculture was grouped in three income levels upto Rs. 100000, 100001 – 200000, and above 200000, respectively. The data showed that 50% of the respondents had Rs. 100001 – 200000 per year; 25 % had upto 100000 or above Rs. 200000 per year income from agriculture activities. As expressed earlier the reason behind low income is the small land holding and other land use problems.

Landlord's Income

The respondents' yearly income from land was splited in three income groups, upto Rs. 200000, 200001 – 300000, and above Rs. 300000. The data showed that 66.66% of the respondents were getting annually between Rs. 200001 – 300000, above Rs. 300000, and 33.33% had upto Rs. 200000 per annum. No person had income above Rs. 300000. It showed that land is productive, the reason behind the low income is small land holding.

Income from Labour Activities

Population living at the coastal area was engaged in different type of labour. 50% of the respondents out of twelve were engaged in fishing. 41.67% of the respondents were engaged in other type of labour activities. 8.33% of the respondents were engaged in fishing + other activities. Being at the coastal area most of the population is employed in fishing directly or indirectly. None of the respondent was involved in livestock labour activity. The yearly three income levels of the respondents from labour activities were

made. Out of twelve respondents interviewed to get their opinion about earning. 83.33% of the respondents were in low (getting upto Rs. 200000) and 16.66% in high income group (getting above Rs. 400000). None of the respondent was in the middle income group. The data analysis showed that there are few people in the area who were getting high profit, whereas maximum number was at lower income level.

Profit Obtained

The yearly savings of the respondents were grouped in to five profit level classes. No profit /No loss, upto Rs. 25000, 25001 – 50000, 50001 – 100000 and above Rs. 100000. The data showed that 46% of the respondents had profit upto Rs. 25000 per year. 20% had gain no profit, 14% had profit of above Rs. 100000, 12% had range between 50001 – 100000 whereas only 8% had profit Rs. 25001 – 50000 per year.

The analyzed data revealed that savings were low in the study area. Mostly people live hand to mouth life.

Respondents' Perceptions about Earning from Various Professions:

Fishing

Majority of the respondents (42.85%) were of view of having medium profit, 28.60% were of opinion just loss/survival and 17.14% were of opinion having low profit from earning from fishing. However 11.42% were having high profit from this profession. The results indicated that the communities engaged in the profession of fishing are better off. The reasons behind the loss/survival expressed by the respondents were dearness, unavailability of market facility and the wearing and tearing cost of the boats.
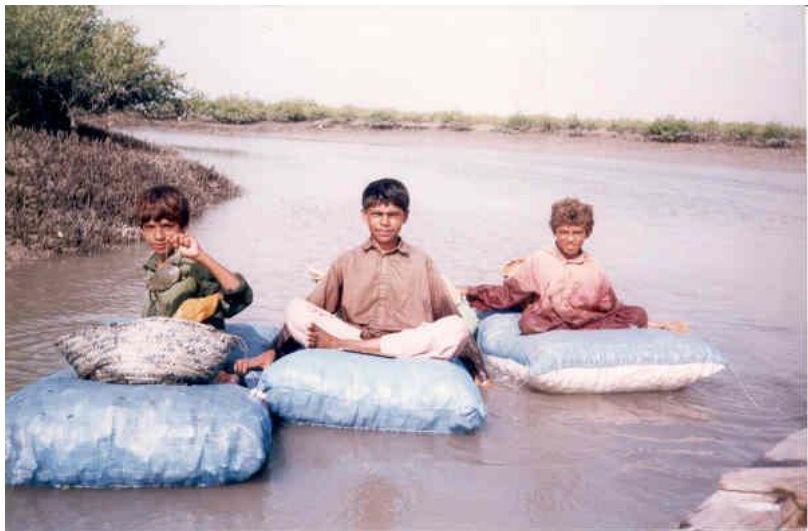
Kids in Search of Livelihood from the Vicinity of Mangroves

Fisherman in Search of Livelihood from the Vicinity of Mangroves

Livestock Earning

The opinion of the respondents about earning from livestock reflected that 80% of the respondents were of view of having medium profit, and 10% of the respondents were of view having high or low profit from this occupation. There was no one which has the view of just loss / survival. The reason behind the profit is the availability of fodder free of cost from nearer mangrove forests.

Agriculture Earning

Opinion regarding earnings from agriculture showed that 75% of the respondents had the opinion as medium profit and 25% had the view as low profit. None of the respondent was having high profit and the opinion of loss / survival. The reason behind medium profit is small land holding and other land use problems.

Response of Landlord about Reasons of no cultivation

Responses of landlords about non-cultivation were also inquired and it was found that water shortage, erosion and/or salinity were the three problems faced by them, which were the main reasons for not cultivating or low productivity.

Erosion was not a serious problem but if the protective barriers 'mangroves" if becomes degenerated then may be serious problem. Being at the tail fresh water is serious problem in the area, and underground water is brackish. Salinity due to sea intrusion is also a serious problem of non-cultivation.

Perceptions Regarding Land Earning

Respondents opinion about earning from the land showed that 66.66 % of the respondents were having medium profit and 33.33% of the interviewee were having just

loss / survival. No one person obtained high profit or low profit from land. It means that the soil is not more productive due to any reason such as water problem, salinity problem or erosion problem.

Earning from Labour Activities

Opinion of the respondents about earning from labour revealed that 50% of the persons engaged in labour showed loss / survival. These persons were engaged in fish catching activities. 25% of the persons showed medium profit from labour. 16.66% received low profit and 8.33% had high profit from labourer activities.The reason behind low percentage in high profit is the monopoly of the middle man working as contractor due to faulty marketing system. Most of the labour lives hand to mouth.

Alternates of Mangrove Tree for Fire Purpose

Fuel type or combination of fuel type used for domestic energy purposes showed that 20% respondents were using *Acacia nilotica* + others and *Avicennia marina* + *Prosopis juliflora* + others as fuel source. 16% were utilizing others only as fuel source on the other hand 12% respondents were using *Avicennia marina* + others, *Acacia nilotica* and *Acacia nilotica* + *Prosopis juliflora* as domestic energy source. Only 8% of the respondents were utilizing *Avicennia marina* + *Phizophora mucronata* (Mangrove vegetation) as a whole for fuel purpose.

Out of twenty respondents 55% proposed *Acacia nilotica* as an alternate source of mangrove vegetation. 35% and 10% suggested *Prospopis juliflora* and *Conocorpus* as an alternate source of mangrove vegetation respectively for domestic energy purpose.

Response Expressed for Importance of Mangroves

Nine important factors were presented to respondents for giving priority number and 94% gave first priority to shelter and progress of fish, 42% gave 2nd priority to shelter and progress of wild birds, 42% gave 3rd priority to shelter and progress of vertebrates. 36% gave 4th priority to fuel wood, 46% gave 5th priority to mangrove protection barriers for villages, 46% gave 6th priority to control on tides and erosion of coastal banks, 36% gave 7th priority to environment, 34% gave 8th priority to apiculture development, and 52% gave 9th priority to eco-tourism (Table 2).

Level of Mangrove Deterioration in the Vicinity

Opinion regarding level of deterioration in the vicinity of was grouped under three opinion classes, severe, moderate and initial. Only 4% respondents rated it as severe deterioration, 24% as moderate and 72% of the respondents mangrove' deterioration at initial stage.

Table 2.   Priority by respondents for Importance of Mangroves

S. No.	Important factor	1	2	3	4	5	6	7	8	9	Total
1.	Fuelwood	1 (2%)	3 (6%)	1 (2%)	18 (36%)	4 (8%)	11 (22%)	4 (8%)	1 (2%)	7 (14%)	50
2.	Shelter and Progress of fish	47 (94%)	3 (6%)	-	-	-	-	-	-	-	50
3.	Shelter and progress of wild birds	-	21 (42%)	20 (40%)	5 (10%)	4 (8%)					50
4.	Shelter and progress of vertebrates	-	15 (30%)	21 (42%)	10 (20%)	3 (6%)	1 (2%)				50
5.	Control on tides and erosion of coastal banks	-	3 (6%)	3 (6%)	4 (8%)	10 (20%)	23 (46%)	7 (14%)			50
6.	Environment	-	1 (2%)	1 (2%)	4 (8%)	7 (14%)	5 (10%)	18 (36%)	7 (14%)	9 (18%)	50
7.	Apiculture development	-	-	-	-	-	7 (14%)	16 (32%)	17 (34%)	10 (20%)	50
8.	Eco-tourism	-	-	-	-	-	-	4 (8%)	20 (40%)	26 (52%)	50
9.	Mangrove protection barriers for villages	2 (4%)	5 (10%)	3 (6%)	11 (22%)	23 (46%)	2 (4%)	2 (4%)	-	2 (4%)	50

Cause of Deterioration

The data revealed the causes of deterioration of mangroves as per respondents view that 32% considered it due to shortage of sweet water, 20% considered due to other livestock, 16% due to fire purpose + other livestock, 14% fodder for camels + other livestock, 8% fire purpose + fodder for camels + other livestock and 6% respondents were of point of view that fodder for camels + construction of huts + other livestock are responsible for mangrove deterioration. Only 4% were blaming fodder for camels + construction of huts as a cause of mangrove deterioration. The most emphasized factors for deterioration are the livestock, camel browsing, fuel use and construction of huts. Ahmed (1983) also reported that grazing, browsing, lopping for fodder, insects, erosion by tidal action and illicit cutting are the major causes of degeneration of the mangrove forests of Sindh.

Suggestions for Effective Regeneration and Development

Respondents suggestions for effective regeneration and development showed that 84% proposed the control on livestock, 50% suggested fresh water + trenching, 48% suggested the control of camels, 38% suggested the check on cutting for fire purpose, 28% suggested agreement on site selection for planting and 16% recommend control on cutting for construction of huts in the mangrove vegetation for affective

Ruthless Lopping of Mangroves for Stall Feeding

regeneration and development of mangroves (Table 3). Data revealed that control on camels and livestock, increased fresh water and control on cutting for fire purpose and construction of huts were mostly suggested measures for effective regeneration and development of mangrove vegetation. Qureshi (2001) reported the control on camel browsing and cutting for fire purpose as suggested measures for effective regeneration / development of mangrove vegetation.

Table 3.   Suggestions for Effective Regeneration and Development

Suggestion	No. of Respondents	Percent
Control on camels	24	48
Control on other livestock	42	84
Control on cutting for fire purpose	19	38
Control on cutting for construction of huts	8	16
Agreement on site selection for planting	14	28
Fresh water + Trenching	25	50

Opinion about Usefulness of Social Forestry

Willingness of the respondents to plant the tree was also inquired and the data showed that 92% of the people were willing to plant the tree and only 8% were against planting. The opposed respondents were of opinion that tree compete with their crops, and reduce their yield. The data analysis depicted 100% respondent were positiveabout the usefulness of social forestry for the area, people and forests. None of the respondents showed negative feelings.

Response expressed by respondents in usefulness of social forestry in different schemes is shown in Table 4. Eight social forestry schemes were presented to them to prioritize them. It is very clear from the table that 86% respondents gave first priority to fodder for livestock, 44% gave second priority to fire wood, 34 % gave third priority as

source of income, 24 % gave fourth priority to environment, 24% gave fifth priority to protection of plants against wind, 30% gave sixth priority to furniture, door, windows etc, 38% gave seventh priority to honey and 22% gave eighth priority to shed shelter as social forestry package.

Table 4.   Response Expressed for Usefulness of Social Forestry

S. No.	Package	1	2	3	4	5	6	7	8	9	10	Total
1.	Firewood	5 (10%)	22 (44%)	8 (18%)	5 (10%)	7 (14%)	2 (4%)	1 (2%)	-	-	-	50
2.	Wood for furniture, door, windows etc.	-	1 (2%)	3 (6%)	7 (14%)	4 (8%)	15 (30%)	10 (20%)	10 (20%)	-	-	50
3.	Fodder for Livestock	43 (86%)	3 (6%)	2 (4%)	-	1 (2%)	1 (2%)	-	-	-	-	50
4.	Shed shelter	-	7 (14%)	2 (4%)	5 (10%)	8 (16%)	5 (10%)	11 (22%)	11 (22%)	-	-	50
5.	Environment	-	10 (20%)	10 (20%)	12 (24%)	9 (18%)	6 (12%)	1 (2%)	2 (4%)	-	-	50
6.	Honey	-	-	-	1 (2%)	3 (6%)	9 (18%)	19 (38%)	18 (36%)	-	-	50
7.	Protection of plants against wind	1 (2%)	2 (4%)	7 (14%)	10 (20%)	12 (24%)	7 (14%)	6 (12%)	5 (10%)	-	-	50
8.	As a source of income	-	7 (14%)	17 (34%)	10 (20%)	6 (12%)	5 (10%)	2 (4%)	3 (6%)	-	-	50

Kind of Trees to be Planted

The response of respondents to the kind of tree to be planted showed that 30 % were willing to plant coconut, 20% date palm, 14% concorpus + date palm, 14% coconut + date palm, 6 % kikar + data palm and 6% were willing to plant coconut + date palm + neem. Only 10% respondents gave no response about the kind of tree to be planted.

Planting Site

The data on question regarding planting site showed that 46 % of the respondents were ready to plant trees at their village common land, 24 % were willing to plant at their village + House / Otak, 20 % were willing to plant at house / Otak. Only 10 % respondents gave no response about planting site. It may be due to the unavailability of space for planting any tree.

CONCLUSIONS

On the basis of the facts drawn from the survey area it was concluded that maximum number of people were enjoying pakka rooms in the study area. Education facilities were low whereas health facilities were adequate. Water supply and sanitation

facility was present in 62.5% villages communication was not a serious problem in the surveyed area and 62.5% of the villages had market facility. In 66% of the surveyed area NGO's/CBO's were working with 20% of the respondents as member to these organizations, and 74% respondents were in favour of these organizations. It was found that 41.33% of the respondents had 5-8 member family size. Majority (30%) of them were educated up to primary. The maximum (92.10%) female were primary only and none of both gender was post graduate. 68% of the families had one earning member.

Maximum number of respondents (70%) were directly employed in fishing as a profession and 50 – 60% of the fishermen community had large catches. It was observed that maximum number of respondents i.e. 20% caught prawn + shrimp, crab and pharra in the surveyed area, whereas catch trend was high to medium and opinion of the respondents about earning from fishing was medium profit oriented with income level upper middle (Rs. 20000 + 30000) / year.

The data regarding livestock showed that 80% herder had their own livestock with maximum (30%) number of camel and buffaloes and main purpose was income generation by selling them or their milk. 40% of the respondents grazed their livestock on P*orterasia coaractat*, *Tamarix dioca* and *Avicennia marina* which is under degeneration due to more palatability. 80% of the respondents had medium profit and had yearly income ranging between Rs. 200001 – 400000 from livestock.

Data revealed that agriculturists had their own land for cultivation. Wheat, banana and rice were mostly cultivated using both new and old implements. 75% of the respondents had medium profit with Rs. 100001 – 200000 per annum income from agriculture.

Water shortage, erosion and salinity were problems faced by landlords and they showed need of funds for seeds and fertilizer purchasing. 66.66% of the respondents were having medium profit from land with annual income between Rs. 200001 – 300000.

The study of the area found that 50 -60% labour activity was done in fishery sector and most of them (50%) showed loss/ survival with annual perception income below Rs. 200000 perception regarding earning from labour activities. In an enquiry regarding the profit obtained by respondents 46% had profit upto Rs. 25000. 25% had not gain any profit, 14% had above Rs. 100000, and 12% had range between 50001 – 100000, whereas only 8% had profit Rs. 25001 – 50000 per year.

It was evident from the study results that only 8% of the respondents were utilizing mangrove vegetation as a whole for fuel purpose and 55% of the respondents proposed *Acacia nilotica* as an alternate source of mangrove vegetation. Response of respondents about importance of mangroves showed that shelter and progress of fish was at first priority, then shelter and progress of wild birds, shelter and progress of vertebrates, fuelwood, protection barriers for villages, control on tides and erosion of coastal banks, environment, apiculture and eco-tourism respectively. The data also revealed that only 4% respondents reported mangrove deterioration as severe. Maximum (32%) of them considered it due to shortage of fresh water down in Indus Delta, whereas 20% of them considered Mangrove deterioration due to livestock.

The results of the study concluded that increased fresh water, control on camels and livestock, control on cutting for fire purpose and construction of huts were mostly suggested measures for effective regeneration / development of mangrove vegetation. 100% of the respondents were in favour of social forestry in the area, and gave first priority to fodder for livestock, then firewood, source of income, environment, protection of plants against wind, wood for furniture, door, windows etc, honey, and shed shelter as social forestry packages respectively. The data indicated that 92% of the respondents were willing to plant coconut or date palm as major choice for plantation at their village common land (46%) or at village, house or otak (24%).

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